HB
299

(7)

COMMITTEE REPORT

HOUSE

FURTHER: FINANCE

Date: _____

Mr. Speaker:

The Committee on STATE AFFAIRS has had HB 299

"An Act making a special appropriation to the Department of Community and Regional Affairs for a study of the effects of landslides and tsunamis on Kodiak Island, and date"

under consideration and (a majority of the committee) (the committee) reports it back with the following recommendations:

[X] do pass [ ] do not pass

[ ] do pass with attached amendments(s)

[ ] replace with CS for _____ [ ] same title [ ] new title

and recommends _____

[ ] AND attaches a "Letter of Intent" [ ] New Fiscal Note

[ ] reports it back without recommendation

[ ] referred to the _____ Committee

MEMBERS SIGNING
DO PASS

MEMBERS HAVING
OTHER RECOMMENDATIONS:

_____ CHAIRMAN

H 60 (Rev. 12/78)

Funding Information
General Fund $900,000
Other Funds -0-
$900,000

Introduced: 2/26/79
Referred: State Affairs and Finance

IN THE HOUSE BY ~~ZHAROFF~~ State Affairs

CS for HOUSE BILL NO. 299

IN THE LEGISLATURE OF THE STATE OF ALASKA

ELEVENTH LEGISLATURE - FIRST SESSION

A BILL

For an Act entitled: "An Act making a special appropriation to the Department of ~~Community and Regional Affairs~~ Natural Resources for a study of the effects of landslides and tsunamis on Kodiak Island; and providing for an effective date."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

* Section 1. The sum of ~~$900,000~~ $479 000 is appropriated from the general fund to the Department ~~of Community and Regional Affairs~~ Natural Resources for geotechnic studies of the Pillar Mountain landslide and tsunamic hazard area on Kodiak Island~~, and for preliminary slope stabilization design~~.

* Sec. 2. The unexpended and unobligated portion of this appropriation lapses into the general fund June 30, 1980.

* Sec. 3. This Act takes effect ~~July 1, 1979.~~ immediately

$5000 committee
$25,000 & holes

Div of Geological & Geophysical Services

DEPARTMENT OF THE ARMY
WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS
P. O. BOX 631
VICKSBURG, MISSISSIPPI 39180

IN REPLY REFER TO WESSR

21 April 1978

Dr. Reuben Kachadoorian
U. S. Geological Survey
345 Middle Field Road
Menlo Park, CA 94025

Dear Reuben:

As requested after the Kodiak meeting, a revised outline of an investigation to obtain needed data and possible costs for evaluating the Pillar Mountain slide is inclosed (Incl 1). Inclosure 1 could be used to answer Mr. Stewart Denslow's request to you for more details. As revised, the possible costs and time for each of the five phases are listed below.

a. Phase I. Site investigation to obtain needed data on current movements, surface and subsurface geology, and engineering properties of in situ material and defects (4 months plus 4-6 months of slope indicator readings).	$447,300
b. Phase II. Analyses to develop type of slide mechanism, slide geometry, current stability, and probability of rapid slide movement (5 months).	100,000
c. Phase III. Time displacement and velocity predictions if Phase II shows high probability of rapid slide movement (3 months).	45,000
d. Phase IV. Wave height predictions from numerical hydraulic model, if warranted by Phase III (4 months).	27,000
e. Phase V. Wave height and run-up predictions from hydraulic physical model, if warranted by Phases III and IV (12 months).	227,000
Total	$846,300
Plus 10% contingency	84,630
Total possible cost	$930,930

WESSR
Dr. Reuben Kachadoorian

21 April 1978

I contacted Mr. Ron Backer, Spokane Mining Research Center, on precise air photo monitoring of landslide movements. He sent the report "Rapid Monitoring of Coal Refuse Embankments" (Incl 2). Ron referred me to Mr. Larry Roth of CH2M Hill for costs. Mr. Roth's guess on costs was $600-$1000 for one flight, including data reduction to provide X, Y, Z coordinates. He is checking further to obtain a better cost estimate for Kodiak.

As you know, we cannot begin any work, if requested, until October 1978. Parts of Phase I might be handled by the State or Kodiak Burrough initially to get the field work underway this season. Another possibility is the Advanced Technology Group at Dames and Moore. Dr. Peter Cundall and others in this group have the capability for th work, including velocity predictions possibly using Dr. Cundall's computer model for jointed rock masses. The capability for numerical and physical hydraulic model studies is unique with the Waterways Experiment Station.

If you need further assitance, please call me at area code 601; 636-3111, extension 2604.

Sincerely yours,

Bill

2 Incl
As stated

W. E. STROHM, JR.
Res Civil Engineer
Engineering Geology and
Rock Mechanics Division

April 21, 1978

Summary of Required Data and Approximate Costs for Evaluation of Pillar Mountain Slide Area, Kodiak, Alaska

Phase I: Site investigation to obtain needed data to evaluate current movement, existing stability, and potential for rapid landslide.

A. Surface movement observation program.		
1. Monthly survey (horizontal and vertical) of line of spikes along Abbott Highway from old docks to new docks. Nine surveys @ $2,000 each	$ 18,000	6 000
(2) Bimonthly precise airphoto surveys of markers inside and outside the slide area (including DH-1, DH-2, C-1, C-2, and S-1) to further define surface movement directions. Four surveys @ $5,000 each (CH2M engineers)	20,000	
(3) Supplement to 2 above. Electronic Distance Measurement (EDM) survey of targets inside slide area from two locations on Gull Island (0.6 miles away). Eight monthly surveys @ $2,000 each	16,000	
B. Collect and review existing reports and information, including movements of new city dock and determine if White Alice Station structures have experienced movement or distress. One engineer, three weeks @ $1200/week	3,600	
C. Field reconnaissance.		
1. Inspect old land slide areas along Inner Harbor to determine possible location of slide debris (i.e., at base of slide or out in the harbor)		
2. Inspect Gull and Uski Islands to check for ancient slide debris or how islands were formed		
IC Two geologists, three weeks each @ $1200/week plus travel ($2,000)	9,200	
D. Geological mapping to refine surface geology, crack pattern, joint sets, bedding, etc (includes low-level air photography, field mapping, and office work)	45,000	45,000
Subtotal IA-ID	($111,800)	

E. Subsurface Investigations.

1.	Four core borings to obtain 4-in.-diam cores of beds and joints (may require slant holes)	
	a. Near DH-2 to depth of Inner Harbor, elevation 145 to elevation 72, 210 ft @ $100/ft	$ 21,000
	b. Near center of main slide along Abbott Highway, elevation 50 to elevation 72, 122 ft	12,200
	c. Vicinity of DH-1, elevation 900 to elevation 100, 800 ft	80,000
	d. Vicinity of S-1, elevation 1100 to elevation 700, 400 ft	40,000
	e. Shipment of samples	10,000
2.	Borehole camera survey of four core borings @ $4,000 each	16,000
3.	Grout slope indicator casing in four borings and install "poor boy" in each (3-ft piece of pipe in bottom of hole attached to airplane cable), 1,532 ft @ $25/ft	38,300
4.	Install piezometers at three depths in two additional borings, one near DH-1 and one near the core boring along Abbott Highway, 900 ft @ $40/ft	36,000
5.	Field supervision and logging of core borings. Two geologists, 20 weeks each @ $1,200/week plus travel	52,000
	IE Subtotal	($305,500)

F. Laboratory tests.

1.	Drained direct shear tests on selected core samples of slide debris base material, weak fracture zones, weaker strata of argillites and graywacke material, 20 tests @ $1,000/test	$ 20,000

2. Repeated direct shear tests on existing joints, joint filling, or precut sections of core samples to determine residual shear strengths, 10 tests @ $1,000/test — 10,000

IF Subtotal — ($ 30,000)

Phase I Subtotal — $447,300

Phase II: Analyses to evaluate potential for rapid slide.

A. Analysis and interpretation of data, define slide mechanism and geometry, determine existing stability, and assess probability of rapid slide movement. Four-man engineer and geologist team, 16 weeks @ $1,200/week — $ 76,800

B. Computer time, drafting, photo reduction, and report — 23,200

Phase II Subtotal — $100,000

Phase III: Velocity predictions.

A. Revision of mathematical model program. — $ 10,000

B. Analyses, two engineers, 10 weeks each @ $1,200/week — 25,000

C. Computer time, drafting, photo reduction, and report — 10,000

Phase III Subtotal — $ 45,000

Phase IV: Wave prediction, numerical model.

It is believed that the WES numerical model should be used initially to define the severity of the wave problem. It can provide an estimate of the initial wave height within a ±25 percent accuracy and the time of the wave's arrival from the source within ±10 percent accuracy at any selected location within the area of consideration. Information needed to conduct the numerical model includes:

A. Bathymetry of the area of consideration.

B. Landslide alignment or direction of slide if it is anticipated that the slide will not move along the landslide axis (from Phase II).

C. An assumed cross section of the landslide as it enters and travels through the water (from Phase II).

D. The velocity and final position of the slide material or better, a calculated or hypothesized time versus displacement curve of the slide (from Phase III).

Assuming a maximum of 10 test cases are required to define the problem, time and cost estimates are as follows:

Item	Time (weeks)	Cost
Revitalizing and adapting present model to Kodiak scheme	4	$ 5,000
Set up and conduct 10 test cases	4	13,000
Letter report	2	1,000
Final report	8	8,000
Total	18	$ 27,000

Since the Rock Mechanics Division's Landslide Velocity Numerical Model Program and the Wave Dynamics Division's Numerical Wave Prediction Model Program both operate on a time-step basis, it would be advantageous to combine the operation of the two programs once a specific landslide scheme is selected. Should this be desired, it is estimated that reprogramming contributions by the Wave Dynamics Division would not exceed an additional cost of about $5,000 and four weeks' time.

Phase V: Hydraulic physical model.

If the numerical study wave-height predictions are not of sufficient accuracy and/or the wave heights need refining, or if further detailed information such as wave run-up, extent of area inundated, and techniques to reduce the severity of the wave action are required, a physical model should be considered. Although such a model is expensive, its application is much more versatile. It is recommended that the model include the area shown on Fig. 1 and that the model scale not be greater than 1:100. Model scales greater than 1:100 would increase the viscosity effect of the model and reduce the accuracy of wave height and run-up measurements. Reproducing the proposed prototype area at a 1:100 undistorted scale would require about 7612 sq ft of model area. This is considerably more area than was estimated in the initial estimate (November 1976). Also, the size and layout of the landslide mass described in Kachadoorian and

Slater's report indicates that the existing model landslide mechanism is not wide enough or structurally strong enough to accommodate the proposed Kodiak landslide; thus our mechanism will have to be reconstructed to meet the wider and heavier loads. Based on these assumptions, time and cost estimates for the physical model are as follows:

Item	Time (weeks)	Cost
Design and Construction (including all model construction, rehabilitation and preparation of landslide material)	16	$141,000
Model testing	16	60,000
Data analysis, conferences, travel, etc.	4	10,000
Report:		
Draft	4	5,000
Final	12	11,000
Total	52	$227,000

Information needed to construct and operate the physical model is as follows:

A. Topography data of the land areas included in the model layout, especially land-water interfacing (slope, vertical walls, etc.), along the immediate shoreline from Gibson Cove through Kodiak Harbor.

B. Bathymetry of the water bodies enclosed by the model (if better survey data are not available, existing C&GS charts can be used to reproduce the required areas of St. Paul's Harbor and the Inner Anchorage area; however, additional contours are needed along the coastal shoreline from Gibson Cover through Kodiak Harbor).

C. In-place mass-volume-elevation-shape characteristics of the various probable landslides (from Phase II).

D. Assumptions as to what size pieces the landslide mass will break into upon sliding (from Phase II).