CEMVS-PM-E

MEMORANDUM THRU

CEMVS-OD (Fenske) 4/28/06
CEMVS-EC (Baldus) 5/13/06
CEMVS-RE (Koscik) 5/19/06
CEMVS-OC (Lewis) 5.24.06
CEMVS- DP (Kellet) 5-30-06

FOR Commander, St. Louis District

SUBJECT: Supplement No. 2 (High Water Access and Recreational Facilities) Design Memorandum No. 10, The Master Plan, Carlyle Lake, Kaskaskia River, Illinois,

1. References:
   a) Carlyle Lake Master Plan, Design Memorandum No. 10, approved 1997
   b) ER 1130-2-550, Chapter 3: Project Master Plans and Operational Master Plans, 15 August 2002
   c) Keyesport Parking Plan Overview and Boat Ramp Plan, 2004
   d) Impact of High Water on Carlyle Lake Facilities, January 2006 (attached as Appendix 1)
   e) EM 110-1-400 Engineering and Design, Recreation Planning and Design Criteria, July 1987
   f) Letter Report, Subject: Operation Letter Report, Carlyle Reservoir, Illinois, Eldon Hazlet State Park Breakwater Construction and Shoreline Revetment Project, dated August 1998.
   g) U.S. Army Corps of Engineers, Report of Sedimentation, Resurvey, Carlyle Reservoir, Upper Mississippi River Basin, Kaskaskia River, Illinois, 1999
   h) Illinois Dept. of Natural Resources, *Preliminary Bikeway Study Carlyle Lake Clinton County, Illinois,* January 2000

2. Purpose: The purpose of this supplement is to request approval for the following Corps actions not addressed in the current Carlyle Lake Master Plan and provide more information on proposed and future actions at the State Areas:

   Corps Areas

   a) Rehabilitation or provision of high water access at Boulder, Coles Creek, Dam East, Dam West and Keyesport
   b) Provision of adequate breakwater protection at the Boulder main ramp and Dam East high water ramp
   c) Reconfiguration of the Keyesport boat ramp parking area
   d) Realignment and extension of the breakwater to consolidate the harbors at Tradewinds marina

e) Conversion of 8 picnic sites to campsites, 10 walk-in campsites to drive-up campsites and adding 10 campsites in the campground in the Boulder Recreation Area
f) Conversion of 10 picnic sites to campsites in the Dam East Spillway
g) Conversion of 9 Coles Creek picnic sites to campsites and relocation of the picnic shelter to the Coles Creek beach.

State Areas

h) Raising the Eldon Hazlet State Park entrance road to provide access during high water events
i) Provision of an additional high water boat ramp lane at the Apache Boat Ramp and relocation of the Deer Run boat ramp
j) High water protection and improvements at the Carlyle Sailing Association
k) Renovation of the Allen Branch area at Eldon Hazlet State Park
l) Development of a loop road in South Shore State Park to facilitate resort development
m) Development of a lodge/resort at South Shore State Park
n) Replacement of shower buildings and vault toilets at Eldon Hazlet State Park
o) Provision of full-service hookups at some Eldon Hazlet State Park campsites.
p) Establishment of an Internal Bike Trail at Eldon Hazlet State Park.

Corps and State Areas

q) Establishment of a bike trail between Eldon Hazlet State Park and South Shore State Park

3. Background Information: High water access issues and the recommended actions to address those issues are included in the attached *Impact of High Water on Carlyle Lake Facilities* (Appendix 1). High water issues and potential solutions were identified at a February 2003 workshop as listed in Appendix B of Appendix 1. Please refer to the study for more detail and a complete description of the problems, issues and alternatives. General and recreation project resource use objectives as stated in Section 7 of the Master Plan support this supplement's proposed actions.

4. Project Description: This section describes the problems in abbreviated format and identifies the proposed actions necessary to maintain access and provide recreational facilities for lake visitors during high water events. The descriptions are grouped according to the responsibilities of the direct managing agency, i.e., the Corps of Engineers (Corps) or the State of Illinois Department of Natural Resources (State).

a) **CORPS AREAS**

1.) High Water Ramps

High water boat ramps at Boulder, Coles Creek, Dam East, Dam West and the main ramp at Keyesport provide limited access to the lake during high water events (See Figure 3 for ramp locations). Design problems, inadequate size and poor traffic flow have limited their usefulness.

Breakwater protection is needed at the main ramp at Boulder and the high water ramp at Dam East. Corps guidance, as referenced in 1.f., states that breakwater alterations are limited to protecting existing facilities. In addition, expenditures of O&M funds are limited to alteration of the existing or proposed breakwaters to a protection frequency of flooding as was originally designed.

The attached boat ramp study (Appendix 1) describes the problems with the boat ramps and the recommended plan to correct the problems. A brief description of the issues in each area and the proposed plans are summarized below and in Table 1.

All elevations given are in feet NGVD (National Geodetic Vertical Datum). The numbering for plates showing individual recreation areas is the numbering used in the current (1997) Carlyle Lake Master Plan.

a. Boulder Recreation Area (Plate 6): The Boulder main ramp elevation is 450 and the high water ramp elevation is 460. The main ramp experiences problems with wave action from the north and northwest although it does have a breakwater protecting it from West and Southwest wave action. The four-lane main ramp is inundated at 451.5 and then only the one-lane high water ramp is available. The break over angle at the top of the high water ramp is incorrect and trailers in excess of 20' long bottom out at the top the ramp. **Proposed Action:** Correct the design of the existing high water ramp and add an additional lane to the high water ramp. Place an additional breakwater north of the main ramp to protect it from north and northwest winds. Estimated cost of the high water ramp renovation is $51,500, BCR = 1.14; estimated cost of breakwater is $90,000.

b. Coles Creek Recreation Area (Plate 7): The Coles Creek Recreation Area main boat ramp is operational to 450 and the high water ramp to 456. The high water ramp has design problems similar to the Boulder high water ramp: trailers greater than 20 feet have limited underside clearance at the top of the ramp due to the incorrect break over angle of the ramp. The entrance road to the ramp is inundated at 456; therefore, no alternatives with higher elevation than 456 are proposed at Coles Creek. **Proposed Action**: Correct the break over angle at the existing high water ramp; estimated cost is $11,737, BCR = 2.28.

c. Dam East (Plate 9a): The two-lane high water ramp at Dam East is useable to 456 and is partially protected by a breakwater. Issues at this ramp include limited parking at the high water ramp and future development of a resort that would require removal of the high water ramp. The main ramp has four-lanes, but it is low (451) and not protected by a breakwater. **Proposed Action:** Add two lanes to the existing high water ramp with a top elevation of 460, extend the high water ramp parking area and raise the existing high water ramp breakwater. Estimated cost of the high water ramp addition is $117,350, BCR = 2.31; estimated cost of the breakwater elevation is $106,259.

d. Dam West Recreation Area (Plate 4): The Dam West main ramp elevation is 450 and the high water ramp elevation is 456. Recently, a breakwater to the south of

the main ramp was extended and elevated and a docking pier (concrete sea wall) was added north of the main ramp. The traffic circulation pattern at the high water ramp is not efficient and causes delays when the ramp is in use. **Proposed Action:** Extend the existing docking pier to improve the efficiency of the high water ramp; elevation of the new docking pier is 456. Estimated cost is $9,290. In addition, provide additional staff during high water events to manage traffic circulation, parking and provide visitor assistance.

e. Keyesport Recreation Area (Plate 5): The main boat ramp is closed when the lake level reaches 453, the elevation of the boat ramp apron. **Proposed Action:** Raise existing main ramp boat apron from 453 to 455 and reconfigure parking spaces. Cost estimate for ramp apron raise is $108,878, BCR = 4.22.

f. Dam West Recreation Area -West Abutment (Plate 4): There is no public or service access to the lake above 460 elevation. **Proposed action**: To provide public and service access to the lake to 472, a new ramp would be constructed at the west abutment of the main dam. A ramp from 450 to 472 could be placed on the embankment and opened when lake levels reach 456. Parking in the area would be limited, but sufficient to accommodate anticipated demand. Estimated cost is $14,443, BCR = 1.20.

2.) Keyesport Recreation Area and Marina Improvements

a. Keyesport Recreation Area (Plate 5). The closure of the north entrance to the Keyesport boat ramp parking lot (to allow sufficient operational area for Tradewinds Marina) has resulted in congested traffic circulation and inadequate parking at the boat ramp. In addition to being heavily used for fishing tournaments, the area has experienced an increase in use by single party users. A proposed plan to reconfigure the parking layout and improve the signage to correct traffic congestion was developed in the Keyesport Parking Plan Overview (see reference 1.c.). According to the Plan, more parking spaces will be created by expanding the beach parking lot, removing a parking island in the main parking lot, and slightly expanding the main parking lot. In addition, the Horseshoe Island parking lot will be rehabbed to accommodate more vehicle/trailer combinations. These changes would result in a potential gain of 32 additional car/trailer parking spaces for the Keyesport area. **Proposed Action:** Implement the Keyesport Parking Plan and rehabilitate the Horseshoe Island ramp parking area. Estimated cost for the Horseshoe Island rehab is $42,783.

b. Keyesport Marina. Tradewinds Marina took over operation of the marina in June 2003. Prior to their assumption of operations the Corps constructed a breakwater to the south of the original marina harbor as discussed in the current Master Plan. The marina has a total of 125 docks in both harbors and an 85 percent occupancy rate. The harbors have reached their capacities and in order to be financially viable, an additional 125 docks need to be added. Reconfiguring the

breakwaters will create the additional space needed for the marina to meet the requirements of the lease developmental plan. Figure 1 shows the breakwater reconfiguration plan. Cost estimate for the breakwater reconfiguration is $90,000.

3.) Boulder Recreation Area

Boulder Recreation Area (Plate 6). Eight campsites at the Boulder Campground are low in elevation and inundated frequently. Due to a downward trend in picnicking, the Boulder Day Use Area is not heavily used.

Proposed Action: Since it is located on high ground and shaded with large trees, it is proposed to convert 8 picnic sites to campsites with full hookups. Adding the campsites would help maintain campsite availability during higher lake elevations and would increase fee collection revenues. An existing comfort station in the picnic area would serve the proposed campsites. The Boulder campsite plan is discussed in detail in Appendix 1. Total cost is $87,900 and the project's B/C ratio is 1.3.

To create additional camping opportunities and to improve an underutilized area, 10 primitive walk-in campsites in the Boulder Campground will be converted to drive-up campsites with impact areas and electric. An existing service road would provide access to the campsites. The total cost of the project is estimated at $52,025; average annual cost is $3831 and annual benefits total $8,400. The BCR (benefit cost ratio) for this action is 2.19.

Ten campsites and a loop road are proposed for the former dredge placement area at the southern end of the campground. These sites will be a replacement for existing campsites in the Boulder Campground that are located too close together and are scheduled for removal. Estimated cost to develop the 10 campsites is approximately $88,991. Average annual cost is $6554 and annual benefits total $7350; the BCR is 1.12.

4.) East Spillway Recreation Area

East Spillway Recreation Area (Plate 9). Located on the east side of the Kaskaskia River, the East Spillway Recreation Area offers a variety of recreational opportunities including fishing, camping and picnicking. Currently, there are 31 picnic sites and 15 campsites. The campsite occupancy rate is high indicating a significant demand for camping. **Proposed Action**: The proposed action consists of converting ten picnic sites to ten campsites. Campsite plans include impact sites, picnic tables, grills and electrical services. Comfort stations are available in the immediate area and the McNair shower building is located approximately 1 mile to the east. The estimated cost of conversion is $52,025. Annual revenues are estimated at $7350, annualized cost is $3831 and the BCR is 1.92

5.) Coles Creek Recreation Area

Coles Creek Recreation Area (Plate 7). Located on the east side of Carlyle Lake, the Coles Creek Recreation Area offers a variety of recreational opportunities. Camping at Coles Creek is extremely popular and there is a high demand for campsites, while picnicking demand has trended downward. **Proposed Action:** The proposed action consists of converting 9 picnic sites to 9 campsites and construction of a 14' x 600' paved road to provide access to campsites. This would include impact sites, picnic tables, grills and electrical services. In addition, the Coles Creek picnic shelter would be relocated to the Coles Creek beach. Comfort stations are available in the immediate area and the Coles Creek Beach shower building is within a short walking distance. The estimated cost of conversion is $47,110 for the campsites and $36,966 for the paved road. Average annual costs are $6192 with annual revenues of $8505 and a BCR of 1.37.

b) **STATE AREAS** – The State or the Carlyle Sailing Association (CSA) will be responsible for implementing the following actions except where noted otherwise.

1.) High Water Ramps

a. Eldon Hazlet State Park Apache Ramp (Plate 14): The Apache boat ramp is operable to 450. A separate one-lane high-water ramp adjacent to the main ramp is operable to 459.9. **Proposed Action:** If the entrance road is raised as discussed in section 4.b.3., adding an additional high water ramp at this location would be beneficial to meet potential demand.

b. South Shore State Park - Deer Run (Plate 15): Located on a small inlet on the east end of South Shore State Park, this ramp has three problems: the channel to the open water is silted in at the entrance to the lake, it has a low elevation (447) and the entrance road floods at 452. **Proposed Action:** Relocate the boat ramp to the cove entrance when the park loop road is developed as discussed in section 4.b.4.a. Estimated cost is $191,000.

2.) Carlyle Sailing Association (Plate 14)

The following actions address high water impacts at the Carlyle Sailing Association:

a. Breakwater/Levee. A breakwater was constructed to 456 ft. NGVD to protect the Carlyle Sailing Association (CSA) during flood damage reduction operations. However, at the north end of the breakwater there is an area where the CSA is not protected. Corps hydraulics branch personnel indicated that damage to the CSA would occur at higher lake levels if the breakwater was not extended. It is proposed to complete the breakwater by extending it 330 feet to protect the CSA from high

Comment: - Consider some of the funding to address the worst of the bank stabilization problems. While it is true that fixing all of these is beyond the scope of funding available, there are likely to be a "critical few" that could be addressed. (Carlyle Lake Association President)
Response: Shoreline erosion has been studied previously and actions were taken to address the most seriously affected areas. No additional studies or actions are planned now other than those required to protect recreation areas. See Section 10 - 07 of the current Master Plan for more discussion of shoreline erosion.

Comment: Why are we proposing so many boat ramps? (Jim Harris)
Response: New ramps locations are not being added, but we are improving the high water functionality of the existing high water ramps. To improve the efficiency of these ramps we are proposing four additional high water lanes at existing high water ramps: one at Boulder, two at Dam East, and one at Apache in Eldon Hazlet State Park. This is stated in the study goals and objectives of the *Impact of High Water on Carlyle Lake Facilities* report, paragraph 1.b.4 and the recreation resource use objectives of the current Master Plan.

Comment: Raise the water north of the RR tracks to improve waterfowl hunting conditions.
Response: Waterfowlers as a group need to develop a consensus and a plan for the north end of the lake. Once a plan is developed, the plan should be presented to the Corps and State for evaluation.

Response: The economic benefits associated with the CSA facility have been formulated by Mr. Dave Kelly of the Plan Formulation Branch and have been incorporated into the supplement. Above 450.5, using the Unit Day Value Method for computing recreation benefits and the information provided by CSA, the average annual recreation benefits were calculated at $10,444.

Comment: Table 2 of the *Impact of High Water on Carlyle Lake Facilities* report should indicate that the CSA ramp becomes dangerous to use at water levels above 450.5 NGVD because all landmarks indicating the exact location of the ramp are submerged at that water level. Also, parking is not sufficient at water levels above 450 NGVD unless permission is granted to make extensive use of the lot just outside the harbor entrance, which can restrict the use of the adjacent park pavilion. More parking is needed for both boats and automobiles. (Ted Beier (CSA))
Response: The elevation of the CSA ramp has been changed to 450.5 in the supplement. The parking lot outside the CSA lease area is designated as CSA Day-Use Parking, but it also serves as parking for the Olympic Pavilion shelter which is occupied most weekends. This has resulted in reduced parking for CSA member and Pavilion users when the lake levels are higher and the CSA members can no longer park on the CSA lease area. The current Master Plan includes a designated grass parking lot (300' x150') for trailers located within the CSA lease area at approximately 460 elevation. If this parking area was rocked, approximately 150 parking spaces would become available and useable during wet weather and high water.

Comment: In Table I of the supplement document add an entry for a rocked parking area adjacent to the entry road to the high water ramp. Details of this lot may be found in previous work of J. Fowler from your office. The funding source would be "State/CSA". (Ted Beier (CSA))
Response: Concur. This parking lot is designated in the current Master Plan and discussed in the previous comment.

Comment: In Table 2 of the supplement document, show the funding source for the high water improvements entry as "State/CSA". Show the funding source for the high water ramp as "State/Corps". This wording was recommended by Mr. Tatham since this facility will tie into the breakwater being planned under Corps funding. (Ted Beier (CSA))
Response: The Corps could potentially fund the breakwater, but funding for CSA recreational items is the responsibility of the State and CSA.

Comment: Consider relocating Boulder high water boat ramp to the cove from the main body of the lake. (Ric Golding, West Access Marina)
Response: Although this may be a more protected site, it was found that the Boulder campground entrance goes under at 456 which would prevent access above those levels whereas the present location would allow access up to 460.

Comment: Need for improved cell phone service on the lake – public safety issue that needs to be resolved (Larry Hasheider, KWA).
Response: Although safety of visitors is a high priority, a solution to this problem is not within scope of this master plan supplement.

Comment: Need for more biking/hiking trail development – Incorporate trail initiatives into supplement. (Renee Wade)
Response: Bike path development is discussed in Sec 11-08 of the current Master Plan and is supported by the Corps. Trail development around the lake has been studied. Most recently, in 2000, the State funded Oates and Associates to study the trail development between Hazlet State Park and South Shore State Park. A preliminary report was produced, but the study was never finalized. However, a general description of that plan has been added to this supplement and additional study and implementation will be pursued as funding and interest dictates. In addition, the State has developed a plan for an internal bike trail in Hazlet State Park as discussed in the current Master Plan section 8-04, paragraph a.3 (Future Actions). That plan has been added to this supplement as well.

Comment: Assure that trail development does not interfere / cause safety issues for hunters and fisherman. (Jon Mills, CLWA)
Response: Any trail development plans will be take into consideration the multi-purpose nature of the Carlyle Lake project and conditions for trail use will be established to optimize use by all lake visitors.

Comment: Need plan for Cox Bridge.
Response: Cox Bridge is potentially eligible for the National Register of Historic Places. After ownership of the bridge is established, funding can be sought for demolition and/or improvements to the bridge.

Comment: Discuss data discrepancies in Impact Study (Appendix 1) (Ric Golding)
Response: The Corps staff met with Ric and discussed the Study.

Comment: In the *Impact of High Water on Carlyle Lake Facilities* report, include the CSA economic impact in Table 8. Numbers were presented at the meeting which would indicate that the CSA ramp provides the highest economic impact of those listed therein. (Ted Beier (CSA))

Enclosure 1

Carlyle Lake Master Plan Supplement
Review Meeting Public Comments
16 February 2006

Comment: Elevation of Hazlet State Park Entrance Road is unnecessary. (Ric Golding)
Response: Further evaluation of the Eldon Hazlet State Park Entrance Road to permit access during flood events will be pursued as funding and interest dictate.

Comment: The quote in the Impact Study "The terrain around Carlyle Lake is relatively flat and there are no available locations that have an elevation necessary to support a campground or picnic area reasonably close to the lake itself" totally ignores the Dam East Access Area, Group McNair Campground and the South Shore State Park
Response: This quote is found in paragraph 4.b.1 of the Impact study and a similar reference to the topography surrounding Carlyle Lake is found in paragraph 1.c.3 in the Analysis Assumptions and Considerations section that states that "higher ground around Carlyle Lake is limited". Generally, these statements are true, since most of the high ground has already been allocated for other land-based recreation facilities. The McNair Group Use area is almost completely occupied, but has a limited area for expansion and the Dam East Access Area is low and has a population of massasauga rattlesnakes. South Shore State Park could be expanded for more camping, but expansion may be limited by snake and cultural issues.

Comment: South Shore State Park should be returned to the Corps (Ric Golding)
Response: At the present time, the State of Illinois has a 25 year lease with the Corps and current management plans for South Shore State Park were approved in the 1997 Master Plan to meet the needs of the visiting public and these are included in the current approved Master Plan. State plans indicate the park is primarily managed to preserve its natural and cultural resources. However, IDNR's priority for this site, as stated in the Master Plan, is to provide a lodge/resort development. Utility infrastructure for any type development at South Shore would require a substantial investment (> $500,000). If the State decides to relinquish the State Park, an established process would be followed as proscribed in ER 1130-2-550, Appendix B. This requires an area to be closed unless an exception is found.

Comment: Need to provide access to restrooms for boaters without tying up launching lanes (Jeff Tischhauser, CLA)
Response: The Dam West and Keyesport main boat ramps have existing docking piers adjacent to the boat ramps for this purpose.

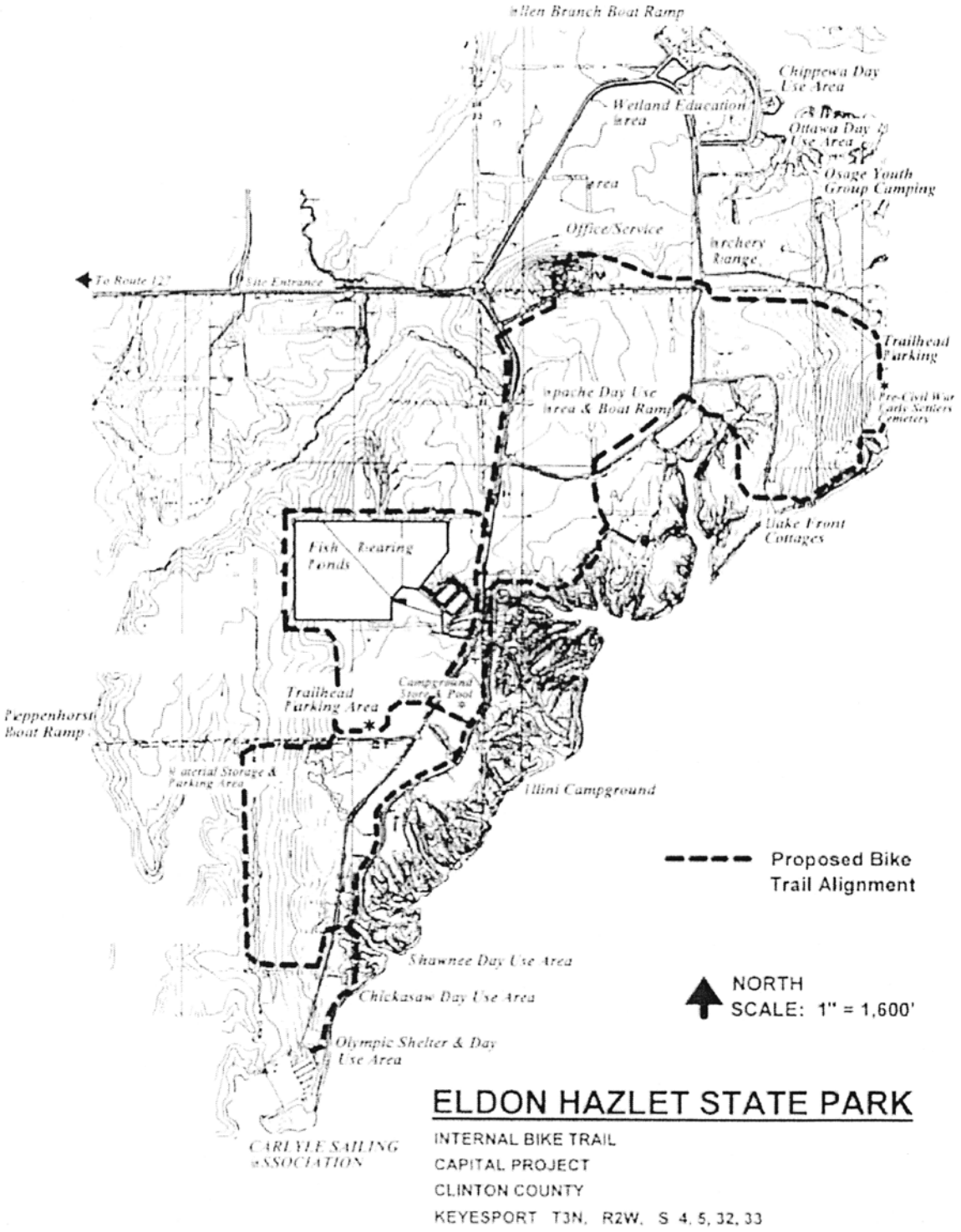


Figure 4 Internal Bike Trail Map

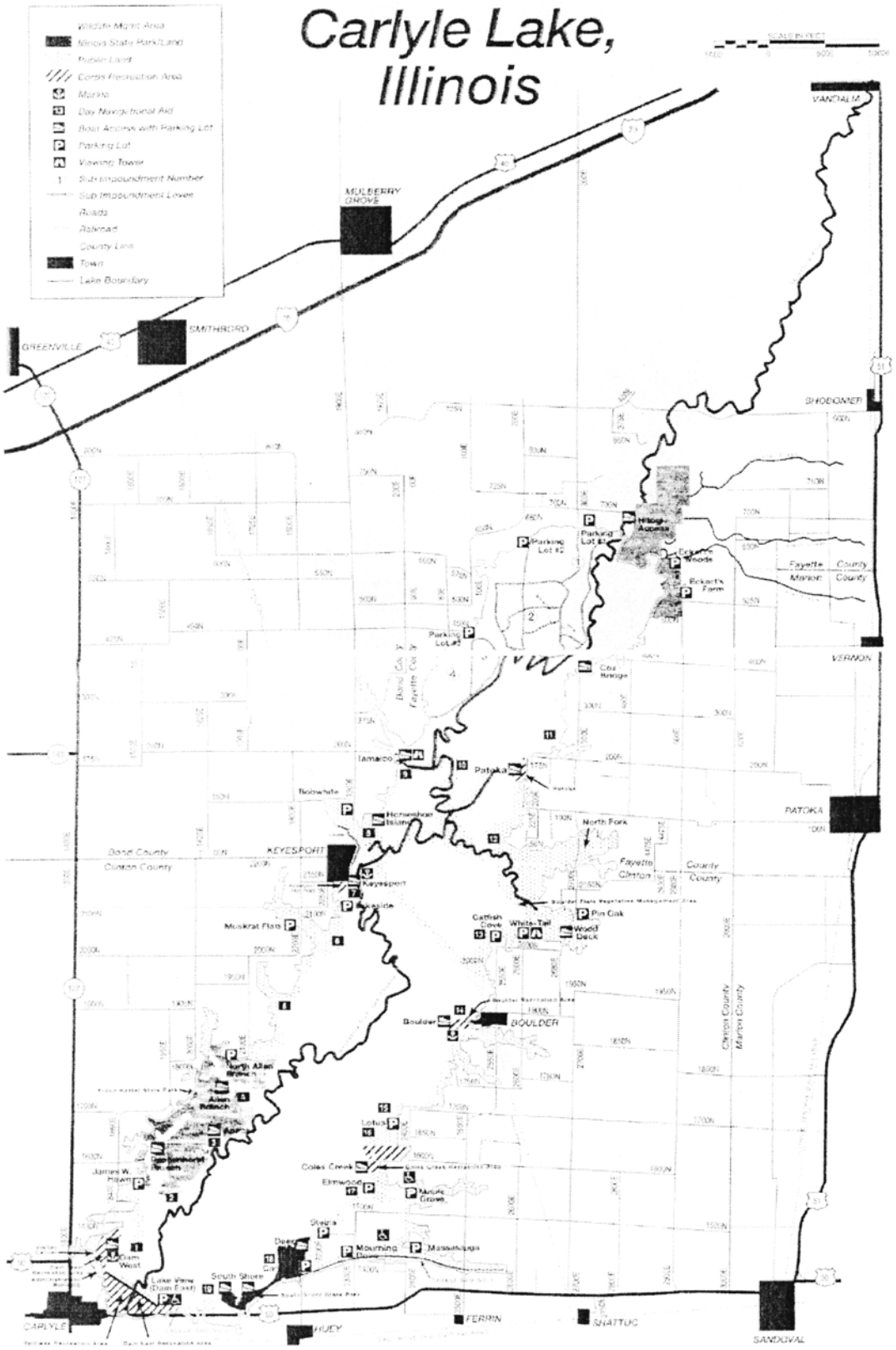
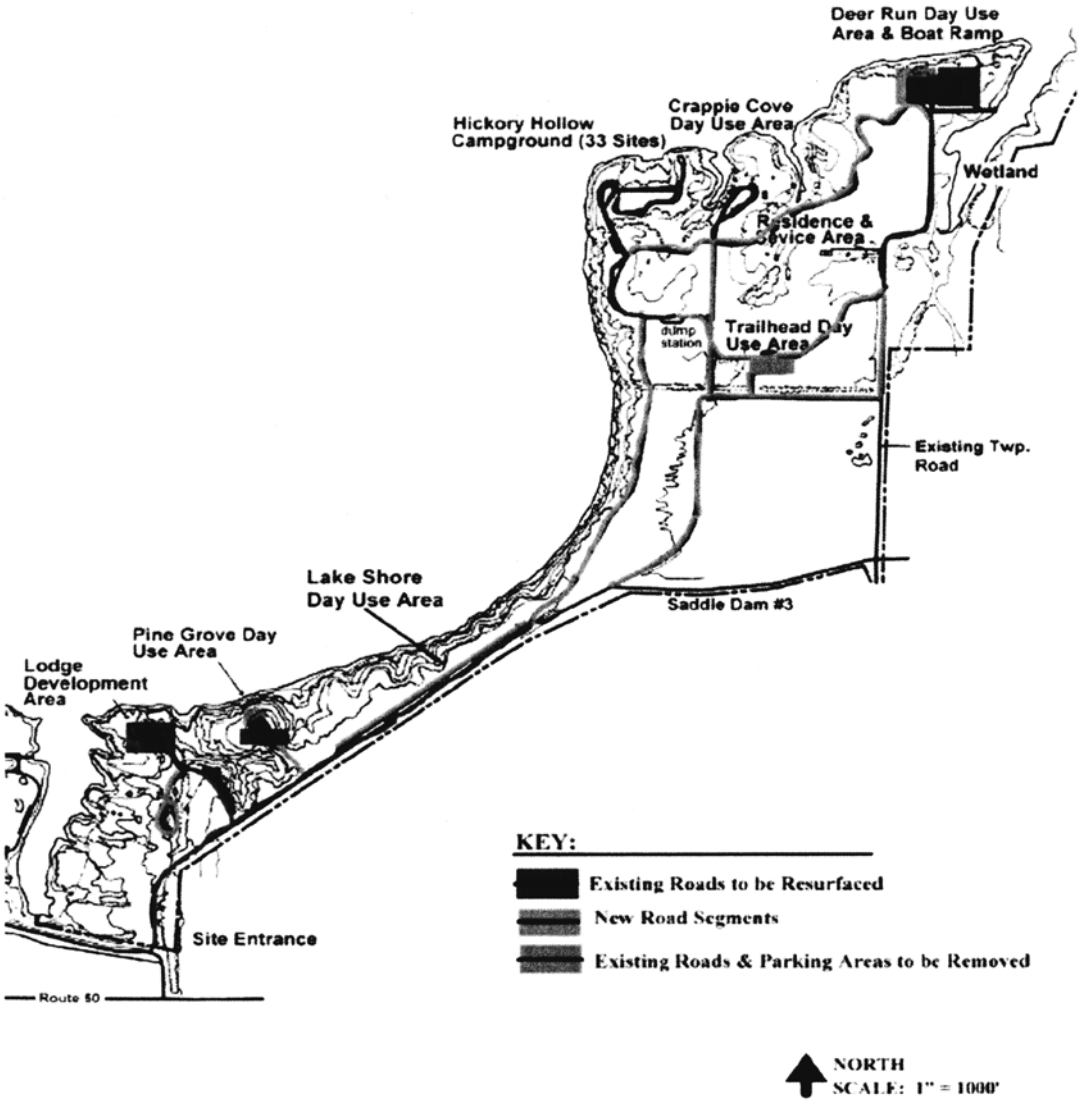


Figure 3 – Carlyle Lake Boat Access Sites



SOUTH SHORE STATE PARK
ROAD IMPROVEMENTS

Plate 2 – South Shore State Park Road Improvements

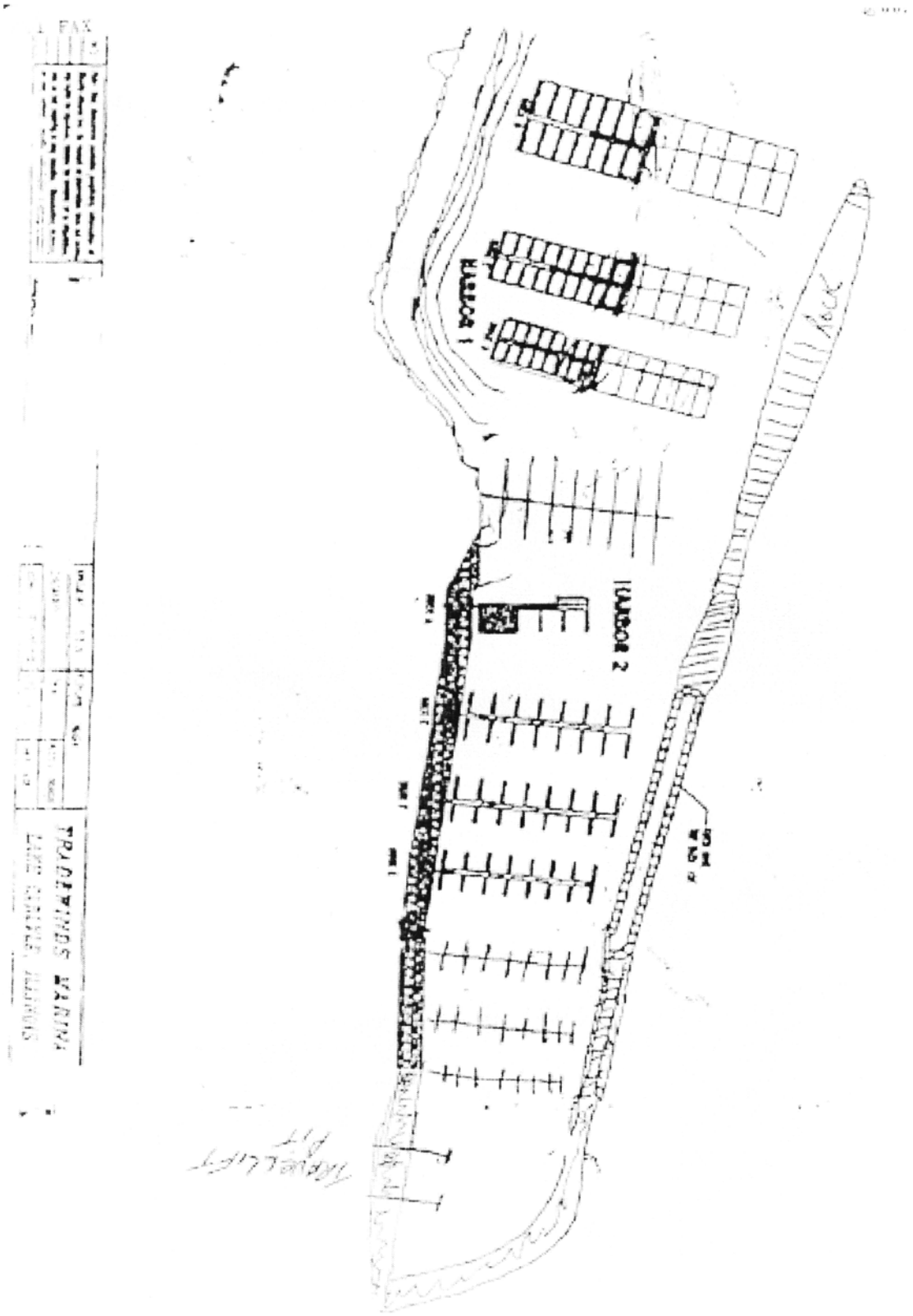


Figure 1 – Tradewinds Marina

9. Recommendations: The proposed actions are in accordance with the Carlyle Lake Master Plan, project resource use objectives and Corps regulations. Approval of this supplement is recommended.

OWEN D. DUTT
Chief, Environmental Analysis Branch

Location	Proposed Action	Funding Source	Cost (no contigencies)	Cost with contingencies (20%)	Environmental Compliance
	High water ramp on breakwater	State	$130,862	$157,034	Categorically excluded
	Rock CSA grass parking lot	State	$42,624	$51,149	Categorically excluded.
South Shore State Park	Add resort/lodge	State	$1.5 to 16 million.	$1.8 to $19.2 million	Impacts were addressed in EA.
	Loop road	State	$3 million	$3.6 million	An EA will be required.
	Relocate Deer Run ramp to cove entrance	State	$191,000	$229,200	Sec 404 permit will address NEPA
State and Corps Areas					
South end of Lake	Lake Bike Trail between Eldon Hazlet State Park and South Shore State Park (Future)	Funding sources will need to be identified.	TBD	TBD	Sec 404 permit will address NEPA

5. Environmental Compliance: Environmental impacts are being addressed as stated in Table 2.

6. Cost Estimate: Cost estimates (with and without contingencies) and funding sources for each project are included in Table 2. Economic justifications for projects are presented in Section 4 and Appendix 1.

7. Public Involvement, Coordination and Technical Review: An initial kickoff meeting to identify issues related to high water was conducted on 3 Feb 2003. See Appendix B of Appendix 1 for a list of concerns, issues and solutions identified at that meeting. The final draft supplement was presented at a workshop on 16 February 2006. Comments received at these meetings were considered and incorporated into this supplement as appropriate. Comments and responses received on the final draft are included as Enclosure 1. An independent technical review was performed by operations personnel and is on file.

8. Conclusions: The proposed projects address the impact of high water on Carlyle Lake facilities and makes efficient, cost-effective proposals to meet the demand for recreational high water access and facilities at Carlyle Lake. This supplement also addresses the need for conversion of picnic sites to campsites, bicycle trails and the potential for resort development at South Shore State Park.

Location	Proposed Action	Funding Source	Cost (no contigencies)	Cost with contingencies (20%)	Environmental Compliance
Dam East Spillway	Convert 10 picnic sites to campsites	Corps	$52,025	$62,430	Categorically excluded.
Keyesport	Raise main ramp apron to 455	Corps	$108,878	$130,654	Categorically excluded.
	Reconfigure boat ramp parking lot spaces	Corps	nominal		Categorically excluded.
	Realign harbor breakwater	Corps	$90,000	$108,000	Sec 404 permit will address NEPA
Horseshoe Island	Rehab parking area to accommodate 6 additional car/trailers spaces	Corps	$42,783	$51,340	Categorically excluded.
State Areas					
Eldon Hazlet State Park	Complete engineering study on raising State Park entrance road.	State	TBD	TBD	Sec 404 permit will address NEPA considerations as well.
	Rehab Allen Branch boat ramp to 5-lanes, pave parking lot, add transfer station, courtesy docks, and fish cleaning station	State	$1.1 million	$1.32 million	Categorically excluded Sec 404 permit, if necessary, will address NEPA considerations as well.
	Replace 20 vault toilets	State	$765,000	$918,000	Categorically excluded.
Eldon Hazlet State Park cont'd	Replace 3 shower buildings. Convert 50-75 standard campsites to full service hook-up sites.	State	$1.25 million	$1.5 million	Categorically excluded.
	Add additional high water lane at Apache Boat Ramp	State	$30,050	$36,060	Categorically excluded.
	Construct an Internal Bike Trail	State	$2.5 million	$3 million	Categorically excluded.
Carlyle Sailing Assoc.	Complete breakwater protection	Corps	$128,750	$154,500	Sec 404 permit will address NEPA considerations as well.
	High water improvements	CSA/ State	$120,000	$144,000	

d) **SUMMARY**

Summary of Proposed Actions: Table 2 summarizes the proposed actions, funding sources, costs and actions required to satisfy environmental compliance requirements.

Table 2 – Summary of Proposed Actions

Location	Proposed Action	Funding Source	Cost (no contigencies)	Cost with contingencies (20%)	Environmental Compliance
Corps Areas					
Dam West	Add docking pier	Corps	$9,290	$11,148	Sec 404 permit will address NEPA considerations as well.
	Add high water ramp at west abutment of dam	Corps	$14,443	$17,332	Categorically excluded
Boulder	Rehab and expand high water ramp	Corps	$51,500	$61,800	Categorically excluded.
	Convert 8 picnic sites to campsites in Boulder picnic area.	Corps	$87,900	$105,480	Categorically excluded.
	Convert 10 walk-in campsites to drive-up sites	Corps	$52,025	$62,430	Categorically excluded.
	Relocate 10 campsites and construct loop road to dredge placement area	Corps	$88,991	$106,789	Categorically excluded.
	Construct breakwater to protect the main ramp.	Corps	$90,000	$108,000	Sec 404 permit will address NEPA considerations as well.
Coles Creek	Rehab high water ramp	Corps	$11,737	$14,084	Categorically excluded.
	Convert 9 picnic sites to campsites and relocate picnic shelter to beach	Corps	$84,076 and $16,280 (shelter)	$100,891 $19,536	Categorically excluded.
Dam East	Rehab high water ramp	Corps	$117,350	$140,820	Categorically excluded.
	Elevate breakwater.	Corps	$106,259	$127,511	Sec 404 permit will address NEPA

Boat Ramp	Alternative 1	Alternative 2	Alternative 3	Recommended Plan	Other
State Areas					
Eldon Hazlet State Park Entrance Rd.	Raise entrance road to 460 or higher. Cost: TBD	N/A	N/A	Further engineering study needed	
Apache High Water, IDNR	Add additional high water ramp adjacent to existing high water ramp (460). Cost:$30,050	N/A	N/A	Alternative 1	
Allen Branch, IDNR	Rehab parking lot and ramp area. Cost: 1.1 million	N/A	N/A	Construction is scheduled for 2006	
Eldon Hazlet	Replace vault toilets, shower buildings and add full-service hookups. Cost 2 million	N/A	N/A	Alternate 1	
Carlyle Sailing Association	Construct high water ramp (455) and access road on proposed breakwater Cost: $131,000 BCR = 1.37	N/A	N/A	Alternative 1	
	Complete breakwater protection of CSA facilities. Cost 128,750	N/A	N/A	Alternative 1	
	Complete high water improvements. Cost: $120,000	N/A	N/A	Alternative 1	
	Rock CSA grass parking area (300'x150'); Cost: $42,624	N/A	N/A	Alternative 1	
Deer Run	Relocate ramp to cove entrance at el. 456 when park loop road is completed. Cost:$191,000	Raise ramp to 452 at same location and dredge mouth of inlet. Cost:$124,900	N/A	Alternative 1	

Table 1 – Comparison of Proposed Alternatives for High Water Facilities and Recommended Plans (Some costs include contingencies)

Boat Ramp	Alternative 1	Alternative 2	Alternative 3	Recommended Plan	Other
Corps Areas					
Boulder	Raise main ramp(450) to 454 Cost: $165,300. BCR is 0.64	Replace high water ramp (460 el.) and add a second high water ramp. Cost: $51,500 BCR = 1.14	Raise main ramp and parking lot to 460 Cost:$842,264 BCR = 0.78	Alternative 2 & breakwater protection	Add breakwater to protect main ramp. Cost: 90,000 Add campground sites to picnic area and camping area Cost::$205,900
Coles Creek	Replace high water ramp (456) with correct design. Cost:$11,737 BCR = 2.28	Raise main ramp (451) and parking lot to 455. Cost:$688,867 BCR = 1.03	N/A	Alternative. 1	
Dam East	Construct new ramp in NE corner of main ramp parking lot (no breakwater). Cost: $38,845 BCR = 3.85	Raise main ramp to 460 Cost: $231,230 BCR = 1.94	Add 2 new ramps adjacent to existing high water ramp and elevate ramp to 460 Cost:$117,350 BCR = 2.31	Alternative 3 & break-water protection	Dam East High Water Breakwater Cost: $122,198
Dam West	Raise main ramp and parking lot to 460 Cost:$1,578,750 BCR = 2.49	Add new docking pier with 456 max. elevation adjacent to existing pier and the existing high water ramp. Cost is $9,290.	Raise main ramp and parking lot to 456 Cost:$1,087,125 BCR = 2.81	Alternative 2	
Keyesport Main	Raise main ramp apron to 455. Cost:$108,878 BCR = 4.22	Raise parking area and ramp to 457. Cost:$597,523 BCR = 1.06	Raise ramp and parking lot to 460 Cost:$978,615 BCR =0 .77	Alternative 1	
Dam West Recreation Area - West Abutment:	Provide high water ramp from 450 to 472 Cost:$14,443 BCR = 1.20	N/A	N/A	Alternative 1	
Horseshoe Is.	Rehab parking lot to accommodate 6 more car/trailer parking spaces. Cost: $42,783	N/A	N/A	Alternative1	

a. This trail would link Eldon Hazlet State Park to the Dam West Access Area, the city of Carlyle, the Carlyle Lake Visitor Center, and South Shore State Park. The trail would be approximately 10 miles in length, and would pass through land controlled by the State of Illinois and the Corps as well as various Townships.

b. The recommended trail alignment would begin near the Concession Area/ Camping Area Main Entrance in Eldon Hazlet State Park and follow existing roadways, the Main Dam and Saddle Dam 2 to South Shore State Park. The preferred spur alignment would traverse through the West Spillway Recreation Area, along the Spillway service road to the General Dean Bridge. The Corps would partner where trail development occurs on Corps lands.

c. Trail sponsors and potential funding sources would be the State of Illinois, Corps, and Illinois Dept of Transportation. Further study and development of trail plans will depend on agency and public interest.

d. A master bikeway plan for the Metro-East area that would tie together the communities of O'Fallon, Lebanon, Breese, Beckemeyer, Aviston, Trenton and Summerfield has been in the planning since 1997. If the Metro-East trail was developed, the Carlyle Lake Bike Trail could tie into that system.

attendance averages over 380,000 visitors at this 305-acre site that is primarily managed for the preservation of its natural and cultural resources while also providing compatible resource oriented recreational activities. Proposed actions include development of a loop road and a resort lodge.

a. Loop Road Rehabilitation: Plans have been developed to rehabilitate the South Shore State Park road system. Proposed actions include realigning a portion of the existing road, a new road loop, a new 20-foot wide paved roadway with aggregate shoulders (2-foot wide in the open and 1-foot wide through wooded areas), roadway removal, upgrading and resurfacing of all existing use area roadways, parking lot redesign and paving, pedestrian trail crossings, site grading and ditching, clearing, culverts, metal vehicular gates, concrete wheel stops, striping, seeding and mulching of all disturbed areas, and landscaping.

The plan shown on Figure 2 is the preferred alternative because it will provide for the greatest utilization of the area by the public. It will provide the best wildlife viewing opportunity and will allow for greater future development of South Shore State Park. The plan provides a more scenic view of the lake, greater site security and visitor safety, protection from road mortality for the area's population of eastern massasauga and would provide high water access to the Deer Run boat ramp or alternative ramp location in the same general area.

Cost of this plan is estimated at $3,000,000. Acquisition of adjacent property and the vacation of the existing County/Township roadway (from Saddle Dam 3 to the existing site roadway system) are necessary for complete project implementation.

b. Lodge Development: A lodge/resort development is proposed and would include construction of both cabins and a separate 100-room lodge with restaurant facilities. Also included in this project would be all site infrastructure/ utilities necessary, paved access road & parking lots, information board/kiosk, roads and parking lot pavement, boat docking facilities for the visitors boats, riprap shoreline protection, public phone service, site/ security lighting, fencing/ vehicular barriers, the seeding & mulching of all disturbed areas, prairie seeding, and all landscaping necessary. The estimated cost of this facility could range between 1.5 to 16 million depending on the level of development. An EA would be required for the resort/lodge when plans are finalized. The lodge resort is discussed in the current Master Plan as future, but now is considered more probable and is being elevated to proposed status.

c) **Corps and State Areas**

1.) Lake Bike Trail. Bike path development is discussed in Section11-08 of the current Master Plan and is supported by the Corps and the State. In 2000, the IDNR funded Oates and Associates to study trail development between Eldon Hazlet State Park and South Shore State Park. A preliminary report was produced, but the study was never finalized.

If the entrance road was raised to 460 or above, approximately 80% of facilities would be open for use including loop roads, comfort stations, campsites, a high water ramp, the Carlyle Lakefront Cottages, a swimming pool and concession store. Further engineering study by the Corps and the State will determine the cost and extent of the road raise necessary to provide optimum access during high water events.

b. Allen Branch Boat Ramp: Allen Branch boat ramp is operable to 450.4. Renovations planned include a new 5-lane concrete boat ramp with concrete maneuvering area and lane striping; new concrete transfer station; heavy duty floating courtesy docks (approx. 360-400 ln. ft.); new bituminous concrete entrance road and parking lot to accommodate 100-150 auto/trailers and 10-15 autos; new site/security lighting (approx. 8 - 10 units); riprap adjacent to new facility installation; new information kiosk for tournament and regulation display; concrete sidewalks to connect facilities; demolition and removal of existing facilities; ADA accessibility provisions for boat access; miscellaneous items including: site grading and drainage improvements, concrete wheel stops, striping, auto/pedestrian signage, seeding and mulching of disturbed areas, and landscaping (with flood tolerant tree species). Construction is scheduled for 2006.

c. Internal Bike Trail: An Internal Bike Trail plan has been developed to accommodate existing demand for bicycling and walking in Eldon Hazlet State Park. The proposed trail plan is shown on Figure 4. Cost is estimated at $2,500,000. Starting at the site entrance, the trail will be constructed as a Class II Trail (one-way road shoulder) approximately 10 miles in length, and will connect all major use areas. Development items include: ditching fill material (both sides of road), site grading and drainage improvements, aggregate base with bituminous concrete paving, striping, trail/vehicular signage, pre-fabricated bridge structures, erosion control improvements, culvert replacements/extensions, shared trail-head facilities for both bikers & hikers (paved access road & parking lot, toilets, information board/kiosk, drinking water/hydrants, bike racks/parking, trail map brochures, etc.), concrete sidewalks & curbing, picnic area facilities (tables, grills, shelter, trash receptacles, etc.), utilities (water, electric, sewer, etc.), public phone service, site/security lighting, fencing/vehicular barriers, the seeding & mulching of all disturbed areas, prairie seeding, and landscaping.

d. Additional proposed projects within the park include replacement of 20 vault toilets, rehabilitation of 3 shower buildings and converting 50-75 campsites to full service hookup sites within the park.

4.) <u>South Shore State Park (Plate 15)</u>

South Shore State Park. South Shore State Park is located on the southeast side of Carlyle Lake approximately three miles east of the city of Carlyle and is being developed and managed by the IDNR via a park and recreation lease. Annual

water wave action. This would be completed and funded by the Corps in accordance with Corps guidance as referred to in 1.f. and 4.a 1. Estimated cost of the extension is $128,750. A high water boat ramp will be constructed on the proposed breakwater. The ramp will be useable to elevation 456 ft. NGVD and will be the responsibility of the State to construct, operate and maintain. The cost of the boat ramp and access road is estimated at $130,862.

b. High Water Improvements. The Carlyle Sailing Association is essentially shut down at lake elevations above 450 ft. NGVD; therefore, the following improvements are needed to insure operation of the harbor and marina above 450 ft NGVD. The CSA and the State will be responsible for these improvements.

- Raising the catamaran field to slope from the present 445 ft. NGVD at normal pool up to 456 ft. NGVD. This can be done with dirt fill and would make the field operational up to elevation 455 ft. NGVD.
- Providing a high water ramp and parking area for the cabin boats with keels. At water elevation 450.5 ft. NGVD, the existing ramp is inoperable for cabin boats. Rocking the grass parking lot would provide additional parking at high water at an estimated cost of $42,624. See paragraph 4.b.2.a. for more detail.
- Adding vertical "Whaler" boards on the sea wall to prevent boats from ramming the metal sea wall. The existing "whaler" board is horizontal at elevation 445 ft. NGVD. The vertical boards would provide protection to boats from 446 to 450 ft. NGVD water levels. The boards, whether 4" x 6" or 2" x 6", would be attached with sections of 4" x 4" angle iron brackets welded to the sea wall. About 15 boards on 10-foot centers would be required.
- Filling the low area on the boat parking lot with asphalt. The parking lot (dry storage area for trailered sailboats) slopes down to the sea wall and then rises. This area is under water at water elevation 450 ft. NGVD, causing pavement damage and unsafe footing

Total estimated cost for these facilities is estimated at $120,000.

3.) Eldon Hazlet State Park (Plate 14)

Several actions are proposed to address high water impacts at Eldon Hazlet State Park:

a. Entrance Road: During high water events, portions of the Eldon Hazlet State Park entrance road are inundated (approximately 1.2 miles of roadway at higher lake elevations), preventing staff and visitor access to all park and concession facilities even though most of the interior road system is unaffected. Major facilities closed by high water include the Carlyle Sailing Association; all concession facilities (camp store, the Carlyle Lakefront Cottages, swimming pool), boat ramps, the 364-site Illini campground, and the administration office/service area. Entrance road improvements are needed so this large recreation area can remain open during high water events in order to serve Carlyle Lake visitors.

Appendix 1:
IMPACT OF HIGH WATER ON CARLYLE LAKE FACILITIES

April 2006

1. Introduction:

a. General: Carlyle Lake project purposes are flood control on the Kaskaskia and Mississippi Rivers, domestic and industrial water supply, releases for the Kaskaskia River Navigation Project, recreation, water quality enhancement, and fish and wildlife conservation. Carlyle Lake is a 26,000-acre reservoir located on the Kaskaskia River at river mile 94.2 and has a drainage area of 2,717 square miles. The Corps operates five intensively developed recreation areas and the State of Illinois has two intensively developed recreation areas on the lake. The Corps manages 9 boat ramp locations and the State manages 7 boat ramp locations on Carlyle Lake.

b. Study Goal and Objectives: This study describes the impact of high water on boat ramps and land-based recreation facilities. Alternatives and recommendations to maintain visitor access during high water events are discussed and cost estimates are provided. The management goal during high water events is to provide safe high water ramps on the open water at well-distributed, functional locations and provide access to land-based recreational facilities. The following are specific objectives for high water facilities (All elevations are in feet NGVD):

1) At a minimum, provide public access to the open lake and recreational facilities to 456 and higher elevation where feasible. Fishermen and other boaters will continue to desire access to the lake at elevations above 456. For these users and other visitors, where feasible and economically reasonable, ramps should be maintained or elevated to 460.

2) Provide or construct sufficient parking at high water boat ramps that is useable during high water events.

3) Provide complete breakwater protection to 455 where necessary and economically feasible.

4) Provide an adequate number of high water ramp lanes at each ramp to maintain efficiency (one for one minimum, two for four lanes optimum).

c. Analysis Assumptions and Considerations: The following factors were considered in evaluating the impact of high water and identifying solutions.

1) Most visitors will continue to use the lake for recreation between 450 and 456.

2) Most Corps of Engineers managed recreation facilities are effectively closed at elevations above 456.

3) Higher ground around Carlyle Lake is limited; therefore, relocation of facilities, especially the land-based facilities, is impractical. Furthermore, entrance roads were not designed for higher lake levels and in certain locations become flooded, cutting off access to recreational facilities on higher ground. In some instances, if access to areas during high water events were available, a significant number of recreation facilities could be open to the public.

4) Visitors come to the lake to recreate on the water, but need the land-based support facilities (picnic sites, restrooms, campsites, beaches, showers, marinas, etc., that are generally not available above 455). Therefore, fewer boat ramps are needed above 456 since visitation is less.

5) Eldon Hazlet State Park facilities (campsites, cabins, pool, picnic sites) are located above elevation 460; however, the road to the park becomes inundated at 456.4. Elevation of the entrance road would allow access to many recreation facilities during high water.

6) Loss of visitation occurs during high water events and results in significant local negative economic impacts (primarily in counties within 30 miles of the project).

7) Inflow into the lake has increased by over 30 percent over the last 10 years possibly due to increased precipitation or other factors.

8) The lake will continue its flood control mission providing downstream flood prevention on the Kaskaskia and Mississippi Rivers in the future in accordance with the water control plan and that will result in higher lake levels on an intermittent basis.

d. Reference:

1) Design of Recreation Areas and Facilities – Access and Circulation – 1982, Chap. 4.

2) Carlyle Lake Watershed Technical Committee, *Carlyle Lake Watershed Plan*, 2002. The Carlyle Lake Watershed Plan planning committee consisted of 28 members representing villages, soil and water conservation districts, drainage districts, the Mid-Kaskaskia River Basin Coalition, environmental groups, farmers, politicians, businesses and the Carlyle Lake Association.

3) Southwestern Illinois RC&D, Inc. *Kaskaskia River Watershed,* 2002

2. Background Information: Previous Flood Impacts and Renovation Efforts

After a record high water event in 1995, the Corps completed several renovations which allowed more facilities to be functional at pool elevations between 450.0 and 455.0. These renovations have lessened the negative impacts to recreation users and the local economy.

Renovations to the Coles Creek Recreation Area were made, including shoreline revetment, raising low areas of roads within the recreation area, raising all campsites in Loop 1 to a higher elevation; replacing campground electrical to allow for the electrical shutoff on specific campsites based on elevation and constructing impact sites for easier cleanup on sites that are susceptible to inundation. Other repairs included repairing damaged campsites in the Boulder Recreation Area and constructing impact sites adjacent to those sites susceptible to inundation, replacing campground electrical to allow for electrical shutoff on specific campsites based on elevation in the Boulder and Dam West Campground, rebuilding eroding campsites and placing revetment on a portion of the shoreline in the Dam West Campground and completing repairs/revetment to numerous areas around the lake where erosion has occurred. In addition, the Keyesport and Boulder marina breakwaters were repaired and raised to provide additional protection to the marina harbors during future high water events.

Also, several additional high water launching lanes were constructed: a single lane ramp in the Boulder and Coles Creek Recreation areas and a double-lane ramp in the Dam West Recreation Area. The IDNR also constructed a high water ramp at the Apache Boat Ramp. These ramps are useable when the regular launching lanes become unusable, i.e., at higher lake levels. In addition, a lane was added to the Dam East high water boat ramp.

3. Statement of Problem:

a. General: High water levels in recent years, have at times, hindered the public's ability to use the lake and land-based recreational facilities. Lake water levels at 450 and above impact Carlyle Lake recreational facilities. As water levels rise, more facilities are impacted. These impacts are detailed in the *Standard Operating Procedure for High Water at Carlyle Lake, Illinois* plan that also identifies actions to be taken to maintain the safety of visitors and prevent damage to facilities. Ultimately, all Corps recreation areas are closed at 456 due to flooding of the facilities themselves or the access to those areas.

b. High water events cause significant impacts to the local economy when they result in the shutdown of recreational facilities around the lake (i.e., boat ramps, campgrounds and day use areas). A report entitled *Recreation Visitor Spending Profiles and Economic Benefit to Corps of Engineer Projects,* produced by the Corps' Environmental Lab in December 2003 studied the local economic impacts of Corps projects. In 1999 the report indicated that campers that boat spent $65.03 per person per trip and day-users that boat spent $19.75 per person per trip in counties within 30 miles of the Carlyle Lake project. Total economic impact in 1999 was $583,319 for campers that boat and $9,637,013 for day use boaters. If some or all of the land-based recreational facilities are closed for many days during the recreation season, the economic impact is felt locally. The Carlyle Lake Watershed Plan stated that a 20 to 40 percent reduction in business occurs[1] when flooding impacts the use of recreational facilities. In 2002, if 30 days of the recreation season had a 50 percent reduction, it would have equated to a 1 to 1.5 million dollar loss in counties within 30 miles of the project. Individuals and businesses have requested the Corps to improve access to the lake when the water levels are high to lessen the local economic impacts and allow visitors to use the lake. They indicated that putting out the official word that the lake is "closed" reduces visitation and impacts local businesses. They expressed hope that access to the water and land-based recreation facilities could be maintained during future high water events.

c. Lake Levels: According to statistics supplied by the Corps' Hydraulics Branch, lake levels were higher and stayed higher more often in the last twenty years than in the project's first twenty years. Duration of water levels for those two time periods is shown in Table 1.

Table 1 – Duration of Water Levels

DURATION				
	1965 – 1984		1985 – 2004	
LEVEL	TOTAL*	PERCENT	TOTAL*	PERCENT
>= 456.00	0	0.0	34	0.5
>= 455.00	26	0.4	49	0.7
>= 454.00	73	1.0	91	1.3
>= 453.00	128	1.8	161	2.2
>= 452.00	234	3.3	264	3.7
>= 451.00	415	5.9	403	5.6
>= 450.00	615	8.7	540	7.5

* cumulative days over corresponding elevation

d. Breakwaters: At Boulder and Dam East main ramps, wave action discourages boaters from launching or makes for unsafe launching conditions due to incomplete breakwater protection or the lack of breakwater protection.

4. Inventory: Carlyle Lake has 18 boat ramp *locations* (grouped by shading in Table 2), 14 of which are located at open water locations. Because the open water locations provide better access to the lake and have more parking available, these ramps were the focus of this study.

a. As shown in Table 2, of the open water ramps, 13 ramp *locations* are still functional when the water level reaches 450, 10 are functional when the lake is at 453, and 6 are functional at 456. The ramps that are still functional at 456 are distributed well geographically, but are limited by parking, number of lanes, their design, or the lack of breakwater protection which discourages use. A map with the location of boat ramp facilities is included as Plate 1.

[1] Carlyle Lake Watershed Plan, 2002, pg. 16

Table 2 – Existing Boat Access Sites

Boat Ramp	Elevation at which Ramp Closes	Design Problems	Breakwater Protection Needed on:	Entrance Road Not Open at High Water	Notes	Parking
Boulder Main	451.5	Low el.;	N-NW		4-lane; incomplete breakwater protection	Sufficient
Boulder High	460	Yes – slope	N-NW		1-lane	Sufficient
Coles Creek Main	451	Low el.			4-lane	Sufficient
Coles Creek High	456	Yes – slope	N-NW		1 –lane	Sufficient
Coles Creek Sailboat	450	Shallow water	N/A		1-lane	Sufficient
Deer Run	447	Silted in at inlet entrance	None	Closes 452	1 lane gravel	Sufficient
Dam East Main	451	Low el.	North		4-lane	Sufficient
Dam East High Water	456	Yes – steep ramp	West (minimal)		2-lane	Sufficient
Dam West Main	451	Low el. and launching ramp traffic circulation	E & N (done)		4-lane	Sufficient
Dam West High	456	None			1-lane	Sufficient
Carlyle Sailing Association	450.5	No launch ramp for cabin boats above 450.5	To complete facility protection	Closes 456	1-lane	Sufficient if water levels not above 450.
Hazlet Apache, IDNR	450	None	N/A	Closes 456.4	2-lane	Sufficient
Apache High Water, IDNR	459.9	None	N/A	Closes 456.4	1-lane	Sufficient
Allen Branch, IDNR	450.5	Low el.	N/A	Closes 452	4-lane	Sufficient
Peppenhorst	450	Low el.; shallow water	N/A	Closes 456.4	1-lane gravel	Minimal
Keyesport Main	453	Low el.			4-lane	Sufficient
Tamalco	453	Channel silted in at normal el.			1-lane	Sufficient
Patoka	453	Channel silted in at normal el.			1-lane	Sufficient
Horseshoe Island	457	Limited Parking			1-lane	Insufficient parking
Cox Bridge	454.5				Not on open lake	Sufficient
Wood Duck	452				1-lane, not on open lake	
North Fork	453				1-lane, not on open lake	
Hitogi	452				Not on open lake	

b. Land-based Recreation Facilities: As shown in Table 3, land-based recreational facilities, i.e., campgrounds, day use areas and marinas are closed as the lake rises. At elevation 455, most land-based facilities are closed.

Table 3 – Land Based Recreation Facilities

Location	Closure Elevation
Dam West Campsites: 5	450
Boulder Campsites: 6; Coles Creek Campsites: 9; Coles Creek Beach Showerhouse and Beach; McNair Beach; Tamalco, Patoka, and Dam East boat ramps;	451
Dam West Campsites: 21;Coles Creek Campsites: 27; Boulder Campsites: 14; Dam West, Coles Creek, Boulder and Allen Branch Main Boat Ramps; Dam West Beach; Coles Creek Beach Shower Building:	452
Dam West Campsites: 30; Coles Creek Campsites:54; Boulder Campsites: 24;	453
Dam West Campsites: 35; Coles Creek Campsites:73; Boulder Campsites: 46;	454
Coles Creek , Boulder , Dam West; Close Entire Campgrounds	455
All recreation areas	456

Several resource concerns have been identified:

1) The terrain around Carlyle Lake is relatively flat and there are limited locations that have the elevation necessary to support a campground or picnic area reasonably close to the lake itself. Eldon Hazlet State Park has recreational facilities located at or above 460 that could provide recreational opportunities if the entrance roadway was elevated from 456 to 460 or 462.5. In addition, smaller campgrounds at South Shore State Park (currently closed), McNair and East Spillway can remain open during high water events.

2) The Kaskaskia River Watershed plan produced in the summer of 2002 by the Southwestern Illinois Resource and Conservation District in cooperation with the Corps of Engineers and Illinois Department of Natural Resources included recreation objectives related to high water such as assisting the private sector in developing business opportunities focused on recreation and developing high water infrastructure facilities at Carlyle Lake[2]. Infrastructure facilities would include boat ramps, campsites and recreational sites.

5. Plan Formulation - Proposed plans for public access improvement have been formulated based on staff knowledge and experience, public input and various planning documents.

a. **Corps Areas**

1.) **Boulder Recreation Area:** The Boulder main ramp elevation is 450 and the high water ramp elevation is 460. The main ramp experiences problems with wave action from the north and northwest. The four-lane main ramp is inundated at 451.5

[2] Kaskaskia River Watershed Plan 2002, pg. 34

and then only the one-lane high water ramp is available. The break over angle at the top of the high water ramp is incorrect and trailers in excess of 20' long bottom out on the top of the ramp.

Three alternatives have been identified to address the demand for high water access:

Alternative 1 would raise the main ramp to 454. The lower southwest corner of the Boulder boat ramp is at 450 and could be raised to 454. Making the four-lane ramp useable to 454 would cost $165,300 including contingencies. Average annual benefits are estimated at $32,252, generating net benefits of $22,668 and a benefit-cost ratio (BCR) of 0.64.

Alternative 2 would correct the existing high water ramp and add an additional lane to the high water ramp to increase efficiency. This alternative with contingencies would cost $51,500. Average annual benefits are estimated at $3,415, generating net benefits of $429 and a benefit-cost ratio (BCR) of 1.14.

Alternative 3 would raise the boat ramp parking lot and main ramp to 460. Parking would not be impacted as the water elevation rises and the four lanes would allow efficient access. The cost estimate for raising the boat ramp and parking lot to 460 is $842,264. Average annual benefits are estimated at $37,943, generating net benefits of negative $10,892 and a benefit-cost ratio (BCR) of 0.78.

Recommendation: Alternative 2: Rehab the existing high water ramp to correct the design problem and add an additional lane.

Breakwater: The existing breakwater at Boulder was designed to protect boaters while they launch and to protect the ramp from wave action from a southwestern direction. There are fewer problems in the summer months, but in the fall and winter, during the hunting season, the wind shifts to the north-northeast. Wave action caused by these winds further damages the ramp and causes additional siltation of the boat ramp. Without complete breakwater protection, boat launching is difficult and visitor safety is compromised. The proposed solution is to extend the breakwater from the shore opposite the end of the breakwater to the northwest approximately 115 feet into the lake. The breakwater will be constructed of approximately 4,150 tons of 400 lb. riprap; the base of the breakwater will be approximately 60 feet in width, the crown will be approximately 20 feet in width, and the height will be built to approximately 455. The construction of this additional breakwater would eliminate the current problems experienced at the ramp and decrease the amount of damage to existing facilities. Cost is estimated at $90,000. Extension of the breakwater at the main ramp would protect the existing government investment during flood damage reduction operations.

Conversion of Picnic Sites to Campsites: During flood damage reduction operations, campsites become inundated and have to be closed. This results in lost revenue and a decrease in visitor services. Picnic sites located in the Boulder Picnic area are largely unused due to a shift in the public's demand for day use facilities. To reduce the number of unused picnic sites and provide needed camping as well as increase revenues, it is proposed to convert 8 picnic sites to 8 full-service campsites.

Proposed Action: As shown in Table 4, eight picnic sites would be converted to campsites in the Boulder Day Use Area at elevation 460. Estimated cost is $87,900. As shown in Table 5, the benefit cost ratio is 1.3.

Recommendation: Convert eight picnic sites to campsites in the Boulder Day Use Area.

Table 4 – Campsite Relocation Costs

Boulder Day Use - 8 Campsites	**Unit Cost**	**Total 8 Sites**
Sites with Impact Areas	$5,443/site	$43,544
Water and Sewer Hookups	$3,000 ea.	$24,000
Extend Access Road 425 ft.	$61.61./ln.ft..	$26,184
Electric service	$1,915/site	$15,320
Electrical Panel	$2,875 ea.	$2,875
Total		**$87,900**
Cost per site Boulder Relocation	$11,225	

Table 5 – Campsite Cost Benefit Ratio

Benefits	Annual
Item	Entire Project
Increased Fee Collection (increase $6.00/campsite/hookup)	($20 per campsite; 50 % occupancy)
Total Revenue	$8,400
Costs	Annual
Initial Construction Costs 20 years at 5.375	$6,473
Benefit/Cost Ratio	1.3

2.) **Coles Creek Recreation Area:** The Coles Creek main boat ramp is operational to 450 and the high water ramp to 456. The high water ramp has design problems similar to the Boulder high water ramp; vehicle/trailers greater than 20 feet have limited underside clearance at the top of the ramp due to the incorrect break over angle of the ramp. The entrance road to the ramp is inundated at 456; therefore, no alternatives with higher elevation than 456 are proposed. Two alternatives have been proposed:

Alternative 1 would renovate the high water ramp to correct this problem. Cost is estimated at $12,900 with contingencies. No breakwater is proposed for this location. Average annual benefits are estimated at $1,707, generating net benefits of $958 and a benefit cost ratio (BCR) of 2.28.

Alternative 2 is to raise the ramp and the entire parking lot to 455. This will provide sufficient parking. Cost is estimated at $688,867. Average annual benefits are estimated at $40,961, generating net benefits of $1,020 and a benefit-cost ratio (BCR) of 1.03.

Recommendation: Alternative 1: Rehab the existing high water ramp to correct design problems.

3.) **Dam East:** The two-lane high water ramp at Dam East is useable to 456 and is partially protected by a breakwater. The issues here are limited parking in the immediate area and the potential for this area to be the location of a resort that would require removal of the high water ramp. The main ramp is four-lanes, but it is low (451) and not protected by a breakwater. Presently, there are three alternatives.

Alternative 1 would relocate the ramp to the northeast corner of the parking lot and place a ramp off the riprap directly to the lake. Cost of adding a new ramp in the NE corner of the main parking lot is $38,845. Average annual benefits are estimated at $9,334, generating net benefits of negative $21,909 and a benefit-cost ratio (BCR) of 0.30

Alternative 2 would raise the Dam East four-lane main ramp and parking lot to 460. That cost is $731,230 If the resort plan is implemented, this may be the only viable alternative since the resort would require the land where the other alternatives are planned. Average annual benefits are estimated at $28,000, generating net benefits of negative $14,396 and a benefit-cost ratio (BCR) of 0.66.

Alternative 3 would rehab the existing high water ramp. Rehabbing the high water ramp would require excavating the adjacent slope to the SE and adding two additional ramps. Estimated cost is $117,350. This would result in a four-lane high water ramp that is located in a protected location and usable to elevation 460. Sufficient parking is available at the Dam East main parking lot. The slope of the existing ramps would remain the same. Average annual benefits are estimated at $15,750, generating net benefits of $8,946 and a benefit-cost ratio (BCR) of 2.31.

The existing high water ramp breakwater would be raised to elevation 460 at a cost of $122,198.

Recommendation: Alternative 3: Because there are no immediate plans for a resort development, rehabilitating the existing high water ramp to include two additional ramps at elevation 460 and raising the existing highwater ramp breakwater is the best option.

4.) **Dam East Breakwater**: The Dam East main boat ramp has no current protection from flooding, and wave action from the northwest. This causes damage to facilities as well as additional siltation of the boat ramp. Visitors using the ramp during heavy wave action have a difficult time launching and retrieving boats causing concern for public safety. The breakwater would be extended northeast approximately 100 feet into the lake and will be constructed of approximately 4600 tons of 400 lb. rip-rap. The base of the breakwater will be approximately 60 feet in width, the crown will be approximately 20 feet in width, and the height will be built to approximately 455. The construction of the additional breakwater would eliminate current problems and decrease the amount of damage to existing facilities and would cost $500,000. If this is not constructed, the boating public could use the high water ramp for launchings when the lake is rough, especially if the high water breakwater is raised (see Dam East Alternative 3).

5.) **Dam West Recreation Area**: The Dam West main ramp elevation is 450 and the high water ramp elevation is 456. Recently, the breakwater was improved by extending it to the Northeast and raising it. Although adequate access during high water is available at Dam West, raising the main ramp and parking lot would provide more parking during high water events. Proposed solutions include the following:

Alternative 1: Raise Dam West boat ramp parking lot to 460. Sufficient parking and all four lanes would be useable. Estimated cost is $1,578,750. Average annual benefits are estimated at $227,593, generating net benefits of $136,053 and a benefit-cost ratio (BCR) of 2.49

Alternative 2: Continue to operate ramps as usual, but improve efficiency by providing additional staff members during high water events to monitor parking and

provide visitor assistance. Add additional docking pier adjacent to the existing docking pier at elevation 456 at a cost of $9,290.

Alternative 3: Raise Dam West boat ramp and parking lot to 456. Estimated cost is $1,087,125. Average annual benefits are estimated at $177,014, generating net benefits of$113,982 and a benefit-cost ratio (BCR) of 2.81.

Recommendation: Alternative 2: Continue to operate the main boat ramp as usual and add on to the existing docking pier.

6.) **Dam West Recreation Area - West Abutment:** To provide public and service access to 472, a new ramp would be constructed at the west abutment to the main dam. A ramp from 450 to 472 could be placed on the existing rip rap and opened when lake levels reach 456. Limited parking is available. Estimated cost is $16,610 with contigencies. Average annual benefits are estimated at $1,156, generating net benefits of $193 and a benefit-cost ratio (BCR) of 1.20.

7.) **Keyesport Recreation Area:** Multiple fishing tournaments departing from the Keyesport Recreation Area as well as popularity of the ramp for access to recreation on the north end of the lake create a large demand for parking in the Keyesport area as well as an efficient ramp that operates to 455.

Keyesport Boat Ramp: The Keyesport boat ramp is closed when the lake level reaches 453.

Alternative 1: The proposed plan is to raise the ramp apron from 453 to elevation 455. The cost estimate for the project is $119,770 with contingencies. Average annual benefits are estimated at $29,315, generating net benefits of $22,371 and a benefit-cost ratio (BCR) of 4.22.

Alternative 2: Raise ramp and parking lot to 457. This option would provide additional parking during high water events as well as access above 455. Cost estimate is $597,523. Average annual benefits are estimated at $36,643, generating net benefits of $1,999 and a benefit-cost ratio (BCR) of 1.06.

Alternative 3: Raise ramp and parking lot to 460. This option would provide maximum parking as well as permit use to the highest lake elevation. Cost estimate is $978,613. Average annual benefits are estimated at $43,972, generating net benefits of negative $12,978 and a benefit-cost ratio (BCR) of 0.77.

Recommendation: Alternative 1: Raise existing apron from 453 to 455.

8.) **Horseshoe Island:** Horseshoe Island boat ramp parking will be reconfigured to create more car/trailer parking at an estimated cost of $49,200 with contingencies.

9.) **Tamalco:** The ramp closes at 451.5. Area is open to 453.1 when the access road to the ramp is used as a high water ramp. The channel off the boat ramp silts in and does not permit lake access at low water. There are no plans for improving boat access at this area.

10.) **Patoka:** The ramp closes at 451.5. Area is open to 453.1 when the access road to the ramp is used as a high water ramp. Shallow water off the boat ramp prevents large boats from using this area at low or summer pool lake levels. There are no plans to improve this area.

11.) **Wood Duck:** The ramp closes at 452. This ramp is not on the main lake. There are no plans to improve the ramp at this area.

b. **State Park Areas**

1.) **South Shore State Park - Deer Run:** Located on a small inlet on the east end of South Shore State Park, this ramp has three problems: the channel to the open water is silted in at the entrance to the lake, it has a low elevation (447) and the entrance road floods at 452. Two alternatives have been proposed.

Alternative 1: The State Park management has proposed relocating the park road on the east end of South Shore State Park to provide improved access to a future lodging location, avoid impacts to the endangered massasauga rattlesnake and provide access during high water events to the east end of the park. This alternative would relocate the Deer Run boat ramp to higher ground (456) at the mouth of the inlet when the State Park loop road development is implemented. Cost is estimated at $90,766 (later revised to $191,000). Average annual benefits are estimated at $9,752, generating net benefits of $4,490 and a benefit-cost ratio (BCR) of 1.85.

Alternative 2: Raise ramp in present location to 452 (entrance road low elevation) and dredge out the mouth of the inlet. Average annual benefits are estimated at $3,706, generating net benefits of negative $41,717 and a benefit-cost ratio (BCR) of 0.8.

Recommendation: Alternative 1: Relocate the ramp to higher ground at entrance to cove if the proposed South Shore State Park loop road development is implemented.

2.) **Eldon Hazlet State Park - Entrance Road:** The entrance road to Hazlet is inundated and closed at lake elevation 456.4 and that prevents the use of all recreation facilities in the park. Eldon Hazlet State Park has recreational facilities located at 460 and above that could provide recreational opportunities during high water events if the entrance roadway was elevated.

IDNR is proposing to study raising the entrance road in partnership with the Corps. If the entrance road was raised to 460 or above, approximately 80% of facilities would be open for use including loop roads, comfort stations, campsites, a high water ramp, cabins, a swimming pool and a store. Further engineering study will determine the cost and extent of the road raise necessary to provide optimum access during high water events.

3.) **Apache Ramp**: The Apache boat ramp is operable to 450. A separate one-lane high-water ramp adjacent to the main ramp is operable to 459.9. If the entrance road is raised, adding an additional high water ramp at this location would be beneficial. The IDNR would incur all costs of the construction. Cost is estimated at $30,046. Average annual benefits are estimated at $2,553, generating net benefits of $811 and a benefit-cost ratio (BCR) of 1.47.

4.) **Allen Branch**: Allen Branch boat ramp is operable to 450.4. Renovations are planned in 2006 for Allen Branch at Hazlet State Park that will include rehabbing the boat ramp (to 5-lanes with a transfer station), courtesy docks, parking areas, and riprap areas. New items include a fish cleaning station and universally accessible provisions for boat access. Construction is scheduled for 2006. In a separate action it is proposed to replace 20 vault toilets, 3 shower buildings and 50-75 full service hookup sites within the park

5.) **Peppenhorst Branch**: The ramp closes at 449.9. Shallow water off the boat ramp does not allow launching of deeper draft boats. There are no plans for this area.

6.) **Carlyle Sailing Association (CSA):** The public boat ramp is inoperable above 450.5. The entrance road to Hazlet floods at 456. The jib crane launching facilities for CSA members is operable to 452. The harbor is shut down above 452.

1. The Corps constructed a 1,000 foot breakwater to 456 to protect harbor facilities in 1995. However, a 330-foot extension of the breakwater is needed to fully protect all the CSA facilities at high water. Cost of the breakwater is estimated at $154,500 including contingencies.

2. The CSA has proposed constructing a high water ramp (elevation 455) on the proposed breakwater specifically to accommodate the cabin boats with large keels Cost of the ramp and access road is estimated at $131,000 with contingencies. Construction of this facility would be the responsibility of the State and the Corps.

Recommendation: Construct a 330 foot breakwater and high water ramp to protect the shoreline, existing facilities and provide visitor safety.

7.) **Hitogi:** The ramp closes at 454.51. This ramp is not on the main lake. There are no plans to improve the ramp at this area.

8.) **North Fork:** The ramp closes at 453. This ramp is not on the main lake. There are no plans to improve the ramp at this area.

6. Evaluation Process: In general, the evaluation of alternatives was based on the study objectives and the results are shown in Table 6:

a. Access road and ramp at 456 and above.
b. Sufficient parking is available.
c. Breakwater protection is present.
d. Sufficient number of ramp lanes.
e. Best location/geographically distributed.
f. Benefit/cost ratio.

Table 6 – Evaluation of Boat Access Alternatives

Ramp	Access /Ramp at least 456	Sufficient Parking	Breakwater Protection	Ramp lanes sufficient/ adequate	Best Location	BCR	Preferred Plan
Corps Areas							
Boulder							
Alt 1 Raise Main Ramp to 454	N	Y	Y	Y	Y	0.64	Alt 2
Alt 2 Improve existing highwater ramp	Y (460)	Y	N	Y	Y	1.14	
Alt 3 Raise Main Ramp to 460	Y	Y	Y	Y	Y	0.78	
Coles Creek							
Alt 1 Renovate highwater ramp	N (455)	Y	N	Y	Y	2.28	Alt 1
Alt 2 Raise main ramp and parking lot to 455	Y	Y	Y	Y	Y	1.03	
Dam East							
Alt 1 Construct high water ramp to NE corner of main ramp lot	Y	Y	N	N	Y	3.85	Alt 3
Alt 2 Raise Main Ramp to 460	Y	Y	N	Y	Y	1.94	
Alt 3 Add 2 lanes to high water ramp and useable at elevation 460	Y	Y	Y	Y	Y	2.31	
Dam West							
Alt 1 Raise Main Ramp to 460.	Y	Y	Y	Y	Y	2.49	Alt 2
Alt 2 Add traffic control and docking pier	y	Y	Y	N	Y	--	
Alt 3 Raise Main Ramp to 456.	Y	Y	Y	Y	Y	2.81	
Keyesport							
Alt 1 Raise Main Ramp apron to 455	N (455)	Y	Y	Y	Y	4.22	Alt 1
Alt 2 Raise ramp and parking lot to 457	Y	Y	Y	Y	Y	1.06	
Alt 3 Raise ramp and parking lot to 460	Y	Y	Y	Y	Y	0.77	
State Areas							
Deer Run							
Alt 1 Relocate ramp to cove entrance	Y	Y	N	Y	N	1.85	Alt. 1
Alt 2 Raise existing ramp to 452	N	Y	Y	N	N	0.8	

7. Comparison of Alternatives.

a. Evaluation of alternatives, where available, will primarily be based on the reasonableness of cost, the recreation benefits maintained (the benefit cost ratio) and the potential for functionality

b. Cost Estimate Summary and Economic Analysis – This cost estimate has been developed from general cost estimates prepared in the field. An appropriate contingency was applied to each estimate as shown in Table 7.

Table 7 – Comparison of Alternatives in Corps and State Areas

Boat Ramp	Alternative 1	Alternative 2	Alternative 3	Recommended Plan	Other	Other
Corps Areas						
Boulder	Raise main ramp to 454 and increase breakwater protection Cost:$165,300	Replace ramp at 12% grade, – Cost: $30,500 Add second high water ramp Cost: $21,000	Raise main ramp and parking lot to 460 Cost:$842,260	Alternative 2 & breakwater protection for main ramp	Add breakwater Cost: 90,000	Relocate campground Cost:$87,900
Coles Creek	Correct high water ramp Cost:$12,900	Raise ramp and parking lot to 455 Cost:$688,867	N/A	Alternative 1		
Dam East	Construct new high water ramp in NE corner Cost:$38,845	Raise main ramp to 460 Cost: $231,230	Add 2 new ramps at 12% grade adjacent to high water ramp Cost:$117,350	Alternative 3 & breakwater protection	Dam East High Water Breakwater Cost: $122,198	Dam East Main Ramp Breakwater Cost: $500K
Dam West	Raise main ramp and parking lot to 460 Cost:$1,578,750	Raise dock pier to 456 and staff parking lot to monitor traffic. Cost:$20,000	Raise ramp and parking lot to 456 Cost:$1,087,125	Alternative 2		
Keyesport Main	Raise main ramp apron to 455. Cost:$119,770	Raise parking area and ramp to 457 Cost:$597,520	Raise ramp and parking lot to 460 Cost:$978,615	Alternative 1		
Horseshoe Island	Rehab parking lot to accommodate more vehicles with trailers Cost:$49,200			Alternative 1		

Boat Ramp	Alternative 1	Alternative 2	Alternative 3	Recommended Plan	Other	Other
Dam West Abutment:	Provide high water ramp from 450 to 472 Cost:$16,610			Alternative 1		
State Areas						
Eldon Hazlet State Park Entrance Rd.	Raise entrance road to 460 or higher. Cost Estimate: TBD			Further engineering study needed		
Apache High Water, IDNR	Add additional high water lane Cost:$30,050			Alternative 1		
Allen Branch, IDNR	Rehab parking lot, ramp modifications, fish cleaning station Cost:1.1 million			Alternative 1		
Carlyle Sailing Association	Construct high water ramp (455) and access road if breakwater is completed. Cost: $131,000			Alternative 1		Complete breakwater protection if justifiable – Cost: $154,500
Deer Run	Move ramp to location on open water, if park loop road is completed Cost:$191,000	Rehab ramp at same location and dredge mouth of inlet Cost:124,900		Alternative 1		

8. Benefits Evaluation: The unit-day value (UDV) method was used to evaluate the economic impacts of each alternative as specified in the National Economic Development (NED) benefit evaluation procedures, contained in ER 1105-2-100 (2000). The UDV, based on General Recreation for Carlyle Lake, was determined to be $4.95 to $10.69 as shown in Appendix A. The UDV and the CY 2002 and 2004 visitation data were used to calculate the economic benefits gained, if the recreation facilities were constructed. The benefit cost ratio and the results of the analysis are shown in Table 8.

Table 8 - Benefits Evaluation

Boat Ramp	Recom-mended Alternative	Average Annual Benefits Recreation	Annualized Cost	Benefit/Cost Ratio
Corps Areas				
Boulder	Alt. 2 & Breakwater	$ $3,415	$	1.14
Coles Creek	Alt.1	$1,707	$749	2.28
Keyesport	Alt. 1	$29,315	$6,944	4.22
Dam West Abutment:	Alt 1.	$1,156	$963	1.20
Dam East	Alt 3 & Breakwater	$15,750	$6,804	2.31
Dam West	Alt. 2	N/A		
State Areas				
Eldon Hazlet State Park Entrance Rd.	Further study needed			
Apache High Water, IDNR	Alt. 1	$2,553	$1,742	1.47
Allen Branch	Construction scheduled			
Carlyle Sailing Assc.	Alt. 1	$8,355	$7,595	1.1
Deer Run	Alt.1 ($90,766)	$9,752	$5,263	1.85

9. Public Participation - Public meetings: Public involvement consisted of a master plan workshop/high water brainstorming session conducted on 27 February 2003 that included interested individuals and local business interests to discuss the options to keep the lake open during high water events. In addition, visitor comment cards and personal knowledge of the lake staff were used to identify issues related to high water events. One of the comments from that meeting included an expressed interest in ramps that are open to 475. However, having ramps that are functional to 455 (or higher where feasible) appeared to have the most consensuses. All the comments from the meeting are provided in Appendix B.

10. Conclusions, recommendations and approvals: Proposed actions for resolving the high water impacts have been addressed in this study. Generally ramps exist or can be made functional to 456 in a geographically balanced array around the lake. Ramps accessible to 460 would be available to 460 on each side of the lake: Boulder, and Eldon Hazlet. One ramp could be provided that would be accessible to 472 at Dam West. The recommendations of this study will be implemented through supplementation of the Carlyle Lake Master Plan.

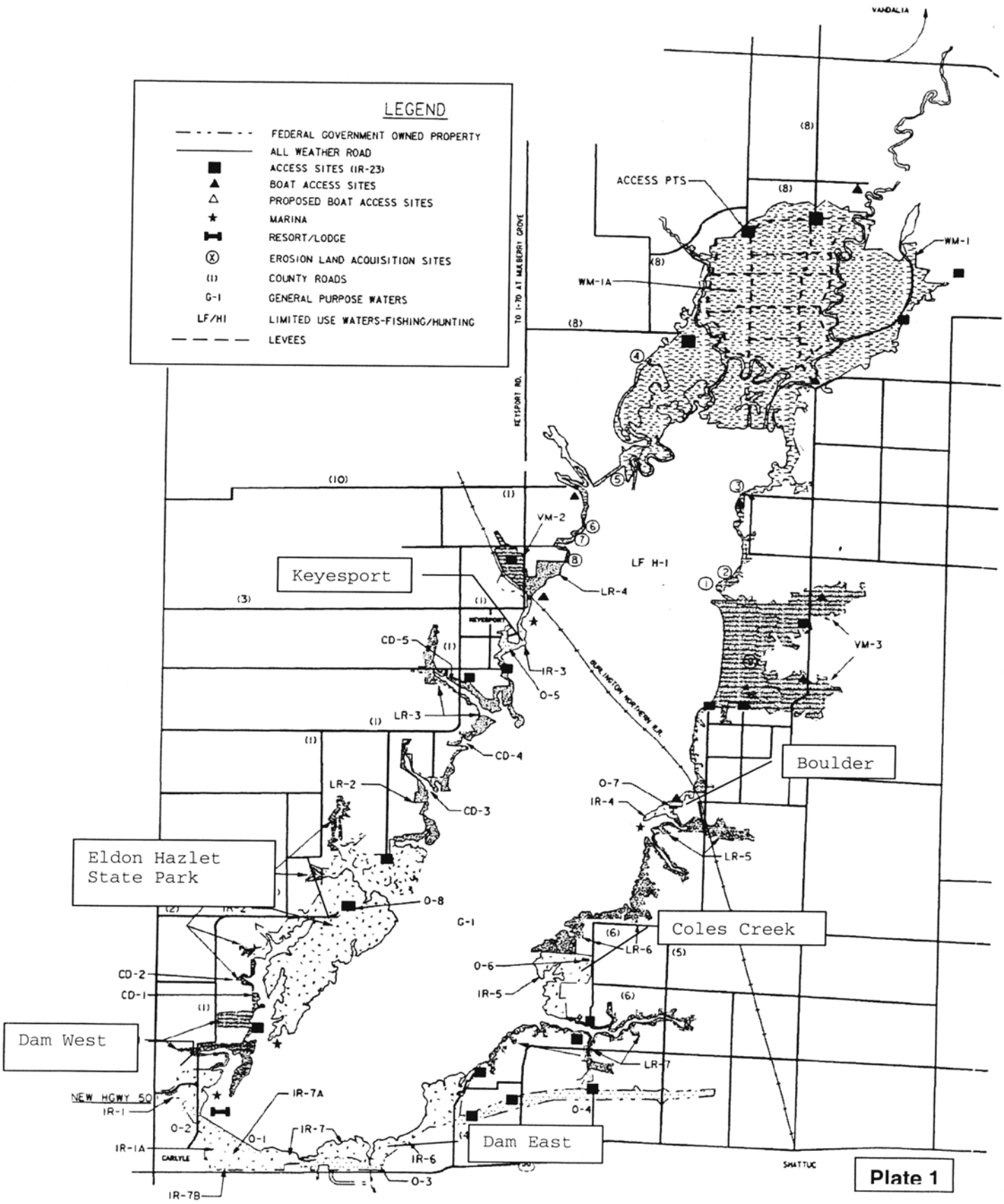
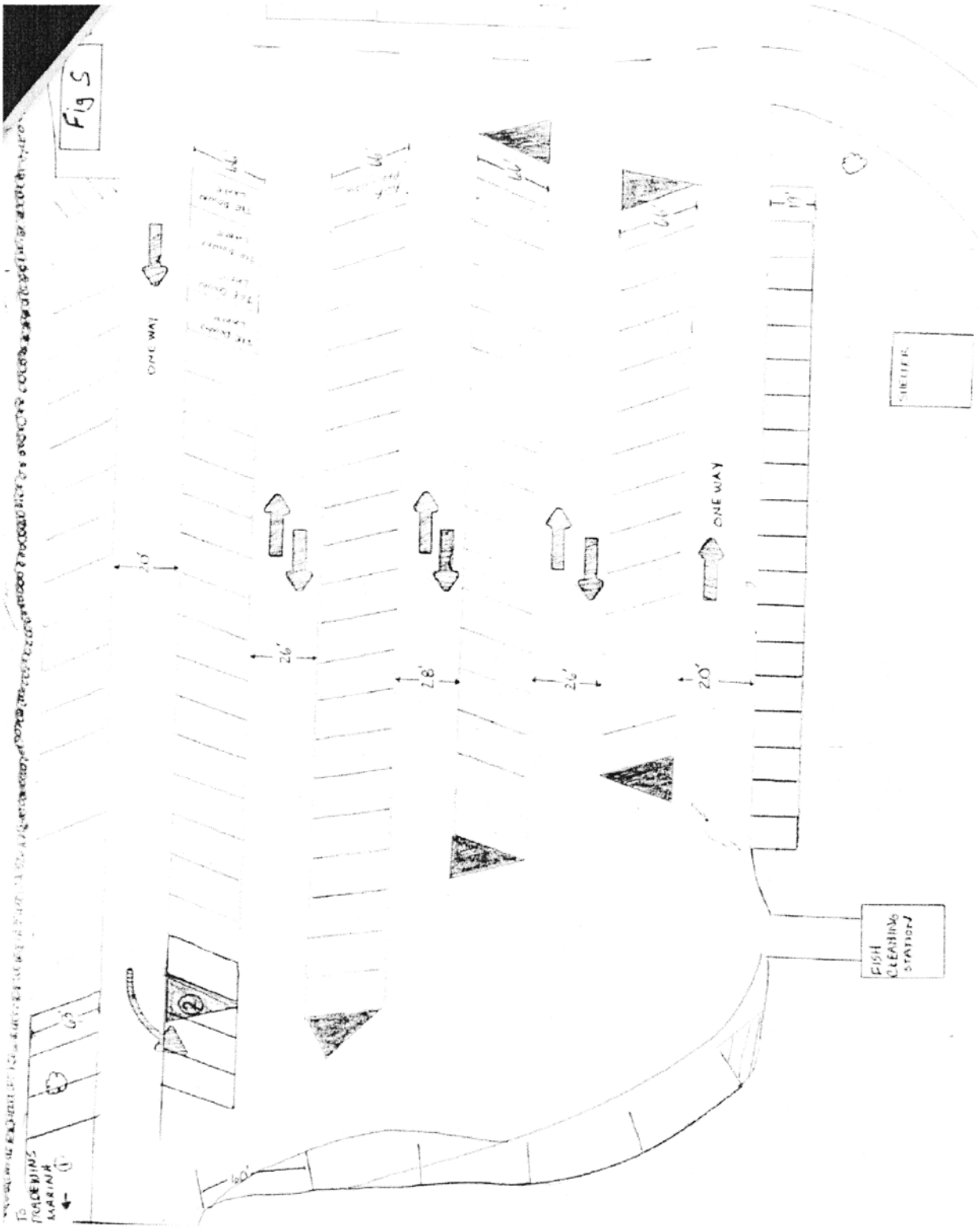

LEGEND
FEDERAL GOVERNMENT OWNED PROPERTY
ALL WEATHER ROAD
ACCESS SITES (IR-23)
BOAT ACCESS SITES
PROPOSED BOAT ACCESS SITES
MARINA
RESORT/LODGE
EROSION LAND ACQUISITION SITES
COUNTY ROADS
GENERAL PURPOSE WATERS
LIMITED USE WATERS-FISHING/HUNTING
LEVEES
VANDALIA
TO I-70 AT MARBERRY GROVE
KEYESPORT RD.
ACCESS PTS
WM-1
WM-1A
VM-2
VM-3
LF H-1
Keyesport
LR-4
CD-5
IR-3
O-5
LR-3
CD-4
LR-2
CD-3
Boulder
O-7
IR-4
LR-5
Eldon Hazlet
State Park
O-8
G-1
Coles Creek
LR-6
O-6
IR-5
CD-2
CD-1
Dam West
LR-7
NEW HGWY 50
IR-1
IR-7A
O-2
O-1
IR-7
IR-1A
CARLYLE
IR-6
Dam East
O-4
O-3
IR-7B
SHATTUC
Plate 1

Plate 2 – Keyesport Parking Plan



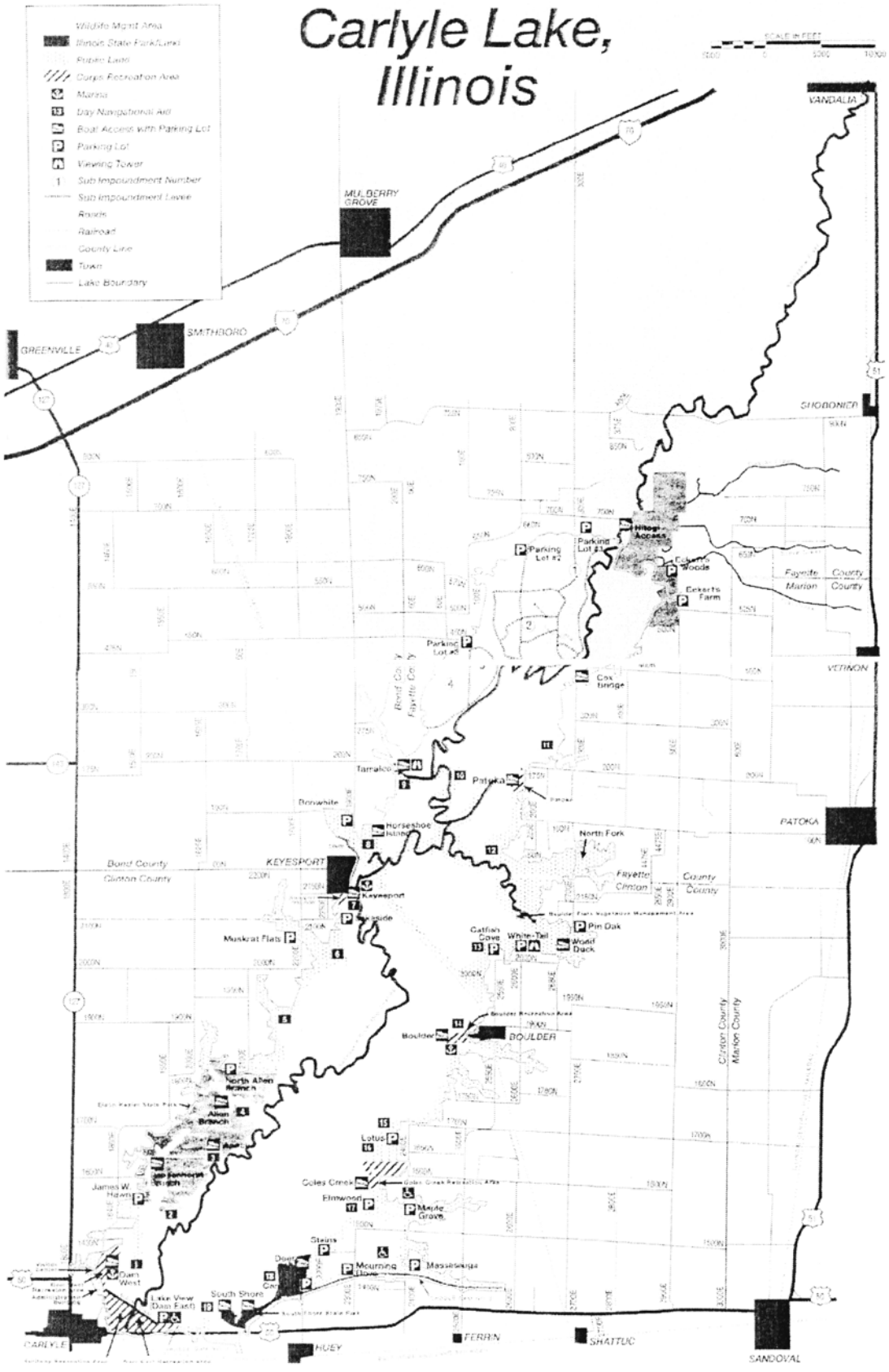

Carlyle Lake, Illinois
Wildlife Mgmt Area
Illinois State Park/Lands
Public Land
Corps Recreation Area
Marina
Day Navigational Aid
Boat Access with Parking Lot
Parking Lot
Viewing Tower
Sub Impoundment Number
Sub Impoundment Levee
Roads
Railroad
County Line
Town
Lake Boundary
SCALE IN FEET
VANDALIA
MULBERRY GROVE
SMITHBORO
GREENVILLE
SHOBONIER
VERNON
PATOKA
KEYESPORT
BOULDER
CARLYLE
HUEY
FERRIN
SHATTUC
SANDOVAL
Bond County
Clinton County
Fayette County
Marion County
Parking Lot #2
Parking Lot #3
Hitogi Access
Eckert's Woods
Eckert's Farm
Parking Lot #8
Cox Bridge
Tamalco
Patoka
Bonwhite
Horseshoe Island
North Fork
Keyesport
Muskrat Flats
Catfish Cove
White-Tail
Pin Oak
Wood Duck
Boulder
North Allen Branch
Allen Branch
Lotus
Coles Creek
Elmwood
Maple Grove
James W. Hawn
Stains
Mourning Dove
Massasauga
Dam West
Lake View (Dam East)
South Shore

Plate 3

Appendix A

Carlyle Lake: High Water Impacts

01. Introduction

The objective of this study is to evaluate the National Economic Development (NED) feasibility of providing safe, continued access to high water ramps throughout Carlyle Lake as well as providing continued land access to land-based recreational facilities. In accordance with Engineering Regulation (ER) 1105-2-100, dated December 1990, an NED benefit-cost analysis is undertaken to assure that the value of the outputs produced (the NED benefits) by continued operation of recreational facilities at Carlyle Lake, Illinois exceeds the value of the inputs used (the NED cost).

Key economic assumptions employed in the NED evaluation of recreation facilities:

(1) All benefits and costs are expressed in March 2005 price levels;
(2) The CWCCIS is used for all necessary price level updates;
(3) The project period of evaluation is estimated to be 50 years with appropriate operation and maintenance;
(4) Project discount rate for the evaluation of NED benefits and costs is 5.375 percent;
(5) Resources have alternative uses and, consequently, opportunity costs;
(6) Individuals are risk neutral and rational economic agents;
(7) All elevations are expressed in feet and are understood to represent "Ft., NGVD" (Feet, National Geodetic Vertical Datum).

02. Project Description

Carlyle Lake was authorized by the 75th Congress in the Flood Control Act of 1938. Carlyle Lake (hereafter, 'Lake') has become one of the prime destination spots for recreational activities, drawing approximately 4.5 million visitors annually. The Lake is a 26,000 acre reservoir located on the Kaskaskia River in Illinois at River Mile 94.2, with a drainage area of 2,717 miles. The Lake extends 13 miles upstream from the Kaskaskia Dam and has a surface area of 26,000 acres and 87 miles of shoreline at normal pool elevation (445.0 feet, NGVD). The Corps of Engineers operates eight intensively developed recreation areas while the State of Illinois operates three recreation areas. This study complements earlier studies describing the impact of high water on lake boat ramps and road access to land-based recreational facilities.

Key considerations employed in the economic evaluation of high water impacts and potential alternative solutions:

1. Most visitors will continue to use the Lake for recreation when lake levels are between elevations 450.0 and 456.0 feet. However, water levels begin to impact Lake recreational facilities at approximately elevation 450.0 ft.
2. Corps recreation facilities at the Lake effectively close at water elevations above elevation 456.0 ft.
3. Relocation of facilities, namely land-based facilities, is impractical due to rather limited high ground around the Lake.
4. Visitors primarily visit the Lake to recreate on the water, but require access to land-based support facilities (picnic sites, marinas, campsites, beaches, restrooms) that are usually not accessible at water elevations above elevation 455.0 ft.
5. Most Eldon Hazlet State Park camping and day use facilities are located at and above elevation 460.0 ft.; however, the lone access road to Hazlet State Park floods (becomes impassable) at elevation 456.4 ft.
6. Lake visitation loss due to high water events has significant economic impacts on local communities as well as counties within a 30-mile radius of the Lake.

Area runoff into the Lake has increased in the past 10 years. Programs implemented to reduce runoff into the Lake will require several years to become fully effective. The Lake continues its primary flood control mission of providing future downstream flood prevention on both the Kaskaskia and Mississippi Rivers in accordance with the Water Control Plan. Lake levels are higher more frequently and remain higher for longer in the past twenty years as compared to the previous twenty years, as shown in Table 1.

Table 1

Carlyle Lake Level Exceedance Durations in Total Days and Percent of Time

	1965-1984		1985-2004	
Lake Level (in feet)	Total Days	Percent of Time	Total Days	Percent of Time
>= 456.0	0	0.0	34	0.5
>= 455.0	26	0.4	49	0.7
>= 454.0	73	1.0	91	1.3
>= 453.0	128	1.8	161	2.2
>= 452.0	234	3.3	264	3.7
>= 451.0	415	5.9	403	5.6
>= 450.0	615	8.7	540	7.5

03. Economic Analysis

Recreation Benefit / Loss Methodology

Recreation benefits are generally defined as the sum of the maximum amount individuals are willing to pay to engage in a recreation activity, rather than forego the activity. This concept is referred to as "willingness-to-pay" and is the method recommended by the U.S. Water Resources Council as an appropriate economic measure of the benefits of outdoor recreation. Economic evaluation for this study is in accordance with guidelines specified in *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*, Washington D.C. (1983) United States Water Resources Council.

Recreational losses occur when flood conditions disrupt and/or eliminate normal visitation due to lost access to recreational facilities and/or inundated facilities. Recreational losses were generated for each recreation area by multiplying the reduced visitation resulting from inundated boat ramps and access roads by the recreational value of partaking in the activity. The elevation at each recreation area was derived and stage-percentage visitation reduction values by activity, under different flood frequency events were calculated. Also, the number of days the Lake pool would remain at each flood stage under different flood frequency events was computed. For each recreation area, the integration of flood frequency elevations and the duration of those elevations with stage-percentage visitation reduction values by recreational activity generated lost recreational days under both existing conditions and with project conditions.

The Unit Day Value approach is recommended for estimating the monetary value of benefits from recreation activities and any subsequent losses from the reduction of those recreation activities due to flooding. This approach is based on the willingness-to-pay of the user for the opportunity to recreate at a particular site. For example, if recreating at that site cost $10.00, for some users the $10.00 fee is the maximum they would be willing to pay. If the fee were raised, those users would choose to recreate elsewhere. However, many users would be willing to pay more than the $10.00 fee to recreate at that site. Therefore, those users are in effect receiving additional benefits for which they do not pay. This concept is referred to as "consumer surplus." The Unit Day Value, in conjunction with the daily number of users, or visits to a particular site, determines the economic value of recreating at that site.

Benefits of recreating at a particular site are computed by quantifying the difference between the number of days a recreation site is accessible under the existing condition and the number of days that recreation site is accessible under the with project condition multiplied by the appropriate unit day value and the daily visitation rate at that site.

The Unit Day Values used are prepared by the Department of the Army, Directorate of Civil Works and published annually in an Economic Guidance Memo (EGM). For this report, EGM 05-05 (Fiscal Year 2005) is used. Unit Day Values, ranging from $4.95 to $10.69 per day, are presented in Table 2.

Table 2

Unit Day Values for Recreation, Fiscal Year 2005

Unit Day Values	
Activity	Value
Camping	$5.16
Picnicking	$4.95
Swimming	$6.51
Hiking	$7.72
Boating	$10.69
Fishing	$8.33

Therefore, Unit Day Value benefits of recreating at a particular site are computed by quantifying the difference between the number of days a recreation site is available under the existing condition and the number of days that recreation site is available under the with project condition, multiplied by the appropriate unit day value and the daily visitation rate at that site.

In addition to the Unit Day Value benefits, there is an economic impact from foregone recreational spending. In Technical Report EL-95-16, *Economic Impact of Recreation on the Upper Mississippi River System*, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS (April 1995), spending by recreation users were surveyed within a 30-mile distance of recreation facilities. The report identified spending on two types of goods, consumable and durable. Durable spending consists of expenditures on goods such as boats, trailers, and camping gear. Such durable goods have an expected life of three or more years. On the other hand, consumable goods, such as food, gasoline, and articles of clothing, are depleted or discarded relatively soon. Services including hairdressing, movie theatres and medical care are also considered consumable goods.

For this study spending on only consumable goods will be considered. The report determined approximately $14.12 (in 2005 dollars) per visitor per day is spent for consumable items. Foregone recreational consumer spending benefits are computed by quantifying the difference between the number of days a recreation site is available under the existing condition and the number of days that recreation site is available under the with project condition, multiplied by $14.12 per visitor per day and the daily visitation rate at that site.

Average annual benefits are the summation of generated unit day value benefits and foregone recreational consumer spending benefits.

Data Resources

Consultation with MVS District Office recreation specialists and Carlyle Lake managerial staff provided crucial data as well as valuable advice and insight for the study. Historical Lake visitation records (visits, visitor hours, visitor days), boat launch revenues, boat ramp closures were provided in daily, monthly and annual increments for all recreation areas evaluated. Also, historical Lake flood elevations and stage percent visitation reduction records by activity were accumulated for all recreation areas.

Several previous economic impact studies and supporting data were reviewed to assure accuracy of computation results of this study, including *Carlyle Lake Water Control Plan Deviation, Economic Impact Study* (November 1996).

Environmental Laboratory ERDC/EL TR-03-21,*Recreation Visitor Spending Profiles and Economic Benefit to Corps of Engineers Projects* (Recreation Management Support Program), U.S. Army Corps of Engineers, Engineer Research and Development Center (December 2003).

Bureau of Land Management (1987), *Recreation 2000*, Washington D.C.: U.S. Department of Interior, Bureau of Land Management.

Historical boat ramp closures, in total days, are presented from 1995-2004, for all recreation areas, in Table 3. Similar data was also provided for the recent flooding events and subsequent boat ramp / recreation area closings at Carlyle Lake in January and February of 2005.

Table 3

Unit Day Values for Recreation, Fiscal Year 2005

Boat Ramp Closed	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
State Areas										
IDNR Apache (Eldon)	66	60		10	9	27		64		7
Eldon Hazlet	66	60		10	9	27		64		7
IDNR Peppenhorst	66	60		10	9	27		64		7
IDNR Allen Branch	63	53			8	24		64		4
Deer Run	29	3						48		
Cox Bridge	13							25		
Carlyle Sailing Assoc.	12							23		
Corps Areas										
Dam West Main Ramp	29	41			5	13		57		1
Boulder Main Ramp	29	41			5	13		57		
Coles Creek Main Ramp	29	41			5	13		57		
Dam East Main Ramp	29	41			5	13		57		
Wood Duck	29	3						48		
Keyesport Main Ramp	28							30		
Tamalco	28							30		
Patoka	28							30		
North Fork	28							30		
Dam West High Water								20		
Coles Creek High Water	12							20		
Dam East High Water	12							20		

Corps Areas

Boulder Recreation Area

The Boulder 4-lane main boat ramp elevation is 450.0 ft. and the 1-lane high water boat ramp elevation is 460.0 ft. There are usage problems with the main ramp due to wave action from the North and Northwest. The main ramp becomes inundated at 450.0 ft., leaving only the 1-lane high water ramp available. The break-over angle at the top of the high water ramp results in insufficient clearance for vehicles/trailers.

Four alternatives have been identified:

Alternative 1 : Raise the main ramp to 454.0 ft. The cost for Alternative 1, including contingencies, is $165,300. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $9,584. Average annual benefits are estimated at $32,252, generating net benefits of $22,668 and a benefit-cost ratio (BCR) of 3.37.

Alternative 2a : Rehab the 1-lane high water ramp to correct the design problem, leaving the high water ramp at 460.0 ft. The cost for Alternative 2a, including contingencies, is $30,500. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $1,768. Average annual benefits are estimated at $1,138, generating net benefits of *negative $630* and a BCR of 0.64.

Alternative 2b : Add an additional (second) lane to the 1-lane high water ramp to increase Lake access under high water conditions. The cost for Alternative 2b, including contingencies, is $51,500. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $2,986. Average annual benefits are estimated at $3,415, generating net benefits of $429 and a BCR of 1.14.

Alternative 3 : Raise the main ramp and boat ramp parking lot to 460.0 ft. Parking and all four lanes of the main ramp would be accessible to a lake level of 460.0 ft. The cost for Alternative 3, including contingencies, is $842,260. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $48,835. Average annual benefits are estimated at $37,943, generating net benefits of *negative $10,892* and a BCR of 0.78.

Coles Creek Recreation Area

The Coles Creek 4-lane main boat ramp elevation is 450.0 ft. and the 1-lane high water boat ramp elevation is 456.0 ft. The high water ramp has break-over angle design problems similar to the Boulder high water ramp. The parking lot elevation rises on a consistent slope from 450.0 to 456.0 ft. The entrance road to the ramps floods (becomes impassable) at 456.0 ft. Therefore, no Alternatives with elevations higher than 456.0 are proposed.

Two alternatives have been identified:

Alternative 1 : Rehab the 1-lane high water ramp to correct the design problem, leaving the high water ramp elevation at 456.0 ft. The cost for Alternative 1, including contingencies, is $12,900. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $749. Average annual benefits are estimated at $1,707, generating net benefits of $958 and a BCR of 2.28.

Alternative 2: Raise the main ramp and boat ramp parking lot to 455.0 ft. Parking and all four lanes of the main ramp would be accessible to a lake level of 455.0 ft. The cost for Alternative 2, including contingencies, is $688,870. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $39,941. Average annual benefits are estimated at $40,961, generating net benefits of $1,020 and a BCR of 1.03.

Dam East Recreation Area

The Dam East 4-lane main boat ramp elevation is 451.0 ft. and the 2-lane high water boat ramp elevation is 456.0 ft. The slope on the high ramp makes it difficult to use and there is limited parking in the immediate area.

Three alternatives have been identified:

Alternative 1: Relocate the ramp to the northeast corner of the Dam East main ramp parking lot and install new breakwater protection. The cost for relocating the ramp, including contingencies, is $38,845. The cost for installing new breakwater protection, including contingencies, is $500,000. The total cost for Alternative 1, including contingencies, is $538,845. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $31,243. Average annual benefits are estimated at $9,334, generating net benefits of *negative $21,909* and a BCR of 0.30.

Alternative 1 (without breakwater): Relocate the ramp to the northeast corner of the Dam East main ramp parking lot. The cost for Alternative 1, including contingencies, is $38,845. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $2,252. Average annual benefits are estimated at $8,680, generating net benefits of $6,428 and a BCR of 3.85.

Alternative 2: Raise the main ramp and boat ramp parking lot to 460.0 ft. Parking and all four lanes of the main ramp would be accessible to a lake level of 460.0 ft. The cost for raising the ramp and parking lot, including contingencies, is $231,230. The cost for installing new breakwater protection, including contingencies, is $500,000. The total cost for Alternative 2, including contingencies, is $731,230. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $42,397. Average annual benefits are estimated at $28,000, generating net benefits of *negative $14,397* and a BCR of 0.66.

Alternative 2 (without breakwater): Raise the main ramp and boat ramp parking lot to 460.0 ft. Parking and all four lanes of the main ramp would be accessible to a lake level of 460.0 ft. The cost for Alternative 2, including contingencies, is $231,230. Average annual

cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $13,407. Average annual benefits are estimated at $26,040, generating net benefits of $12,633 and a BCR of 1.94.

Alternative 3: Rehab the 2-lane high water ramp by excavating the adjacent slope to the southeast and adding two additional ramps. This would result in a 4-lane high water ramp, significantly increasing Lake access under high water conditions. Sufficient parking for increased traffic is available at the Dam East main parking lot. The cost for Alternative 3, including contingencies, is $117,350. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $6,804. Average annual benefits are estimated at $15,750, generating net benefits of $8,946 and a BCR of 2.31.

Dam West Recreation Area

The Dam West 4-lane main boat ramp elevation is 451.0 ft. and the 1-lane high water boat ramp elevation is 456.0 ft. Recently, the breakwater protection was improved by raising it and extending it to the northeast. Raising the ramp to 460.0 ft. would provide more parking during high water events.

Two alternatives have been identified:

Alternative 1: Raise the main ramp and boat ramp parking lot to 456.0 ft. Parking and all four lanes of the main ramp would be accessible to a lake level of 456.0 ft. The cost for Alternative 1, including contingencies, is $1,087,125. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $63,032. Average annual benefits are estimated at $177,014, generating net benefits of $113,982 and a BCR of 2.81.

Alternative 2: Raise the main ramp and boat ramp parking lot to 460.0 ft. Parking and all four lanes of the main ramp would be accessible to a lake level of 460.0 ft. The cost for Alternative 2, including contingencies, is $1,578,750. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $91,537. Average annual benefits are estimated at $227,593, generating net benefits of $136,053 and a BCR of 2.49.

Keyesport Recreation Area

The Keyesport 4-lane main boat ramp elevation is 453.0 ft. Fishing tournaments departing from the Keyesport Recreation Area generates a large demand for parking.

Three alternatives have been identified:

Alternative 1: Raise the main ramp apron to 455.0 ft. The cost for Alternative 1, including contingencies, is $119,770. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $6,944. Average annual benefits are estimated at $29,315, generating net benefits of $22,371 and a BCR of 4.22.

Alternative 2: Raise the main ramp and boat ramp parking lot to 457.0 ft. Parking and all four lanes of the main ramp would be accessible to a lake level of 457.0 ft. The cost for Alternative 2, including contingencies, is $597,520. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $34,645. Average annual benefits are estimated at $36,645, generating net benefits of $2,000 and a BCR of 1.06.

Alternative 3: Raise the main ramp and boat ramp parking lot to 460.0 ft. Parking and all four lanes of the main ramp would be accessible to a lake level of 460.0 ft. The cost for Alternative 2, including contingencies, is $978,615. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $56,741. Average annual benefits are estimated at $43,972, generating net benefits of *negative $12,769* and a BCR of 0.77.

Dam West Recreation Area - West Abutment

The West Abutment boat ramp is 450.0 ft. Limited parking is available.

One alternative has been identified:

Alternative 1: Construct a new ramp at the west abutment to the dam. The ramp, raised from 450.0 ft. to 475.0 ft, could be placed in the dry and opened when lake levels reach 456.0 ft. The cost for Alternative 1, including contingencies, is $16,610. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $963. Average annual benefits are estimated at $1,156, generating net benefits of $193 and a BCR of 1.20.

State Areas

Eldon Hazlet State Park

Entrance Road. Eldon Hazlet State Park has recreation facilities located at and above elevation 460.0 ft., yet the entrance roadway to the Hazlet Park facilities floods (becomes impassable) at elevation 456.4 ft. Therefore, raising the entrance road would provide continued access to Hazlet Park recreation facilities under high water conditions.

Two alternatives have been identified:

Alternative 1: Raise the entrance road to 460.0 ft. Hazlet Park facilities would be accessible to a lake level of 460.0 ft. The cost for Alternative 1, including contingencies, is $1,161,175. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $67,326. Average annual benefits are estimated at $80,146, generating net benefits of $12,821 and a BCR of 1.19.

Alternative 2: Raise the entrance road to 462.5 ft. Hazlet Park camping and day use facilities would be accessible to a lake level of 460.0 ft., and Hazlet Park facilities at elevation 462.5 ft. or higher would be accessible to a lake level of 462.5 ft. The cost for Alternative 2, including contingencies, is $1,632,220. Average annual cost, realizing a project evaluation period of 50 years and a 5.375%

discount rate, is estimated at $94,637. Average annual benefits are estimated at $83,486, generating net benefits of *negative $11,151* and a BCR of 0.88.

Apache Ramp. The Hazlet Apache 2-lane main boat ramp elevation is 450.0 ft. A separate 1-lane high water boat ramp adjacent to the main ramp is at elevation 459.9 ft. As noted above, the entrance roadway to the Hazlet Park facilities floods (becomes impassable) at elevation 456.4 ft.

One alternative has been identified:

Alternative 1: If the Hazlet Park entrance road is raised to 460.0 ft., an additional lane would be added to the 1-lane high water ramp, increasing Lake access under high water conditions. The cost for Alternative 1, including contingencies, is $30,050. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $1,742. Average annual benefits are estimated at $2,553, generating net benefits of $811 and a BCR of 1.47.

Carlyle Sailing Association

A high water ramp on the breakwater would provide access to 456 NGVD. The cost of the boat ramp and access road is estimated at $130,862.

Alternative 1: If the 2006 EGM 06-03 is used to establish a point value and general recreation value (in $), the result is a point value of 35 and a conversion general recreation value of ($4.79 + $5.98)/2 = $5.39. Benefits computed and the resulting average annual economic benefits are estimated at $10,444. The average annual cost of $131,000 is $7,595. Net benefits are $2849. The BCR would be $10,444 / $7,595, or 1.37.

Allen Branch Recreation Area

The Allen Branch 4-lane main boat ramp elevation is 450.5 ft.

Two alternatives have been identified:

Alternative 1: A general upgrade including resurfacing of parking lots, ramp modifications, and a more accessible boat ramp. The cost for Alternative 1, including contingencies, is $340,200. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $19,725. Average annual benefits are estimated at $6,412, generating net benefits of *negative $13,313* and a BCR of 0.33.

Alternative 2: Raise the main ramp, boat ramp parking lot and entrance road to 452.0 ft. Parking, all four lanes of the main ramp and the entrance road would be accessible to a lake level of 452.0 ft. The cost for Alternative 2, including contingencies, is $593,185. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $34,390. Average annual benefits are estimated at $15,390, generating net benefits of *negative $19,000* and a BCR of 0.45.

Deer Run Recreation Area

Located on a small inlet on the east end of South Shore State Park, the 1-lane main (and only) boat ramp has three problems: the channel to open water becomes silted in at the Lake entrance; the ramp is at elevation 447.0 ft.; and the entrance road floods (becomes impassable) at elevation 452.0 ft. Proposals include relocating the ramp to higher ground with direct water access or dredging out the boat channel.

Two alternatives have been identified:

Alternative 1: Relocate the ramp to the mouth of the inlet, a higher ground elevation of 456.0 ft., *when* the South Shore State Park loop road development is implemented. The cost for Alternative 1, including contingencies, is $90,770 (later revised to $191,000). Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $5,263. Average annual benefits are estimated at $9,752, generating net benefits of $4,489 and a BCR of 1.85.

Alternative 2: Raise the ramp to 452.0 ft. and dredge out the mouth of the inlet every three years. The cost for raising the ramp, including contingencies, is $25,500. The cost for dredging the inlet mouth to a depth of 6.0 ft. is $124,720, and dredging would be performed every three years. Combined average annual costs for both raising the ramp and dredging, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $1,479 and $43,944, respectively, totaling $45,423. Average annual benefits are estimated at $3,706, generating net benefits of *negative $41,717* and a BCR of 0.08.

Appendix B - Master Plan Brainstorming Session
Master Plan Supplement Brainstorming Meeting
February 27, 2003

1. LAND BASED ACCESS
- Raise Hazlet road only after all other ramps are raised
- Want high water ramps to 475 NGVD
- No "Closed" signs during high water
- Flowage easements – need to be concerned for residents/property
- Raise 2.2 miles of Hazlet road – road closes at 456 (Park Closed)
- Raise CSA area/facilities – closes at 449.5 – Need to raise CSA lot to 455
- Facilities to 450 is not good enough
- Need to capitalize or develop of high elevation areas on east side of lake (i.e. South Shore)
- Rehab road at South Shore in 2 years (IDNR programmed)
- IDNR programming
    - Allen Branch boat ramp upgrade (only minimal raise)
    - Deer Run Peppenhorst Branch Boat Ramp's – scoping to make improvements
    - Apache – resurfacing this spring
- City of Carlyle sewer lagoons need flood protection
- All facilities need to be upgraded to be more user friendly during high use
- Facilities need to be well designed/constructed to 455
- Need to improve existing facilities before we build more (esp. beyond 455)
- Need to focus on all facilities/areas at the Lake–Not just Dam West
- Need to make improvements beyond 455-456
- Need to raise portions of the beaches
- Need to maximize economic conditions and use of the lake at least to 455 (i.e. from 445-455)
- The Federal government owes improvements at Carlyle to the public because it is not functioning as designed
- CSA needs high water launching more that other areas from 455 and below

2. WATER BASED ACCESS
- Ramps to 475
    - 2 lane boat ramp – each corner of the dam
    - Boulder Access – high water ramp extended to road
    - Concrete platform CSA to launch at high levels
    - Keyesport – boat ramp at beach
    - South Shore State Park – Hickory Hollow Campground – high water ramp
- Not using word "Closed"
- High Water Ramp CSA – Raise CSA facilities/parking lots
- Allen Branch – extra lane/floating docks

IMPACT OF HIGH WATER ON CARLYLE LAKE FACILITIES

January 2006

1. Introduction:

a. General: Carlyle Lake project purposes are flood control on the Kaskaskia and Mississippi Rivers, domestic and industrial water supply, navigation releases for the Kaskaskia River, recreation, water quality enhancement and fish and wildlife conservation. Carlyle Lake is a 26,000-acre reservoir located on the Kaskaskia River at river mile 94.2 and has a drainage area of 2,717 square miles. The Corps operates five intensively developed recreation areas and the State of Illinois has two intensively developed recreation areas on the lake. The Corps manages 9 boat ramp locations and the State manages 7 boat ramp locations on Carlyle Lake.

b. Study Goal and Objectives: This study describes the impact of high water on boat ramps and land-based recreation facilities. Alternatives and recommendations to maintain visitor access during high water events are discussed and cost estimates are provided. The management goal during high water events is to provide safe high water ramps on the open water at well-distributed, functional locations and provide access to land-based recreational facilities. The following are specific objectives for high water facilities (All elevations are in feet NGVD):

1) At a minimum, provide public access to the open lake and recreational facilities to 456 and higher elevation where feasible. Fishermen and other boaters will continue to desire access to the lake at elevations above 456. For these users and other visitors, where feasible and economically reasonable, ramps should be maintained or elevated to 460.
2) Provide or construct sufficient parking at high water boat ramps that is useable during high water events.
3) Provide complete breakwater protection to 455 where necessary and economically feasible.
4) Provide an adequate number of high water ramp lanes at each ramp to maintain efficiency (one for one minimum, two for four lanes optimum).

c. Analysis Assumptions and Considerations: The following factors were considered in evaluating the impact of high water and identifying solutions.

1) Most visitors will continue to use the lake for recreation between 450 and 456.
2) Most Corps of Engineers managed recreation facilities effectively close at elevations above 456.
3) Higher ground around Carlyle Lake is limited; therefore, relocation of facilities, especially the land-based facilities, is impractical. Furthermore, entrance roads were not designed for higher lake levels and in certain locations become flooded, cutting off access to recreational facilities on higher ground. In some instances, if access to areas during high water events were available, a significant number of recreation facilities could be open to the public.
4) Visitors come to the lake to recreate on the water, but need the land-based support facilities (picnic sites, restrooms, campsites, beaches, showers, marinas, etc., that are generally not available above 455). Therefore, fewer boat ramps are needed above 456 since visitation is less.
5) Eldon Hazlet State Park facilities (campsites, cabins, pool, picnic sites) are located above elevation 460; however, the road to the park becomes inundated at 456.4. Elevation of the entrance road would allow access to many recreation facilities during high water.
6) Loss of visitation occurs during high water events and results in significant local negative economic impacts (primarily in counties within 30 miles of the project).
7) Inflow into the lake has increased by over 30 percent over the last 10 years possibly due to increased precipitation or other factors.

8) The lake will continue its flood control mission providing downstream flood prevention on the Kaskaskia and Mississippi Rivers in the future in accordance with the water control plan and that will result in higher lake levels on an intermittent basis.

d. Reference:

1) Design of Recreation Areas and Facilities – Access and Circulation – 1982, Chap. 4.

2) Carlyle Lake Watershed Technical Committee, *Carlyle Lake Watershed Plan*, 2002. The Carlyle Lake Watershed Plan planning committee consisted of 28 members representing villages, soil and water conservation districts, drainage districts, the Mid-Kaskaskia River Basin Coalition, environmental groups, farmers, politicians, businesses and the Carlyle Lake Association.

3) Southwestern Illinois RC&D, Inc. *Kaskaskia River Watershed,* 2002

2. Background Information: Previous Flood Impacts and Renovation Efforts

After a record high water event in 1995, the Corps completed several renovations which allowed more facilities to be functional at pool elevations between 450.0 and 455.0. These renovations have lessened the negative impacts to recreation users and the local economy.

Renovations to the Coles Creek Recreation Area were made, including shoreline revetment, raising low areas of roads within the recreation area, raising all campsites in Loop 1 to a higher elevation; replacing campground electrical to allow for the electrical shutoff on specific campsites based on elevation and constructing impact sites for easier cleanup on sites that are susceptible to inundation. Other repairs included repairing damaged campsites in the Boulder Recreation Area and constructing impact sites adjacent to those sites susceptible to inundation, replacing campground electrical to allow for electrical shutoff on specific campsites based on elevation in the Boulder and Dam West Campground, rebuilding eroding campsites and placing revetment on a portion of the shoreline in the Dam West Campground and completing repairs/revetment to numerous areas around the lake where erosion has occurred. In addition, the Keyesport and Boulder marina breakwaters were repaired and raised to provide additional protection to the marina harbors during future high water events.

Also, several additional high water launching lanes were constructed: a single lane ramp in the Boulder and Coles Creek Recreation areas and a double-lane ramp in the Dam West Recreation Area. The IDNR also constructed a high water ramp at the Apache Boat Ramp. These ramps are useable when the regular launching lanes become unusable, i.e., at higher lake levels. In addition, a lane was added to the Dam East high water boat ramp.

3. Statement of Problem:

a. General: High water levels in recent years, have at times, hindered the public's ability to use the lake and land-based recreational facilities. Lake water levels at 450 and above impact Carlyle Lake recreational facilities. As water levels rise, more facilities are impacted. These impacts are detailed in the *Standard Operating Procedure for High Water at Carlyle Lake, Illinois* plan that also identifies actions to be taken to maintain the safety of visitors and prevent damage to facilities. Ultimately, all Corps recreation areas are closed at 456 due to flooding of the facilities themselves or the access to those areas.

b. High water events cause significant impacts to the local economy when they result in the shutdown of recreational facilities around the lake (i.e., boat ramps, campgrounds and day use areas). A report entitled *Recreation Visitor Spending Profiles and Economic Benefit to Corps of Engineer Projects,* produced by the Corps' Environmental Lab in December 2003 studied the local economic impacts of Corps projects. In 1999 the report indicated that campers that boat spent $65.03 per person per trip and day-users that boat spent $19.75 per person per trip in counties within 30 miles of the Carlyle Lake project. Total economic impact in 1999 was $583,319 for campers that boat and $9,637,013 for day use boaters. If some or all of the land-based recreational facilities are closed for many days during the recreation season, the economic impact is felt locally. The Carlyle Lake Watershed Plan stated that a 20 to 40 percent reduction in business occurs[1] when flooding impacts the use of recreational facilities. In 2002, if 30 days of the recreation season had a 50 percent reduction, it would have equated to a 1 to 1.5 million dollar loss in counties within 30 miles of the project. Individuals and businesses have requested the Corps to improve access to the lake when the water levels are high to lessen the local economic impacts and allow visitors to use the lake. They indicated that putting out the official word that the lake is "closed" reduces visitation and impacts local businesses. They expressed hope that access to the water and land-based recreation facilities could be maintained during future high water events.

c. Lake Levels: According to statistics supplied by the Corps' Hydraulics Branch, lake levels were higher and stayed higher more often in the last twenty years than in the project's first twenty years. Duration of water levels for those two time periods is shown in Table 1.

Table 1 – Duration of Water Levels

DURATION				
	1965 – 1984		1985 – 2004	
LEVEL	TOTAL*	PERCENT	TOTAL*	PERCENT
>= 456.00	0	0.0	34	0.5
>= 455.00	26	0.4	49	0.7
>= 454.00	73	1.0	91	1.3
>= 453.00	128	1.8	161	2.2
>= 452.00	234	3.3	264	3.7
>= 451.00	415	5.9	403	5.6
>= 450.00	615	8.7	540	7.5

* cumulative days over corresponding elevation

d. Breakwaters: At Boulder and Dam East main ramps, wave action discourages boaters from launching or makes for unsafe launching conditions due to incomplete breakwater protection or the lack of breakwater protection.

4. Inventory: Carlyle Lake has 18 boat ramp *locations* (grouped by shading in Table 2) , 14 of which are located at open water locations. Because the open water locations provide better access to the lake and have more parking available, these ramps were the focus of this study.

a. As shown in Table 2, of the open water ramps, 13 ramp *locations* are still functional when the water level reaches 450, 10 are functional when the lake is at 453, and 6 are functional at 456. The ramps that are still functional at 456 are distributed well geographically, but are limited by parking, number of lanes, their design, or the lack of breakwater protection which discourages use. A map with the location of boat ramp facilities is included as Plate 1.

[1] Carlyle Lake Watershed Plan, 2002, pg. 16

Table 2 – Existing Boat Access Sites

oat Ramp	Elevation at which Ramp Closes	Design Problems	Breakwater Protection Needed on:	Entrance Road Not Open at High Water	Notes	Parking
Boulder Main	451.5	Low el.;	N-NW		4-lane; incomplete breakwater protection	Sufficient
Boulder High	460	Yes – slope	N-NW		1-lane	Sufficient
Coles Creek Main	451	Low el.			4-lane	Sufficient
Coles Creek High	456	Yes – slope	N-NW		1 –lane	Sufficient
Coles Creek Sailboat	450	Shallow water	N/A		1-lane	Sufficient
Deer Run	447	Silted in at inlet entrance	None	Closes 452	1 lane gravel	Sufficient
Dam East Main	451	Low el.	North		4-lane	Sufficient
Dam East High Water	456	Yes – steep ramp	West (minimal)		2-lane	Sufficient
Dam West Main	451	Low el. and launching ramp traffic circulation	E & N (done)		4-lane	Sufficient
Dam West High	456	None			1-lane	Sufficient
Carlyle Sailing sc. 450.5	~~452~~ – cabin boats; 455 – trailerable boats	No launch ramp for cabin boats above 452	To complete facility protection	Closes 456	1-lane	~~Sufficient~~ Parking is problem (CAE)
Hazlet Apache, IDNR	450	None	N/A	Closes 456.4	2-lane	Sufficient
Apache High Water, IDNR	459.9	None	N/A	Closes 456.4	1-lane	Sufficient
Allen Branch, IDNR	450.5	Low el.	N/A	Closes 452	4-lane	Sufficient
Peppenhorst	450	Low el.; shallow water	N/A	Closes 456.4	1-lane gravel	Minimal
Keyesport Main	453	Low el.			4-lane	Sufficient
Tamalco	453	Channel silted in at normal el.			1-lane	Sufficient
Patoka	453	Channel silted in at normal el.			1-lane	Sufficient
Horseshoe Island	457	Limited Parking			1-lane	Insufficient parking
Cox Bridge	454.5				Not on open lake	Sufficient
Wood Duck	452				1-lane, not on open lake	
North Fork	453				1-lane, not on open lake	
Hitogi	452				Not on open lake	

b. Land-based Recreation Facilities: As shown in Table 3, land-based recreational facilities, i.e., campgrounds, day use areas and marinas are closed as the lake rises. At elevation 455, most land-based facilities are closed.

Table 3 – Land Based Recreation Facilities

Location	Closure Elevation
Dam West Campsites: 5	450
Boulder Campsites: 6; Coles Creek Campsites: 9; Coles Creek Beach Showerhouse and Beach; McNair Beach; Tamalco, Patoka, and Dam East boat ramps;	451
Dam West Campsites: 21;Coles Creek Campsites: 27; Boulder Campsites: 14; Dam West, Coles Creek, Boulder and Allen Branch Main Boat Ramps; Dam West Beach; Coles Creek Beach Shower Building:	452
Dam West Campsites: 30; Coles Creek Campsites:54; Boulder Campsites: 24;	453
Dam West Campsites: 35; Coles Creek Campsites:73; Boulder Campsites: 46;	454
Coles Creek , Boulder , Dam West; Close Entire Campgrounds	455
All recreation areas	456

Several resource concerns have been identified:

1) The terrain around Carlyle Lake is relatively flat and there are no available locations that have the elevation necessary to support a campground or picnic area or reasonably close to the lake itself. Eldon Hazlet State Park has recreational facilities located at 460 and above that could provide recreational opportunities if the entrance roadway was elevated from 456 to 460 or 462.5. In addition, smaller campgrounds at South Shore State Park, McNair and East Spillway can remain open during high water events.

2) The Kaskaskia River Watershed plan produced in the summer of 2002 by the Southwestern Illinois Resource and Conservation District in cooperation with the Corps of Engineers and Illinois Department of Natural Resources included recreation objectives related to high water such as assisting the private sector in developing business opportunities focused on recreation and developing high water infrastructure facilities at Carlyle Lake[2]. Infrastructure facilities would include boat ramps, campsites and recreational sites.

5. Plan Formulation - Proposed plans for public access improvement have been formulated based on staff knowledge and experience, public input and various planning documents.

a. **Corps Areas**

1.) **Boulder Recreation Area:** The Boulder main ramp elevation is 450 and the high water ramp elevation is 460. The main ramp experiences problems with wave action from the north and northwest. The four-lane main ramp is inundated at 451.5

[2] Kaskaskia River Watershed Plan 2002, pg. 34

and then only the one-lane high water ramp is available. The break over angle at the top of the high water ramp is incorrect and trailers in excess of 20' long have insufficient underside clearance..

Three alternatives have been identified to address the demand for high water access:

Alternative 1 would raise the main ramp to 454. The lower southwest corner of the Boulder boat ramp is at 450 and could be raised to 454. Making the four-lane ramp useable to 454 would cost $165,300 including contingencies. Average annual benefits are estimated at $32,252, generating net benefits of $22,668 and a benefit-cost ratio (BCR) of 0.64.

Alternative 2 would correct the existing high water ramp and add an additional lane to the high water ramp to increase efficiency. This alternative with contingencies would cost $51,500. Average annual benefits are estimated at $3,415 generating net benefits of $429 and a benefit-cost ratio (BCR) of 1.14.

Alternative 3 would raise the boat ramp parking lot and main ramp to 460. Parking would not be impacted as the water elevation rises and the four lanes would allow efficient access. The cost estimate for raising the boat ramp and parking lot to 460 is $842,264. Average annual benefits are estimated at $37,943, generating net benefits of negative $10,892 and a benefit-cost ratio (BCR) of 0.78.

Recommendation: Alternative 2: Rehab the existing high water ramp to correct the design problem and add an additional lane.

Breakwater : The existing breakwater at Boulder was designed to protect boaters while they launch and to protect the ramp from wave action from a southwestern direction. There are fewer problems in the summer months, but in the fall and winter, during the hunting season, the wind shifts to the north-northeast. Wave action caused by these winds further damages the ramp and causes additional siltation of the boat ramp. Without complete breakwater protection, boat launching is difficult and visitor safety is compromised. The proposed solution is to extend the breakwater from the shore opposite the end of the breakwater to the northwest approximately 115 feet into the lake. The breakwater will be constructed of approximately 4,150 tons of 400 lb. riprap; the base of the breakwater will be approximately 60 feet in width, the crown will be approximately 20 feet in width, and the height will be built to approximately 455. The construction of this additional breakwater would eliminate the current problems experienced at the ramp and decrease the amount of damage to existing facilities. Cost is estimated at $90,000. Extension of the breakwater at the main ramp would protect the existing government investment during flood damage reduction operations.

Conversion of Picnic Sites to Campsites: During flood damage reduction operations, campsites become inundated and have to be closed. This results in lost revenue and a decrease in visitor services. Picnic sites located in the Boulder Picnic area are largely unused due to a shift in the public's demand for day use facilities. To reduce the number of unused picnic sites and provide needed camping as well as increase revenues, it is proposed to convert 8 picnic sites to 8 full-service campsites.

Proposed Action: As shown in Table 4, eight picnic sites would be converted to campsites in the Boulder Day Use Area at elevation 460. Estimated cost is $87,900. As shown in Table 5, the benefit cost ratio is 1.3.

Recommendation: Convert eight picnic sites to campsites in the Boulder Day Use Area.

Table 4 – Campsite Relocation Costs

Boulder Day Use - 8 Campsites	**Unit Cost**	**Total 8 Sites**
Sites with Impact Areas	$5,443/site	$43,544
Water and Sewer Hookups	$3,000 ea.	$24,000
Extend Access Road 425 ft.	$61.61./ln.ft..	$26,184
Electric service	$1,915/site	$15,320
Electrical Panel	$2,875 ea.	$2,875
Total		**$87,900**
Cost per site Boulder Relocation	$11,225	

Table 5 – Campsite Cost Benefit Ratio

Benefits	Annual
Item	Entire Project
Increased Fee Collection (increase $6.00/campsite/hookup)	($20 per campsite; 50 % occupancy)
Total Revenue	$8,400
Costs	Annual
Initial Construction Costs 20 years at 5.375	$6,473
Benefit/Cost Ratio	1.3

2.) **Coles Creek Recreation Area:** The Coles Creek main boat ramp is operational to 450 and the high water ramp to 456. The high water ramp has design problems similar to the Boulder high water ramp; vehicle/trailers greater than 20 feet have limited underside clearance at the top of the ramp due to the incorrect break over angle of the ramp. The entrance road to the ramp is inundated at 456; therefore, no alternatives with higher elevation than 456 are proposed. Two alternatives have been proposed:

Alternative 1 would renovate the high water ramp to correct this problem. Cost is estimated at $12,900. No breakwater is proposed for this location.
Average annual benefits are estimated at $1,707, generating net benefits of $958 and a benefit cost ratio (BCR) of 2.28.

Alternative 2 is to raise the ramp and the entire parking lot to 455. This will provide sufficient parking. Cost is estimated at $688,867. Average annual benefits are estimated at $40,961, generating net benefits of $1,020 and a benefit-cost ratio (BCR) of 1.03.

Recommendation: Alternative 1: Rehab the existing high water ramp to correct design problems.

3.) **Dam East:** The two-lane high water ramp at Dam East is useable to 456 and is partially protected by a breakwater. The issues here are limited parking in the immediate area and the potential for this area to be the location of a resort that would require removal of the high water ramp. The main ramp is four-lanes, but it is low (451) and not protected by a breakwater. Presently, there are three alternatives.

Alternative 1 would relocate the ramp to the northeast corner of the parking lot and place a ramp off the riprap directly to the lake. Cost of adding a new ramp in the NE corner of the main parking lot is $38,845. Average annual benefits are estimated at $9,334, generating net benefits of negative $21,909 and a benefit-cost ratio (BCR) of 0.30

Alternative 2 would raise the Dam East four-lane main ramp and parking lot to 460. That cost is $731,230 If the resort plan is implemented, this may be the only viable alternative since the resort would require the land where the other alternatives are planned. Average annual benefits are estimated at $28,000, generating net benefits of negative $14,396 and a benefit-cost ratio (BCR) of 0.66.

Alternative 3 would rehab the existing high water ramp. Rehabbing the high water ramp would require excavating the adjacent slope to the SE and adding two additional ramps. Estimated cost is $117,350. This would result in a four-lane high water ramp that is located in a protected location and usable to elevation 460. Sufficient parking is available at the Dam East main parking lot. The slope of the existing ramps would remain the same. Average annual benefits are estimated at $15,750, generating net benefits of $8,946 and a benefit-cost ratio (BCR) of 2.31.

The existing high water ramp breakwater would be raised to elevation 460 at a cost of $122,198.

Recommendation: Alternative 3: Because there are no immediate plans for a resort development, rehabilitating the existing high water ramp to include two additional ramps at elevation 460 and raising the existing highwater ramp breakwater is the best option.

4.) **Dam East Breakwater**: The Dam East main boat ramp has no current protection from flooding, and wave action from the northwest. This causes damage to facilities as well as additional siltation of the boat ramp. Visitors using the ramp during heavy wave action have a difficult time launching and retrieving boats causing concern for public safety. The breakwater would be extended northeast approximately 100 feet into the lake and will be constructed of approximately 4600 tons of 400 lb. rip-rap. The base of the breakwater will be approximately 60 feet in width, the crown will be approximately 20 feet in width, and the height will be built to approximately 455. The construction of the additional breakwater would eliminate current problems and decrease the amount of damage to existing facilities and would cost $500,000. If this is not constructed, the boating public could use the high water ramp for launchings when the lake is rough, especially if the high water breakwater is raised (see Dam East Alternative 3).

5.) **Dam West Recreation Area**: The Dam West main ramp elevation is 450 and the high water ramp elevation is 456. Recently, the breakwater was improved by extending it to the Northeast and raising it. Although adequate access during high water is available at Dam West, raising the main ramp and parking lot would provide more parking during high water events. Proposed solutions include the following:

Alternative 1: Raise Dam West boat ramp parking lot to 460. Sufficient parking and all four lanes would be useable. Estimated cost is $1,578,750. Average annual benefits are estimated at $227,593, generating net benefits of $136,053 and a benefit-cost ratio (BCR) of 2.49

Alternative 2: Continue to operate ramps as usual, but improve efficiency by providing additional staff members during high water events to monitor parking and

provide visitor assistance. Add additional docking pier adjacent to the existing docking pier at elevation 456 at a cost of $20,000.

Alternative 3: Raise Dam West boat ramp and parking lot to 456. Estimated cost is $1,087,125. Average annual benefits are estimated at $177,014, generating net benefits of$113,982 and a benefit-cost ratio (BCR) of 2.81.

Recommendation: Alternative 2: Continue to operate the main boat ramp as usual and add on to the existing docking pier.

6.) **Dam West Recreation Area - West Abutment:** To provide public and service access to 472, a new ramp would be constructed at the west abutment to the main dam. A ramp from 450 to 472 could be placed on the existing rip rap and opened when lake levels reach 456. Limited parking is available. Estimated cost is $16,610. Average annual benefits are estimated at $1,156, generating net benefits of $193 and a benefit-cost ratio (BCR) of 1.20.

7.) **Keyesport Recreation Area:** Multiple fishing tournaments departing from the Keyesport Recreation Area as well as popularity of the ramp for access to recreation on the north end of the lake create a large demand for parking in the Keyesport area as well as an efficient ramp that operates to 455.

Keyesport Boat Ramp: The Keyesport boat ramp is closed when the lake level reaches 453.

Alternative 1: The proposed plan is to raise the ramp apron from 453 to elevation 455. The cost estimate for the project is $119,770. Average annual benefits are estimated at $29,315, generating net benefits of $22,371 and a benefit-cost ratio (BCR) of 4.22.

Alternative 2: Raise ramp and parking lot to 457. This option would provide additional parking during high water events as well as access above 455. Cost estimate is $597,523. Average annual benefits are estimated at $36,643, generating net benefits of $1,999 and a benefit-cost ratio (BCR) of 1.06.

Alternative 3: Raise ramp and parking lot to 460. This option would provide maximum parking as well as permit use to the highest lake elevation. Cost estimate is $978,613. Average annual benefits are estimated at $43,972, generating net benefits of negative $12,978 and a benefit-cost ratio (BCR) of 0.77.

Recommendation: Alternative 1: Raise existing apron from 453 to 455.

8.) **Horseshoe Island:** Horseshoe Island boat ramp parking will be reconfigured to create more car/trailer parking.

9.) **Tamalco:** The ramp closes at 451.5. Area is open to 453.1 when the access road to the ramp is used as a high water ramp. The channel off the boat ramp silts in and does not permit lake access at low water. There are no plans for improving boat access at this area.

10.) **Patoka:** The ramp closes at 451.5. Area is open to 453.1 when the access road to the ramp is used as a high water ramp. Shallow water off the boat ramp prevents large boats from using this area at low or summer pool lake levels. There are no plans to improve this area.

11.) **Wood Duck:** The ramp closes at 452. This ramp is not on the main lake. There are no plans to improve the ramp at this area.

b. **State Park Areas**

1.) **South Shore State Park - Deer Run:** Located on a small inlet on the east end of South Shore State Park, this ramp has three problems: the channel to the open water is silted in at the entrance to the lake, it has a low elevation (447) and the entrance road floods at 452. Two alternatives have been proposed.

Alternative 1: The State Park management has proposed relocating the park road on the east end of South Shore State Park to provide improved access to a future lodging location, avoid impacts to the endangered Massasauga rattlesnake and provide access during high water events to the east end of the park. This alternative would relocate the Deer Run boat ramp to higher ground (456) at the mouth of the inlet when the State Park loop road development is implemented. Cost is estimated at $90,766. Average annual benefits are estimated at $9,752, generating net benefits of $4,490 and a benefit-cost ratio (BCR) of 1.85.

Alternative 2: Raise ramp in present location to 452 (entrance road low elevation) and dredge out the mouth of the inlet. Average annual benefits are estimated at $3,706, generating net benefits of negative $41,717 and a benefit-cost ratio (BCR) of 0.8.

Recommendation: Alternative 1: Relocate the ramp to higher ground at entrance to cove if the proposed South Shore State Park loop road development is implemented.

2.) **Eldon Hazlet State Park - Entrance Road:** The entrance road to Hazlet is inundated and closed at lake elevation 456.4 and that prevents the use of all recreation facilities in the park. Eldon Hazlet State Park has recreational facilities located at 460 and above that could provide recreational opportunities during high water events if the entrance roadway was elevated.

IDNR is proposing to raise the entrance road in partnership with the Corps. If the entrance road was raised to 460 or above, approximately 80% of facilities would be open for use including loop roads, comfort stations, campsites, a high water ramp, cabins, a swimming pool and a store. Further engineering study by the Corps will determine the cost and extent of the road raise necessary to provide optimum access during high water events.

3.) **Apache Ramp**: The Apache boat ramp is operable to 450. A separate one-lane high-water ramp adjacent to the main ramp is operable to 459.9. If the entrance road is raised, adding an additional high water ramp at this location would be beneficial. The IDNR would incur all costs of the construction. Cost is estimated at $30,046. Average annual benefits are estimated at $2,553, generating net benefits of $811 and a benefit-cost ratio (BCR) of 1.47.

4.) **Allen Branch**: Allen Branch boat ramp is operable to 450.4. Renovations are planned in 2006 for Allen Branch at Hazlet State Park that will include rehabbing the boat ramp (to 5-lanes with a transfer station), courtesy docks, parking areas, and riprap areas. New items include a fish cleaning station and universally accessible provisions for boat access. Construction is scheduled for 2006. In a separate action it is proposed to replace 20 vault toilets, 3 shower buildings and 50-75 full service hookup sites within the park

5.) **Peppenhorst Branch**: The ramp closes at 449.9. Shallow water off the boat ramp does not allow launching of deeper draft boats. There are no plans for this area.

6.) **Carlyle Sailing Association (CSA)**: The public boat ramp is inoperable above 455 and the harbor is shut down. Above 452, cabin boats cannot be launched. The entrance road to Hazlet floods at 456. The jib crane launching facilities for CSA members is operable to 452.

1. The Corps constructed a 1,000 foot breakwater to 456 to protect harbor facilities in 1995. However, a 330-foot extension of the breakwater is needed to fully protect all the CSA facilities at high water. Cost of the breakwater is estimated at $154,500 including contingencies.

2. The CSA has proposed constructing a high water ramp (elevation 455) on the proposed breakwater specifically to accommodate the cabin boats with large keels Cost of the ramp and access road is estimated at $131,000. Construction of this facility would be the responsibility of the CSA. An alternative would be to raise the boat ramp and parking lot to 454. Cost is estimated at 1.25 million dollars.

Recommendation: Construct a 330 foot breakwater and high water ramp to protect the shoreline, existing facilities and provide visitor safety.

7.) **Hitogi:** The ramp closes at 454.51. This ramp is not on the main lake. There are no plans to improve the ramp at this area.

8.) **North Fork:** The ramp closes at 453. This ramp is not on the main lake. There are no plans to improve the ramp at this area.

6. Evaluation Process: In general, the evaluation of alternatives was based on the study objectives and the results are shown in Table 6:

a. Access road and ramp at 456 and above.
b. Sufficient parking is available.
c. Breakwater protection is present..
d. Sufficient number of ramp lanes.
e. Best location/geographically distributed..
f. Benefit/cost ratio.

Table 6 – Evaluation of Boat Access Alternatives

Ramp	Access /Ramp at least 456	Sufficient Parking	Breakwater Protection	Ramp lanes sufficient/ adequate	Best Location	BCR	Preferred Plan
Corps Areas							
Boulder							
Alt 1 Raise Main Ramp to 454	N	Y	Y	Y	Y	0.64	Alt 2
Alt 2 Improve existing highwater ramp	Y (460)	Y	N	Y	Y	1.14	
Alt 3 Raise Main Ramp to 460	Y	Y	Y	Y	Y	0.78	
Coles Creek							
Alt 1 Renovate highwater ramp	N (455)	Y	N	Y	Y	2.28	Alt 1
Alt 2 Raise main ramp and parking lot to 455	Y	Y	Y	Y	Y	1.03	
Dam East							
Alt 1 Construct high water ramp to NE corner of main ramp lot	Y	Y	N	N	Y	3.85	Alt 3
Alt 2 Raise Main Ramp to 460	Y	Y	N	Y	Y	1.94	
Alt 3 Add 2 lanes to high water ramp and useable at elevation 460	Y	Y	Y	Y	Y	2.31	
Dam West							
Alt 1 Raise Main Ramp to 460.	Y	Y	Y	Y	Y	2.49	Alt 2
Alt 2 Add traffic control and docking pier	y	Y	Y	N	Y	--	
Alt 3 Raise Main Ramp to 456.	Y	Y	Y	Y	Y	2.81	
Keyesport							
Alt 1 Raise Main Ramp apron to 455	N (455)	Y	Y	Y	Y	4.22	Alt 1
Alt 2 Raise ramp and parking lot to 457	Y	Y	Y	Y	Y	1.06	
Alt 3 Raise ramp and parking lot to 460	Y	Y	Y	Y	Y	0.77	
State Areas							
Deer Run							
Alt 1 Relocate ramp to cove entrance	Y	Y	N	Y	N	1.85	Alt. 1
Alt 2 Raise existing ramp to 452	N	Y	Y	N	N	0.8	

7. Comparison of Alternatives.

a. Evaluation of alternatives, where available, will primarily be based on the reasonableness of cost, the recreation benefits maintained (the benefit cost ratio) and the potential for functionality

b. Cost Estimate Summary and Economic Analysis – This cost estimate has been developed from general cost estimates prepared in the field. An appropriate contingency was applied to each estimate as shown in Table 7.

Table 7 – Comparison of Alternatives in Corps and State Areas

Boat Ramp	Alternative 1	Alternative 2	Alternative 3	Recommended Plan	Other	Other
Corps Areas						
Boulder	Raise main ramp to 454 and increase breakwater protection Cost:$165,300	Replace ramp at 12% grade, – Cost: $30,500 Add second high water ramp Cost: $21,000	Raise main ramp and parking lot to 460 Cost:$842,260	Alternative 2 & breakwater protection for main ramp	Add breakwater Cost: 90,000	Relocate campground Cost:$87,900
Coles Creek	Correct high water ramp Cost:$12,900	Raise ramp and parking lot to 455 Cost:$688,867	N/A	Alternative 1		
Dam East	Construct new high water ramp in NE corner Cost:$38,845	Raise main ramp to 460 Cost: $231,230	Add 2 new ramps at 12% grade adjacent to high water ramp Cost:$117,350	Alternative 3 & breakwater protection	Dam East High Water Breakwater Cost: $122,198	Dam East Main Ramp Breakwater Cost: $500K
Dam West	Raise main ramp and parking lot to 460 Cost:$1,578,750	Raise dock pier to 456 and staff parking lot to monitor traffic. Cost:$20,000	Raise ramp and parking lot to 456 Cost:$1,087,125	Alternative 2		
Keyesport Main	Raise main ramp apron to 455. Cost:$119,770	Raise parking area and ramp to 457 Cost:$597,520	Raise ramp and parking lot to 460 Cost:$978,615	Alternative 1		
Horseshoe Island	Rehab parking lot to accommodate more vehicles with trailers Cost:$49,200			Alternative 1		

Boat Ramp	Alternative 1	Alternative 2	Alternative 3	Recommended Plan	Other	Other
Dam West Abutment:	Provide high water ramp from 450 to 472 Cost:$16,610			Alternative 1		
State Areas						
Eldon Hazlet State Park Entrance Rd.	Raise entrance road to 460 or higher. Cost:Estimate: TBD			Further engineering study needed		
Apache High Water, IDNR	Add additional high water lane Cost:$30,050			Alternative 1		
Allen Branch, IDNR	Rehab parking lot, ramp modifications, fish cleaning station Cost:1.1 million			Alternative 1		
Carlyle Sailing Assc.	Construct high water ramp (455) and access road if breakwater is completed. Cost: $131,000	Raise parking lot and boat ramp to 456. Cost is estimated at 1.25 million		Alternative 1		Complete breakwater protection if justifiable – Cost: $154,500
Deer Run	Move ramp to location on open water, if park loop road is completed Cost:$90,766	Rehab ramp at same location and dredge mouth of inlet Cost:124,900		Alternative 1		

8. Benefits Evaluation: The unit-day value (UDV) method was used to evaluate the economic impacts of each alternative as specified in the National Economic Development (NED) benefit evaluation procedures, contained in ER 1105-2-100 (2000). The UDV, based on General Recreation for Carlyle Lake, was determined to be $4.95 to $10.69 as shown in Appendix 1. The UDV and the CY 2002 and 2004 visitation data were used to calculate the economic benefits gained, if the recreation facilities were constructed. The benefit cost ratio and the results of the analysis are shown in Table 8.

Table 8 Benefits Evaluation

Boat Ramp	Recommended Alternative	Average Annual Benefits Recreation	Annualized Cost	Benefit/Cost Ratio
Corps Areas				
Boulder	Alt. 2 & Breakwater	$ $3,415	$	1.14
Coles Creek	Alt.1	$1,707	$749	2.28
Keyesport	Alt. 1	$29,315	$6,944	4.22
Dam West Abutment:	Alt 1.	$1,156	$963	1.20
Dam East	Alt 3 & Breakwater	$15,750	$6,804	2.31
Dam West	Alt. 2	N/A		
State Areas				
Eldon Hazlet State Park Entrance Rd.	Further study needed			
Apache High Water, IDNR	Alt. 1	$2,553	$1,742	1.47
Allen Branch	Construction scheduled			
Carlyle Sailing Assc.	Alt. 1	Not considered.		
Deer Run	Alt.1	$9,752	$5,263	1.85

look at benefits

-30,400 visitors
-$325,000
Tells estimate

9. Public Participation - Public meetings: Public involvement consisted of a master plan workshop/high water brainstorming session conducted on 27 February 2003 that included interested individuals and local business interests to discuss the options to keep the lake open during high water events. In addition, visitor comment cards and personal knowledge of the lake staff were used to identify issues related to high water events. One of the comments from that meeting included an expressed interest in ramps that are open to 475. However, having ramps that are functional to 455 (or higher where feasible) appeared to have the most consensuses. All the comments from the meeting are provided in Appendix 2.

10. Conclusions, recommendations and approvals: Proposed actions for resolving the high water impacts have been addressed in this study. Generally ramps exist or can be made functional to 456 in a geographically balanced array around the lake. Ramps accessible to 460 would be available to 460 on each side of the lake: Boulder, and Eldon Hazlet. One ramp could be provided that would be accessible to 472 at Dam West. The recommendations of this study will be implemented through supplementation of the Carlyle Lake Master Plan.

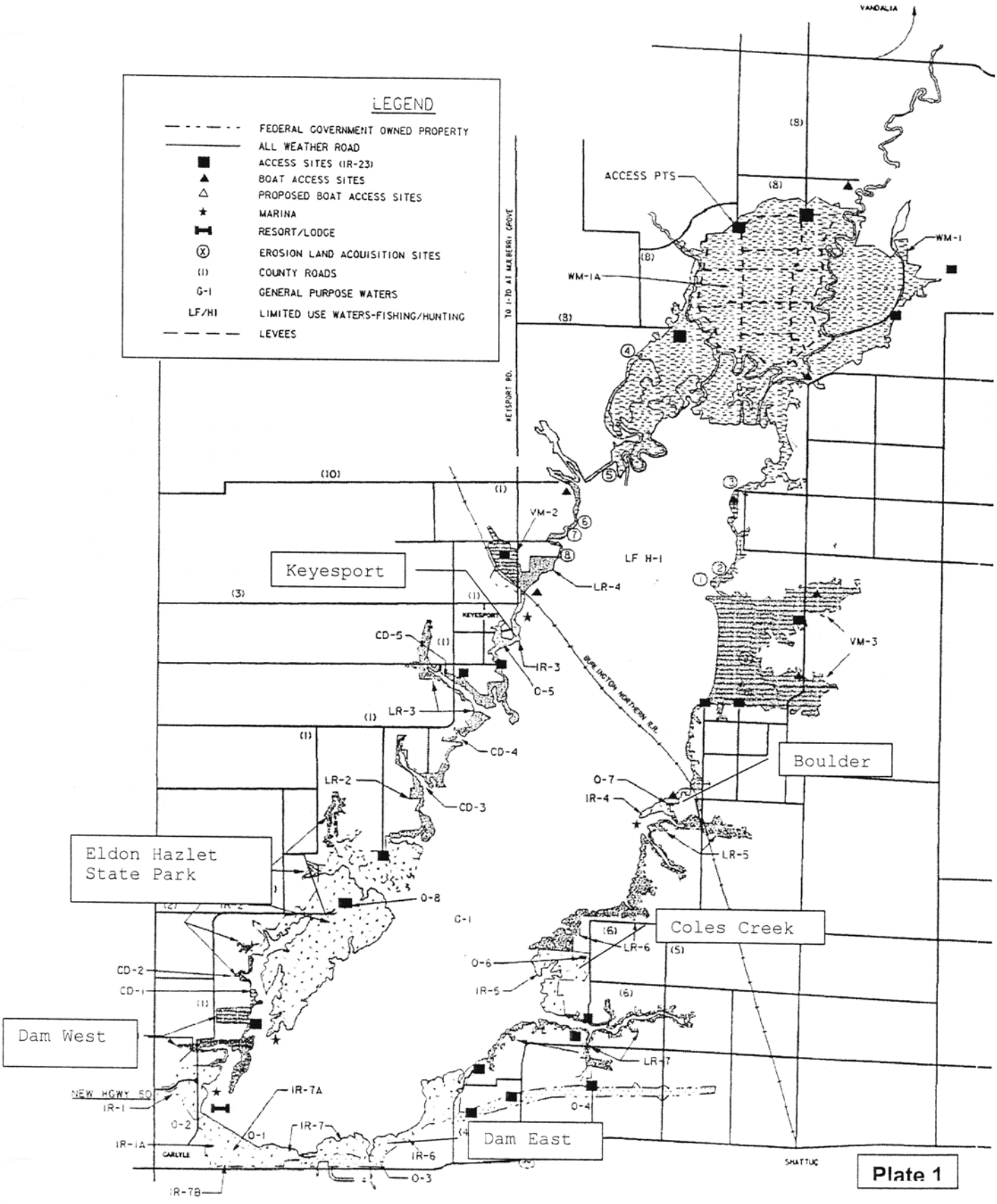
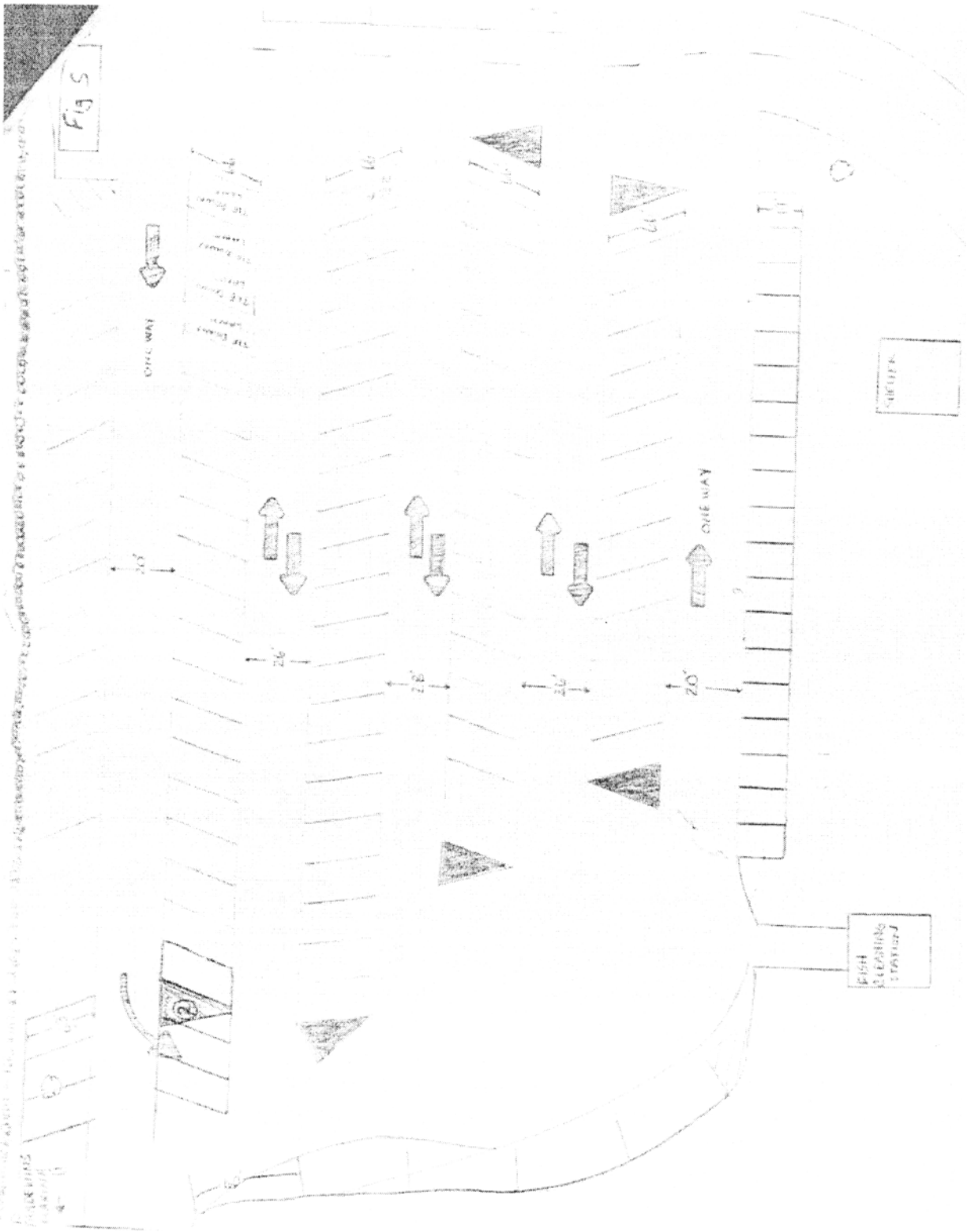

LEGEND
FEDERAL GOVERNMENT OWNED PROPERTY
ALL WEATHER ROAD
ACCESS SITES (IR-23)
BOAT ACCESS SITES
PROPOSED BOAT ACCESS SITES
MARINA
RESORT/LODGE
EROSION LAND ACQUISITION SITES
COUNTY ROADS
GENERAL PURPOSE WATERS
LIMITED USE WATERS-FISHING/HUNTING
LEVEES
VANDALIA
ACCESS PTS
WM-1
WM-1A
TO I-70 AT MULBERRY GROVE
KEYESPORT RD.
VM-2
VM-3
LF H-1
Keyesport
LR-4
LR-3
CD-5
IR-3
O-5
CD-4
LR-2
CD-3
BURLINGTON NORTHERN R.R.
Boulder
O-7
IR-4
LR-5
Eldon Hazlet
State Park
O-8
G-1
Coles Creek
LR-6
O-6
IR-5
CD-2
CD-1
Dam West
LR-7
NEW HGWY 50
IR-1
IR-7A
O-4
O-2
O-1
IR-7
IR-1A
CARLYLE
IR-6
Dam East
O-3
IR-7B
SHATTUC
Plate 1

Plate 2 – Keyesport Parking Plan



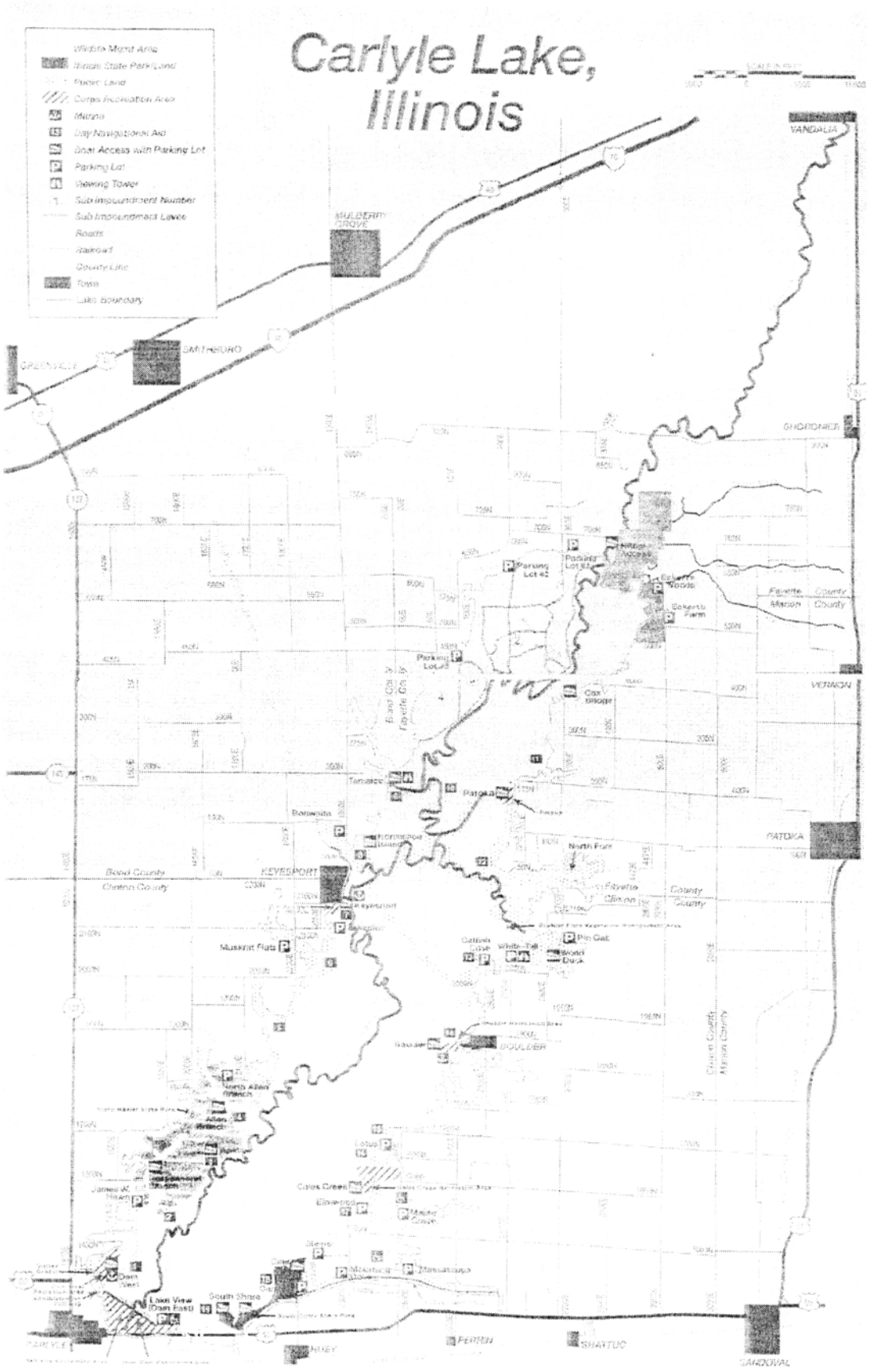

Carlyle Lake, Illinois
Wildlife Mgmt Area
Illinois State Park/Land
Public Land
Corps Recreation Area
Marina
Day Navigational Aid
Boat Access with Parking Lot
Parking Lot
Viewing Tower
Sub Impoundment Number
Sub Impoundment Levee
Roads
Railroad
County Line
Town
Lake Boundary
VANDALIA
MULBERRY GROVE
SMITHBORO
GREENVILLE
SHOBONIER
Parking Lot #2
Parking Lot #1
Hilltop Access
Bakerts Woods
Bakerts Farm
Fayette County
Marion County
Parking Lot #3
Cox Bridge
VERNON
Tamalco
Patoka
Bonwella
North Fork
PATOKA
Bond County
Clinton County
KEYESPORT
Keyesport
Fayette County
Clinton County
Muskrat Flats
Pin Oak
Wood Duck
BOULDER
North Allen Branch
Allen Branch
Lotus
Coles Creek
Elmwood
Dam West
Lake View (Dam East)
South Shore
Massasauga
PERRIN
SHATTUC
SANDOVAL

Plate 3

Appendix I

Carlyle Lake : High Water Impacts

01. Introduction

The objective of this study is to evaluate the National Economic Development (NED) feasibility of providing safe, continued access to high water ramps throughout Carlyle Lake as well as providing continued land access to land-based recreational facilities. In accordance with Engineering Regulation (ER) 1105-2-100, dated December 1990, an NED benefit-cost analysis is undertaken to assure that the value of the outputs produced (the NED benefits) by continued operation of recreational facilities at Carlyle Lake, Illinois exceeds the value of the inputs used (the NED cost).

Key economic assumptions employed in the NED evaluation of recreation facilities:

(1) All benefits and costs are expressed in March 2005 price levels;
(2) The CWCCIS is used for all necessary price level updates;
(3) The project period of evaluation is estimated to be 50 years with appropriate operation and maintenance;
(4) Project discount rate for the evaluation of NED benefits and costs is 5.375 percent;
(5) Resources have alternative uses and, consequently, opportunity costs;
(6) Individuals are risk neutral and rational economic agents;
(7) All elevations are expressed in feet and are understood to represent "Ft., NGVD" (Feet, National Geodetic Vertical Datum).

02. Project Description

Carlyle Lake was authorized by the 75th Congress in the Flood Control Act of 1938. Carlyle Lake (hereafter, 'Lake') has become one of the prime destination spots for recreational activities, drawing approximately 4.5 million visitors annually. The Lake is a 26,000 acre reservoir located on the Kaskaskia River in Illinois at River Mile 94.2, with a drainage area of 2,717 miles. The Lake extends 13 miles upstream from the Kaskaskia Dam and has a surface area of 26,000 acres and 87 miles of shoreline at normal pool elevation (445.0 feet, NGVD). The Corps of Engineers operates eight intensively developed recreation areas while the State of Illinois operates three recreation areas. This study complements earlier studies describing the impact of high water on lake boat ramps and road access to land-based recreational facilities.

Key considerations employed in the economic evaluation of high water impacts and potential alternative solutions:

1. Most visitors will continue to use the Lake for recreation when lake levels are between elevations 450.0 and 456.0 feet. However, water levels begin to impact Lake recreational facilities at approximately elevation 450.0 ft.
2. Corps recreation facilities at the Lake effectively close at water elevations above elevation 456.0 ft.
3. Relocation of facilities, namely land-based facilities, is impractical due to rather limited high ground around the Lake.
4. Visitors primarily visit the Lake to recreate on the water, but require access to land-based support facilities (picnic sites, marinas, campsites, beaches, restrooms) that are usually not accessible at water elevations above elevation 455.0 ft.
5. Most Eldon Hazlet State Park camping and day use facilities are located at and above elevation 460.0 ft.; however, the lone access road to Hazlet State Park floods (becomes impassable) at elevation 456.4 ft.
6. Lake visitation loss due to high water events has significant economic impacts on local communities as well as counties within a 30-mile radius of the Lake.

Area runoff into the Lake has increased in the past 10 years. Programs implemented to reduce runoff into the Lake will require several years to become fully effective. The Lake continues its primary flood control mission of providing future downstream flood prevention on both the Kaskaskia and Mississippi Rivers in accordance with the Water Control Plan. Lake levels are higher more frequently and remain higher for longer in the past twenty years as compared to the previous twenty years, as shown in Table 1.

Table 1

Carlyle Lake Level Exceedance Durations in Total Days and Percent of Time

	1965-1984		1985-2004	
Lake Level (in feet)	Total Days	Percent of Time	Total Days	Percent of Time
>= 456.0	0	0.0	34	0.5
>= 455.0	26	0.4	49	0.7
>= 454.0	73	1.0	91	1.3
>= 453.0	128	1.8	161	2.2
>= 452.0	234	3.3	264	3.7
>= 451.0	415	5.9	403	5.6
>= 450.0	615	8.7	540	7.5

03. Economic Analysis

Recreation Benefit / Loss Methodology

Recreation benefits are generally defined as the sum of the maximum amount individuals are willing to pay to engage in a recreation activity, rather than forego the activity. This concept is referred to as "willingness-to-pay" and is the method recommended by the U.S. Water Resources Council as an appropriate economic measure of the benefits of outdoor recreation. Economic evaluation for this study is in accordance with guidelines specified in *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*, Washington D.C. (1983) United States Water Resources Council.

Recreational losses occur when flood conditions disrupt and/or eliminate normal visitation due to lost access to recreational facilities and/or inundated facilities. Recreational losses were generated for each recreation area by multiplying the reduced visitation resulting from inundated boat ramps and access roads by the recreational value of partaking in the activity. The elevation at each recreation area was derived and stage-percentage visitation reduction values by activity, under different flood frequency events were calculated. Also, the number of days the Lake pool would remain at each flood stage under different flood frequency events was computed. For each recreation area, the integration of flood frequency elevations and the duration of those elevations with stage-percentage visitation reduction values by recreational activity generated lost recreational days under both existing conditions and with project conditions.

The Unit Day Value approach is recommended for estimating the monetary value of benefits from recreation activities and any subsequent losses from the reduction of those recreation activities due to flooding. This approach is based on the willingness-to-pay of the user for the opportunity to recreate at a particular site. For example, if recreating at that site cost $10.00, for some users the $10.00 fee is the maximum they would be willing to pay. If the fee were raised, those users would choose to recreate elsewhere. However, many users would be willing to pay more than the $10.00 fee to recreate at that site. Therefore, those users are in effect receiving additional benefits for which they do not pay. This concept is referred to as "consumer surplus." The Unit Day Value, in conjunction with the daily number of users, or visits to a particular site, determines the economic value of recreating at that site.

Benefits of recreating at a particular site are computed by quantifying the difference between the number of days a recreation site is accessible under the existing condition and the number of days that recreation site is accessible under the with project condition multiplied by the appropriate unit day value and the daily visitation rate at that site.

The Unit Day Values used are prepared by the Department of the Army, Directorate of Civil Works and published annually in an Economic Guidance Memo (EGM). For this report, EGM 05-05 (Fiscal Year 2005) is used. Unit Day Values, ranging from $4.95 to $10.69 per day, are presented in Table 2.

Table 2

Unit Day Values for Recreation, Fiscal Year 2005

Unit Day Values	
Activity	Value
Camping	$5.16
Picnicking	$4.95
Swimming	$6.51
Hiking	$7.72
Boating	$10.69
Fishing	$8.33

Therefore, Unit Day Value benefits of recreating at a particular site are computed by quantifying the difference between the number of days a recreation site is available under the existing condition and the number of days that recreation site is available under the with project condition, multiplied by the appropriate unit day value and the daily visitation rate at that site.

In addition to the Unit Day Value benefits, there is an economic impact from foregone recreational spending. In Technical Report EL-95-16, *Economic Impact of Recreation on the Upper Mississippi River System*, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS (April 1995), spending by recreation users were surveyed within a 30-mile distance of recreation facilities. The report identified spending on two types of goods, consumable and durable. Durable spending consists of expenditures on goods such as boats, trailers, and camping gear. Such durable goods have an expected life of three or more years. On the other hand, consumable goods, such as food, gasoline, and articles of clothing, are depleted or discarded relatively soon. Services including hairdressing, movie theatres and medical care are also considered consumable goods.

For this study spending on only consumable goods will be considered. The report determined approximately $14.12 (in 2005 dollars) per visitor per day is spent for consumable items. Foregone recreational consumer spending benefits are computed by quantifying the difference between the number of days a recreation site is available under the existing condition and the number of days that recreation site is available under the with project condition, multiplied by $14.12 per visitor per day and the daily visitation rate at that site.

Average annual benefits are the summation of generated unit day value benefits and foregone recreational consumer spending benefits.

Data Resources

Consultation with MVS District Office recreation specialists and Carlyle Lake managerial staff provided crucial data as well as valuable advice and insight for the study. Historical Lake visitation records (visits, visitor hours, visitor days), boat launch revenues, boat ramp closures were provided in daily, monthly and annual increments for all recreation areas evaluated. Also, historical Lake flood elevations and stage percent visitation reduction records by activity were accumulated for all recreation areas.

Several previous economic impact studies and supporting data were reviewed to assure accuracy of computation results of this study, including *Carlyle Lake Water Control Plan Deviation, Economic Impact Study* (November 1996).

Environmental Laboratory ERDC/EL TR-03-21,*Recreation Visitor Spending Profiles and Economic Benefit to Corps of Engineers Projects* (Recreation Management Support Program), U.S. Army Corps of Engineers, Engineer Research and Development Center (December 2003).

Bureau of Land Management (1987), *Recreation 2000*, Washington D.C.: U.S. Department of Interior, Bureau of Land Management.

Historical boat ramp closures, in total days, are presented from 1995-2004, for all recreation areas, in Table 3. Similar data was also provided for the recent flooding events and subsequent boat ramp / recreation area closings at Carlyle Lake in January and February of 2005.

Table 3

Unit Day Values for Recreation, Fiscal Year 2005

Boat Ramp Closed	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
State Areas										
IDNR Apache (Eldon)	66	60		10	9	27		64		7
Eldon Hazlet	66	60		10	9	27		64		7
IDNR Peppenhorst	66	60		10	9	27		64		7
IDNR Allen Branch	63	53			8	24		64		4
Deer Run	29	3						48		
Cox Bridge	13							25		
Carlyle Sailing Assoc.	12							23		
Corps Areas										
Dam West Main Ramp	29	41			5	13		57		1
Boulder Main Ramp	29	41			5	13		57		
Coles Creek Main Ramp	29	41			5	13		57		
Dam East Main Ramp	29	41			5	13		57		
Wood Duck	29	3						48		
Keyesport Main Ramp	28							30		
Tamalco	28							30		
Patoka	28							30		
North Fork	28							30		
Dam West High Water								20		
Coles Creek High Water	12							20		
Dam East High Water	12							20		

Corps Areas

Boulder Recreation Area

The Boulder 4-lane main boat ramp elevation is 450.0 ft. and the 1-lane high water boat ramp elevation is 460.0 ft. There are usage problems with the main ramp due to wave action from the North and Northwest. The main ramp becomes inundated at 450.0 ft., leaving only the 1-lane high water ramp available. The break-over angle at the top of the high water ramp results in insufficient clearance for vehicles/trailers.

Four alternatives have been identified:

Alternative 1 : Raise the main ramp to 454.0 ft. The cost for Alternative 1, including contingencies, is $165,300. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $9,584. Average annual benefits are estimated at $32,252, generating net benefits of $22,668 and a benefit-cost ratio (BCR) of 3.37.

Alternative 2a : Rehab the 1-lane high water ramp to correct the design problem, leaving the high water ramp at 460.0 ft. The cost for Alternative 2a, including contingencies, is $30,500. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $1,768. Average annual benefits are estimated at $1,138, generating net benefits of *negative $630* and a BCR of 0.64.

Alternative 2b : Add an additional (second) lane to the 1-lane high water ramp to increase Lake access under high water conditions. The cost for Alternative 2b, including contingencies, is $51,500. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $2,986. Average annual benefits are estimated at $3,415, generating net benefits of $429 and a BCR of 1.14.

Alternative 3 : Raise the main ramp and boat ramp parking lot to 460.0 ft. Parking and all four lanes of the main ramp would be accessible to a lake level of 460.0 ft. The cost for Alternative 3, including contingencies, is $842,260. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $48,835. Average annual benefits are estimated at $37,943, generating net benefits of *negative $10,892* and a BCR of 0.78.

Coles Creek Recreation Area

The Coles Creek 4-lane main boat ramp elevation is 450.0 ft. and the 1-lane high water boat ramp elevation is 456.0 ft. The high water ramp has break-over angle design problems similar to the Boulder high water ramp. The parking lot elevation rises on a consistent slope from 450.0 to 456.0 ft. The entrance road to the ramps floods (becomes impassable) at 456.0 ft. Therefore, no Alternatives with elevations higher than 456.0 are proposed.

Two alternatives have been identified:

Alternative 1 : Rehab the 1-lane high water ramp to correct the design problem, leaving the high water ramp elevation at 456.0 ft. The cost for Alternative 1, including contingencies, is $12,900. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $749. Average annual benefits are estimated at $1,707, generating net benefits of $958 and a BCR of 2.28.

Alternative 2: Raise the main ramp and boat ramp parking lot to 455.0 ft. Parking and all four lanes of the main ramp would be accessible to a lake level of 455.0 ft. The cost for Alternative 2, including contingencies, is $688,870. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $39,941. Average annual benefits are estimated at $40,961, generating net benefits of $1,020 and a BCR of 1.03.

Dam East Recreation Area

The Dam East 4-lane main boat ramp elevation is 451.0 ft. and the 2-lane high water boat ramp elevation is 456.0 ft. The slope on the high ramp makes it difficult to use and there is limited parking in the immediate area.

Three alternatives have been identified:

Alternative 1: Relocate the ramp to the northeast corner of the Dam East main ramp parking lot and install new breakwater protection. The cost for relocating the ramp, including contingencies, is $38,845. The cost for installing new breakwater protection, including contingencies, is $500,000. The total cost for Alternative 1, including contingencies, is $538,845. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $31,243. Average annual benefits are estimated at $9,334, generating net benefits of *negative $21,909* and a BCR of 0.30.

Alternative 1 (without breakwater): Relocate the ramp to the northeast corner of the Dam East main ramp parking lot. The cost for Alternative 1, including contingencies, is $38,845. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $2,252. Average annual benefits are estimated at $8,680, generating net benefits of $6,428 and a BCR of 3.85.

Alternative 2: Raise the main ramp and boat ramp parking lot to 460.0 ft. Parking and all four lanes of the main ramp would be accessible to a lake level of 460.0 ft. The cost for raising the ramp and parking lot, including contingencies, is $231,230. The cost for installing new breakwater protection, including contingencies, is $500,000. The total cost for Alternative 2, including contingencies, is $731,230. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $42,397. Average annual benefits are estimated at $28,000, generating net benefits of *negative $14,397* and a BCR of 0.66.

Alternative 2 (without breakwater): Raise the main ramp and boat ramp parking lot to 460.0 ft. Parking and all four lanes of the main ramp would be accessible to a lake level of 460.0 ft. The cost for Alternative 2, including contingencies, is $231,230. Average annual

cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $13,407. Average annual benefits are estimated at $26,040, generating net benefits of $12,633 and a BCR of 1.94.

Alternative 3: Rehab the 2-lane high water ramp by excavating the adjacent slope to the southeast and adding two additional ramps. This would result in a 4-lane high water ramp, significantly increasing Lake access under high water conditions. Sufficient parking for increased traffic is available at the Dam East main parking lot. The cost for Alternative 3, including contingencies, is $117,350. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $6,804. Average annual benefits are estimated at $15,750, generating net benefits of $8,946 and a BCR of 2.31.

Dam West Recreation Area

The Dam West 4-lane main boat ramp elevation is 451.0 ft. and the 1-lane high water boat ramp elevation is 456.0 ft. Recently, the breakwater protection was improved by raising it and extending it to the northeast. Raising the ramp to 460.0 ft. would provide more parking during high water events.

Two alternatives have been identified:

Alternative 1: Raise the main ramp and boat ramp parking lot to 456.0 ft. Parking and all four lanes of the main ramp would be accessible to a lake level of 456.0 ft. The cost for Alternative 1, including contingencies, is $1,087,125. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $63,032. Average annual benefits are estimated at $177,014, generating net benefits of $113,982 and a BCR of 2.81.

Alternative 2: Raise the main ramp and boat ramp parking lot to 460.0 ft. Parking and all four lanes of the main ramp would be accessible to a lake level of 460.0 ft. The cost for Alternative 2, including contingencies, is $1,578,750. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $91,537. Average annual benefits are estimated at $227,593, generating net benefits of $136,053 and a BCR of 2.49.

Keyesport Recreation Area

The Keyesport 4-lane main boat ramp elevation is 453.0 ft. Fishing tournaments departing from the Keyesport Recreation Area generates a large demand for parking.

Three alternatives have been identified:

Alternative 1: Raise the main ramp apron to 455.0 ft. The cost for Alternative 1, including contingencies, is $119,770. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $6,944. Average annual benefits are estimated at $29,315, generating net benefits of $22,371 and a BCR of 4.22.

Alternative 2: Raise the main ramp and boat ramp parking lot to 457.0 ft. Parking and all four lanes of the main ramp would be accessible to a lake level of 457.0 ft. The cost for Alternative 2, including contingencies, is $597,520. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $34,645. Average annual benefits are estimated at $36,645, generating net benefits of $2,000 and a BCR of 1.06.

Alternative 3: Raise the main ramp and boat ramp parking lot to 460.0 ft. Parking and all four lanes of the main ramp would be accessible to a lake level of 460.0 ft. The cost for Alternative 2, including contingencies, is $978,615. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $56,741. Average annual benefits are estimated at $43,972, generating net benefits of *negative $12,769* and a BCR of 0.77.

Dam West Recreation Area - West Abutment

The West Abutment boat ramp is 450.0 ft. Limited parking is available.

One alternative has been identified:

Alternative 1: Construct a new ramp at the west abutment to the dam. The ramp, raised from 450.0 ft. to 475.0 ft, could be placed in the dry and opened when lake levels reach 456.0 ft. The cost for Alternative 1, including contingencies, is $16,610. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $963. Average annual benefits are estimated at $1,156, generating net benefits of $193 and a BCR of 1.20.

State Areas

Eldon Hazlet State Park

Entrance Road. Eldon Hazlet State Park has recreation facilities located at and above elevation 460.0 ft., yet the entrance roadway to the Hazlet Park facilities floods (becomes impassable) at elevation 456.4 ft. Therefore, raising the entrance road would provide continued access to Hazlet Park recreation facilities under high water conditions.

Two alternatives have been identified:

Alternative 1: Raise the entrance road to 460.0 ft. Hazlet Park facilities would be accessible to a lake level of 460.0 ft. The cost for Alternative 1, including contingencies, is $1,161,175. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $67,326. Average annual benefits are estimated at $80,146, generating net benefits of $12,821 and a BCR of 1.19.

Alternative 2: Raise the entrance road to 462.5 ft. Hazlet Park camping and day use facilities would be accessible to a lake level of 460.0 ft., and Hazlet Park facilities at elevation 462.5 ft. or higher would be accessible to a lake level of 462.5 ft. The cost for Alternative 2, including contingencies, is $1,632,220. Average annual cost, realizing a project evaluation period of 50 years and a 5.375%

discount rate, is estimated at $94,637. Average annual benefits are estimated at $83,486, generating net benefits of *negative $11,151* and a BCR of 0.88.

Apache Ramp. The Hazlet Apache 2-lane main boat ramp elevation is 450.0 ft. A separate 1-lane high water boat ramp adjacent to the main ramp is at elevation 459.9 ft. As noted above, the entrance roadway to the Hazlet Park facilities floods (becomes impassable) at elevation 456.4 ft.

One alternative has been identified:

Alternative 1: If the Hazlet Park entrance road is raised to 460.0 ft., an additional lane would be added to the 1-lane high water ramp, increasing Lake access under high water conditions. The cost for Alternative 1, including contingencies, is $30,050. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $1,742. Average annual benefits are estimated at $2,553, generating net benefits of $811 and a BCR of 1.47.

Allen Branch Recreation Area

The Allen Branch 4-lane main boat ramp elevation is 450.5 ft.

Two alternatives have been identified:

Alternative 1: A general upgrade including resurfacing of parking lots, ramp modifications, and a more accessible boat ramp. The cost for Alternative 1, including contingencies, is $340,200. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $19,725. Average annual benefits are estimated at $6,412, generating net benefits of *negative $13,313* and a BCR of 0.33.

Alternative 2: Raise the main ramp, boat ramp parking lot and entrance road to 452.0 ft. Parking, all four lanes of the main ramp and the entrance road would be accessible to a lake level of 452.0 ft. The cost for Alternative 2, including contingencies, is $593,185. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $34,390. Average annual benefits are estimated at $15,390, generating net benefits of *negative $19,000* and a BCR of 0.45.

Deer Run Recreation Area

Located on a small inlet on the east end of South Shore State Park, the 1-lane main (and only) boat ramp has three problems: the channel to open water becomes silted in at the Lake entrance; the ramp is at elevation 447.0 ft.; and the entrance road floods (becomes impassable) at elevation 452.0 ft. Proposals include relocating the ramp to higher ground with direct water access or dredging out the boat channel.

Two alternatives have been identified:

Alternative 1: Relocate the ramp to the mouth of the inlet, a higher ground elevation of 456.0 ft., *when* the South Shore State Park loop road development is implemented. The cost for Alternative 1,

including contingencies, is $90,770. Average annual cost, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $5,263. Average annual benefits are estimated at $9,752, generating net benefits of $4,489 and a BCR of 1.85.

Alternative 2: Raise the ramp to 452.0 ft. and dredge out the mouth of the inlet every three years. The cost for raising the ramp, including contingencies, is $25,500. The cost for dredging the inlet mouth to a depth of 6.0 ft. is $124,720, and dredging would be performed every three years. Combined average annual costs for both raising the ramp and dredging, realizing a project evaluation period of 50 years and a 5.375% discount rate, is estimated at $1,479 and $43,944, respectively, totaling $45,423. Average annual benefits are estimated at $3,706, generating net benefits of *negative $41,717* and a BCR of 0.08.

Appendix 2 - Master Plan Brainstorming Session
Master Plan Supplement Brainstorming Meeting
February 27, 2003

1. LAND BASED ACCESS
- Raise Hazlet road only after all other ramps are raised
- Want high water ramps to 475 NGVD
- No "Closed" signs during high water
- Flowage easements – need to be concerned for residents/property
- Raise 2.2 miles of Hazlet road – road closes at 456 (Park Closed)
- Raise CSA area/facilities – closes at 449.5 – Need to raise CSA lot to 455
- Facilities to 450 is not good enough
- Need to capitalize or develop of high elevation areas on east side of lake (i.e. South Shore)
- Rehab road at South Shore in 2 years (IDNR programmed)
- IDNR programming
    - Allen Branch boat ramp upgrade (only minimal raise)
    - Deer Run Peppenhorst Branch Boat Ramp's – scoping to make improvements
    - Apache – resurfacing this spring
- City of Carlyle sewer lagoons need flood protection
- All facilities need to be upgraded to be more user friendly during high use
- Facilities need to be well designed/constructed to 455
- Need to improve existing facilities before we build more (esp. beyond 455)
- Need to focus on all facilities/areas at the Lake—Not just Dam West
- Need to make improvements beyond 455-456
- Need to raise portions of the beaches
- Need to maximize economic conditions and use of the lake at least to 455 (i.e. from 445-455)
- The Federal government owes improvements at Carlyle to the public because it is not functioning as designed
- CSA needs high water launching more that other areas from 455 and below

2. WATER BASED ACCESS
- Ramps to 475
    - 2 lane boat ramp – each corner of the dam
    - Boulder Access – high water ramp extended to road
    - Concrete platform CSA to launch at high levels
    - Keyesport – boat ramp at beach
    - South Shore State Park – Hickory Hollow Campground – high water ramp
- Not using word "Closed"
- High Water Ramp CSA – Raise CSA facilities/parking lots
- Allen Branch – extra lane/floating docks