NPSEN-DB-CP 11 March 1971

MEMO FOR: RECORD (5 MAR 71)

SUBJECT: Swift Creek

1. I called Mr. Wallman, OEP, to advise him of our damage survey on Swift Creek in the recent flood. Flooding in the vicinity of Swift Creek occurred in January 1971 as a result of rains and snowmelt in the mountains together with the releasing of water which was blocked by an old slide in the mountains. Mr. Dave Wood, Assistant County Engineer, told me that the slide occurred ten to fifteen years ago or more, and it was triggered during an earthquake. Swift Creek has been carrying the bedload from the slide area for six to eight years to the extent that the channel keeps filling continually. Local people and Whatcom County have removed the bedload on yearly bases for several years. The county had requested the Corps of Engineers to assist them with Swift Creek as a result of the recent flood. Our investigation revealed that Swift Creek flood inundated several 100 acres of farmland, county road, and bridges, lumber mill, and several homes. Fine gravel silts have deposited in the flooded area and the lower channel of Swift Creek. Swift Creek is flowing now in a overflow channel to Breckenridge Creek. In view of the fact that the bedload deposits have been clearing in the past, I asked whether clearing the channel of silt and gravel deposits would be eligible work under PL 606.

2. After further discussion, Mr. Wallman told me that clearing the channel of debris identifiable to the recent flood would qualify under PL 606. However, I indicated that identifying the material would be very difficult. Although I estimated 2 feet to 3 feet of material may have deposited in the channel at the upper end. The estimated yardage would range from 50,000 to 100,000 cubic yards.

3. After discussion on the slide, Mr. Wallman requested that we investigate the slide to determine if it could be stabilized. The work could qualify under PL 606 if something could be done to stabilize the slide and it is within the economic justification. I told Mr. Wallman that I would have our F&M people determine if anything can be done. Mr. Wallman indicated that if we couldn't justify stabilization of the slide, then we may be forced to back off. Mr. Wallman was interested in visiting the slide area.

NPSEN-DB-CP 11 March 1971
SUBJECT: Swift Creek

4. Mr. Wellman gave verbal approval to proceed with the work. I requested that the Corps of Engineers be notifed by letter. Mr. Wellman will send a TWX. I requested that it include the work for Smith Creek and the investigations. We will proceed to obtain the resolution from Whatcom County for Swift Creek work.

5. I called Mr. Barnwell, Whatcom County Engineer, for the resolution. He stated we would have it by Monday or Tuesday.

MEYERS

cc: Mr. Wellman, OEP, Bothell, Wn.
Steinborn/Weber
Derrick/Knutson
McKinley
F&M Br
Uomoto
Opers Div
Program Devel Br
Planning Br (Hydraulics)
Meyers

NPSEN-DB-CP 11 March 1971

MEMO FOR: RECORD 5 MAR 71

SUBJECT: Swift Creek

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Roster
Whatcom County
Swift Creek Slide Meeting
July 26, 1971

Name	Organization	Address
Hugh Fowler	Office of Emergency Preparedness	Bothell, Wa
Ray Wilson	"	"
BRAD BAKER	DEPT OF MINES & GEOLOGY	OLYMPIA, WA
✓ Gerald W. Thorsen	Div. Mines & Geol. (Natural Resources)	Olympia
Shirley S. Jeffcott	County Comm	Everson
ROY GRUNHURD	ASST ENG COUNTY	BELLINGHAM
✓ EARL BARNWELL	CO. ENG.	"
Greg Hastings	Dept. of Ecology	Olympia
Roy Summerville	ASCS	Lynden Wn
Carl Thompson	Civil Def.	Bellingham
✓ Herbert Miller	Civil Defense	Whatcom County
✓ Byron D Moser	USDA - SCS.	Bellingham
✓ Edward J. Kiehle	USDA - SCS	Bellingham
[illegible]	[illegible]	Olympia
Gerard Roth [illegible]	County Commissioner	Whatcom County
✓ [illegible] K Meyers	Corps of Engineers	Seattle
CECIL C. BYRD JR.	WASH. STATE C.D.	OLY

NPSEN-DB-CP 11 August 1971

MEMO FOR RECORD

SUBJECT: Report on 26 July 1971 Meeting with Whatcom County Commissioners on Swift Creek Landslide

1. On 26 July, meeting was held with Whatcom County Commissioners to discuss Swift Creek problems. Personnel attending the meeting are shown on the attached Roster. The purpose of the meeting was to inform the Commissioners of the Swift Creek landslide problems, the results of the Corps' study and limits of the work that could be accomplished.

2. Meeting was opened by Mr. Cecil Byrd, Washington State Civil Defense Coordinator with introductions. Mr. Hugh Fowler, O.E.P., reviewed work directed by O.E.P. and accomplished by the Corps of Engineers on Swift Creek this Spring. Mr. Meyers summarized the work accomplished by the Corps and reviewed the reconnaissance report on Swift Creek landslide. Major points briefly discussed were:

a. Description of slide (aerial)

b. Causes and results of sliding

c. Possible courses of action

d. Debris basin

e. Cost and operation

f. Economics

I stated that plans studied were economically unjustified and unfeasible. Also, I stated that the Corps has no authority to maintain channel clearing on Swift Creek and that we had insufficient justification to assist in construction of a debris basin on Swift Creek under Flood Control Authority (Sec. 208, and 205).

3. Gregg Hastings, Department of Ecology, asked if we had included benefits for the Sumas Basin because the flour and fines from the slide were depositing in the Sumas Creek clear to the Canadian Border. I indicated that we were aware of the problem and that no benefits were included because of existing silt conditions in the Sumas and limited extent of our study for O.E.P. Mr. Hastings felt that additional benefits could be derived for the Sumas Creek fishery. I suggested that the Commissioners request the Corps study the Swift and Sumas Creeks flood problem and submit any additional data on benefits.

4. Mr. Moser, S.C.S., stated that the flood control problem of Sumas Basin is being studied by S.C.S. under Public Law 566. Study area covers about 250,000 acres and about 400 families. Efforts are being made to form a Flood Control District. Mr. Moser re-emphasized that the Swift Creek area has been studied many times and found unjustified.

5. Debris basin was discussed. Material from the basin could be used by County for road aggregate but not for concrete aggregate because of the Serpentine material, as pointed out by Mr. G. Thorsen, D.N.R. Mr. Stan Jeffcott, County Commissioner, suggested that Gold Mine Creek be diverted from Swift Creek to reduce the debris in Swift Creek. I indicated this could be done, but that the material would still continue to come from Swift Creek slide but would take a longer time to get down to the flat. Crevasses in the slide were considered a natural hazard to hunters.

6. Following requested copies of Corps' report on Swift Creek landslide:

Gerald Thorsen 1/
Earl Barnwell 1/
Gregg Hastings
Herb Miller 1/
Ed Hawley 1/
Cecil Byrd
Hank Harder

1/ Copy given at meeting.

7. Conclusions:

a. Corps has no authority to maintain Swift Creek channel.

b. Flood control project unjustified based on Swift Creek landslide report.

c. O.E.P. has no authority to fund future maintenance of Swift Creek.

d. Flood control project for Sumas area being studied by S.C.S. under Public Law 566.

e. If study by Corps is made, upon request by Whatcom County, benefits on Sumas Creek should be included.

1 Incl
Roster

WALLACE K. MEYERS

Copy furnished:
Mr. Hugh Fowler, O.E.P., Bothell, Wash.
Mr. Steinborn
Knutson/McKinley
F&M Branch
Planning Br/Econ.
Hogan, Hydraulics Sect
W. Meyers

3 JUN 1971

NPSEN-DB-CP

Creath A. Tooley, Regional Director
Executive Office of the President
Office of Emergency Preparedness
Region 8
Federal Regional Center
Bothell, Washington 98011

Dear Mr. Tooley:

References:

a. OEP letter dated 9 April 1971 to Division Engineer, North Pacific Division requesting the Corps of Engineers to perform major disaster assistance in the State of Washington (Disaster Contract OEP-300-DR, Corps of Engineers, NPD, Request No. 2).

b. NPSEN-DB-CP letter dated 1 April 1971 regarding the reconnaissance investigation of Swift Creek slide, Whatcom County.

This letter transmits our reconnaissance investigation report on the Swift Creek slide, inclosure 1. An aerial photo of the Swift Creek slide is attached for your use, inclosure 2.

The only practical method of controlling the material from the Swift Creek slide appears to be by the use of a debris basin on the alluvial fan about one mile below the slide on Swift Creek. The debris basin should have capacity for a maximum washout of slide material of one million cubic yards. Estimated first cost for the debris basin is $1,900,000. Annual costs, excluding Operation and Maintenance costs are $100,000, based on a 50-year life with the capital recovery factor of 5-1/8 percent. Average annual O&M costs are estimated at $250,000. Benefits that could result from construction of the debris basin are based on prevention of future damages of about $1,000,000 over 50 years, or annual benefits of $59,000. Comparison of annual costs of $350,000 with annual benefits of $59,000 provides an unfavorable benefit/cost ratio. Therefore, the construction of the debris basin is economically unjustified.

NPSEN-DB-CP
Creath A. Tooley, Regional Director

Myers/ek/665
1 Jun 71

The work accomplished by the Corps of Engineers this spring on Swift Creek was an emergency temporary measure to assist Whatcom County in recovery from the January 1971 flood disaster. Swift Creek channel was cleared of debris identifiable with the January 1971 flood. However, the creek will fill up yearly again as has occurred in the past years. The Corps of Engineers has no authority to maintain the clearing of Swift Creek. Also, based on this study, the Corps of Engineers has insufficient justification to assist Whatcom County in constructing a debris basin in Swift Creek under our Flood Control Authority. Therefore, the future clearing of Swift Creek should be done by local authorities; i.e., city, county, state, Flood District, etc. The basin, through which Swift Creek flows, could be considered a flood plain and land uses there could be controlled to minimize flood damages under existing state law (RCW86.16).

The local people in the Swift Creek area should be informed of the National Flood Insurance Program which may be discussed in the meeting with Whatcom County Commissioners. The National Flood Insurance Act of 1968 was amended in 1969 to include mud slide coverage. The coverage offered by this program is limited to family dwellings of one to four family units and properties principally occupied by small business concerns. Application of this program in the Swift Creek area would furnish insurance coverage for the flood and mud slide hazards to family and small business units adversely affected. Inquiries regarding this program should be made to the Federal Insurance Administrator in the U.S. Department of Housing and Urban Development 451 Seventh Street S.W., Washington, D.C. 20410.

As stated in reference "b", the Corps of Engineers will be happy to assist you in a meeting with the Whatcom County Commissioners to discuss and advise them of the temporary nature of the channel clearing on Swift Creek because of the slide problem. Please advise us when the meeting with the County Commissioners is established.

-McKINLEY

Sincerely yours,

KNUTSON

H. W. MUNSON
Lt. Colonel, Corps of Engineers
Deputy District Engineer

DERRICK

STEINBORN

2 Incl
As stated

cc w/o incl:
F&M Br
Plng Br
McKinley
Uomoto
Meyers
Lemke

Copy Furnished w/o incl:
Beecher Snipes, Asst. Director
for Planning
Department of Ecology
Water Resources Branch
335 General Administration Bldg
Olympia, Washington 98501

EXEC OFC/s/
ED DB FILE

MFR
Coordinated with:
F&M Br
Plng Br/Econ.
Lemke
McKinley
Uomoto

RECONNAISSANCE INVESTIGATION REPORT
SWIFT CREEK LANDSLIDE

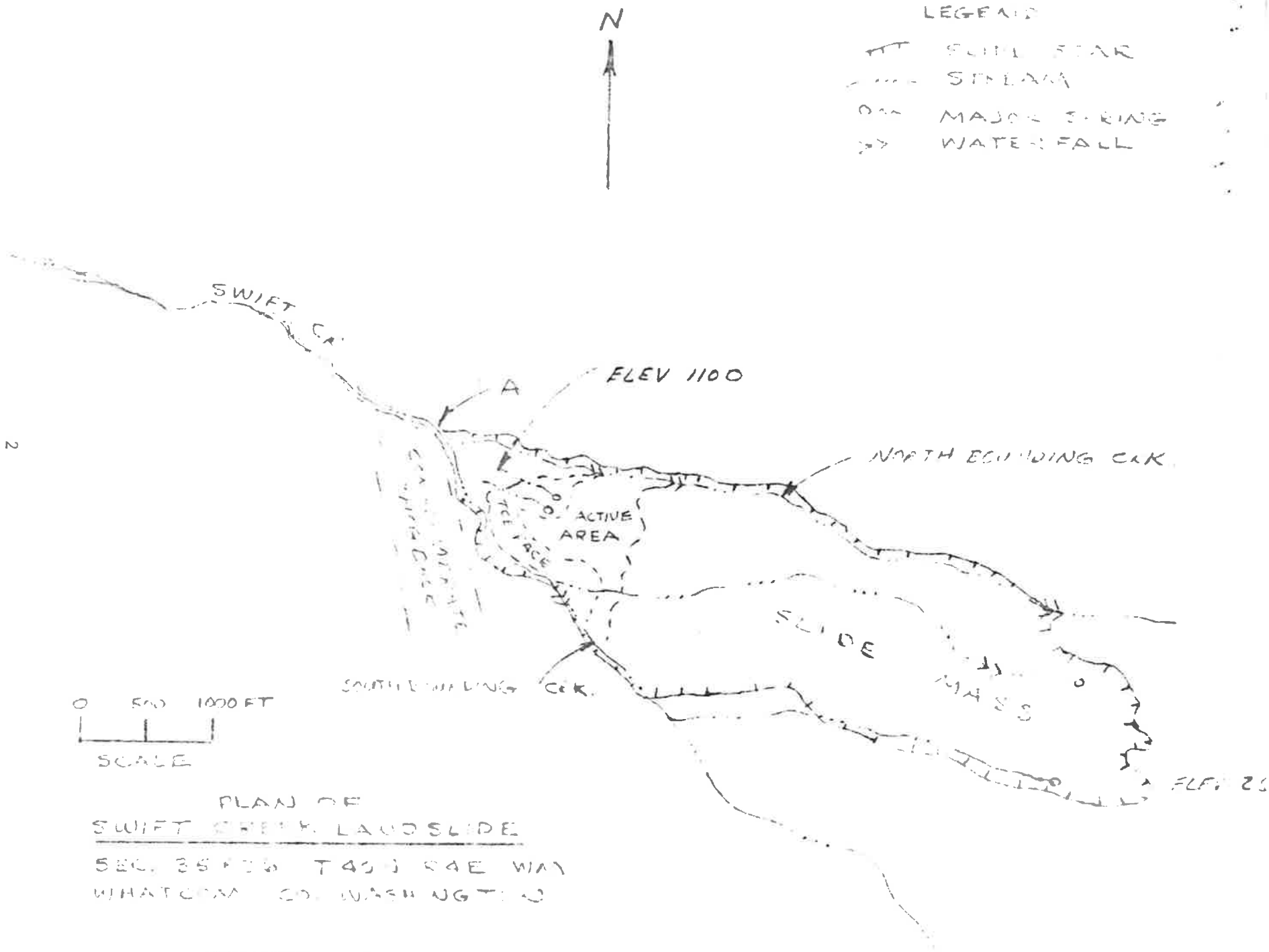
1 June 1971

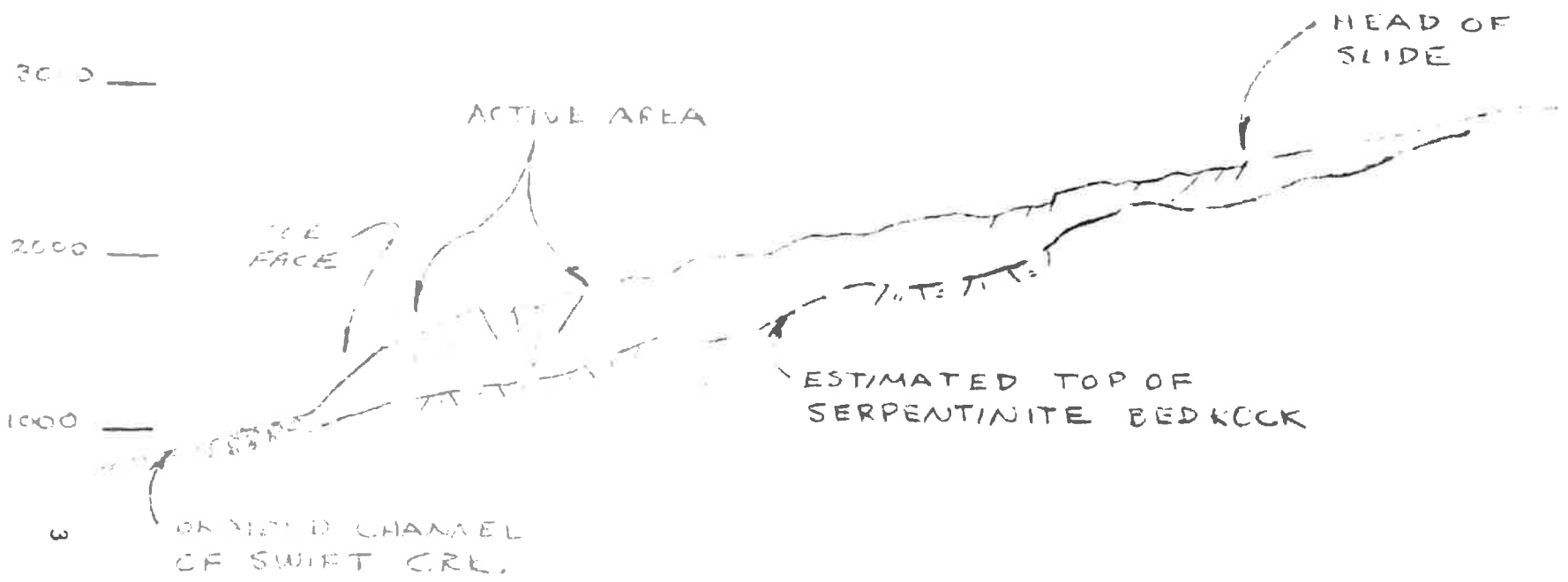
1. Introduction. Swift Creek Landslide lies on the western slope of Sumas Mountain in Sections 35 and 36 of T 40N, R 4E, W.M., about 4 miles east of the town of Everson, Washington. The western slope of Sumas Mountain rises steeply from the glacial outwash plain at an elevation of 100 feet to well over 3,000 feet in a distance of 2-1/2 miles. The entire mountain is covered by a thick evergreen-deciduous jungle typical of the western slope of the Cascade Range. Several streams discharge from the mountain side onto the glacial outwash plain. Most of these are tributary to the Sumas River. These streams have built and continue to build a series of coarse grained alluvial fans (composed of gravel, cobbles and boulders) out from the toe of the mountain front. The finer grained detritus (sand and rock flour) is carried downstream and periodically deposited along the channel of the Sumas River, ultimately reaching the sea. Swift Creek is the most active of these because of the size of its drainage basin and the presence of the large landslide. The creek displays a heavily braided channel from the toe of the slide to well down on its alluvial fan and it is evident that much of the coarse detritus moves through this reach of the stream as a series of brief debris flows.

2. Geology. The core of Sumas Mountain is composed of slightly metamorphosed sedimentary rocks (argillites, meta sandstones, meta conglomerates and limestones) together with a variety of extrusive igneous rocks. These were intruded by an ultra basic igneous mass which has subsequently altered to a sheared, slickensided mass of serpentine and is known as the Sumas Mountain Serpentinite. Some of this material is highly sensitive to water and weathers rapidly to clay upon exposure to the atmosphere or water. The western flank of Sumas Mountain is composed of well cemented to poorly cemented conglomerate and sandstone partly belonging to the Chuckanut Formation and partly to younger materials. Low on the western flank these rocks strike north south and dip about 35 degrees west forming a sharp hogback ridge on the south side of Swift Creek close to the mountain front. The Puget Ice lobe overrode all of Sumas Mountain during the Pleistocene and plastered gravel clay till and related glacial deposits over most of the mountain. Thus the glacial materials may rest on any of the older rocks. The till has been locally stripped away by erosion exposing both the younger flanking sedimentary rocks and the older core materials.

3. Description of the Slide. (Figures 1 and 2) The landslide is an elongate feature having a length of approximately 5,500 feet and a maximum width of 1,700 feet. It presently heads about elevation 2,600 and the lowest part of the presently active toe is about elevation 1,100. The landslide has some aspects of a valley glacier in both its movement characteristics and in the manner material is wasted at the toe. The lower 1,000 to 1,200 feet comprises the most obvious active

Incl 1


N
LEGEND
SURVEY STAR
STREAM
MAJOR SPRING
WATER FALL
SWIFT CR
A
ELEV 1100
NORTH EQUINOX CR K
ACTIVE AREA
ICE FACE
SLIDE MASS
SOUTH EQUINOX CR K.
0 500 1000 FT
SCALE
PLAN OF
SWIFT CREEK LANDSLIDE
SEC. 35 T40 N R4E WM
WHATCOM CO. WASHINGTON



SWIFT CREEK LANDSLIDE

LONGITUDINAL PROFILE

SCALE: 1" = 1000'
HORIZ. & VERT

FIGURE 2

area and consists of a steep toe face nearly 400 feet high behind which are a series of tilted blocks separated by crevasses approaching depths of 50 feet. Signs of recent activity are seen frequently all over the main body of the slide mass and cracks caused by removal of support are observed around the periphery. The bulk of the material in the slide mass is glacial till with lesser amounts of sandstone, conglomerate and some large blocks of serpentine. Several small creeks originate on the slide, but the major bounding drainages originate off the slide. A number of waterfalls are present across small scarps in glacial till on the upper part of the mass. Springs emerge in many areas all over the slide and commonly are heavily charged with blue and white serpentine rock flour giving the impression that the slide mass is locally only a few tens of feet thick. On the south side of the toe slope, movement continues to crowd the south bounding creek onto the bedrock surface resulting in a spectacular waterfall. The head of the slide is not distinct, but rather consists of a series of scarps gradually diminishing in magnitude upslope and indicating progressive uphill extention of the slide by sapping. Comparison of 1961 and 1971 aerial photographs indicate headward sapping on the order of 500 feet, few significant changes between major blocks of the slide mass, but considerable mass wasting and changes of slide block configuration in the active toe area during this interval.

4. Causes and Results of Sliding. A brief geologic reconnaissance indicates that the mountainside is probably failing by water lubrication of the underlying serpentinite which rapidly turns to clay under such conditions. The number of fresh serpentinite blocks found in parts of the slide together with blocks of conglomerate and sandstone indicate that failure takes place below the bedrock surface. All evidence indicates that the failure is slow and that the slide has progressively extended upslope by sapping and will continue to do so without widening appreciably. Further movement is precipitated by ground water damming in slide mass, by the addition of snow melt at the head and by the streams which originate off the slide and flow along or onto the slide. While there appears to be little danger of rapid mass failure in the future, activity at the toe may occasionally cause ephemeral damming of the affected streams resulting in gushes of water and debris moving down onto the alluvial fan and possibly onto the glaciated plain below. Moreover the quantity of rock flour carried by the stream is not likely to diminish.

5. Remedial Action. Two possible approaches to the problem are available if economically justified.

a. Allow the slide to continue and control the detritus shed by construction of a debris dam at the point where the valley narrows (point A, figure 1) below the toe of the slide or construct a large debris basin on the alluvial fan or the adjacent plain west of the mountain front. In either case a considerable amount of maintenance would be required so that the catchment area was always prepared for gushes of material.

b. Attempt to stabilize the slide by improving and detouring surface drainage and the installation of subsurface drains.

6. Further Studies. Prior to approaching a realistic cost estimate for the above, it is necessary to obtain good topographic and geologic mapping. The cost of this work is estimated at $9,000. Subsurface exploration based on the evaluation of geologic mapping will undoubtably be required at a later stage. A minimum drilling program on the slide would cost about $60,000. Minimum drilling programs for a debris dam or basin are estimated at $15,000 each. However for the purpose of this reconnaissance study, a preliminary cost estimate for a debris basin is presented herein without the benefit of any drilling program. The debris basin was selected for further study for the following reasons:

a. Diversion of surface inflow to the slide would not stabilize the slide as there is still an unknown quantity of water gaining access into the slide as well as rain falling directly on the slide. Neither the ground water or rainfall could be feasibly intercepted.

b. The cost of slide stabilization is expected to be far greater than the cost of either the debris dam or debris basin.

c. A debris dam just below the slide may not be practical as backwater behind the dam would lubricate the slide and a stable upstream slope may be impossible to achieve.

7. Debris Basin. The debris basin tentatively, should be constructed on the alluvial fan where Swift Creek exits from the mountain range (see figure 3). The debris basin should have capacity for a maximum washout slide material of one million cubic yards. The debris would consist of an excavated basin, embankment and a reinforced concrete spillway and stilling basin.

8. Cost Estimate. The preliminary construction cost estimate of the debris basin is:

Clearing, Grubbing & Disposal	75 Ac @ 500		$ 37,500
Excavation, Basin	500,000 C.Y. @	$1.00	500,000
Foundation Preparation	L.S.		50,000
Embankment & Waste	500,000	0.65	325,000
Spillway & Stilling Basin, Conc	1,500 C.Y.	150.00	225,000
Riprap	L.S.		25,000

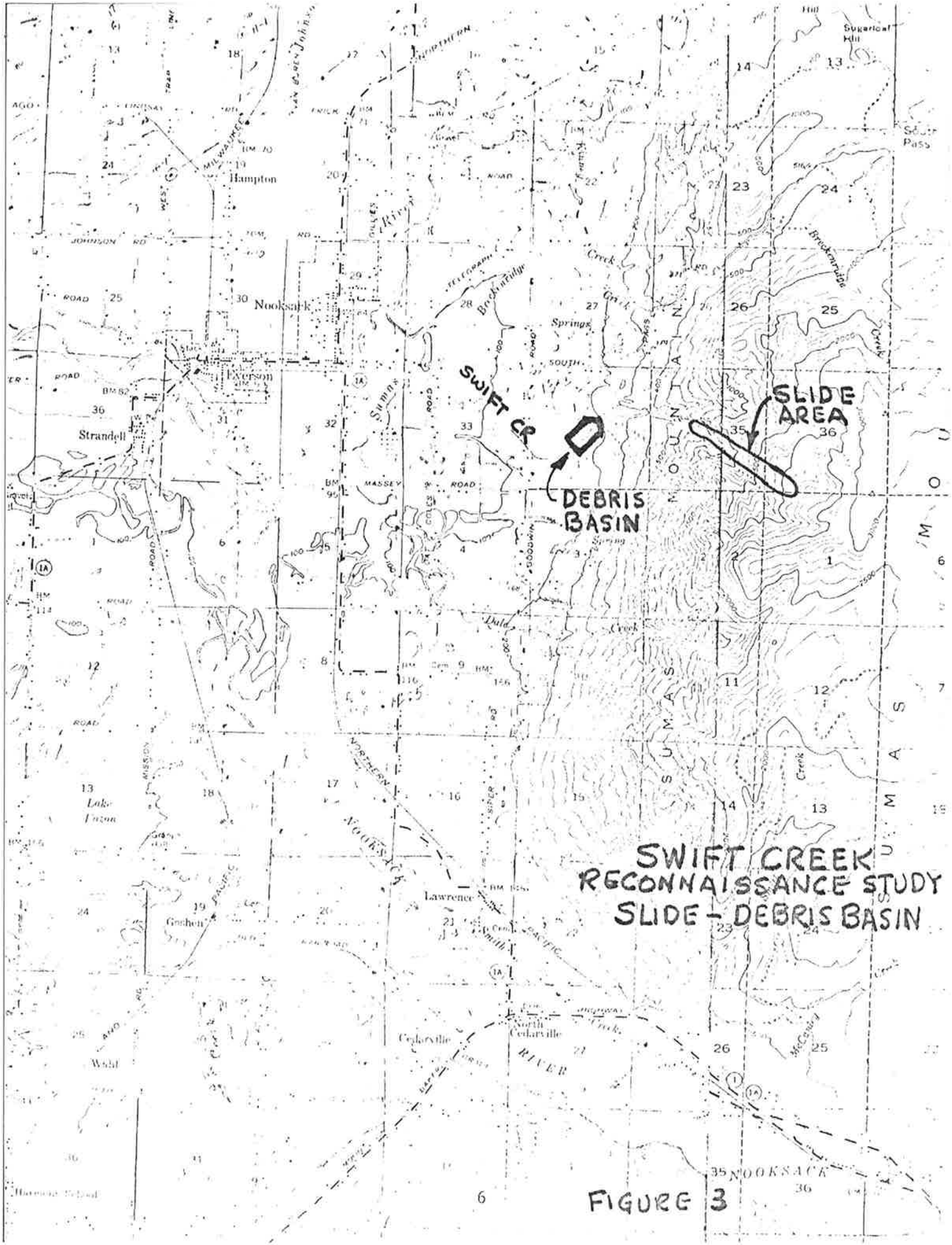

SWIFT CR
DEBRIS BASIN
SLIDE AREA
SWIFT CREEK
RECONNAISSANCE STUDY
SLIDE - DEBRIS BASIN
Hampton
Nooksack
Everson
Strandell
Lawrence
Goshen
Lake Louise
Cedarville
North Cedarville
Sugarloaf Hill
Swift Pass
Springs
Creek
SUMAS
NOOKSACK
RIVER

FIGURE 3

Access Road	L.S.	80,000
Environmental Landscaping		50,000
Subtotal		$1,292,500
Contingencies 25%		323,500
Total Construction Cost		$1,616,000
Lands & Damages		134,000
Engr & Des, and Supv & Admin		150,000
Project First Cost		$1,900,000

9. Annual Operation and Maintenance Cost. Annual operation and maintenance consists of excavation and clearing the debris basin. The bedload excavated from Swift Creek in Spring of 1971 was about 70,000 c.y. However it is estimated that considerably more material was transported by Swift Creek during the 1971 flood. The annual bedload excavation from the debris basin is expected to range from 50,000 to 500,000 c.y., with an average annual bedload of 250,000 c.y. The annual O&M cost is $250,000 based on $1.00/c.y.; with the material being disposed in the vicinity of the debris basin.

10. Economic Analysis. Flood plain of Swift Creek consists of approximately 900 acres with about 25 single-family dwellings and farm residences with farm outbuildings. A lumber mill covering about 15 acres and employing about 15 people is also located in the area subject to flooding. Land use in flood plain is predominately in pasture with a few acres devoted to corn, peas, beans, beets, carrots and berries. Market value of agricultural land is estimated by local realtors at $1,000 to $1,500 per acre.

11. Flood damage from inundation in the January 1971 flood event was confined to mud and silt deposits on the land and in drainage ditches. The owner of the lumber mill and a sample survey of residents indicated no monetary damage to the mill or dwellings. About 40 acres of farm land received heavy deposits of silt averaging 6-12 inches deep. It is estimated that to correct this damage by removing this mud and silt would cost about $500 per acre or $20,000. In addition, the cost to clean the drainage ditches throughout the flood plain is estimated to be $25,000 (500 acres average cost @ $50 per acre). Emergency work to restore the channel was estimated at $60,000. Total damages from the 1971 flood event were about $105,000. Over a 50-year period, future damages are estimated at approximately $1 million, or an average annual damage of $59,000 when amortized over 50 years at 5-1/8 percent rate of interest. Project first cost are estimated to be $1,900,000 or $100,000 based on a capital recovery factor at 5-1/8 percent. Annual operation and maintenance consists of excavation costs of $250,000.

Total annual costs are $350,000 compared with annual benefits, $59,000 provide an unfavorable benefit cost ratio.

12. Conclusion. Based on the economic analysis, the construction of a debris basin is not economically justified.