

**Community Erosion Assessment
Lower Kalskag, Alaska
4 March 2009**

1. Community: Lower Kalskag, Alaska



Figure 1: Lower Kalskag location and vicinity map

2. Community Profile Summary:

Lower Kalskag (KAL-skag) is a second class city of 269 people located on the north bank of the Kuskokwim River, two miles downriver from Upper Kalskag. It is 26 miles west of Aniak, 89 miles northeast of Bethel, and 350 miles west of Anchorage. The climate is semi-arctic with maritime influences from the Bering Sea. Precipitation averages 19 inches, with 60 inches of snowfall annually. Temperatures range between -55 and 87 degrees Fahrenheit. The Kuskokwim is ice-free from mid-June through October.

3. Concise Description of Erosion Problem:

The primary cause of erosion along the river banks in front of Lower Kalskag is ice scour during spring breakup. Local residents also reported this as the primary cause of erosion that loosens material on the upper bank that is then washed away during summer peak flows. The river necks down from a width of roughly 1700 feet to approximately 1200

feet just downstream of the community. This necking down forces ice towards the river banks and contributes to ice jams and ice scour. Upper bank erosion due to ice scour was also observed on the opposite banks of the river.

Lower Kalskag is experiencing varying erosion rates along the majority of the community's shoreline. For the purposes of this study, the bank was divided into three river reaches of varying lengths. Reach 1 is defined as the first 2,150 feet of bank at the upstream edge of the community and is eroding at an average of 6 feet per year. Reach 2 is comprised of the next 1,750 feet of bank and stretches in front of the local store and is eroding at an average rate of 3.0 feet per year. Reach 3 is comprised of the 3,200 feet of bank in front of the main community and is eroding at an average rate of 1.5 feet per year.

One of the larger concerns relates to the cemetery in Reach 3. A portion of the grounds have already been lost to erosion. As a result, the community has moved several graves to a new cemetery located next to the church. Based on discussions with the community, it is estimated that between 250 and 300 graves exist in the old cemetery.

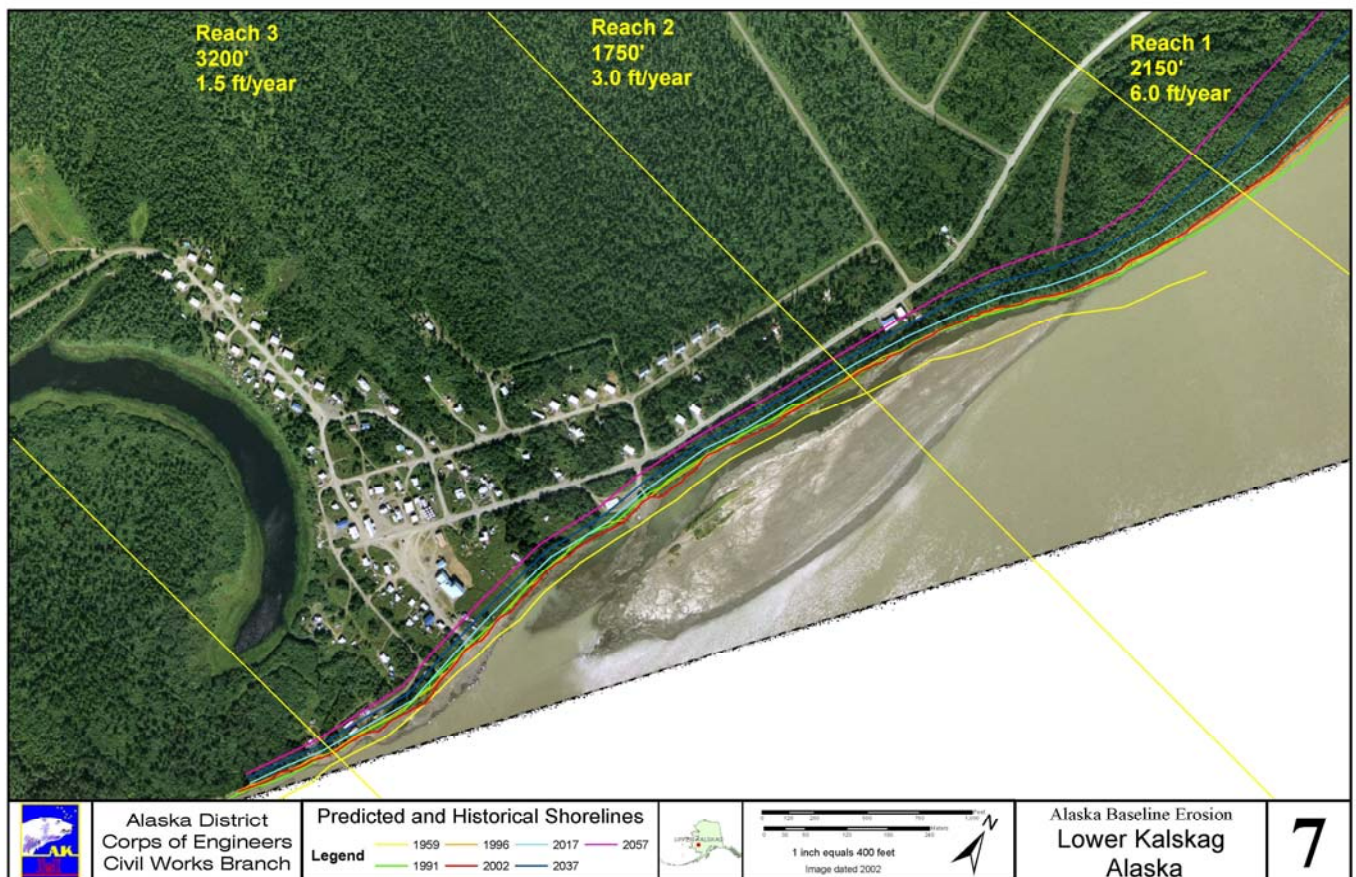


Figure 2: Lower Kalskag Erosion Map

4. Potential Erosion Damages

Using the projected erosion interval lines on the aerial photograph, the economic damages were developed for the 50-year period of analysis and broken down into the sub-intervals of 0-10 years, 11-30 years and 31-50 years. Breaking down the economic damages into these sub-intervals allows us to determine when the greatest economic impact is expected to occur. Determining when the greatest economic impact could occur is important so that timely decisions can be made when an erosion retarding measure needs to be taken. For the purposes of this report, damages were assessed by time interval rather than attempting to estimate the exact year that the damage occurs. The analysis was completed in this manner to try and account for two types of uncertainty:

1. That which is associated with predicting erosion which is progressing at varying rates over time (including episodic events); and
2. That which exists when performing a surface analysis as opposed to doing an in depth investigation such as soils exploration and expensive modeling efforts.

Damage Categories:

The approach used to determine potential erosion damages is based on several assumptions as they pertain to the damage categories of residential, commercial, public infrastructure, and land values. This evaluation relies on previous reports and information gathered during site visits to determine appropriate values where data was unavailable. Assumptions used for the various damage categories are described more fully in the following discussion of future damages. Structures were considered a loss when the bank line encroached within ten feet of the structure's foundation.

Damages caused by erosion in Lower Kalskag fall into six damage categories: land, residential structures, commercial structures, infrastructure, cemeteries, and environmental hazards. Structures were considered a loss when the bank line encroached within ten feet of the structure's foundation. Approximately 5% of erosion damages in Lower Kalskag are expected to occur within the first 10 years of the examined time period.

5. Expected Damages

Though many potential damage categories were evaluated during this assessment, Lower Kalskag's expected erosion damages fit into six classifications: land, residential structures, commercial structures, infrastructure, cultural resources, and environmental (fuel farm decommission). For the purposes of this report all structures were considered a loss when the bank line encroached within ten feet of the foundation.

The period of analysis for this evaluation is 50 years and all damage categories have net present values calculated based on the federal fiscal year 2009 discount rate of 4 5/8 percent. The sections below detail expected losses with a summary provided in Table 1. **Error! Reference source not found..**

Lower Kalskag is losing 22,950 square feet (0.53 acres) of land per year. Estimated land losses for River Reach 1 are 15.1 acres with land losses for River Reach 2 expected to be 6.15 acres and Reach 3 losing 5.62 acres. It is expected that 26.87 acres will be lost over the 50-year period of analysis with a corresponding value of \$269,000 and a net present value of \$107,000.

The majority of expected residential damages in Lower Kalskag are located in Reach 3 with one threatened residence in Reach 2. At-risk structures include 5 residences and 5 outbuildings. Each of the outbuildings is valued at \$1,000 and each residence is valued at \$205,000.

There are three threatened commercial structures in Lower Kalskag including a retail store, office building, and one associated outbuilding, all located in Reach 2.

Building damages in Lower Kalskag are expected to total \$2.0 million with a net present value of \$392,000 and an average annual cost of \$20,200.

Infrastructure that lies within the 50-year erosion profile includes: 1,670 feet of roads, 3 poles with associated wires, both the school and AVEC fueling stations, and the bulk fuel farm with its associated building. The fuel farm is estimated to be lost in years 11 to 30. There are environmental considerations that accompany this loss that are discussed later in this section.

In total, Lower Kalskag has \$1.6 million of infrastructure at risk due to erosion. The combined net present value of these items is \$522,000. The average annual loss of infrastructure is valued at \$27,000.

The primary environmental concerns in Lower Kalskag are the fuel farms. The surrounding soils are likely contaminated and will pose a threat to the local ecosystem and related fish stocks when they are eroded away. Decommission and closure of the facility is essential to avoid these harmful effects. Based on our above assumptions, this will be necessary within the 11 to 30 year time frame. This process has a cost of \$491,000 million with a net present value of \$217,000 and an average annual cost of \$11,200.

Another environmental concern is the risk associated with eroding graves. It is estimated that 170 graves will need to be relocated at a cost of \$1.3 million with a net present value of 524,000 and an average annual cost of \$27,100.

Summary

In total, there are almost \$5.67 million of potential damages expected in Lower Kalskag over the 50-year period of analysis with a net present value of \$1.8 million and an average annual value of \$91,000. Table 1 summarizes damages and breaks them down by time interval.

Table 1. Summary of Total Expected Damages.

Damage Category	Quantity	Time Span (Years)			Total Value (50 years)	Net Present Value	Average Annual Value
		0-10	11-30	31-50			
Land	26.87	\$ 58,000	\$ 105,000	\$ 105,000	\$ 269,000	\$ 107,000	\$ 5,500
Residential	5	1,000	206,000	824,000	1,031,000	244,000	12,600
Commercial	3	--	--	1,006,000	1,006,000	148,000	7,600
Infrastructure	--	130,000	671,000	779,000	1,580,000	522,000	27,000
Grave Relocation	170	293,000	488,000	495,000	1,275,000	524,000	27,100
Fuel Farm Decommission	--	--	491,000	--	491,000	217,000	11,200
Total damages	--	\$482,000	\$1,961,000	\$3,209,000	\$5,652,000	\$1,762,000	\$ 91,000

6. Potential Solutions:

The community of Lower Kalskag has a moderate erosion problem that is threatening several public structures and cultural resources, most notably the cemetery and school fuel filling point and to a much lesser degree the Kalskag Native Store.

Several alternatives are presented to address the erosion in Lower Kalskag. Relocating structures and the cemetery should be the preferred long term solution for the erosion problems in Lower Kalskag. As the bend upstream of the community migrates downriver it is expected that erosion will increase in front of the community. Structural alternatives can provide erosion protection through their design life but it is likely that additional measures will be required in the future. In addition to the alternatives offered above the practice of revegetating the river bank in front of the community should continue. This will slow the overall rate of erosion in areas that are planted.

Alternatives:

1. Relocate the graves from the old cemetery to the newly established cemetery that is located much further from the river bank.
2. Construct a 600-foot riprap revetment to protect the cemetery from further erosion at a cost of \$1.7 million (\$2,333 per linear foot). This revetment will provide protection for the design life of the structure with future protection required as the river erodes upstream and downstream of the revetment.
3. Relocate the school's fuel filling point further back from the top of bank.
4. Long range plans should include relocation of the Kalskag Native Store. (30+ years).

7. Conclusion:

The community of Lower Kalskag has a moderate erosion problem that is threatening several public structures and cultural resources, most notably the cemetery and school fuel filling point and to a much lesser degree the Kalskag Native Store. Because the potential damages are to public facilities and the relative size of the project is small, this

would make the proposed solution a good candidate for the Corps Section 14 program. The community likely would not have the financial capability of providing the required local match, and would need to seek assistance through the state or other entities to come up with needed funding.

8. Community Photos:



N 61° 30.612' W 160° 21.693'

Lower Kalskag

P1011202

**Photo 1. Perimeter fence around old tank farm, upstream corner 25.0' from top of bank.
Downstream corner <1' from top of bank.**



N 61° 30.727' W 160° 21.605' Lower Kalskag P1011212
Photo 2. Bollard protecting school filling point looking towards the river, 7.0' to the top of bank.



N 61° 30.755' W 160° 21.582' Lower Kalskag P1011215
Photo 3. Looking upstream from the top of bank in front of the cemetery. Planted willows in the background.

8. Additional Information:

This assessment, as well as those for other communities, can be accessed on the internet at www.AlaskaErosion.com. The web site also contains additional information on addressing erosion issues, educational materials, and contact information.

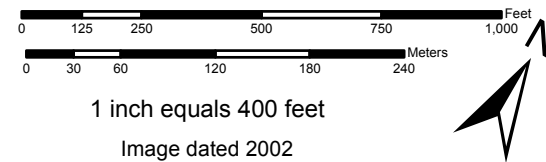


Alaska District
Corps of Engineers
Civil Works Branch

Predicted and Historical Shorelines

Legend

1959	1996	2017	2057
1991	2002	2037	



Alaska Baseline Erosion
Lower Kalskag
Alaska