2013 Legislature TPS Report 58566v1

Agency: Commerce, Community and Economic Development

Grants to Municipalities (AS 37.05.315)

Grant Recipient: Ouzinkie **Federal Tax ID:** 92-0035750

Project Title: **Project Type:** New Construction and Land Acquisition

Ouzinkie - Mahoona Lake Dam Repair and Replacement

State Funding Requested: $1,800,000 **House District:** 35 / R

One-Time Need

Brief Project Description:

Construct an access road to and replace the failing municipal water and hydro electric dam at Mahoona Lake.

Funding Plan:

Total Project Cost:	$2,087,000
Funding Already Secured:	($287,000)
FY2014 State Funding Request:	($1,800,000)
Project Deficit:	$0

Funding Details:

2011,dam safety inspection and analysis r&m consulting $25,000.

2012,emergency level reduction control A.N.T.H.C.$70,000 emergency funds.-

2012,road to hydro plant and bridge replacement $10,000 state grant $15,000 city match.-

Fall 2012 to June 2013 A.N.T.H.C.$167,000 preliminary design and engineering, road and dam.

City of Ouzinkie in kind donation of all rock and gravel for road and dam including surfacing material,approximately value $100,000

Detailed Project Description and Justification:

This legislative request includes finalized, design, permitting and construction of an access road to the Mahoona Lake Hydro Electric and Municipal Water Dam, and design, permitting, and construction of the replacement dam. The existing dam is located 1.5 miles east of the City, located on Spruce Island near Kodiak, Alaska. The dam is in a severely dilapidated condition and has the potential for catastrophic failure which will result in the loss of millions of dollars of critical municipal infrastructure upon failure, the community would be without an adequate water supply, incur significant damage or destruction of the powerhouse,bridges, roads, other facilities and fish habitat as well as potential loss of life, and require 100 percent diesel power generation and municipal water rationing and sterilization until such time as a replacement dam and hydro facility can be funded.

The City of Ouzinkie operates water, waste water and power utilities for the community. The Mahoona Lake Dam was constructed in 1987 to provide a stable water supply and hydroelectric power. It is a timber buttress dam composed of wooden lagging (tongue and groove) running the height of the dam, supported by a series of horizontal girts (stringers). The dam was modified in 1996 to raise the timber portion of the dam, lengthening the dam with sheet-pile walls on each end, constructing a new concrete spillway and adding an earthen saddle dam south of the main dam. Timber buttress construction is rarely used today; the weakness of the design is the eventual deterioration of the structural and facing timber. (Source: Mahoona Lake Dam Periodic Safety Inspection, HDR Alaska, Inc., 20 November 2007)

Contact Name: Astrid Rose
Contact Number: 465-3271

For use by Co-chair Staff Only:

$1,800,000 Approved

2:00 PM 5/9/2013

The current reservoir and hydroelectric system includes 400 acre-feet of capacity, a 6,000 foot/18-inch diameter PVC penstock, a 1.5 mile primitive access road, and a 125kW hydroelectric power house. Backup power is provided by a diesel power plant with output capacity of 200kW. Current peak demand for power in Ouzinkie is approximately 140kW. The 125kW hydroelectric system cannot meet this demand and hydro use must be balanced with the need for City water. Also, water volume can be reduced during periods of low precipitation so the power supply must be supplemented by diesel power.

The deterioration and safety deficiencies of the Mahoona Lake Dam have been well-documented, including a June 2011 field inspection by the State of Alaska Department of Natural Resources Dam Safety and Construction Unit (DSCU) and a field inspection by R&M Engineers, under contract by the City. The DSCU report confirms that the dam needs near-term rehabilitation and lists dam replacement as the safest long-term solution. The report by the DSCU noted that the Mahoona Dam is in poor condition, including a severe degradation of structural integrity. (Source: Mahoona Lake Dam Periodic Safety Inspection, 11 July 2011).

The deteriorated and unsafe condition of the dam indicates the need for construction of a new dam. In addition, a larger holding capacity would stabilize year-round power production,eliminating fuel cost for diesel power generation and State Power Cost Equalization Subsidies currently at approximately 100,000.00 per year at current diesel prices , and provide additional capacity to support the new airport and harbor development. For now, the existing reservoir has been lowered to reduce pressure on the dam and only allows limited use of the hydro plant to reserve enough water for the communities water supply until dam replacement is funded and completed.

The State of Alaska Dam Safety and Construction Unit has identified the dam as its top priority in the State for remediation and replacement, and the agency strongly supports the proposed replacement. The City of Ouzinkie has identified dam safety improvements as its number one capital improvement priority.

The proposed project includes four components described below.

1. Installation of level control piping to reduce potential losses upon dam failure/Permitting to Existing Dam: This includes a Periodic Safety Inspection, permitting and construction for dam repairs, and access road repairs during the 2012 construction season.

2. Analysis/Design of Replacement Dam and Access Road: This includes site investigation, system evaluation, geotechnical services, environmental review, permitting requirements, and conceptual design for replacement dam.

3. Design/Construction of Access Road: Access to the dam site must be upgraded in order to complete the repair and replacement projects.

4. Final Design/Construction of Replacement Dam: Design and construct a dam from durable materials such as roller compacted concrete or concrete faced rock fill.With removal of a rock outcrop limiting usable water, The new dam will increase usable reservoir capacity substantially.

The following summarizes current expenditures and the cost estimates for the proposed project:

Temporary Repairs/Permitting to Existing Dam: $70,000
repair first section of dam road and replace bridge,$25,000

Contact Name: Astrid Rose
Contact Number: 465-3271

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Design/Permit, Access Road and Dam: $352,000
Final Design/Permit and Construction of Replacement Dam: $1,800,000
Total$2,090,000

The temporary repairs are critical to reduce risk to the general public and property. The dam replacement is the most cost-effective way to mitigate risk of dam failure, increase year-round use of renewable energy and substantially reduce the cost of power to residents and customers. The proposed repair and replacement project has the following benefits.

1. Protect life and property below Mahoona Lake as well as fish and wildlife habitat in the Mahoona Lake drainage.

2. Provide uninterrupted hydroelectric power, eliminating need for state P.C.E.subsidy and significantly lowering the cost of power to consumers

3. Provide long-term stability and continuity of the City's electric and water utilities and reduced cost of operation and maintenance.

4. Increase power production capacity to support power generation for the entire electric utility customer base and a projected increase in demand.

Project Timeline:

Periodic Safety Inspection and Dam Safety Permitting: Current

Temporary Repairs/Permitting to Existing Dam and Access Road: June-Sept 2012

Analysis/Design/Permitting of road and Replacement Dam: June 2012-June 2013

Final Design/Bid/Contract for Replacement Dam and Access Road: Jan-July 2013

Mobilization/Construction of Replacement Dam and Access Road: August-Nov 2013

Entity Responsible for the Ongoing Operation and Maintenance of this Project:

CIty of Ouzinkie

Grant Recipient Contact Information:

Name:	Dan Clarion
Title:	Mayor
Address:	P.O. Box 109
	Ouzinkie, Alaska 99644
Phone Number:	(907)680-2251
Email:	ouzinkiemayor@ouzinkie.org

Has this project been through a public review process at the local level and is it a community priority? [X] Yes [ ] No

For use by Co-chair Staff Only:

2:00 PM 5/9/2013

Contact Name: Astrid Rose
Contact Number: 465-3271

Alaska Native Tribal Health Consortium

Division of Environmental Health and Engineering
3900 Ambassador Drive • Suite 301 • Anchorage, Alaska 99508 • Phone: (907) 729-3600 • Fax: (907) 729-4090 • www.anthc.org

October 5, 2012

The Honorable Dan Clairon
Mayor, City of Ouzinkie
PO Box 109
Ouzinkie, Alaska 99644

Dear Mayor Clairon:

Re: Technical Assistance - Planning Support - Replacement - Critical Community Infrastructure - Including Water Impoundment Dam and Raw Water Supply Pipeline - Ouzinkie

Mahoona Lake provides a source of drinking water and hydro-electric power for the community of Ouzinkie. In June of 2011, the State of Alaska, Department of Natural Resources Dam Safety and Construction Unit (DNR) inspected the dam that impounds Mahoona Lake and noted concerns regarding the condition of the dam structure. In September, R&M Consultants conducted a periodic safety inspection of the dam. The findings of the inspection recommended among other things, that immediate mitigating actions be taken to reduce the water level behind the dam.

For the past year, the Alaska Native Tribal Health Consortium (ANTHC) has been assisting the City of Ouzinkie to assess and mitigate the threat posed by a structural failure of the dam. Potential failure of the dam structure threatens life and property downstream of the dam, the drinking water supply for the community and the community's ability to produce hydro-electric power. In November 2011, ANTHC prepared an engineering report entitled "Ouzinkie, Alaska, Recommendations for a Dam Water Level Control" and subsequently constructed the recommended level control structure. This work effort required over 200 hours of ANTHC staff time and over $5,000 in emergency funding. Unfortunately, the level control structure is not a long term solution and cannot address large storm events. A significant storm event could quickly fill up the dam/lake and threaten catastrophic failure of the dam structure. The concerns over an impending catastrophic dam collapse are further exacerbated by a high degree of wood rot in the dam's structure and continued degradation of the wooden members.

The ANTHC understands the critical nature of this project and is prepared to provide technical assistance and planning support for the evaluation of sanitation facility requirements in regards to the dam, and the partial design of a system to meet these requirements. This includes staff resources to begin the planning and design of a replacement dam structure, dam access road, and the associated raw water transmission line. We anticipate that this initial commitment will advance the project design to 50% completion. We understand that the City of Ouzinkie is in the process of securing a loan to fund the completion of the design.

A construction project to replace the failing Mahoona Lake impoundment does not neatly fit into any one traditional funding stream because it serves both energy and sanitation needs for the community. To this extent, the City of Ouzinkie is working with their legislative delegation and the Ouzinkie Native Corporation representatives to seek a direct appropriation from the State Executive Branch in an effort to begin construction of the project in 2013. The ANTHC fully supports this effort.

We look forward to working with the City of Ouzinkie on this important project. If you have any questions about our commitment or support, please do not hesitate to call me at (907) 729-3509.

Sincerely,

Daniel Reitz, P.E.
Director
Operations Development

cc: DEHE, Anchorage - John Warren/David Beveridge/
Shad Schoppert/Matthew Dixon/
Michael Black/Steven Weaver

ANTHC Resources expended on the dam level control structure:		
Task	Hours	Estimated Cost
Design analysis and engineering	118*	$17,828
Computer aided design	40	$3,505
Tribal utilities support engineering	30	$3,629
Tribal utilities support superintendent	160	$16,886
Tribal utilities support intern	80	$5,965
Materials		$8,000
Total expended on dam level control structure		**$55,813**
ANTHC resources expended on preliminary design surveys:		
Survey of access road and dam site	65 hours	$6,432
Total expended to date on all dam issues		**$62,245**

Proposed Dam Construction Cash Flow Scenario :		
Construction Time Frame	Tasks	Estimated Cost
Fall 2013-December 2013	Mobilize, set up camp, open rock pits, begin access road construction	$610,000
March 2014-July 2014	Complete access road construction, demolish old wood dam structure and construct rock fill dam structure (Construction of main dam structure must occur over the months of May, June and July in order to take advantage of dry weather and to minimize issues and costs of diverting large amounts of water)	$805, 000
August 2014-December 2014	Complete dam, access road, connections to penstock, dam site drainage and begin penstock replacement	$855,000
March 2015-December 2015	Finish construction of penstock, upgrade turbine and close out project	$1,305,000
Project Total		**$3,575,000**

Emergency Action Plan for Alaska Dam Safety Program

DAM EMERGENCY CONTACT RECORD

1	Date: Sept. 21, 2011	Time: 3:00 PM
2	Name of Dam: Mahoona Dam	NID # AK00207
3	Project location: Ouzinkie, Spruce Island Alaska	
4	Report received from: John Magee & Matt Morrow Affiliation: R+M Consultants Contact Information: 522-1707	
5	Description of the emergency: R+M conducted visual inspection of dam for periodic safety inspection, coincidentally subsequent to significant precipitation. Substantial amount of seepage through face of timber dam, combined with identification of rotten wood in structural members, leads R+M to recommend urgent, temporary mitigation measures to stabilize structure, pending long term resolution.	
6	Dam condition is (circle one): Failure in progress Failure imminent within ____ hrs (Non-failure emergency)	
7	EAP on file with ADNR? Yes (No) Uncertain	EAP activated? Yes (No) Uncertain
8	Hazard Potential Classification (from Table 1-1 or Appendix E): I (High) (II (Significant)) III (Low)	
9	Is evacuation required? Yes (No) Uncertain	Notifications made? Yes No Uncertain
10	Is search and rescue required? Yes (No) Uncertain	Is search and rescue in progress? Yes (No)
11	Situation (from Table 1-2): A B (C) D	Emergency Classification (from Table 1-2): IIC
12	Describe Mitigation actions planned or in progress: Structural evaluation to be followed by development of temporary mitigation plan.	
13	Other actions planned: Long term solution will need to be developed. Substantial amount of deterioration may preclude permanent repair without replacement.	
14	Resources available or required for response: Emergency funding needed for temporary mitigation as well as funding for long term solution.	
15	Plan to obtain additional resources: Needs development. Follow up inspection by R+M planned for 9/23/11.	
16	Support requested from State: Funding. Ouzinkie has limited resources.	
17	Plan for communication and contact during the event: R+M will complete periodic safety inspection report and submit it to ADNR.	
18	Does dam owner/operator response appear adequate (See Table 1-3)? Yes No (Uncertain)	
19	Notes: ADNR Dam Safety observed Mahoona Dam on 6/10/11. Water level was approx. 0.8 ft lower than R+M observed on 9/15/11. Deterioration was noted, but seepage was substantially less earlier in year.	
20	Recorded by: Charles Cobb	Phone # (907) 269-8636

For instructions and additional information see Chapter 1, 2, 3 and 4 of the *Emergency Action Plan for Alaska Dam Safety Program.*

OUZINKIE MAHOONA PICTS BY JOHN MAGEE 09/15/11

IMGP3295 12:48:25 2011:09:15

IMGP3296 12:48:33 2011:09:15

IMGP3298 12:49:08 2011:09:15

IMGP3299 12:49:14 2011:09:15

IMGP3300 12:49:19 2011:09:15

IMGP3301 12:59:22 2011:09:15

OUZINKIE MAHOONA PICTS BY JOHN MAGEE 09/15/11

IMGP3302 12:59:30 2011:09:15

IMGP3303 12:59:36 2011:09:15

IMGP3304 12:59:49 2011:09:15

IMGP3305 12:59:59 2011:09:15

IMGP3306 13:00:13 2011:09:15

IMGP3307 13:01:18 2011:09:15

OUZINKIE MAHOONA PICTS BY JOHN MAGEE 09/15/11

IMGP3308 13:01:28 2011:09:15

IMGP3309

IMGP3310

IMGP3311

IMGP3312

IMGP3313 13:05:38 2011:09:15

OUZINKIE MAHOONA PICTS BY JOHN MAGEE 09/15/11

IMGP3314

IMGP3315

IMGP3316 13:07:18 2011:09:15

IMGP3317 13:07:25 2011:09:15

IMGP3318 13:08:08 2011:09:15

IMGP3319 13:08:17 2011:09:15

OUZINKIE MAHOONA PICTS BY JOHN MAGEE 09/15/11

IMGP3320 13:09:18 2011:09:15

IMGP3321 13:09:27 2011:09:15

IMGP3323 13:13:28 2011:09:15

IMGP3324 13:13:43 2011:09:15

Rotation of IMGP3324 13:13:43 2011:09:15

IMGP3325 13:24:29 2011:09:15

OUZINKIE MAHOONA PICTS BY JOHN MAGEE 09/15/11

IMGP3326 13:24:43 2011:09:15

IMGP3327 13:24:49 2011:09:15

IMGP3328 13:25:00 2011:09:15

IMGP3329 13:25:16 2011:09:15

IMGP3330 13:25:52 2011:09:15

Re-exposure of IMGP3330 13:25:52 2011:09:15

Construction Cost Summary

CITY OF OUZINKIE
DAM REPLACEMENT
ENGINEER'S OPINION OF PROBABLE COST

10/4/2012

See Attached Pages

WORK ITEM	*General Provisions*	*Access Road Improvements*	*Portland Cement Concrete*	*Dam Demolition*	*Dam Earthwork*	*Penstock and Turbine*	*Total*
ESTIMATED COST	332,350	537,338	316,250	35,650	558,900	1,794,000	$3,574,488

TOTAL ESTIMATED PROJECT COST **$3,574,488**

Project Breakout:

Access Road	$592,420
Dam Replacement	$1,004,165
Penstock	$988,951
Turbine	$988,951

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF MINING, LAND AND WATER

DAM SAFETY AND CONSTRUCTION UNIT

SEAN PARNELL, GOVERNOR

550 W. 7th AVENUE SUITE 1020
ANCHORAGE, ALASKA 99501-3577
PHONE: (907) 269-8636
Fax: (907) 269-8947

FIELD INSPECTION REPORT
MAHOONA DAM
(AK00207)

Inspection Date:	June 10, 2011
Report Date:	July 11, 2011
Weather:	Overcast, 50°F
Inspection Objectives:	Site visit
Owner Contact:	The Honorable Dan Clarion, Mayor of Ouzinkie
ADNR Personnel:	Charles Cobb, Chandler Engel ADNR
Documentation:	Photos and field book notes were taken and are available for review at DNR-DMLW in Anchorage.

Field Inspection Notes

Field Inspection Overview: The ADNR Dam Safety and Construction Unit (Dam Safety) visited the Mahoona Dam at Ouzinkie, AK on June 10, 2011. The Mayor of Ouzinkie, the Honorable Dan Clarion, accompanied Dam Safety during the field visit.

Site Conditions: The weather was overcast and breezy. All snow had melted around the dam. The ground was damp, but not saturated.

The water surface of the impoundment was several inches below the elevation of the spillway invert.

Thick shrubby growth covered most of the downstream face of the embankment section of the dam and the area directly downstream of the timber dam.

There was a significant amount of woody debris observed upstream and downstream of the spillway. Many dead trees remain standing in the reservoir which appear to be the source of the woody debris.

Dam Overview: The Mahoona Dam is located approximately 1.5 miles east of the City of Ouzinkie, on Spruce Island near Kodiak, AK. Primary access is a 1.2 mile long unpaved road off of 3rd Street. The last half mile of the road was inaccessible by street vehicle during the field visit because of a muddy section.

The main dam is composed of four sections: a timber buttress dam flanked on both ends by sheetpile core embankment sections, and concrete spillway founded on bedrock. An independent saddle dike to the south of the main dam is separated by a small treed knob.

Dam Descriptions and Conditions:

Saddle Dike

An earthen saddle dike was constructed when the main dam was raised in 1996 to prevent the reservoir from spilling through a natural depression to the southeast of the main dam. Design drawings show the dike as an embankment composed of "local impervious organic material", faced with "impervious fabric" overlaid with rip-rap. The saddle dam is approximately 4-6 feet tall and 80 feet long.

There was no evidence of seepage or slope instability at the saddle dam. Woody growth was present on the dike, which can be seen in Photo A-1.

Main Dam

Timber Section

The timber buttress dam section is the longest portion of the Mahoona Dam and can be seen in Photo A-2.

Timber buttress dam construction is a classic technique which is rarely used today. The main weakness of the timber buttress design is the eventual deterioration of the structural and facing timber.

The structural timber section of the Mahoona Dam is built in a fashion similar to the generic timber buttress dam described in the document *Engineering Guidelines for the Evaluation of Hydropower Projects*, published by the Federal Energy Regulatory Commission (FERC, 1997). The terminology used to describe the dam's structural components in the FERC document differs from that used in the Mahoona Dam design drawings. The design drawing terminology is included in brackets in the following section for clarity. The various components are shown in Figures A3 through A6.

The face of the dam is composed of wooden lagging [tongue and groove] running the height of the dam, which is supported by a series of horizontal studs [stringers] which run parallel to the major axis of the dam. Both the face and the weight of the water above the face are supported by a row of bents placed downstream. The bents are triangular frameworks consisting of a wale [bent], struts [posts], cross-members [post-braces] and a sill [footer]. The bent connections are generally pinned together with threaded bolts. The wales run the full height of the dam perpendicular to the face studs and transfer the face load to the bents. The wales also hold the lapped stud connections together. In each bent, three struts of increasing length support the wale and bear the compressive load of the face along their long axis. Cross-members provide tensile strength by resisting the displacement of the struts which are under a compressive force. The face load is transferred from the struts to a concrete sill which makes up the foundation of each bent and provides shear resistance at the interface between the structure and the rock/soil foundation. Shear strength at the sill/rock interface at

Mahoona is achieved through the use of rebar dowels drilled into rock. Some lateral wooden bracing was also installed across the row of bents apparently to stiffen the structure.

The wooden structural members of the Mahoona Dam did not appear to be treated with creosote or any other obvious material to inhibit deterioration. A significant portion of the structural members were observed to be very damp due to persistent flow through small seeps in the dam face. The lagging and studs appeared to be nearly saturated up to the current water surface elevation, the wales and the bottom two rows of struts were very wet, and the long cross-members were wet over half their length due to dripping water, as shown in Photos A-3 and A-4.

Splitting was observed in several of the wales and lower struts. The damaged wales were splitting longitudinally on the downstream face in line with the bolted connections, though some had complimentary splitting on the perpendicular face, seen in Photo A-5. The damaged struts were primarily in the shortest row and were splitting where they butted against the wales. In general the studs did not exhibit obvious signs of deterioration, but several of the very wet studs supported moderate moss growth. The lagging was very damp and water was observed seeping through the entire face below the reservoir elevation. With the exception of one location discussed below, the lagging appeared to be in fair condition.

The concrete sills which provide the foundation to the buttress structure appeared to be in good condition. There were no obvious signs of displacement of the sills or excess cracking in the concrete.

Dam Safety observed a small outlet pipe installed through a single vertical piece of lagging to the right of the penstock (looking upstream), shown in Photo A-6. The 1 to 1.5 inch metal outlet pipe is controlled at its end with a ball valve. It was not clear for what purpose the valve was installed, and it does not appear on design drawings available in the Dam Safety office. The piece of lagging through which the outlet was installed has swelled considerably and displaced approximately one half inch downstream relative to the adjacent lagging. Further displacement appears to have been arrested by the horizontal studs above and below the outlet valve. Jets of water were observed emanating from the edges displaced board.

The 21 inch PVC plastic pipe low level outlet and 21 inch PVC plastic pipe penstock both pass through the base of the face of the dam. There did not appear to be any significant leaks around the penetrations. The low level outlet valve is apparently closed. A buoy was inserted into the end of the low level outlet, and was held in with a piece of rebar spanning the opening. The 2007 periodic safety inspection report indicates that the net buoy was installed at the terminus of the low level pipe to hold back seepage from the low level outlet valve. During the site visit, the buoy did not feel particularly rigid and therefore did not appear to be exposed to the full head of the reservoir. The valve stem controlling the low level outlet valve had been removed. The penstock has a control valve, with a key in place, approximately 60 feet downstream of the dam, adjacent to and upstream of the air release standpipe.

A wooden platform runs across the top of the timber section and provides access to the crest and the right side of the dam. The platform was in good condition, though the railings were weathered and in fair condition.

Both abutments of the timber section are concrete retaining walls and were in good condition with no signs of seepage.

Embankment Sections

There are two embankment sections adjacent to the timber section. The largest section spans from the right abutment of the timber section to the spillway, shown in Photo A-7. A short section ties the left

concrete abutment of the timber dam to existing ground. Both sections appeared to be in good condition. There was no evidence of slope instability or seepage on either section. Both embankments were covered in brushy growth on them which prevented a close inspection. A sheetpile core was exposed on the left embankment and appeared to be in good condition at the surface. A sheetpile core was not visible on the right side, but is shown in original design drawings and is visible in construction photographs.

Concrete Spillway Section

An ungated concrete spillway channel at the right abutment of the dam controls excess flow from the lake. The reservoir water level was several inches below the spillway invert, which can be seen in Photo A-8. As stated previously, a significant amount of woody debris was observed both upstream and downstream of the spillway, which can be seen in Photos A-8 and A-9.

The spillway concrete appeared to be in good condition. Some cracking along cold joints on the spill surface was observed, but the concrete condition did not appear significantly different than depicted in photographs from 1999. Minimal concrete degradation was observed on the spillway walls.

A significant amount of undercutting at the downstream end of the spillway was observed, shown in Photo A-10. The spillway was installed without a stilling basin and flow passing through the spillway falls directly on fractured bedrock. Over time this bedrock has eroded leaving a cavity under the spillway slab approximately 3 feet tall, 6 feet deep and around 10 feet wide which can be partially seen in Photo A-11. This is a significant dam safety issue because if left unchecked the undercutting will likely cause the concrete slabs forming the spillway floor to eventually fail. Some seepage was observed at the right side of the undercut, as shown in Photo A-10.

A gabion basket wall is located along the left side of the channel below the spillway. One basket at the base of the wall had failed and had partially emptied its contents into the spillway channel.

Summary and Conclusions: Generally, the Mahoona dam is in poor condition. There are a number of deficiencies which were identified during Dam Safety's cursory site visit. The structural integrity of the timber section is the most obvious concern, due to the degradation of structural members the dam face. The absence of a stilling basin and resulting spillway undercutting is also a significant concern.

At this point the deficiencies at the Mahoona Dam could likely be corrected through aggressive maintenance. The repair of the timber section would almost certainly require a draw down of the reservoir which will impact the City of Ouzinkie's water and power supply operations. It is unlikely that even a very good repair procedure will alleviate the need for similar repair efforts in the future.

The spillway undercutting problem could likely be repaired by filling the existing void and installing an energy dissipation structure at the end of the spillway or otherwise armoring the transition from the spillway slab to the bedrock channel. The City should consider operational options such as using the low level outlet to pass excess reservoir water to limit flow over the spillway during normal operations to slow the advance of the spillway undercutting.

The amount of repairs needed the Mahoona Dam require a *Certificate of Approval to Repair a Dam* issued by the ADNR Dam Safety and Construction Unit.

The Mahoona Dam is overdue for a Periodic Safety Inspection (PSI) as required by 11 AAC 93.159. The PSI must be conducted in accordance with the preapproved scope of work listed in section 10.4.2 of the *Guidelines for Cooperation with the Alaska Dam Safety Program*. Although not a requirement, Dam Safety suggests that the scope of work also include a simple alternatives analysis

weighing the benefits of repairing the dam versus replacing it with a more safe and stable structure requiring less costly maintenance.

Action Items

- Clear brush from the embankment faces and directly downstream of the timber section.
- Remove woody debris from around the spillway.
- Regularly monitor the large leak in the face lagging around the small outlet pipe.
- Monitor the spillway undercutting especially after high flow events.
- Report any significant changes in the performance of the dam to Dam Safety.
- Retain a qualified engineer to perform a Periodic Safety Inspection on the Mahoona Dam.
- Develop a plan to mitigate the hazards posed by the deficiencies identified in the PSI report and submit an application to Dam Safety for a *Certificate of Approval to Repair, Modify or Construct a Dam* as appropriate.

Attachment A - Photographs

* * * *End of Report* * * *

T:\Dam Safety\Dam Projects\Mahoona Lake\Field Inspections\Mahoona Dam Field Inspection Report 6-10-11.docx

Attachment A

to

Field Inspection Report

of

July 11, 2011

for

Mahoona Dam

NID# AK00207

Alaska Department of Natural Resources

Dam Safety and Construction Unit

PHOTOGRAPHS

PHOTO A-1
SADDLE DIKE

PHOTO A-2
MAHOONA DAM

PHOTO A-3
WOODEN BUTRESS SECTION

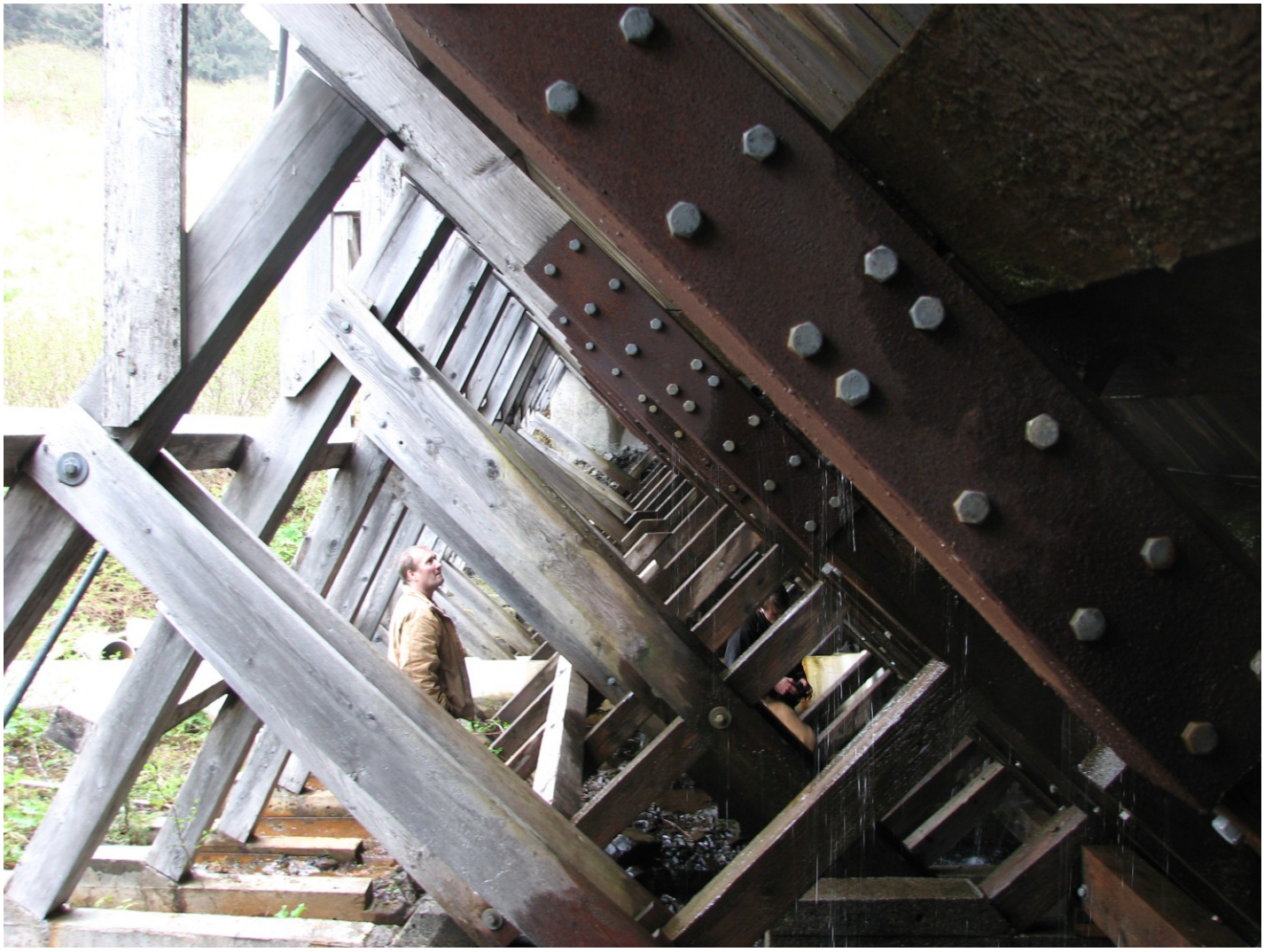

PHOTO A-4
WOODEN BUTTRESS SECTION

PHOTO A-5
SPLIT STRUT AND WALE