

DISPOSITION FORM

For use of this form, see AR 340-15, the proponent agency is TAGCEN.

REFERENCE OR OFFICE SYMBOL

NPSEN-DB-CI

SUBJECT

Skagit River, Washington, Nookachamps/Clearlake
Non-Structural Alternative Studies

TO Proj. Mgr., Skagit River

FROM Ch, Civil Des Sect.

DATE 08 May 1979

CMT 1

YANG/rn/3699

1. Attached for your information and use is the summary report on Non-Structural Alternative Studies prepared over the last 3 months.

2. I understand that our report will be the basis of more detailed analysis of certain promising alternative solutions with intent to complete these studies for inclusion of results in the final GDM. Contour maps, work sheets, and backup material for our work are available upon request.

HANSON

cc:

Farrar/McKinley

Harnisch/Thompson

Hanson/Yang

P004111

D R A F T

HANSON/EN-DB

DERRICK/EN-DB

ED-DB FILE

NPSEN-DB-CI

5 April 1979

MEMO FOR: RECORD

SUBJECT: Feasibility of Structural and Non-Structural Flood Control Alternatives for Nookachamps, Clear Lake, Sterling, Lower Sedro Woolley, and West Mount Vernon, Skagit County, Washington

1. Two field reconnaissance trips were taken to collect information needed for evaluation of the feasibility of various flood control alternatives in the subject areas: first of which was covered in a Memorandum for Record dated 2 February 1979 by Yang (copy attached as inclosure 1 for ready reference). It involved visual inspection of possible levee alignment locations and general field conditions as well as discussions with local residents concerning their views and experiences of the flood problems. The second field trip was undertaken on 13-15 March 1979 by Bob Hohlweg, Glen Stevens, Don Thompson, and Simon Yang. It consisted of review of areas not covered by contour maps available at the time of the first trip and detailed inventory of houses and farm facilities for the purposes of evaluation of non-structural alternatives and comparison of costs and benefits for all the alternatives. Both trips were participated in by Mr. Don Nelson, Flood Coordinator for Skagit County, Mr. Jack Morris

P004112

made separate real estate surveys and Karen Northup made visual inspection of the possible levee alignment locations and found no significant environmental conflicts with the levees around Clear Lake and along Mud Lake. There are reports of a bald eagle's nest located at the south end of Clear Lake. Such would have to be coordinated with the United States Fish and Wildlife Service; however, Ms. Northup did not feel the levees would significantly impact the habitat of this species. Photographs were taken during both field trips and are catalogued and available for viewing in Civil Design Section.

2. Field inspections revealed that most houses in the Nookachamps and Clear Lake areas were built or floodproofed to a level above the 1951 flood (about a 15-year event), none had flooding of the first floor in the 1975 flood (an estimated 10-year event). In fact, many residents who are not recent arrivals could relate to the 1951 flood, indicating that common sense and conventional wisdom had dictated a certain degree of protection for houses knowingly built in the flood plains. There are cases like that of Judge Ward's house which had living spaces elevated above the estimated 100-year with project flood level. Most of the heavily invested, expensive homes in the Sterling area also were built on high grounds above the 100-year flood level. Since many houses have already been floodproofed or have built-in basements, further raising of the houses becomes both structurally and economically impractical, especially in view of the fact that surprisingly high-water velocities were experienced by residents in the Nookachamps during the 1975 flood. During the second field reconnaissance trip

some elevations indicated on the contour maps of Nookachamps area were found to be 4 or 5 feet to as much as 10 feet off compared to other information sources.

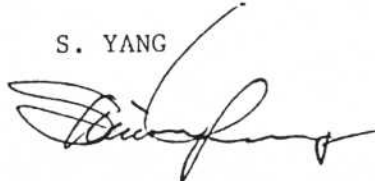
3. Among the more vocal residents in the Nookachamps area that we had discussions with, Mr. Larry G. Gadbois indicated strongly that he objected to the Skagit Levee project, thinking it offered protection to the downstream areas at the expense of the Nookachamps area. After being told by Don Nelson and Don Thompson that the effect of a 100-year frequency flood would be so disastrous to the whole lower Skagit Valley that it may never recover fully, and certainly will affect the Nookachamps area economically if not, otherwise, he changed his views somewhat. It has also been noted that many residents shared the misconception with Mrs. Don Austin that the levee project will put 2 feet of additional water into Nookachamps in any flood event, whereas our projection of an additional 1.5 feet of water is for the 100-year flood. These misunderstandings pointed out the need for more lucid explanations to the local residents as to the purposes and effects of the project on all the areas affected as well as the possible consequences of not doing the project.

4. Based upon the field information gathered and input from Real Estate Division, F&M Branch, H&H Branch, Estimating Section as well as contour maps, a dozen levee arrangements and ten non-structural solutions were considered. See table showing the various solutions considered for each of the areas studied (inclosure 2). Quantity and Cost calculations were made for combinations of levee alignments and least-cost non-structural alternatives protecting each area to the level of an estimated 100-year flood. The levee alignments are indicated on the aerial photograph of the Nookachamps - Clear Lake vicinity (inclosure 3). A summary of cost calculations is shown in inclosure 4. Benefit and Benefit/Cost ratio calculations provided by Economic Evaluation Section indicated that due to limited benefits that could be derived from induced damages and the high cost of the various possible protective measures, flood protection of the areas studied are not economically feasible. Using an interest rate of 6-7/8 percent, the Benefit/Cost ratios for various alternatives range from 0.11 to 0.71. A summary of the alternatives and Benefit/Cost ratios for the areas studied is attached as inclosure 5.

5 Incl
As

cc:
Cook (Proj Mgr)
Brooks (Skagit Study)
Thompson (Economics)
Newbill (F & M Br)
Soyle (Hydraulics)
Stevens (hydrology)
Morris (RE)
Yang/Hanson (Civ Des Sec)
Northup (ERS)

S. YANG



HANSON

DERRICK

ED-DB FILE

NPSEN-DB-CI

2 February 1979

MEMORANDUM FOR: RECORD

SUBJECT: Field Reconnaissance of Nookachamps Area on Skagit River,
Washington

1. Upon verbal request from Vernon Cook of Design Branch. in a meeting on 25 January 1979, a mini task force was organized for the purpose of collecting field information and study possible alternatives to alleviate possible induced damages that could be caused by the proposed Skagit levee project at and downstream of Nookachamps area.
2. A field reconnaissance trip was undertaken on 29-30 January 1979. by Don Thompson (Economics), Bob Newbill (Foundations and Materials). Wayne Wagner (Hydraulics). Glen Stevens (Hydrology). Jack Morris (Real Estate), and Simon Yang (Civil Design).
3. During the field reconnaissance, visual inspection of the possible levee alignments were made, photographs taken, and high-water marks and information on past floods, as told by local residents and Mr. Don Nelson of the Skagit County Engineer's office, were related to contour map of the area. Based on several field sources and hydrological and hydraulic calculations made prior to the field trip, the 1975 winter high water was established to be at elevation 39 feet \pm within the accuracy limits of the available contour map. Pending completion of remaining portion of the contour map, at least one additional field reconnaissance trip will be needed to assess and verify field conditions as well as to complete calculations needed to evaluate some of the alternatives.
4. Alternative solutions of structural and nonstructural nature besides levees were also field investigated for the Nookachamps area in general, as well as west Mount Vernon, Sterling, and Clear Lake areas. Guided by Mr. Don Nelson, a number of local residents were visited by the reconnaissance team. Their views of the flood problems and solutions, as well as historical flood information, were sought. The information obtained is listed by name of source as follows:

INCL 1

P004116

NPSEN-DB-CI

SUBJECT: Field Reconnaissance of Nookachamps Area on Skagit River,
Washington

a. Mr. Moore, who lives in the house located on high ground at northwest corner of Swan Road bridge over Nookachamps Creek, told the team of the benchmark on the southeast corner of the bridge. Benchmark elevation is 39.62 feet. He also pointed out the 1975 highwater marks painted on power poles along Swan Road. He mentioned that raising Swan Road as a method of floodproofing was considered by local residents, but found it impractical because the height required. Based on the benchmark elevation, using a hand level, the 1975 high-water mark is pegged at an approximate elevation of 39 feet. (See photographs of the general area of Swan Road Bridge.)

b. Mrs. Gadbois was interviewed at the Gadbois meat business located on the east side of Mud Lake Road about 1,000 feet northeast of the T intersection with Swan Road. She indicated that the 1975 high water reached within 2 inches of the road surface in front of their business and was on the porch of Mr. Gadbois Senior's house located southwest of the T intersection. Field check of these elevation points confirmed high-water marks observed on the power poles along Swan Road.

c. Mrs. Ward indicated that during the 1975 high water, there were 7 inches of water on the concrete ground floor slab of the house which has estimated elevation of 39 feet. It has elevated living spaces on the second floor level. However, the horse barn had about 2-1/2 feet of water. Based on this information and field level check, the 1975 high-water elevation at this location is estimated to be 39.6 feet. This house is well floodproofed against an estimated 100-year flood. Photographs of the house were taken.

d. Discussion with Mr. Ken Johnson on his dairy farm revealed that in the 1951 flood his father had housed the cattle on the second floor of the barn. Since then the herd required to operate a viable dairy farm has grown steadily from the maximum number of 80 head that Mr. Johnson's father owned to his present herd of 300, with 150 milk cows, 130 of which are being milked. This increase in herd size also precludes the possibility of neighboring farms assisting each other by providing temporary shelter or high ground during floods. Besides, the moving of cattle during floods is extremely difficult and causes unrest and loss of milk production. Each relocation takes about a week. During the 1975 high water, Mr. Johnson had accommodated the cows on high ground near the machine shed and on the front lawn of his house. He felt what was needed was some simple milking facility with concrete slab and overhead shelter to accommodate milking each cow at least once every 24 hours to avoid damage to cow's health and capacity for future milk production. A cattle pad of 1-1/2 to 2 acres in size

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SUBJECT: Field Reconnaissance of Nookachamps Area on Skagit River,
Washington

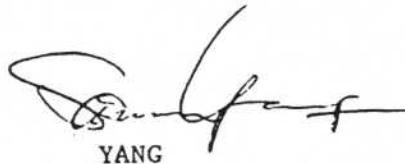
will be needed to accommodate 300 cows during floods, based on the minimum need of about 50 square feet per cow or 8-foot by 16-foot space per three cows. In 1975 he suffered minor damage because milk delivery was made just before isolation due to flooding occurred. Mr. Johnson indicated the high-water levels on the milk barn (see photographs). Based on this information and contour map, available natural ground elevation near the milk barn is about 39 feet. The high-water elevations were estimated to be about 41.7 feet for 1951 high water and 39.8 feet for 1975. (Estimated water levels are: 42.5 feet for 100-year flood without project, 44 feet for 100-year flood with project at day 1, and 44.5 feet for 100-year flood at end of project life.) Mr. Johnson also indicated that 1975 high water came within 2-1/2 feet of first floor of his house, but various essential machinery and facilities such as electric pumps, water heater, furnace, etc. are all above the 1951 highwater level which is the level of protection he would prefer. Mr. Johnson also discussed flood history of the area. He indicated that during the 1975 high water only one home had water in the first floor and in 1951 three homes had flooding of the first floor that was consistent with field observations that most homes were floodproofed to at least a ten-year event. He had also rejected the idea of ring diking around the farm facilities since it will be costly involving extensive diking and offer little security due to constant fear of breaching of the dike which would be disastrous. He echoed opinion of some of the other local residents that the Burlington Northern Railroad Bridge is a major bottleneck.

e. Mr. and Mrs. Don Austin told about having 3 inches of water in their house in 1951 and in 1921 water was up to the window sill (about 2 feet of water in the house). In 1975 the water level was at third of the four concrete block steps leading from the walk to the porch (about 1 foot below floor of house or 2 feet above the walk and 5 feet above the field to the west of the house. They told about hearing the roar of the water coming up the east fork of the Nookachamps Creek at the Highway 9 bridge which is a serious constriction point. Mrs. Austin realized they are in a flood area, but still likes their house and surroundings (they were making extensive repairs and remodeling their house.) Mrs. Austin's main concerns about the Skagit levee project are: (1) will the project increase flood level on their property by leveeing off other former outlets that could have offered relief to their area (e.g. Samish and Burlington areas; Burlington dikes were breached offering some relief in 1951 high water.). (2) she's concerned about at what frequency flood would they begin to sustain induced damages? She shared with other local residents the misconception that the 2 feet of additional water we projected for the 100-year flood can be expected for all flood events. She also had questions about the accuracy of our study methods and prediction

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SUBJECT: Field Reconnaissance of Nookachamps Area on Skagit River,
Washington

of high-water levels. More study of the possible induced damage water levels for various flood events is urged by this reconnaissance team. Team members also suggested that due to his familiarity with the area, Mr. Don Nelson of the Skagit County engineer's office could provide additional input. Therefore, he should be asked to review these field notes.



YANG

cc:

Cook (Proj Mgr)
Brooks (Skagit Study)
Thompson (Economics)
Newbill (F & M Br)
Wagner (Hydraulics)
Stevens (Hydrology)
Morris (RE)
Yang/Hanson (Civ Des Sec)

ALTERNATIVE SOLUTIONS CONSIDERED :

AREAS SOLUTIONS	NOOKA- CHAMPS	CLEAR LAKE	SEDRO-WOOLLEY /STERLING	WEST MT. VERNON
STRUCTURAL LEVEES	YES, NOT COST EFFECTIVE	YES	NO YES	NO YES
NON-STRUCTURAL SOLUTIONS RE-ARRANGE INDOOR ITEMS	ALREADY DONE ✓	ALREADY DONE ✓	ALREADY DONE ✓	ALREADY DONE ✓
MINOR FLOOD PROOF	NOT EFFECTIVE ✓	NOT EFFECTIVE ✓	NOT EFFECTIVE ✓	NOT EFFECTIVE ✓
RAISE BLDG.	YES	YES	YES	NO
RELOCATE TRAILERS	YES	YES	NO	YES
REMOVE BLDG.	YES	YES	NO	YES
RING DIKE	YES NO	YES	NO	NO
ELEVATED PAD, MOUNDS	YES	NO	NO	NO
FLOWAGE EASEMENT	LOCAL ITEM	LOCAL ITEM	LOCAL ITEM	LOCAL ITEM
FLOOD INSURANCE SUBSIDY	↓	↓	↓	↓
FLOOD FORECAST & WARNING	↓	↓	↓	↓

ESTIMATED COSTS OF FLOOD CONTROL METHODS

AREAS METHODS	NOOKA- CHAMPS	CLEAR LAKE	STERLING	LOWER SEDRO- WOOLLEY	WEST MT. VERNON
STRUCTURAL LEVEES	"A" \$ 11,013,000 (# 7,500)	"C" + "H" * \$ 995,000 (# 1,500)	"2" + "7" \$ 1,342,000 (# 1,000)	—	—
NON- STRUCTURAL SOLUTIONS	\$ 1,054,000 B/C = 0.29	\$ 2,157,500	\$ 170,000	\$ 253,500 B/C = 0.40	\$ 1,220,000 B/C = 0.37
BREAKDOWN OF NON- STRUCTURAL SOLUTION COSTS :					
RAISE BLDGS	\$ 192,500	\$ 747,500	\$ 170,000	\$ 32,500	—
MOVE TRAILERS	\$ 45,000	\$ 273,000	—	—	YES
BUY-OUTS	\$ 678,000	\$ 705,000	—	\$ 221,000	\$ 1,220,000
RING DIKES	—	\$ 432,000	—	—	—
CATTLE PAD	\$ 138,500	—	—	—	—

NOTES :

ALL COSTS ARE ESTIMATED FOR PROTECTION AGAINST 100 YR FLOOD.
 FIGURES IN BRACKETS ARE ESTIMATED ANNUAL MAINTENANCE COSTS
 * THIS IS BASED ON THE LEAST COST ALINEMENTS HOWEVER, INTERIOR
 DRAINAGE COSTS COULD RAISE THIS FIGURE TO ABOVE \$1,000,000.

S. YANG 14 APRIL, 1979

INCL. 4

P004121

ESTIMATED COSTS FOR LEVEE ALIGNMENTS IN THE
NOOKACHAMPS VICINITY: 100 YR. EVENT DESIGN UNLESS OTHERWISE NOTED

1. STERLING - LEVEE SEGMENTS 2 & 7

INITIAL FEDERAL & NON-FEDERAL COST = \$ 1,342,000

ANNUAL MAINTENANCE COST (\approx 0.6 MILE) = \$ 1,000

2. DIKE "A" ALONG SKAGIT RIVER

100 YR. \$ 11,013,000

INITIAL FEDERAL & NON-FEDERAL COST = 50 YR. \$ 9,120,000

ANNUAL MAINTENANCE COST (\approx 6 MILES) = \$ 7,500

ABOVE COSTS DO NOT INCLUDE COST OF ADDITIONAL LEVEE HEIGHT
NEEDED FOR DOWN STREAM LEVEES DUE TO LOSS OF RESERVOIR SPACE.

FOLLOWING LEVEE ALIGNMENTS PROTECT CLEAR LAKE AREA:

3. DIKES "B" & "H"

INITIAL FEDERAL & NON-FEDERAL COST = \$ 3,570,000

ANNUAL MAINTENANCE COST (\approx 1.7 MILE) = \$ 2,000

4. DIKES "B" & "I"

INITIAL FEDERAL & NON-FEDERAL COST = \$ 3,915,000

ANNUAL MAINTENANCE COST (\approx 1.8 MILE) = \$ 2,000

5. DIKES "C" & "H"

INITIAL FEDERAL & NON-FEDERAL COST = \$ 995,000

ANNUAL MAINTENANCE COST (\approx 1 MILE) = \$ 1,500

6. DIKES "C" & "I"

INITIAL FEDERAL & NON-FEDERAL COST = \$ 1,227,000

ANNUAL MAINTENANCE COST = \$ 1,500

S. YANG 27 MAR. '79

7. DIKES "D", "E" & "H"

INITIAL FEDERAL & NON-FEDERAL COST = \$ 1,140,000

ANNUAL MAINTENANCE COST (\approx 1.7 MILE) = \$ 2,000

8. DIKES "D", "E" & "I"

INITIAL FEDERAL & NON-FEDERAL COST = \$ 1,485,000

ANNUAL MAINTENANCE COST = \$ 2,000

9. DIKES "F" & "H"

INITIAL FEDERAL & NON-FEDERAL COST = \$ 2,332,000

ANNUAL MAINTENANCE COST (\approx 2.7 MILES) = \$ 3,500

10. DIKES "F" & "I"

INITIAL FEDERAL & NON-FEDERAL COST = \$ 2,677,000

ANNUAL MAINTENANCE COST (\approx 2.2 MILES) = \$ 3,500

11. DIKES "G" & "H"

INITIAL FEDERAL & NON-FEDERAL COST = \$ 1,840,000

ANNUAL MAINTENANCE COST (\approx 2.2 MILES) = \$ 2,800

12. DIKES "G" & "I"

INITIAL FEDERAL & NON-FEDERAL COST = \$ 2,185,000

ANNUAL MAINTENANCE COST = \$ 2,800

S. YANG 31 MAR. 79

CLEAR LAKE NON-STRUCTURAL SOLUTIONS & COSTS :

1. RAISE STRUCTURES	
10 LCS @ \$5,000	\$ 50,000
77 LCM @ \$7,500	\$ 577,500
12 LCL @ \$10,000	\$ 120,000
2. MOVE 21 TRAILER HOMES & PURCHASE LAND	
MOVE 21 TRAILERS @ \$3,000 EACH	\$ 63,000
21 LOTS @ \$10,000 EACH	\$ 210,000
3. BUY OUT 28 PROPERTIES TOTAL VALUE	\$ 425,000
LAND PURCHASE 28 LOTS @ \$10,000 EACH	280,000
4. RING DIKE SCHOOL & 2 LCS.	\$ 198,000
5. RING DIKE BUSINESS DISTRICT BLOCK	\$ 234,000
	<u>\$ 2,157,500</u>
	\$ 2,296,000 <u>2,796,000</u>

WEST MT. VERNON NON-STRUCTURAL SOLUTION COSTS AS PER REAL ESTATE DIVISION :

ESTIMATED COST :	\$ 976,000
15% CONTINGENCIES	146,000
10% ENGINEERING & ADMINISTRATION	98,000
TOTAL	<u>1,220,000</u>
	\$ 1,609,025

P004124

S. YANG 31 MAR. 79

NOOKACHAMPS AREA NON-STRUCTURAL SOLUTIONS & COSTS :

1. RAISE STRUCTURES

6 LCS @ \$ 5,000	\$ 30,000
11 LCM @ \$ 7,500	\$ 82,500
8 LCL @ \$ 10,000	\$ 80,000

2. MOVE 3 LARGE TRAILER HOMES & 1 SMALL	\$ 15,000
BUY 3 LOTS @ \$ 10,000 EACH	\$ 30,000

3. BUY OUT 18 PROPERTIES TOTAL VALUE	\$ 498,000
18 LOTS @ \$ 10,000 EACH	\$ 180,000

4. JOHNSON FARM CATTLE PAD	\$ 138,500
	<hr/>
	\$ 1,054,000
	\$ 1,596,500
	\$ 1,069,000

STERLING NON-STRUCTURAL SOLUTION COSTS =

RAISE 9 LCS @ \$ 5,000	\$ 45,000
6 LCM @ \$ 7,500	\$ 45,000
8 LCL @ \$ 10,000	\$ 80,000
	<hr/>
	\$ 170,000
	321,000
	197,500

LOWER SEDRO-WOOLLEY NON-STRUCTURAL SOLUTION COSTS =

RAISE 3 LCM @ \$ 7,500	\$ 22,500
1 LCL @ \$ 10,000	\$ 10,000
BUY OUT 7 PROPERTIES TOTAL VALUE	\$ 151,000
7 LOTS @ \$ 10,000	70,000
	<hr/>
	\$ 253,500

P004125

~~390,500~~ 196,500

ESTIMATING SHEET

PROJECT Skagit Levees REVISED 23 MAR '79 LOCATION Burlington - Gates Valley FEATURE Segment 2
 DATE 9 Aug 78 TAKE OFF WPM PRICED JLR CALC CHK JLR APPROVED JLR SHEET OF

ITEM AND DESCRIPTION	QUANTITY	UNIT	MAT'L	LABOR	SUB-CONT	RENTAL EQUIPT.	MATERIAL	LABOR	SUB-CONTRACT	TOTAL
<i>Federal Cost</i>										
Clearing	4.0	AC				1500 3000 ⁰⁰			6000 12,000	
Stripping (1' deep) (strip pile 1/2 mile)	20,100	SY				1 ⁰⁰			20,100	
Embankment (5.5 mile haul)	36,300	CY				370 4.70			135,710 170,610	
Topsoil (from stripping)	2500	CY				6 ⁰⁰			15,000	
Seeding	14,200 14,200	BS				2 1500 ⁰⁰			4320 4,500	
Gravel Surfacing (5.5 mile haul)	810	CY				10 ⁰⁰			8,100	
12" CMP Culvert	115	LF				12 ⁰⁰			1,380	
12" Flapgate	2	ea				300 ⁰⁰			600	
Concrete (Culvert outlets) w/ Rebar	2	CY				500 ⁰⁰			1,000	
<i>Non Fed. Cost</i>										
Land	4.0	AC				10,000 ⁰⁰			40,000 40,000	
Sub total									140,910 273,290	
Contingency (=5%)									25% Cont. 48,170 68,322	
Total									Total 229,080 341,612	
									Say \$ 342,000	

ESTIMATING SHEET

SEG. 7

Skagit Levees REVISED 23 MAR. 79. SY.

B-14-78

Rosenbark



John

Griff

FEDERAL COSTS

stripping, common 6"	33035 SY	0.50	16518
stripping, A/C pavement & shoulder	1073 SY	2.00	2146
Embankment (HAUL 9 MILES)	92534 CY	4.75 6.05	439537 559,830
TOPSOIL	4945 CY	6.10	29670
SEEDING	2450 AC.	3.70 1500.00	8883 9,000
CULVERTS 1' DIA.	330 LF	12.00	3960
Flapgates 1' DIA.	4 ea.	300.00	1200
Concrete	5 CY	50.00	2500
Access Gates	5 ea.	50.00	2500
Gravel Surfacing - 4"-6"	3682 CY	10.00	36820

Non Federal COSTS

STRIPPING, common 6"	4001 SY	0.50	2001
Embankment (HAUL 9 MILES)	11158 CY	4.75 6.05	5300 67,506
TOPSOIL	577 CY	6.10	3462
SEEDING	2450 AC.	3.70 1500.00	1036 1,500
LANDS, EASEMENTS, R/W.	8 Ac.	5000.00	40,000
Road Fill, 10" gravel	621 CY	10.00	6290
Gravel surfacing, 4"-6"	336 CY	10.00	3360
Dwings, A/C 2"	450 SY	3.70 4.00	2850 3,800
misc: - raise 1 power pole	1 ea.	300.00	300
- 43' of 3" cast iron pipe to replace water line @ sta 39400	43 LF	15.00	645
- replace 173 LF of 3 strand barb-wire fence.	173 LF	2.00 3.00	519
Steel rails	655 LF	12.00	7860

801,387
 + 200,347 = 25% CONT.
 \$1,001,734
 TOTAL
 Say \$1,000,000

~~824,835~~
 + 25% Cont.
~~156,115~~
 \$981,000
 TOTAL

P004127

7860
~~221 235~~

ESTIMATE NO. 10

(SKAGIT RIVER)

Dike A. - 100 - ft

1 2

2/6/79

Skagit Bureau

Highway

Northwest

YANG 23 Mar. 79

Federal Cost

Embankment	878,980 C.Y.	6.05	5,317,829
2 Riprap - Class III	116,040 C.Y.	12.85	1,491,114
18" Riprap - Class II	6,190 C.Y.	12.85	79,542
1' gravel filter	44,470 C.Y.	6.70	297,949
1' quarry spalls	22,340 C.Y.	10.20	227,868
Excavation, common	3660 C.Y.	3.50	12,810
Topsoil	46,740 C.Y.	6.00	280,440
Seedling	280,450 S.Y. (58 Ac)	1500.00	87,000
Stripping - 6" deep	298,140 S.Y.	0.50	149,070
4-10' x 10' BOX CULVERTS WITH INLET, OUTLET STRUCTURES AND GATES	4 x 180 L.F.	800.00	576,000
Gravel lower top - 6"	7580 C.Y.	5.00	37,900

Non-Federal Cost
Lands
(Private)

84.2 Ac.

3000.00

252,600

\$ 8,810,122
+ 25% Cont. 2,202,530

TOTAL \$ 11,012,652
Say \$ 11,013,000

P004128

(SKAGIT RIVER)
 Dike A - 50 ft
 2 2

2/6/79

Skagit River
 Highway

Prokhorov
 YANG 23 Mar. 79

Description	Quantity	Unit	Rate	Amount
Federal Cost				
Employment	664,060	C.Y.	6.05	4,017,563
2 Riprap - Class II	111,200	C.Y.	12.85	1,428,920
18 Riprap - Class II	5,530	C.Y.	12.85	71,060
1' gravel filter	42,010	C.Y.	6.70	281,467
1' quarry spalls	22,340	C.Y.	10.20	227,868
Topsoil	39,790	C.Y.	6.00	238,740
22' m	238,760	S.Y.	1500.00	75,000
Shipping - 6" deep	263,400	S.Y.	0.50	131,700
Excavation, common	3,660	C.Y.	3.50	12,810
4-10'x10' Box CULVERTS	4x170	LF.	800.00	544,000
WITH INLET, OUTLET STRUCTURES AND GATES				
Gravel lease top - 6"	7,580	C.Y.	5.00	37,900
Non - Federal Cost				
Land (Private)	76.3	Ac.	3000.00	228,900

\$ 7,295,928
 +25% Cont. 1,823,982
 TOTAL \$ 9,119,910
 Say \$ 9,120,000

NOOKACHAMPS AREA ESTIMATING SHEET

PROJECT SKAGIT LEVEE PROJECT - 100-year Flood DIKE B (SWAN ROAD) PRICE LEVEL _____

DATE 7/2/79 TAKE OFF 7/2/79 PRICED _____ CALC. CHKD. YANG 23 Mar. 79 APPROVED _____ SHEET 1 OF 1

ITEM AND DESCRIPTION	QUANTITY	UNIT	MAT'L	LABOR	EQUIP.	SUB-CONT.	MATERIAL	LABOR	EQUIPMENT	TOTAL
FEDERAL COST										
STRIPPING - (6" Deep)	63,410	S.Y.				0.50	31,705			
Embankment	266,520	C.Y.				6.05	1,612,446			
Topsoil	10,330	C.Y.				6.00	61,980			
Seeding	61,950	S.Y. (13 AC)				1500.00	19,500			
GRAVEL 6" Layer Top - 6"	1160	C.Y.				5.00	5,800			
4 - 10'x10' BOX CULVERTS WITH INLET & OUTLET STRUCTURES AND GATES.	4x190	L.F.				800.00	608,000			
2 - 36" C.M.P.	240	L.F.				35.00	8,400			
CONC. HEADWALLS	2	EA.				1000.00	2,000			
2 - FLAPGATES - 36"	2	EA.				1200.00	2,400			
NON FEDERAL COST										
LANDS										
Public	0.84	Ac.				3000.00	2,520			\$ 2,488.37
Private	12.6	Ac.				3000.00	37,800		125% Cont.	622.09
6" gravel road top	150	C.Y.				10.00	1,500			TOTAL \$ 3,110.46
Access gates	7	ea.				500.00	3,500			Ray \$ 3,110.00
Rolling embankment	10,740	S.Y.				6.05	64,977			
Topsoil	1000	C.Y.				6.00	6,000			
Seeding	6000	S.Y.				0.30	1,800			
Abandonment concrete	4100	S.Y.				0.50	2,050			
Abandonment A/C	240	S.Y.				2.00	480			
A/C - 2"	280	S.Y.				4.00	1,120			
10" gravel road base	120	C.Y.				10.00	1,200			
Gravel fills	1100	L.F.				12.00	13,200			

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