

***WILLOW CREEK STATE RECREATION AREA
RIVER ACCESS STUDY***

Final Report

Prepared for:

**Alaska Department of Natural Resources
Division of Parks and Outdoor Recreation
550 W 7th Ave, Suite 1380
Anchorage, AK 99501-3561**

Prepared by:



**HDR Alaska, Inc.
2525 C Street, Suite 305
Anchorage, Alaska 99503**

September 2006

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1.0 Study Description

The Willow Creek State Recreation Area (SRA) is located on the banks of the Susitna River adjacent to and immediately downstream of the mouth of Willow Creek. Local boaters have expressed a desire for a boat launch ramp to access the Susitna River at this location. Potential boat launch sites at this location were studied previously in 1997 and 2000. The 1997 study found that the Willow Creek area was not a good location for constructing a boat ramp site. In 2000, a follow-up study concluded that the decision to construct a ramp anywhere in the Willow Creek area must be made knowing that it will be subject to erosion, deposition, or channel shifts. These features of the Susitna River would negatively impact the operation, maintenance, and long-term stability of any ramp in the Willow Creek area.

Six years have passed since the last study was published. The local desire for a boat ramp at this location has not diminished. The Alaska Department of Natural Resources, Division of Parks and Outdoor Recreation (DPOR) has been tasked by the Alaska Legislature with re-evaluating the Willow Creek area for a potential site for a boat launch into the Susitna River.

2.0 Project Authorization and Scope

The Alaska Department of Natural Resources Division of Parks and Outdoor Recreation contracted with HDR Alaska, Inc. (HDR) under a professional service agreement to:

- Review and update the 2000 study to reflect 2006 conditions.
- Determine if safe and viable boating access to the Susitna River can be provided at Susitna RM 49.7 (approximately the location of the existing notch cut into the bank).
- Prepare a concept design and provide construction and operation and maintenance costs for a small-scale facility with a single launch ramp, 100-space parking area, a concrete vault toilet, trash facilities and a water well.

DPOR issued a notice to proceed to HDR for this work on April 26, 2006.

3.0 Project Background

Currently, small boat access to the lower 75 miles of the Susitna River is provided primarily by launch facilities at Susitna Landing near Mile 82 of the Parks Highway and at Deshka Landing near Mile 67 of the Parks Highway. The Alaska Department of Fish and Game Division of Sport Fish owns Susitna Landing and the Deshka Landing is privately owned. Access is also possible from a ramp into Cook Inlet at the Port of Anchorage.

In 1997 the Alaska Department of Fish and Game Division of Sport Fish (DSF) studied the Lower Susitna River between Bell Island and Willow Creek. The purpose of that study was to determine the ideal location for a major new boat launch and parking facilities on the lower Susitna River. A site at Willow Creek was not chosen in this 1997 report for several reasons. These included the susceptibility of the area to erosion and deposition, the potential for major channel shifts in that segment of the Susitna River, the presence of wetlands and cultural

artifacts, the distance to primary sport fishing destinations on the Deshka and Yentna Rivers, and the potential difficulty for boaters to negotiate the Susitna River channels in that area.

In 2000 the DSF studied the Willow Creek area in greater detail. The purpose of that study was to determine the most feasible site for a boat launch ramp exclusively in the Willow Creek area. That report looked at 5 potential sites in the Willow Creek area and concluded that the best site in the Willow Creek area for a ramp was approximately 1 mile downstream of the mouth of Willow Creek. It also concluded that the decision to construct a ramp anywhere in the Willow Creek area must be made with the consideration that there is a high likelihood that it will be subject to erosion, deposition, and shifting of channels which may cause it to become unusable.

See Figures 1, 2 and 3 for a vicinity map and aerial photos of the study area. Additional ground photos are included in Appendix 1 along with an oblique aerial of the site. The river miles (RM) used in this report are the same as were used in the 1997 and 2000 DSF reports. River mile zero is approximately at the confluence of the Susitna River and Cook Inlet.

4.0 Site Review

4.1 Review of Available Information

Available information on the Susitna River at Willow Creek was collected and reviewed. This information included:

- aerial photos dated June 16, 1962 at a scale of 1"=2,000'
- aerial photo mosaics for the Susitna River dated September 16, 1983 at a scale of 1"=2,000'
- aerial photos dated July 3, 1996 at a scale of 1"=2,000'
- ADNR land status mapping
- USDA, Soil Survey for Susitna Valley Area, Alaska, December 1973
- Willow Creek SRA, Master Plan, 1990
- Willow Creek SRA, Proposed Boat Launch Site Plan, 1990
- R&M Consultants, Susitna Hydroelectric Project, River Morphology, 1982
- Quadra Engineering, Willow Creek Boat Launch Conceptual Design, 1983
- Giles McDonald & Associates, Willow Creek Recreation Area Boat Launching Ramp Hydrologic Investigation, November 1988
- USDA, Soil Survey of the Matanuska-Susitna Valley Area, Alaska, 1995
- Alaska Department of Fish and Game Division, of Sport Fish, "Lower Susitna Boating Access Study", December 1997
- Alaska Department of Fish and Game Division, of Sport Fish, "Lower Susitna Boating Access Study, Willow Creek Site", November 2000.
- Aerial Photography dated May 10, 2006 at a scale of 1"=2,000'
- Aerial Photography dated May 10, 2006 at a scale of 1"=500'

4.2 River Morphology

Downstream of the Kashwitna River Confluence (RM 61), the Susitna River branches out into multiple channels separated by islands with established vegetation. This reach of the river has been named Delta Islands because it resembles the distributary channel network common with large river deltas. The Delta Islands river section has a very broad floodplain with little lateral control. The floodplain consists of river-deposited alluvial sediments that the river can easily move. The area is subject to major changes during flood events. Through this reach, the very broad floodplain and channel network can be divided into three categories: western braided channels, intermediate meandering channels and eastern split channels.

The western braided channel network is considered to be the main portion of this river system. It appears to constitute the largest flow area and lowest thalweg elevation. This channel will likely remain the dominant one since it provides the shortest distance between the upstream and downstream ends of the Delta Islands' section of the river. Because it has the shortest distance, it has the steepest gradient and the highest potential energy for conveyance of water and sediment. Most changes to the river channel during flood events will likely take place in the higher energy western braided channels.

The eastern split channels will tend to be more stable since the meandering pattern reduces the channel gradient. Distribution of water from the west to the east is likely to be highly variable since conditions at bifurcation points can rapidly change. At RM 51, one mile upstream of Willow Creek, there is past and present history of shifting gravel bars and fallen trees that create navigation problems into this eastern channel. At RM 52, two miles upstream of Willow Creek, the 2006 aerial photos showed a channel shift that had partially blocked the easternmost channel. This site was visited during the site reconnaissance and the channel had eroded through the blockage. Changes such as these can redistribute flow in the eastern channels. Redistribution of flow in the eastern channels can have dramatic impacts on navigability of channels.

The evaluated site is at RM 49.7. There is an existing cut in the bank at this site. The 1,500 feet of bank immediately upstream of this site has been and is still actively eroding. Sediment is actively depositing in the 2,000 feet downstream of the site. A comparison of aerial photos (Figure 4) showed that the most erosion is located at a point approximately 600 feet upstream of the evaluated launch site. Lesser amounts of erosion had occurred in the vicinity of the evaluated launch site. Estimated erosion is shown in table 4-1. An additional 5 to 10 feet was eroded in the vicinity of the evaluated launch site in August 2006.

Table 4-1. Estimated Erosion Rates

Period	# of years	600 feet upstream of ramp		Vicinity of ramp	
		Erosion (feet)	Rate of erosion (feet/year)	Erosion (feet)	Rate of erosion (feet/year)
1966 to 1983	17	80	5	15	1
1983 to 1996	13	175	13	45	3
1996 to 2006	10	10	1	30	3
1966 to 2006	40	265	7	90	2

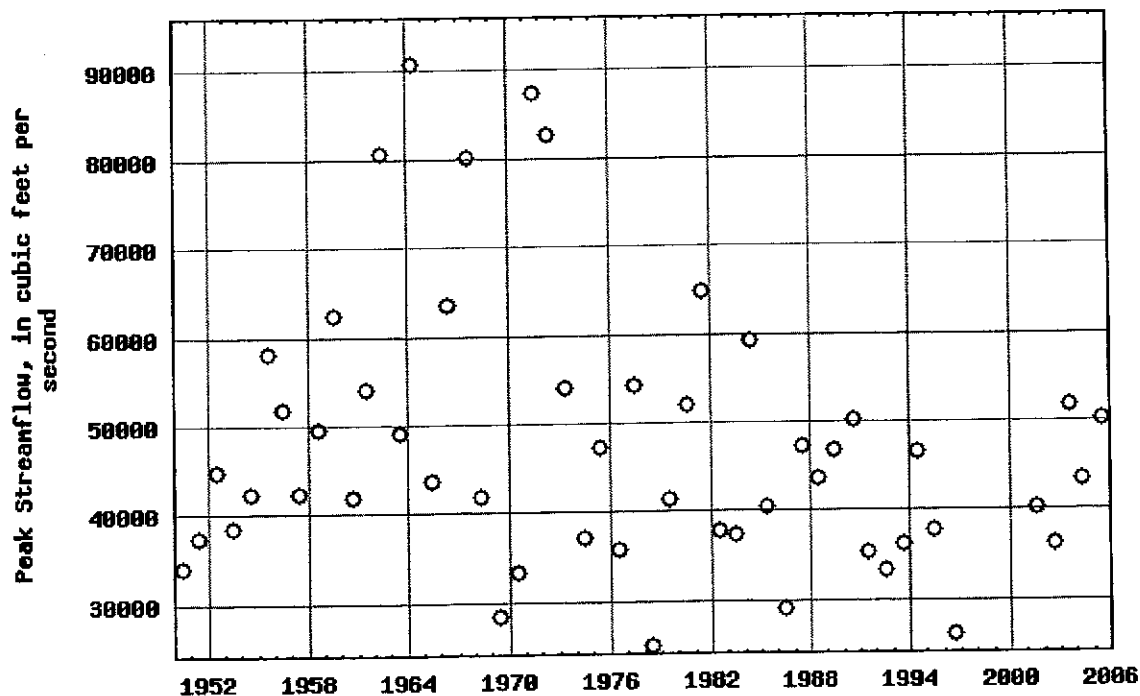
Erosion protection of this bank is possible but would need to extend approximately to 1,500 feet upstream to ensure a stable revetment. This would be very costly and require extensive negotiations with resource agency permit reviewers. The material eroded from this area was deposited downstream and has created an island with a high-water side channel. The island is presently accreting and will likely continue to accrete as long as upstream erosion continues.

The flood of October 12, 1986 was the largest recorded event on the Susitna River at Susitna Station (Period of record 1975 to 1992). A longer period of record (1952 to 2006) is available for the Susitna River at Gold Creek (see Table 4-2, below). This record shows that a number of large floods occurred prior to 1975 but that no large floods have occurred since then. Flooding occurred on during preparation of this report in August 2006. The flow in the Susitna River was estimated by the USGS as approximately a 5 to 10 year event and the flow in Willow Creek was estimated by the USGS as approximately a 5 to 10 year event. This is discussed in more detail in section 4.3.

The largest floods on this section of the Susitna River are generally due to heavy, basin wide, fall rainfall, combined with snowmelt in the high elevations. It is not expected that floodwaters will be significantly higher than the top of the existing upper bench due to the broad floodplain in this area.

Table 4-2. Susitna River at Gold Creek Historical Peak Flows

USGS 15292000 SUSITNA R AT GOLD CREEK AK



4.3 Site Reconnaissance

Field reconnaissance was conducted on August 3, 2006. Approximate river flow was 41,000 cubic feet per second (cfs) at the Parks Highway (Susitna River at Sunshine). Table 4-3 provides

historical median flows at the Parks Highway for the boating months of May through September. The flow at the time of this reconnaissance was a low flow for the month of August.

Table 4-3. Susitna River at Parks Highway (Sunshine) Historical Median Flows

Month	Historical Median Flow (cfs)
May	27,000
June	60,000
July	62,000
August	54,000
September	32,000
October	13,000

The evaluated launch site is at RM 49.7. There is an existing cut in the bank at this site. A cross-section was measured 80 feet upstream of the existing cut in the bank. Overall primary channel width was approximately 750 feet. A secondary channel on the west side was not surveyed. The deepest point of the channel (thalweg) was 70 feet from the east shoreline and was 10 feet deep. The elevation difference between the top of bank and the water surface at the time of the reconnaissance was 9.5 feet. Therefore, the channel depth was approximately 20 feet below the top of bank.

Surface current velocity at the cross section was measured between 6 to 8 feet per second. The highest velocities were closest to the east shoreline. Depth and velocity along this cross section are shown in Table 4-4.

Table 4-4. RM 49.7 Launch Site Water Depth and Velocity (partial channel)

Distance from east top of bank (feet)	Water Depth (feet)	Surface Velocity (feet/second)
4	0.0	
10	4.5	8.3
33	6.0	8.0
42	8.5	6.6
48	9.0	7.7
60	9.5	8.1
72	10.0	7.4
90	9.0	8.1
105	9.5	7.4
120	8.1	6.3
132	8.2	5.9
144	8.0	5.9
156	7.5	5.5
171	6.8	5.5
189	5.9	
201	4.3	
219	4.1	
231	3.5	
297	0.0	

A peat probe was used to explore the soils inland from the ramp area. Twelve locations were probed. Soft soils were found to a depth of 2 to 5 feet.

Active erosion, evidenced by numerous fallen trees along the shoreline, was observed along the east shoreline for 1,500 feet upstream of the proposed ramp site.

Immediately downstream of this site is the entrance to a river side channel. This entrance was blocked with snags and presents an immediate danger for boaters exiting or entering this site. These snags will need to be cleared as part of maintenance for this site. At the time of the reconnaissance this side channel was too shallow for boating.

Additional site reconnaissance was done following a flood event that began on August 18, 2006. This was a large event on Willow Creek (peak flow of 7970 cfs at Willow Creek near Willow and estimated return interval in excess of 100 years) and a moderate event on the Susitna River (estimated return interval of 5 to 10 years). At the peak of the flood, the Susitna River was slightly over the top of its banks. The ramp site was inspected on August 30, 2006, as the flood was in recession. Approximately 5 to 10 feet of bank was lost in the proposed ramp area and the cut in the bank was filled in with silts and sands to a level 2 feet below the top of the bank.

4.4 Conclusions of Site Review

It is technically possible to construct a boat launch at RM 49.7. As stated in the 2000 report and reiterated here, any decision by DOPR to construct a launch at this site must accept that:

- River bank erosion will continue in this area. It is not economically feasible to stabilize the banks in this area. Therefore a ramp must be setback a sufficient distance from the river to avoid erosion from directly impacting the ramp over its lifetime.
- It is difficult to launch or retrieve a boat directly into the current in the channel of the Susitna River at RM 49.7. A launch at this site will require a basin for safe and convenient launching and retrieving.
- Because of the extensive upstream erosion a basin constructed in this area will have sediment deposited in the basin. To maintain ramp operation, ongoing maintenance dredging will be required to remove deposited material. Dredging will likely be required in the fall and after each major flood event. Multiple consecutive dredgings may be required to keep the ramp open as water levels fall following a flood event.
- Immediately downstream of the site there are many snags that present a boating hazard. These will need to be initially removed and ongoing maintenance will need to be done to remove snags as they are deposited in this area.
- There is a risk that shifting of river channels in the future may cause the river to abandon this river channel or hinder boating upstream or downstream from this site. Either of these circumstances could make the ramp unusable.

5.0 Concept Design

5.1 Site Location

This site is located on undeveloped land at RM 49.7 on the east side of the Susitna River approximately 2000 feet downstream of the most downstream mouth of Willow Creek. Distances to other locations on the river are shown in Table 5-1. The distance from the Parks Highway at milepost 70.8 to the ramp site is approximately 4 miles.

Table 5-1. RM 49.7 Distances to Other Locations on Susitna River

Location	River Mile	Distance from RM 49.7 Site (river miles)
Susitna Landing	61	11 miles upstream
Willow Creek	50	0.3 miles upstream
Deshka Landing	45.5	4.2 miles downstream
Deshka River	40.5	9.2 miles downstream
Rolly Creek	39.5	10.2 miles downstream
Susitna Station	25	24.7 miles downstream
Yentna River	27	22.7 miles downstream
Cook Inlet	0	49.7 miles downstream

5.2 Concept Site Development Plan

A launch ramp at this site must be setback from the existing eroding shoreline to avoid it being immediately threatened by bank erosion and to provide safe launch conditions. Recent erosion has been averaging approximately 3 feet per year. Assuming a 25-year design lifetime for the ramp and a minimum basin length of 75 feet, the toe of the ramp should be set a minimum of 150 feet back from the existing shoreline and a greater distance is desirable if the site plan allows. The ramp should be located upstream of the depositional zone to avoid sediment deposition in the river channel riverward of the ramp.

The invert of the boat basin should be located deep enough that it will provide sufficient water to allow access at the time this ramp will be used. If this is late fall then the water surface elevation in the river should be verified at this time. For the purposes of this report the invert of the boat basin has been set at 4 feet below the existing break in slope of the channel. This will match the channel invert approximately 10 feet west from the shoreline and will allow for a minimum 3 to 4-foot deep basin during the June through August boating season.

The bottom width of the basin should be a minimum of 30 feet wide to allow a boat to be turned so that it can be powered out of the basin into the river current. The side slopes of the ramp should be set at a minimum of 3:1 horizontal to vertical for stability. No hardening, rip rap or similar surfacing should be installed at the outlet of the basin. Any hardening will only be outflanked by the river and large rock in the river channel will become a future hazard to boating.

Conceptual ramp location, traffic circulation and parking are shown on Figure 5. The parking area has been located to the south east of the launch ramp to avoid, as much as possible, the deeper peat

soils to the east. It is also set away from the entrance road to provide a vegetated screen and avoids the historic trail to the south. Access to the ramp would be controlled and launch fees collected at the existing State Parks entry station.

A single lane, 16 foot wide, concrete plank ramp would be constructed. This ramp would be set at a slope of 15% and would be approximately 100 feet long.

The roads and parking areas would be gravel surfaced. Parking would be provided for 100, 10-foot by 40-foot spaces. No delineation, such as bumpers, would be provided for the parking spaces. A concrete vault toilet, a dumpster screen, and a potable water well and watering point are included.

5.3 Topography - Soils - Vegetation - Wetlands

The ground at this launch and parking location is flat and the banks at this site were approximately 10 feet above the water level at a flow of 41,000 cfs at the Susitna River at Sunshine. The ground surface in this area is likely flooded during high water events on the Susitna River and design of facilities should take this into account.

Inland of the evaluated launch site to about the existing entrance station, the soils are classified by the Soil Survey of Matanuska Susitna Valley Area (SCS, 1995) as Killey-Moose River Complex. The Killey-Moose River Complex is described as 3 to 60 inches of stratified silty sandy sediment over gravelly sand. Further inland the SCS classifies the soil as Salamatoff Peat which is described as very poorly drained peat soils with up to 5 feet of peat overlying unknown soils. Soil probing done in 2006 in the Killey-Moose River Complex soil type in this area penetrated 2 to 3 feet before encountering solid material. Soil probing done in 2006 in the Salamatoff Peat soil type in this area penetrated 5 feet before encountering solid material.

Construction of roads and parking areas may require placement of a geotextile and surcharging of the soft underlying soils. A detailed soils evaluation will be required in design to define the limits of each type of soil and the amount of fill required. If the deep peat cannot be avoided fill depths of up to 6 feet may be required.

The vegetation in the silty soils consists of paper birch, white spruce, cottonwood and native grasses. Vegetation in the peat areas consists of black spruce, ericaceous shrub scrub and sedge-shrub bog meadow and fen meadow.

5.4 Property Ownership

The project appears to be on ADNR land within the State Recreational Area. This should be confirmed during the design survey.

5.5 Cultural Significance

An archeological reconnaissance of the proposed area was done on May 17, 2000. It was noted that cultural features might be found in this area. It was recommended that the area be intensively tested to determine the nature and extent of the cultural remains. This should be done

as a part of design and should be done prior to design so that project features can avoid cultural features if possible.

5.6 Environmental Contaminants

The site is located in an area undisturbed by recent human activity. A formal environmental audit of the area was not conducted because visual inspection suggested that contamination was highly unlikely.

5.7 Resource Agency Permits

The following permits/approvals will be required for this project:

1. USCOE 404/Section 10 permit.
2. ADNR ACMP CZM questionnaire and ACMP Consistency Determination Evaluation.
3. ADNR Habitat Title 41 Permit.
4. ADEC 401 Certification of Reasonable Assurance, needed for USCOE Permit issuance.
5. ADNR Land Use Permit, if fill below OHW is greater than 1 cy/linear foot.
6. ADNR Development Plan, if Land Use Permit is required.
7. Mat-Su Borough Acknowledgement of Existing Land Use Regulations
8. EPA NPDES Construction Runoff Permit Notice of Intent (NOI) with accompanying Stormwater Pollution Prevention Plan (SWPPP).
9. ADEC On-Site Sewage Disposal and Public Drinking Water Design Plan Approvals.

The permitting process for the project could take anywhere from 40 to 90 days after permit application submittal. Project complexities, agency personnel availability, and mitigation negotiations are the normal factors affecting the permit process timeline. All permit applications (except those noted in the following paragraph) must be submitted at the same time to the permitting agencies and the Alaska Department of Natural Resources Office of Project Management and Permitting, for a coordinated review and public noticing. The permitting process should be initiated during the design stage when the project design is fairly well established, but not so locked in that agency mitigation measures can not be easily included.

DEC design plan approvals, according to regulation, must be submitted 30 days prior to construction. However due to backlogs and limited personnel, ADEC recommends submittal be at least 45 days prior to construction to insure that the review is done prior to the planned construction date. The EPA NPDES NOI must be submitted to EPA and ADEC 7 days prior to ground breaking activity. A copy of the SWPPP must be submitted to ADEC with the NOI.

The Corps of Engineers (USCOE) requires mitigation for wetland losses/fills. Mitigation occurs at different levels, starting with avoidance, then minimization, rectifying and reducing, and finally monitory compensation. Project amenities such as raised walkways or wetland enhancement, along with minimization and avoidance, effect the need for monitory compensation. The habitat value of the wetland as well as the amount of said wetlands available at the site, not its property value, are factors in determining the amount of monitory compensation necessary for a specific wetland loss. In the project area, monetary compensation in lieu costs can be anywhere from \$0 to \$8,000 per acre.

6.0 Construction Costs

6.1 Construction Costs

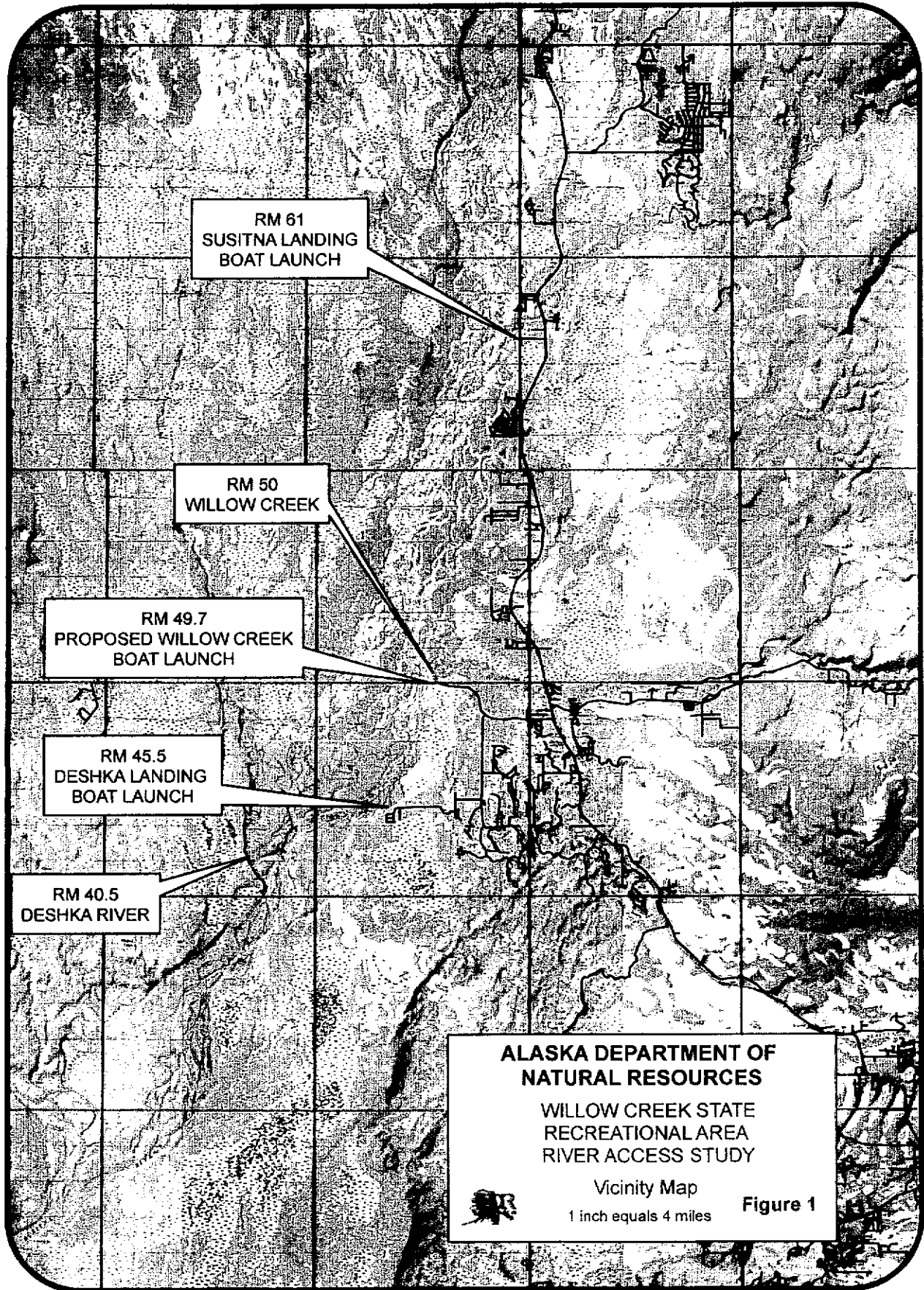
The estimated cost for construction of a boat launch at RM 49.7 is approximately \$1,000,000. This cost includes surveying, soils investigation, cultural survey, design, permitting, construction, construction management, and administration. A 20% contingency on the construction is included. Potential mitigation costs for filling wetlands for road and parking lot construction are included. There are assumed to be no property acquisition costs, as the land is presently owned by the ADNR. Unit prices were based on bid tabulations from Susitna Landing Facility Improvements dated February 22, 2006. Details of this estimate are shown in Appendix 2.

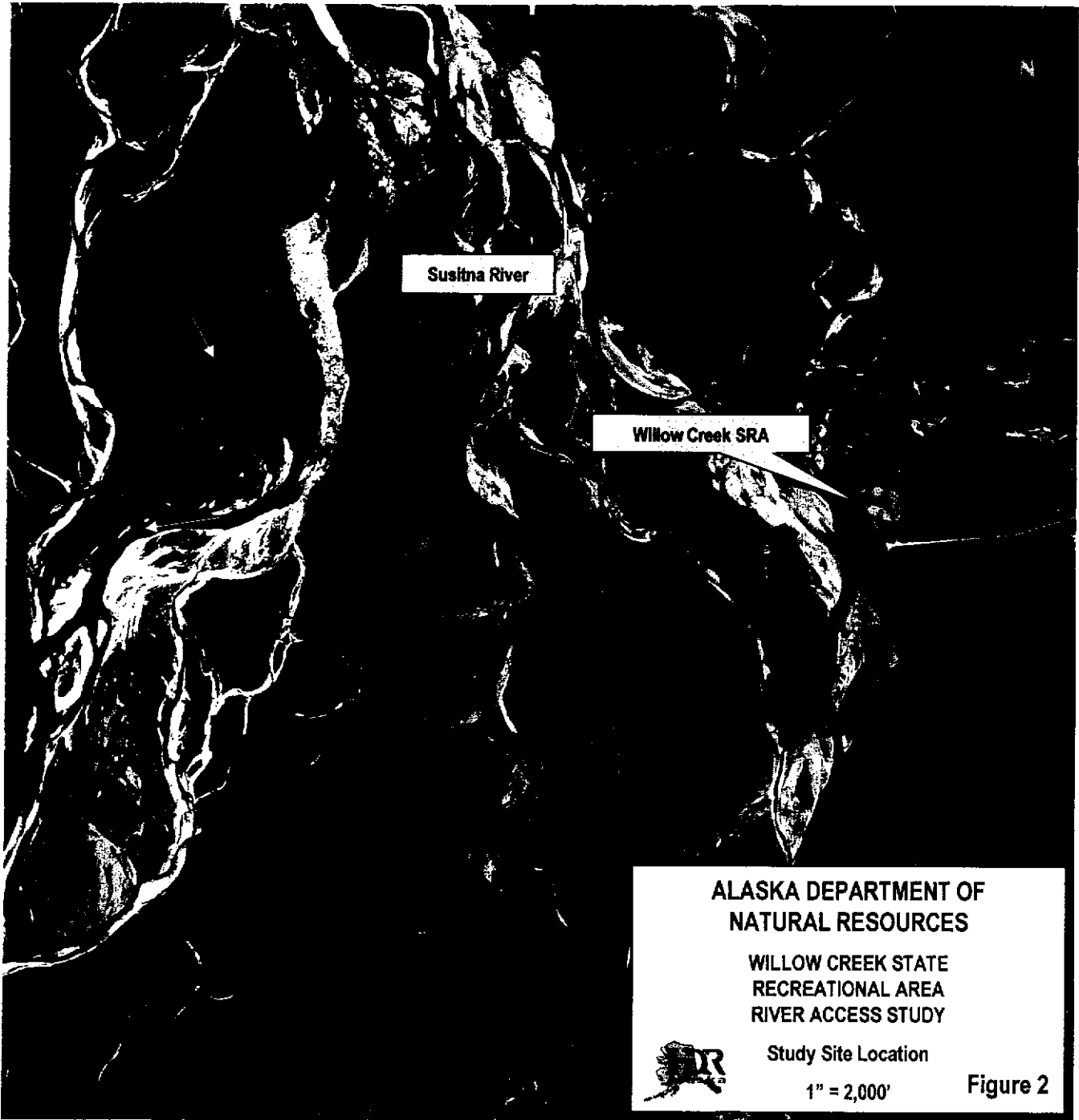
6.2 Operations and Maintenance Costs

Estimated first year annual maintenance cost is \$40,000. This cost includes boat ramp and parking lot maintenance. Dredging is assumed to occur 2 times each year, once in the fall and once following a significant high water event. We have assumed that a long term permit will be issued for the dredging and that permitting will not be required for each dredging.

Estimated first year annual operations cost is \$66,000. This cost includes an employee to manage the ramp and an employee to assist with fee collection, but does not include costs of emptying additional vault toilet holding tanks, trash collection and electricity costs which will be borne by the SRA.

Details of this estimate are shown in Appendix 2.





**ALASKA DEPARTMENT OF
NATURAL RESOURCES**

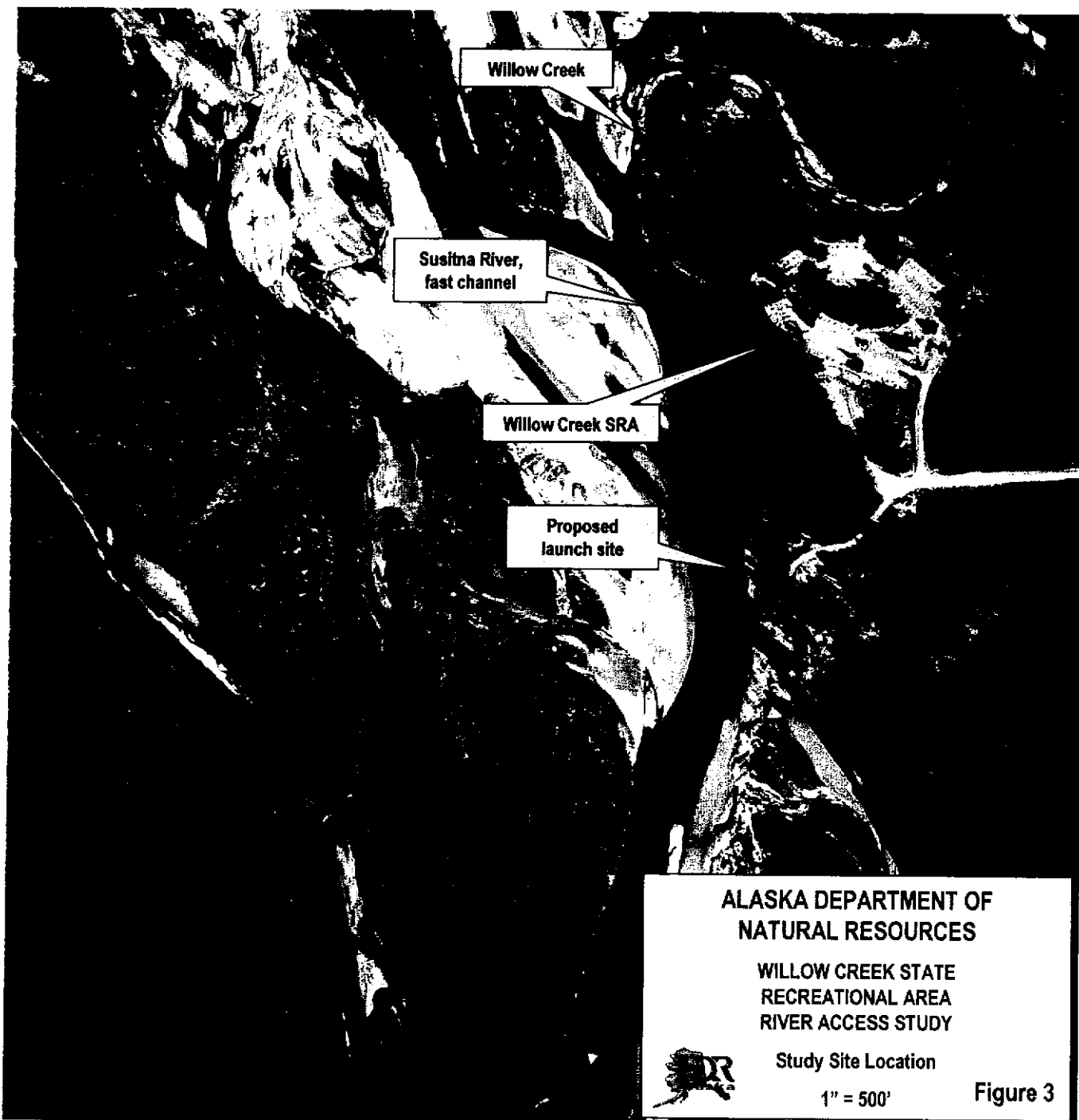
**WILLOW CREEK STATE
RECREATIONAL AREA
RIVER ACCESS STUDY**



Study Site Location

1" = 2,000'

Figure 2



C

D

RIVER BANK
MEANDER 1996

RIVER BANK
MEANDER 1983

RIVER BANK
MEANDER 1966

CONCEPT LEVEL
SITE PLAN

HDR
HDR Alaska, Inc.



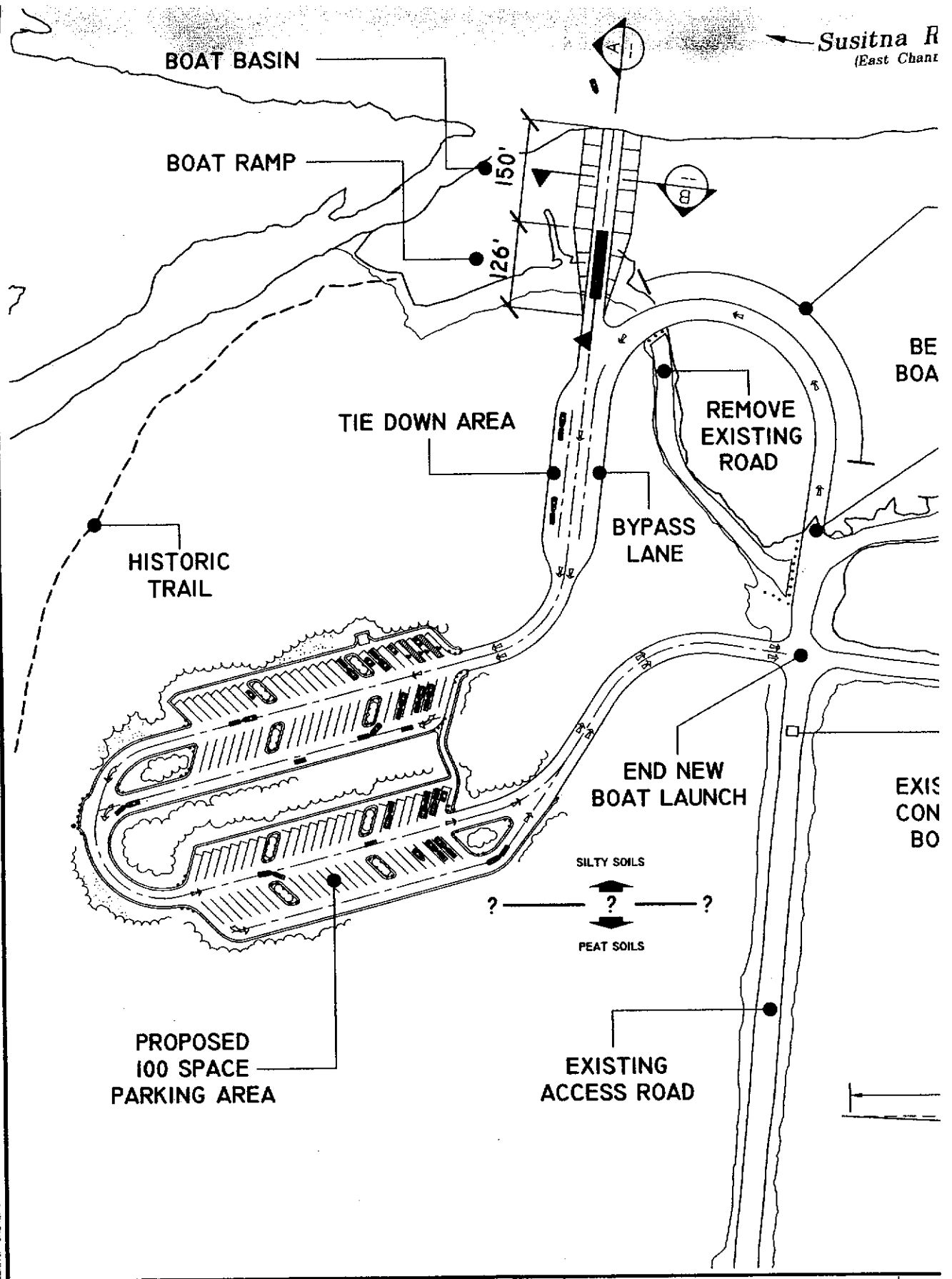
Department
Natural Resources

ALASKA DEPARTMENT OF NATURAL RESOURCES
WILLOW CREEK STATE RECREATION AREA
RIVER ACCESS STUDY

HISTORICAL CHANGES IN RIVER

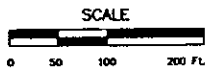
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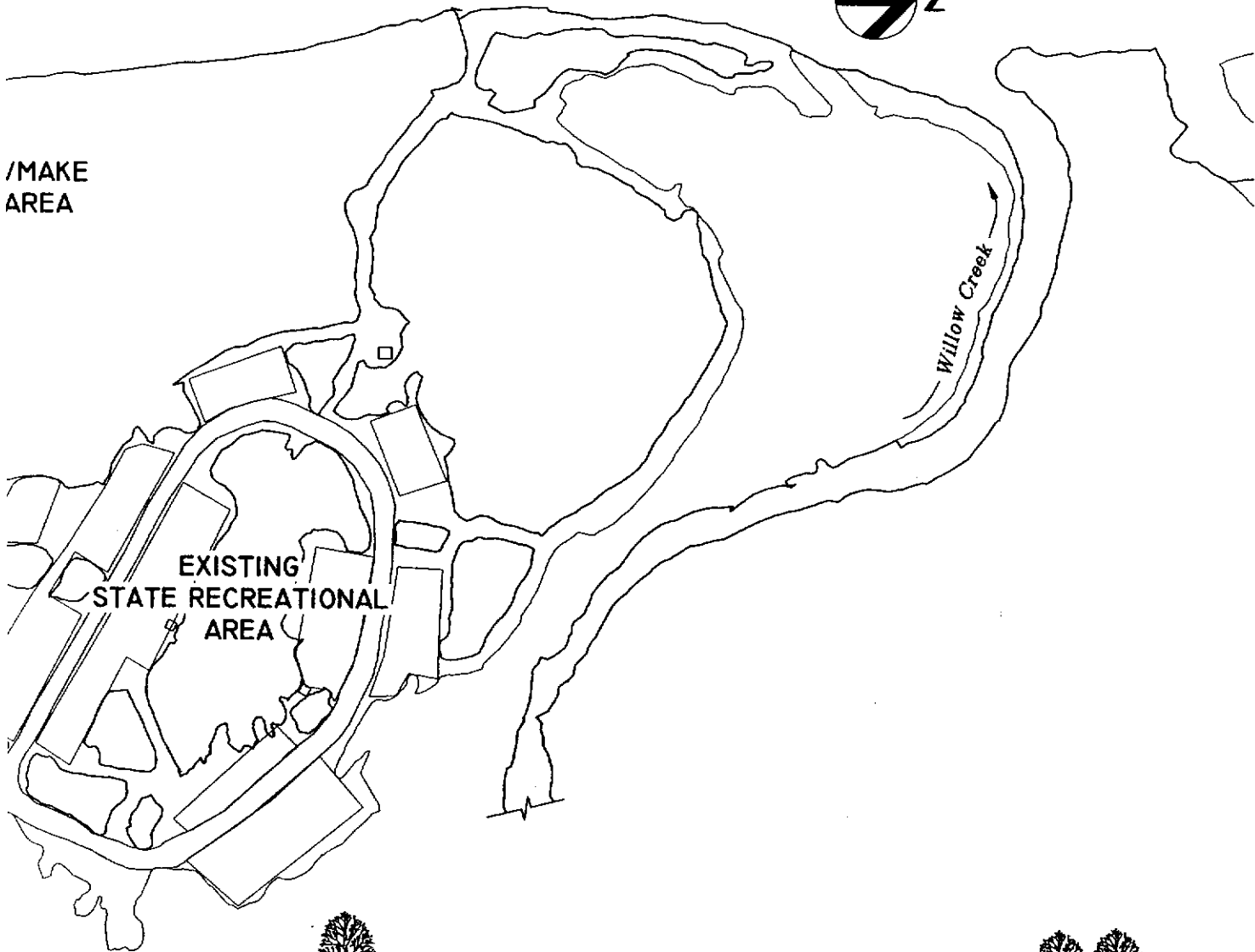
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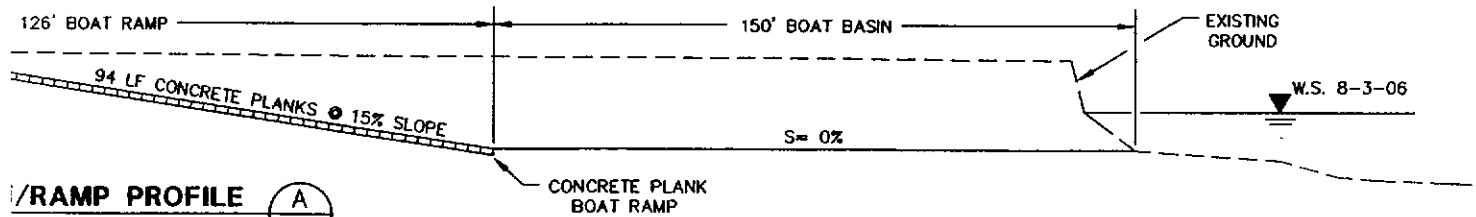
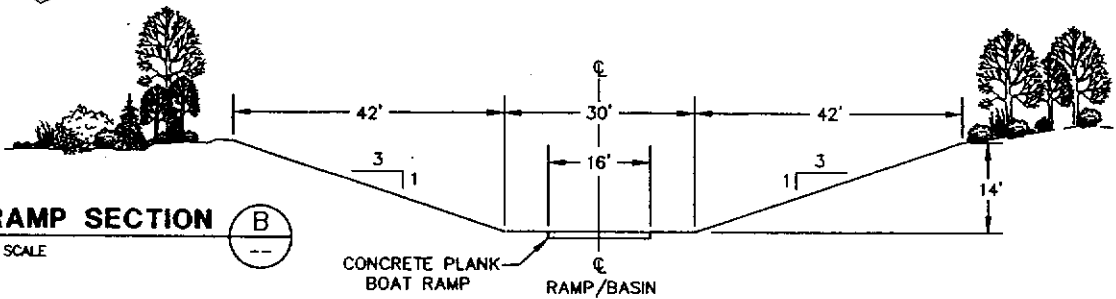
Revision No.	Description	Date

MAKE AREA



BASIN/RAMP SECTION (B)

SCALE: NOT TO SCALE



/RAMP PROFILE (A)

TO SCALE



ALASKA DEPARTMENT OF NATURAL RESOURCES
WILLOW CREEK STATE RECREATION AREA
RIVER ACCESS STUDY

CONCEPTUAL SITE PLAN

Figure Number:

5

Sheet of

Appendix 1
Site Photos



8/3/06 - Ramp location, looking east from Susitna River.



8/3/06 - Ramp location, looking west toward Susitna River.



8/3/06 - Proposed ramp location, looking upstream.



8/3/06 - Ramp location, looking downstream.



8/3/06 - Typical bank, just upstream of ramp.



8/3/06 - Typical bank, just upstream of ramp, note continued erosion.



8/3/06 - Typical shrub wetland at parking area.



8/20/06 - Ramp Site, during August 2006 high water.



8/30/06 - Ramp Site, following partial recession of August 2006 high water,
looking west



8/30/06 - Ramp Site, following recession of August 2006 high water,
looking upstream.



5/10/06 – Oblique photo looking east.

**Appendix 2
Construction Cost Estimates**

**Willow Creek State Recreation Area
River Access Study
Estimate of Construction Cost**

No.	Item	Unit	UnitCost (\$)	Qty	Cost
1	Land and Land Rights	LS	\$0.00	0	\$0
2	Mobilization and Demobilization	LS	\$40,000.00	1	\$40,000
3	Temporary Erosion and Pollution Control	LS	\$3,000.00	1	\$3,000
4	Surveying	LS	\$30,000.00	1	\$30,000
5	Clearing and Grubbing	ACRE	\$13,000.00	5	\$68,900
6	Unclassified Excavation	CY	\$12.00	10,073	\$120,875
7	Borrow	CY	\$13.00	4,146	\$53,895
8	Crushed Aggregate Base	TON	\$26.00	560	\$14,552
9	Geotextile, separation	SY	\$3.00	3,109	\$9,328
10	Culverts	LF	\$60.00	120	\$7,200
11	Single Lane Boat Ramp	LS	\$80,000.00	1	\$80,000
12	Vault toilets	EA	\$50,000.00	1	\$50,000
13	Garbage Facilities	LS	\$7,000.00	1	\$7,000
15	Class C Well	LS	\$15,000.00	1	\$15,000
16	Waterline	LF	\$15.00	200	\$3,000
17	Water Spigot	EA	\$1,000.00	2	\$2,000
18	Power Extension	MI	\$80,000.00	0.15	\$12,000
19	Entrance Gate	EA	\$6,500.00	2	\$13,000
20	Signage, Entrance	LS	\$2,200.00	1	\$2,200
21	Signage, Information	LS	\$20,000.00	1	\$20,000
22	Seeding	LB	\$150.00	20	\$3,000
23	Landscaping	LS	\$30,000.00	1	\$30,000
			Subtotal		\$584,949
			Contingency (20%)	0.2	\$116,990
			Subtotal		\$701,939
			Survey, Geotech, Design (15%)	0.15	\$105,291
			Permitting and Environmental	see below	\$107,400
			Construction Management (6%)	0.06	\$42,116
			Administration (6%)	0.06	\$42,116
			TOTAL		\$998,863
Permitting and Environmental					
	Wetlands Delineation		\$10,000.00		
	Archeological Survey		\$25,000.00		
	Permit Acquisition		\$30,000.00		
	Wetlands Mitigation		\$42,400.00		
	Total		\$107,400.00		

**Willow Creek State Recreation Area
River Access Study
Estimate of Annual Operations and Maintenance Costs**

No.	Item	Unit	UnitCost (\$)	Qty	Cost
1	Maintenance of Access Road	MI	\$1,000.00	0.5	\$500
2	Site Snow Removal	YR	\$2,000.00	0	\$0
3	Routine Maintenance of Facilities (materials)	YR	\$2,000.00	0.5	\$1,000
4	Routine Maintenance of Facilities (Labor)	YR	\$7,000.00	0.5	\$3,500
5	Dredging	EA	\$10,000.00	2	\$20,000
6	Snag removal	EA	\$5,000.00	1	\$5,000
			Subtotal		\$30,000
			Contingency (20%)	0.20	\$6,000
			Administration (10%)	0.10	\$3,600
			TOTALS		\$39,600
Operations					
No.	Item	Unit	UnitCost (\$)	Qty	Cost
1	Labor for fee collection	MO	\$7,500.00	4	\$30,000
2	Labor for Site operation	MO	\$7,500.00	4	\$30,000
			Subtotal		\$60,000
			Administration (10%)	0.10	\$6,000
			TOTALS		\$66,000