FLOOD CONTROL ECONOMIC JUSTIFICATION STUDY

AVON BY-PASS AND EXTENTION OF DIKES TO SEDRO WOOLLEY

APPRAISAL OF DAMAGES 1815 H.W. AND 1921 H.W.

SKAGIT RIVER WEST OF AND INCLUDING SEDRO WOOLLEY

SAMISH RIVER DELTA

VOLUME I

GENERAL APRAISAL DATA AND MAPS

DEC. 1940

FLOOD CONTROL ECONOMIC JUSTIFICATION STUDY
SKAGIT RIVER
July 1950

INDEX TO VOLUMES

APPRAISAL OF DAMAGES, 1921 H.W. & 1815 H.W.

Binding

S Vol. 1 1940 Appraisal. General Data & Maps, Recap. of Damages, Appraisal of Miscl. Items, Appraisal Factors, Indices of Maps & Aerial Photos

S " 2 " " Township Notes
T33N-R2E
T33N-R3E
T33N-R4E (includes Conway)
T36N-R3E (" Blanchard & Edison)

S " 3 " " Township Notes
T34N-R2E (" La Conner)
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S " 4 " " Township Notes
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T35N-R5E (" Sedro Woolley)

APPRAISAL OF DAMAGES; 112,000 cfs., 210,000 cfs., 300,000 cfs. & 400,000 c

S Vol. 5 1950 Appraisal. Indices, Map Reference, Summaries & Curves, General Data, Land Use, Crop Damages.

S " 6 " " Roads & Highways, Railroads, Bridges, Highway & Railroad Traffic Interruptions, Navigation & Snagging.

E " 7 " " Miscellaneous Items, Livestock, Farm Machinery, Weeds, Clean-up Costs, Salt Water Damage, Loss of Milk Production, Assessed Valuation by School Districts. (Supporting data only)

E " 8 " " 1/ Areas (Left Bank)
1A (includes Conway), 1B, 1C, 1D, 1E, 1F, 1H & 1J

E " 9 " " 1/ Areas (Right Bank)
1H, 1K, 1L, 1M, 1N (includes Burlington)

E " 10 " " 1/ Area (Right Bank) 1G (includes La Conner)

E " 11 " " 1/ Areas 2 (includes Blanchard & Edison), 3 (includes Clear Lake), & 4

1/ Channel Areas
Avon By-Pass to mouth of Skagit River
" " " " Highway Bridge at Sedro Woolley

S " 12 1949-1950 Sedro Woolley to Rockport

RIGHT OF WAY COSTS

S " 13 1950 Appraisal. Avon By-Pass R/W Costs; 900', 1300', 1700', 1800', 2500' & 2900' widths.

1/ Includes Buildings & Contents and Miscellaneous Items such as Livestock, Machinery, Weeds, Clean-up Costs, and Loss of Milk Production. For Damages on remaining items see Vol. 5 & 6.

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SKAGIT RIVER

MAP REFERENCE

File No.	Kind	Description	Scale	Sheets
E-6-1-21	WP	Kroll Township Plats T36N - R3E T35N - R3E & R4E T34N - R2E & R4E T33N - R3E & R4E	2" = 1 mi.	7
E-6-4-29	OP	1935 B.M. Marks and Bench Marks Conway to Concrete (C. B Corey 1935)		2
E-6-4-31	T	Mileage & Local Names, Sedro Woolley to mouth, Shows levees & soundings 1932 scale	1" = 400'	5
E-6-6-1	WP	Topography, Skagit Flats, by Milleboe (1940)	1" = 1000'	4
E-6-6-1.1	WP	Reference Elevations for Flood Damage Appraisal, Samish Area (1950) Based on E-6-6-1 (Milleboe Survey)	1" = 1000'	5
E-6-6-2		Avon By-Pass (1942)	2" = 1 mi.	2
E-6-6-4	OP	1940 Flood Damage Appraisal, Topog. Skagit Flats (1940) Madison	1" = 1000' 1" = 1 mi.	6 2
E-6-6-56	PS Film	Mosaic of Aerial Photos, Used as Index to 1947 & 1948 Air Photos (Used in 1950 Appraisal)	1" = 1 mi.	4
E-6-6-61	OP	Backwater Sections by Westby (1949) from File K-2-106, Plate No. 2	2" = 1 mi.	1
E-6-6-63	Aerial Photos	Land Use Classification, U.S. Soil Conservation Service, Skagit River - Rockport to mouth 1941-1943, 1950 Appraisal Data	4" = 1 mi.	64
E-6-6-64		1947 Aerial Photos enlarged to scale 1" = 300'. Used in Flood Damage Appraisal, shows shot nos. for levels.		

Sheet 1	Sedro Woolley
" 2	Clear Lake
" 3	Burlington
" 4	Blanchard
" 5	Edison
" 6	Avon
" 7	Area So. of Avon & W. of Mt. Vernon
" 8	Area North & West of Mt. Vernon
" 9	Area So. of Mt. Vernon
" 10	Conway

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File No.	Kind	Description	Scale	Sheets
E-6-6-70		Film negatives for enlargements of the Aerial Photos of preceding towns, file E-6-6-64		
E-6-6-78	OT & TP	1950 Levee Survey. Lines T, S, R, sublines A & B, based on file E-6-4-31 (1932) & C-2-3 (1930)	1" = 400'	6
E-6-6-79	OP	Nov. 1949 H.W. Marks, Sauk River to mouth of Skagit River	2" = 1 mi.	2
E-6-6-80	Film Neg.	Vicinity Map - 1950 Flood Damage Appraisal, July 1950. Skagit River Valley showing Areas Appraised	1" = 1 mi.	1
E-6-6-90	L	Area Inundated 1949 H.W., marked copy of Mt. Vernon Quad. 161A (1950 Appraisal)	1" = 1 mi.	1
"	L	Area Inundated 1949 H.W., marked copy of Clear Lake Quad. 173 (1950 Appraisal)	1" = 1 mi.	1
"	L	Area Inundated 1949 H.W., marked copy of Hickersham Quad. 48 (1950 Appraisal)	1" = 1 mi.	1
"	WP	Area Inundated 1949 H.W., marked copy of Mt. Vernon Quad. 161C. Shows Location of Roads, & Fire Lines. Also shows Appraisal Limits of 1921 H.W. & 1949 H.W. and Index to Level Shot Nos. used in 1950 Flood Damage Appraisal	1" = 4000'	1
E-6-6-91	PS	Skagit River, Avon By-Pass Layouts, Flowage Costs & Flood Damage Study (1950). Shows limits of alternate 1800', 2500' & 2900' R/W widths (also shows building locations for Flood Appraisal Subareas 1K, 1L, & 1M)	1" = 400'	13
E-6-6-92	WP	Map shows appraisal limits of 210,000, 300,000, & 400,000 cfs. Discharges & Limits of Saltwater Damages (1950) Area covered from Samish Valley to south of Burlington. This is a marked copy of file E-6-6-1.1	1" = 1000'	4
E-6-6-93	OP	Location of Parcel Numbers used in Flood Damage Appraisal, Areas 1G, 1A, & Areas 1B to 1J (Burlington south to Snohomish County Line) (1950)	2" = 1 mi.	4
E-6-6-94	OP	Map showing Areas inundated by Samish River Flood of Dec. 1949 (Rice). Also shows Backwater sections (1950)	2" = 1 mi.	

File No.	Kind	Description	Scale	Sheets
E-6-6-94	OP	Map showing outline of Appraisal Area boundaries for 1950 Appraisal. This is a marked copy of K-2-107, plate 3	1" = 1 mi.	1
E-6-6-95	TP	Skagit River, Avon By-Pass Layouts for alternate 1800', 2500', & 2900' R/W widths (1950)	1" = 2000'	1
"	OP	Skagit County Road Map marked in red pencil showing boundary limits of areas covered by Aerial Photos. Map used as Index to Photos (1950)	1" = 2 mi.	1
E-6-6-96	WP	Skagit River, Avon By-Pass Layouts for alternate channel R/W widths of 1800', 2500', & 2900'. Layouts shown in red pencil on Metsker map sheets for T34N, R3E, 4E (1950)	2" = 1 mi.	2
E-6-6-97	OP	Flood Damage Appraisal, Plat of town of Burlington, marked copy shows building locations & Flood Damage Appraisal Data (1950) Rice. Shot Nos. for levels, see Field Books 4-143	1" = 200'	1
"	OP	Plat of town of Sedro Woolley, marked copy showing building locations & Flood Damage Appraisal Data (1950) Rice	1" = 200'	1
"	OP	Plat of town of Mt. Vernon, marked copy showing building locations & Appraisal Data (1950) Rice	1" = 200'	1
"	WP	Plat of town of La Conner, marked copy showing locations of building parcels (1950 Appraisal) Rice	1" = 200'	1
E-6-6-98	OP	Marked Print of K-2-83 shows References to Level Books & page numbers, and Level Notes of the 1930 Survey (1950)	2" = 1 mi.	1
"	OP	Map marked for Observation Points to be used in taking corresponding readings of High & Low Tides, Skagit River (1950 Appraisal). Marked copy of E-6-6-61		1
E-40-1-3	OP	Area Inundated Dec. 1949 H.T. Samish River by Rice 1950		
D-12-29.8	WP	Sanborn Maps, town of Burlington, shows location of Building Parcels, 1940 & 1950 Appraisals	1" = 50'	4

File No.	Kind	Description	Scale	Sheets
E-12-29.9	WP	Sanborn Maps, town of La Conner, shows location of Building Parcels, 1940 & 1950 Appraisals	1" = 50'	3
E-12-29.10	WP	Sanborn Maps, town of Mt. Vernon, shows location of Building Parcels, 1940 & 1950 Appraisals	1" = 50'	18
E-12-29.11	WP	Sanborn Maps, town of Sedro Woolley, shows location of Building Parcels, 1940 & 1950 Appraisals	1" = 50'	12
K-2-76	OP	Sketch, Delta control Survey (1930) shows Triangulation Station locations & Descriptions	2" = 1 mi.	1
K-2-83		Delta Survey, Skagit River, Plane Table Survey by Greeley, 1930	2" = 1 mi.	1
K-2-93	OP PS Pos.	Plane Table Survey, Avon By-Pass, 1930 " " " " " "	1" = 400' " "	6 13
K-2-102	OP	Sullivan Slough Alternate Diversion Plan. Field sketch to accompany Field Book S-1 (file 4.92) by B. G. Long, 1930	1" = 1000'	1
K-2-106	OP	Skagit River Topography from Newhalem to Sedro Woolley (1932) Plate No. 2	2" = 1 mi.	1
K-2-107	OP	Skagit River Topography (U.S.E.D. 1932) Plate No. 3, shows all areas of Skagit Valley below Sedro Woolley	1" = 1 mi.	1
G/2-3	Hard copy	1930 Skagit River Survey by Greeley	1" = 400'	4 rolls

AERIAL PHOTOS

E-6-6-56	Index to Aerial Photos flown 1947-1948, Skagit River, Hamilton to mouth	1" = 1 mi.	4
E-6-6-56	1947-1948 Aerial Photos, Skagit River, area as above	1" = 1760'±	
C.W.Br. 5-21	1937 Aerial Photos, Skagit River with 1940 Appraisal Data	1" = 1030'±	

U.S.G.S. QUADRANGLE MAPS

File No.	Description	Edition	Scale
6	Mt. Vernon Quad.	1911	1" = 1 mi.
7	Stillaguamish "	1937	1" = 2 mi.
40	Mt. Baker District "	1915	1" = 4 mi.
43	Samish Lake "		1" = 4000'
43A	" " "	1942	1" = 1 mi.
43C	Film reproduction & B.P. of U.S.G.S. original field copy from Washington, D. C. office. Samish Lake Quad.		1" = 2 mi.
48	Mickersham Quad.	1921	1" = 1 mi.
161A	Mt. Vernon "	1943	1" = 1 mi.
161B	" " "		1" = 4000'
161C	Film reproduction & B.P. of U.S.G.S. original field copy from Washington, D. C. office. Mt. Vernon Quad.		1" = 4000'
173	Clear Lake Quad.	1944	1" = 1 mi.

MISCELLANEOUS REFERENCE NOTES IN ACCORDEX BINDERS

File No.	Description	Year
4-5c	Hilleboe Survey N.W. of Burlington. Filed in Map Records Section.	1940
4-118.1	Hilleboe Survey. Stadia Shot Nos. on air photo strips. Nos. correspond with shot nos. in field books. Area N.W. of Burlington. Filed in Map Records Section with field books. 4-118	1940
7-9	Flood of 27-29 Nov. 1949. Flood emergency data including air pictures and map of flooded area. Filed in C.W. Br. Files.	1949

JOB FIELD BOOKS

File No.	No. Books	Description	Year	Party Chief
4-135	8	Levee Survey. Horiz. & Vert. Control. Includes tie to gages.	1950	Rice
4-136	2	Levee Survey. Typical Cross Sections	1950	"
4-137	1	Dodge Valley. Horiz. & Vert. Control and Cross Sections	1950	"
4-138	2	Check Levels, Conway to La Conner	1950	"
4-143	14	Levels. Bldg. Floor Elevations for Flood Damage Appraisal.	1949	Rice Whipple
		Area 1A — Book 14 Area 1G — " 12, 13 Avon — " 9 Blanchard — " 10 Burlington — " 1, 2, 3 Clear Lake — " 11 Conway — " 8 Edison — " 10 La Conner — " 7 Mt. Vernon — " 6 Sedro Woolley — " 4, 5		
4-144	4	1949 H.W. Elevations from Rockport to mouth of Skagit River	1949 1950	Rice
4-145	1	1949 H.W. Elevations. H.W. Marks #15 to #27 inclusive	1950	"

REFERENCE FIELD BOOKS

File No.	No. Books	Description	Year	Party Chief
308-35.26	1	Skagit River Monuments & References	1929	O'Leary
308-35.27	3	Skagit Survey Levels	1929	Donlin
308-35.29	36	Horiz. & Vert. Control, Lower Skagit River	1929	Hildebrandt
4-92	1	Stadia Traverse. Skagit River Diversion, Avon to La Conner	1930	B.C.Long
4-94	2	Levels, Skagit Delta	1930	B.C.Long
4-111	4	Horiz. & Vert. Control, Skagit Delta	1930	B.C.Long
4-114	2	1935 H.W. Elevations	1935	J.B.Corey
4-118	5	Levels, Vicinity of Burlington (Also see 4-118.1 for location of shot nos.)	1940	T.Hilleboe
4-119	5	Levels, between Burlington & Mt. Vernon	1940	Madison E.Trigve
5-114	2 of 18	Levels, Swinomish Slough	1932	O'Leary
5-119	1	Levels, Swinomish Slouth	1936 1937	O'Leary
5-129	1 of 2	Levels, Swinomish Slough Dredging	1939	O'Leary

REFERENCE RAILROAD PROFILES

File No.	Railroad	Description
G-62	N.P. Ry.	Sumas Branch Line. Biglake to Hoogdale
G-66 (in 2 parts)	G.N. Ry.	Rockport - Anacortes Branch Line. Rockport to Whitmarsh
G-67 (in 2 parts)	G.N. Ry.	Vancouver Branch Line. Stanwood to Belleville
G-68	G.N. Ry.	Vancouver Branch Line. Belleville to Samish Bay

RIVER PROFILES

File No.	Kind	Description
E-6-6-62	O.P.	Overbank Flood Profiles, Skagit River for 120,000 - 210,000 - 300,000 & 400,000 c.f.s. discharges. Scale: Horiz. 2" = 1 mi. Vert. 1" = 5' (Westby - 1949)
E-6-6-65	O.P.	Profile Natural Channel, Skagit River for 120,000 - 210,000 - 300,000 & 400,000 c.f.s. discharges. Scale: Horiz. 2" = 1 mi. Vert. 1" = 5' (Westby - 1949)

FLOOD CONTROL ECONOMIC JUSTIFICATION STUDY

AVON BY-PASS AND EXTENTION OF DIKES TO SEDRO WOOLLEY

APPRAISAL OF DAMAGES 1815 H.W. AND 1921 H.W.

SKAGIT RIVER WEST OF AND INCLUDING SEDRO WOOLLEY

SAMISH RIVER DELTA

P 001940

VOLUME I

GENERAL APPRAISAL DATA AND MAPS

DECEMBER 1940

P 001941

H.R. Madison

INDEX TO VOLUME I

FLOOD CONTROL ECONOMIC JUSTIFICATION STUDY

SKAGIT RIVER

SUPPLEMENTAL DATA

9A

July 1950

Appraisal of Damages - 112,000 cfs., 210,000 cfs., 300,000 cfs., 400,000 cfs.

INDEX TO VOLUME 5

Indices, Map Reference, Summaries & Curves,
General Data, Land Use & Crop Damages

LAND & CROPS

APPRAISAL FIELD REPORT

FLOOD CONTROL ECONOMIC JUSTIFICATION STUDY
AVON BY-PASS AND EXTENTION OF DIKES TO SEDRO WOOLLEY
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APPRAISAL OF DAMAGES SKAGIT RIVER
WEST OF AND INCLUDING SEDRO WOOLLEY AND SAMISH RIVER DELTA
1921 H.W. and 1815 H.W.

VOLUME I
December 1940

APPRAISAL FIELD REPORT

1. This appraisal of the Skagit River and Samish River Deltas is an estimate of damages that would result from a flood of equal magnitude and duration as the one of December, 1921, under present conditions. It is based on a peak discharge of 210,000 cu. ft. per sec. of the Skagit River near Sedro Woolley.

2. An appraisal was also made of the theoretical damages that would be caused, under present conditions, by a flood of equal proportions to the one that is said to have occurred in about 1815. It has been estimated that the discharge of the Skagit River reached a volume in 1815 of 400,000 cu. ft. per sec. near Sedro Woolley. The year of the flood and the volume of discharge were determined by Mr J.E. Stewart, Hydraulic Engineer of the U.S.G.S., after an analysis and study of all data and evidence available. The estimated discharge volume of 400,000 cu. ft. per sec., as determined by Mr Stewart, was nearly a maximum. However, he also reached the conclusion that there had been prior to 1815 several floods approximately as large, or perhaps somewhat greater. (See Report J.E. Stewart 1923)

3. It is assumed that the above discharge volume of the 1921 H.W. and 1815 H.W. would be attained in winter sometime during the months of November, December, January or February. All damages, especially crop damages, in this appraisal have been based on the above assumption.

4. The appraisal of the 1921 Highwater has been indicated in the notes as "1921 H.W."

5. The appraisal of the 1815 Highwater has been indicated in the notes as "1815 H.W." or "Max. H.W."

6. Appraisals: The appraisal field work was commenced Sept. 12, 1940, and completed Dec. 14, 1940.

7. The field work was supervised by Mr Harry R. Madison. Appraisors were Messers. Thomas Levan, Chas. Holt, Willard Whipple and Einar Trigve. The field office was located in the Pierce Arcade Bldg., Mount Vernon, Wash.

8. Appraisal Notes: The notes are contained in four volumes, Volumes I to IV. (a) Volume I (this volume) contains the general appraisal data, maps, appraisal note of miscellaneous items and appraisal factors and forms used. The Recapitulation of Damages of the entire area appraised is shown on page 23 , this volume. The Recapitulation of Damages of the area that would be directly benifitec by the Avon By-Pass and the extention of dikes to Sedro Woolley appears on page 25 , also this volume.
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(b) Volume II contains the appraisal notes of the following townships:
T33N-R2E
T33N-R3E
T33N-R4E
T36N-R3E

(c) Volume III contains the appraisal notes of the following townships:
T34N-R2E
T34N-R3E
T34N-R4E
T34N-R5E

(d) Volume IV contains the appraisal notes of the following townships:
T35N-R2E
T35N-R3E
T35N-R4E
T35N-R5E

9. Appraisal Field Maps: These consist of eight sheets, numbered 1 to 8, on a scale of 1" = 1000' and one index sheet, numbered sheet A, on a scale of 1" = 1 mi. The map is titled "Topography - Skagit River Flats". Sheets 1 to 4, inclusive, were surveyed by T.H. Hilleboe in 1940. Since only a portion of the flood plain was mapped, the map was extended by tracing in aerial photo mosaic of the balance of the area. The mosaic was assembled without picture point control. The scale of the sheets traced from the air pictures is approximately 1" = 1030'. The U.S.E.D. file number of this map is E-6-6-1.

10. In addition to the "Topography - Skagit River Flats" map, a six sheet plane-table map on a scale of 1" = 400' was used. The title of this map is "Skagit Delta Survey 1930". The U.S.E.D. file number is K-2-93. The map covers a strip about [illegible] to 1 mi. wide from near the Great Northern Railway crossing of the Skagit River to Padilla Bay. A photo copy of this map is included on pages 110 to 115 this volume.

11. Small sized maps were also drawn of each of the principal towns appraised. These maps show the ground elevation of street intersections and the appraisal elevations for both 1921 H.W. and 1815 H.W. The maps are filed in this volume pages 126 to 130.

12. Sanborn Maps: were used in all towns for which they were available, namely:

Burlington	4 sheets	U.S.E.D. FILE NO.	D-12-29-8
La Conner	3 "	" "	" 9
Mount Vernon	18 "	" "	" 10
Sedro Woolley	12 "	" "	" 11

These maps are for the most part on a scale of 50' = 1". The U.S.E.D. file numbers ~~is~~ ARE SHOWN ABOVE TO RIGHT

13. Aerial Photographs: The entire area appraised was photographed from the air in Oct. 1937 by Brubaker Aerial Surveys. The direct contact prints, on a scale of approximately 1030' = 1", were used. These direct contact prints were assembled into a mosaic. The section lines were drawn on the pictures in yellow, the township lines in brown. The section numbers are shown in bright red. The 1815 H.W. ~~xxxxxxxx~~ appraisal limits are also shown in bright red. The approximate 7' contour, or the limit of salt water at ordinary high tide in the event of the failure of the salt water dikes, is shown in purple. The dikes have been emphasized by a heavy black line. Tillable Special Land not otherwise classified has been shown on the photos in vermillion red. Lands thus colored contain crops during the flood period of November, December, January and February. Further data regarding land classification appears under the heading of "Extent and Character of Area Appraised".

14. A complete index of the aerial photographs by Section, Township and Range has been included on ~~the next~~ page. 90.

16. Topographic Surveys:: There was no general topographic survey made of the area, except sheets 1 to 4, inclusive, of the map entitled "Topography - Skagit River Flats" and the six plane table sheets entitled "Skagit Delta Survey 1930".

17. The U.S.G.S. Quadrangle Sheets covering the appraised area are Samish Lake Quadrangle, Wickersham Quadrangle and Mount Vernon Quadrangle. A copy of each of these maps has been included on pages 107 to 109 .

18. Elevations: All elevations used in this appraisal are M.S.L. on U.S.C.& G.S. datum adjusted to North America 1929 network, EXCEPT TOWN OF LA CONNER, WHICH IS M.L.L.W.

19. A line of levels equivalent to first order work was run extending from U.S.C. & G.S. B.M. no. Z6 = No. 20 - U.S.G.S. located near the Great Northern Railway depot in Mount Vernon, along the G.N.R.R. to U.S.C. & G.S. Bench Mark no. E13 located at the Burlington National Bank in Burlington. A return loop of this level line was run via U.S. Highway #99 to B.M. No. 26 in Mount Vernon. (See field book file number 4-119 (5 Of 5).

20. An elevation tie was made from the above level line to U.S.E.D. monument number A-400 located on top of dike about 1¼ mis. N.E. of the G.N.R.R. bridge across Skagit River. A tie was also made to U.S.E.D. monument A-410 located on top of dike 1000' west of Skagit River bridge - U.S. Highway #99. A tie to the Great Northern Railway datum was made at the Great Northern drawbridge, Skagit River crossing. The result of these ties, showing elevations and equations, is shown on page 102 , this volume. The elevations are also shown in field book file number 4-119 (5 Of 5).

21. A level loop was run from U.S.C. & G.S. B.M. No. Q61 located about 350' west of the Great Northern depot in Sedro Woolley to the Skagit River bridge on the Clear Lake Road, thence to the N.P.R.R. Skagit River crossing and return to B.M. No. Q61 via the N.P.R.R.

22. Levels were run from the above loop at the N.P.R.R. Skagit River bridge to U.S.G.S. - P.B.M. 77RS 1940 located in the northern end of the town of Clear Lake. (See letter page 102A) This line of levels was extended about 2 mis. south of the town of Clear Lake into the East Fork of Nookachamps Valley.

23. Levels were run in the towns of Burlington, Clear Lake, Conway, La Conner, Mount Vernon and Sedro Woolley. In most cases the elevation of street intersections only was obtained, altho the floor level of most large buildings, such as warehouses, factories and some store buildings, was obtained. Fire hydrants, wherever available in the towns, were used for temporary bench marks. (See field books file number 4-119 (1 to 5). All elevations are on adjusted closed loops.

24. Elevation of Gages: All elevations are U.S.C. & G.S. datum adjusted to North America 1929 network.

(a) N.P.R.R. bridge south of Sedro Woolley, zero of the old gage attached to piling east of the N.P.R.R. Skagit River bridge = 9.01 (This gage is out of plumb and is in bad condition)

(b) G.N.R.R. Skagit River bridge south of Burlington, zero of gage attached to fender pier west of bridge = 8.43'.

(c) Mount Vernon - four gages in Mount Vernon as follow: (SEE FIELD BOOK 4-119 (3 OF 5)

D. Zero of gage on City Dock = -0.06
A " " " PT OF MYRTLE ST. 12' So. OF BLDG = 3.69
B " " " " " " " S. LINE OF BLDG = 3.19
C " " " " " " " 30. So. OF BLDG = 3.74

25. The field books for elevation ties to gages are filed under number 4-119 books (1 of 5), (3 of 5) and (5 of 5).

26. Water Stages Skagit River: (See Profiles pages 121 to 125 this volume)

Location	Flood	Gage Reading	Crest Stage U.S.C.&G.S. Datum-M.S.L.	Peak Discharge C.S.F.
(a) N.P.R.R. Skagit River Bridge	1815	33.5	54.6	400,000
	1856	30.0	51.1	300,000
	1909	26.5	47.6	220,000
	1897	24.9	46.0	190,000
	1896	24.8	45.9	185,000
	1906	24.7	45.8	180,000
	1921	24.3	45.4	210,000
	1917	24.1	45.2	195,000
	1932	21.1	42.2	
	Zero Damage	17.9	39.0	110,000
	SAFE BANK FULL			120,000
(b) G.N.R.R. Skagit River Bridge	1815	33.0	a. 41.5	
	1856		b.	
	1909	29.6	38.1	
	1921	29.3	c. 37.~~4~~	140,000
	1932	28.2	36.7	
	1924	25.5	34.~~0~~	
	Zero Damage	25.5	34.0	
(c) Mount Vernon City Dock Gage	1815		d. 29.5	
	1856		e.	
	1921		27.~~3~~1	
	1932		26.7	
	Zero Damage		25.0	

Footnotes: (a) J.E. Stewart estimated 48.1, but this elevation is too high, according profile on page 121

(b) Stewart estimated 44.5, but this elevation is also too high. See profile page 1

(c) The elevation shown is within the diked channel. The 1921 H.W. outside of diked channel was 36.5.

(d) Stewart estimated 35.5, but this is too high, according to profile, 123.

(e) " " 32.0, but this is too high. " " " "

27. Drainage Districts: There are eleven organized drainage districts within the appraised area. See page43 for damages to drainage systems.

28. Diking Districts: There are 23 organized diking districts in Skagit County, all of which are within the appraised area. The boundaries of these districts are shown on the map on page 116. A complete tabulation of annual assessment levies for all districts from 1916 to 1940, inclusive, is shown on ~~the next~~ page.28.

29. Present Dikes: Nearly all of the delta areas of both the Skagit and Samish Rivers are protected from salt water at high tide and river water at ordinary high water stage by a system of dikes. The salt water dikes, as they are generally ed, extend around the lower edges of both deltas. The river dikes extend along the

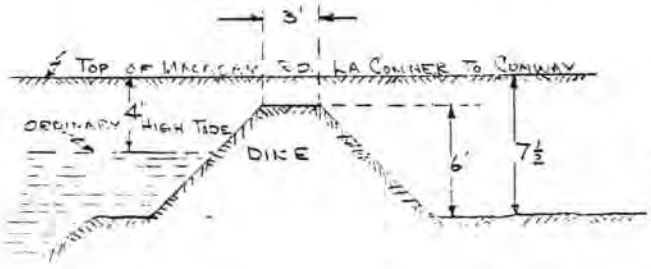
Skagit River and its forks from its mouth to the east side of the town of Burlington. These river dikes have been built on both sides of the channel and differ from the salt water dikes inasmuchas they are usually of heavier construction. The river dikes have mostly a 10' width on top, while the salt water dikes are but 3' on top. See page 41 under the heading of "Damage to Dikes" for additional information on dikes On this page are two typical cross section views of salt water dikes.

30. The river channel with the present system of dikes will not carry safely a volume much beyond 110,000 c.s.f. This is but little more than ordinary high water. A discharge volume of 110,000 c.s.f. has been used in this appraisal as zero damage. A flood of 1921 proportions would break thru the dikes at most any point offering the least resistance.

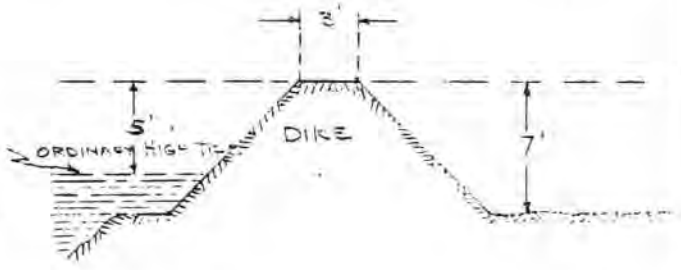
31. 1815 H.W. (Max.) Appraisal Elevations: The 1815 H.W. appraisal elevations are based on a discharge volume of 400,000 cu. ft. per sec. NEAR SEDRO WOOLLEY. Mr J.E. Stewart found evidence that a flood, which he determined occurred in 1815, reached a high water elevation of 54.6' at Sedro Woolley.

32. Profiles were plotted starting with the 1815 H.W. elevation of 54.6' at the N.P.R.R. bridge south of Sedro Woolley and extending to the salt water dikes at the lower end of the Skagit River Delta as well as the Samish River Delta. (See profiles Page 121 to 123). The alignment of these profiles has been projected on sheet 2 of Skagit River topography, page 120 this volume. The 1815 H.W. profiles follow, on an average, about 5' above the general contour of the land, tapering off to a foot above the salt water dikes located at the lower edge of the Skagit and Samish River Deltas. The 1815 H.W. elevations obtained from the profiles were plotted on the 1" = 1000' field sheets along the profile alignment lines. Equal 1815 H.W. elevations on the various profile alignment lines were then connected. The resulting grid formed the basis for the 1815 H.W. or Maximum appraisal elevations.

33. The terminal 1815 H.W. elevation at the salt water dikes, of profile lines A, B, and E is 9.0' M.S.L. - U.S.C.& G.S. Datum. Profile line C terminates at 8.5' and lines D and F at 10.0'. Following are diagrams showing a typical cross section of the salt water dikes:



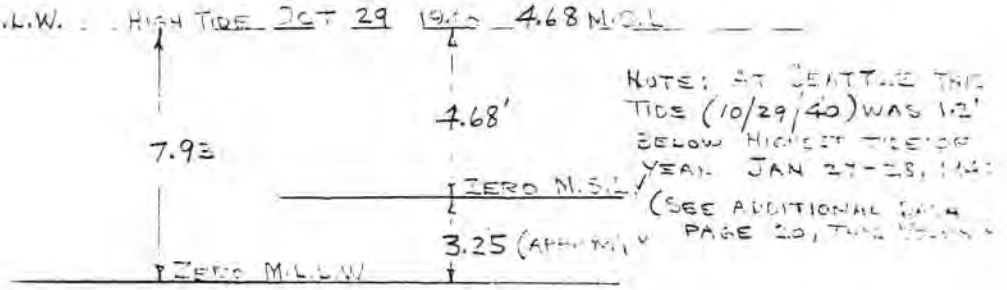
Dike on Sullivan Slough
¼ mile east of La Conner



Dike on Samish River Slough
1 mile SW of Edison

34. The 1815 H.W. Appraisal Limits: Are shown in bright red on the aerial photos, the 1" = 1000' field maps, the U.S.G.S. quadrangle sheets on pages 107 to 109 , this volume, and on sheet A page 106 , also this volume.

35. Tide Data and Conversion M.L.L.W. to M.S.L: The highest tides during OCTOBER of 1940 ~~was~~ 7.93' M.L.L.W. (4.68 M.S.L.) on Oct. 29 ~~and 28~~ on Swinomish Slough at La Conner. Below is a sketch showing the conversion from M.L.L.W. to M.S.L.



Sketch showing conversion from M.L.L.W. to M.S.L. at highest tide in 1940.

Additional data on tides at La Conner is shown in the paragraph "Tidal Erosion" on page 20 this volume.

36. 1921 H.W. Appraisal Elevations: Were obtained from various sources. Some were obtained from the Great Northern Railway profiles, page 124 and 125 this volume. Others from local residents. Except for the towns, no 1921 H.W. appraisal was actually made. Even if time had permitted making a detailed 1921 H.W. appraisal its worth would be questionable since a flood of equal magnitude as of 1921 H.W. under present conditions might break thru the dikes at any point, as previously stated, thus creating a condition entirely different from that of the 1921 flood. Therefore, it was deemed more practical to work out the 1921 H.W. damages as a percentage of the 1815 H.W. damages. This percentage was determined by using the Diking Districts Annual Assessment data, shown on ~~xxx~~ page 27 , as a guide. The difference between the annual assessment levies for 1921 and 1922 reflects the damage sustained by the various districts by the 1921 flood. The levies are not in direct proportion to the damages, however. In addition, a ratio between the 1921 H.W. and the 1815 H.W. damages was obtained in the towns appraised. Since both the 1921 and 1815 H.W. damages were appraised in all the towns, this ratio could be readily determined. Here too, however, the damage relation between the 1921 H.W. and the 1815 H.W. in towns as compared to farm areas is not the same. Therefore, by using all of the above data as a guide, a per cent factor was worked out for each district. This factor was applied to each district within the township in direct proportion to the area of that district within the township. These portions of districts in the townships were then totaled and an average per cent factor for the township was obtained. It will be noted that in some districts there was no increase in levies between 1921 and 1922. From this it is assumed that there was no flood damage in these districts in 1921. This feature has been included in the calculations used in obtaining the average per cent factor for the township.

37. Town Appraisals: The following towns were appraised in detail for 1921 H.W. and 1815 H.W. damages:

Avon	(See map page 112 this volume)
Blanchard	(" Sheet 1 - Topography- Skagit River Flats)
Burlington	(" map page 126 this volume)
Clear Lake	(" " " 127 " "
Conway	(" " " 127A " "

Edison (See Sheet 1 - Topography -Skagit River Flats)
La Conner (" Map page 128 this volume)
Mount Vernon (See map page 129 this volume)
Sedro Woolley (" " " 130 " "

38. Appraisal elevations for these towns are indicated on the maps listed above. Elevation of street intersections are also shown on these maps.

39. Business establishments were appraised on Form #9, a copy of which has been included on page 84. In many cases, floor level elevations were obtained, otherwise the floor level elevation was determined from street intersection elevations. The number of days loss of business and pay loss to employees was determined by adding 1 day for each five-tenths of a foot of water over the floor level plus 1 day. Thus, if an establishment had 2 ft. of water over the floor the number of days loss equals 5 days.

40. Town Dwelling Appraisals: Were made on the typed form shown on page 85 . On this form, dwellings and sheds, etc., in each block were classified and tabulated. The average floor elevation of dwellings in the block was determined from the street intersection elevations. This was not an accurate method of appraisal, but the average result can be expected to be fair.

41. For flood damages to dwellings see tables of Good, Low Cost and Cheap Construction on pages 72 to 76. Other tables have been set up on page for dwellings that would float or be totally destroyed.

42. Appraisal of Buildings in Rural Areas: No topographic data or elevations were available for most of the areas outside of the towns. In order to obtain an estimate of flood damages to buildings, the aerial photographs were resorted to. The air pictures clearly show each group of farm buildings. It is assumed that in the group there is one dwelling and perhaps three or four sheds. The balance of the buildings are usually barns. The size of the buildings can usually be roughly estimated. These farm buildings were summarized by sections and tabulated on the typed Township Summary from shown on page 83 this volume. The depth of water was estimated from the profiles on pages 120 to 123 and all other topographic data available. This method of appraisal, altho far from being exact, was the best available for the time alotted.

43. Land Appraisals: An attempt was made to classify land from the data transcribed from the A.A.A. records. Of the total area of 79,802.4 acres, only 43,546.2 or 54.5% was tabulated by the A.A.A. records. The areas included in the A.A.A. records are shown by number on the map on page 117 118 and tabulated by the same number on the Acreage Summary from #14, a sample of which is included on page 87 .

44. Since only about half the acreage in the area to be appraised was classified by the A.A.A., a method using the aerial photographs was devised. It consisted of assembling the air pictures into a mosaic and mounting them on plywood. The mounted mosaic was then placed into a truck. Roads were spaced sufficiently close to enable classification of all areas from the car. The land classifications were placed directly on the mosaic. The areas were later planimetered. These areas were then tabulated by sections on the A.A.A. Acreage Summary forms and combined.

45. On page 66 are the Land and Crop Classifications and damage factors used in the appraisal. Detail sheets, showing the process of arriving at a damage factor for some of these crops are shown on pages 67 to 70 . No crop damages have been included for annual crops which would not be in the ground during the four winter months of November thru February.

46. Crop Damages Due to Salt Water (Tide Water: 60% of all dikes along salt water would probably be damaged by a flood of 1815 H.W. proportions. The diked land fronting tide water is from 4' to 6½' below ordinary high tide (see diagram of dikes page 1 Salt water would flow inland over the diked farm lands for varying distances up to 2½ mis. It is doubtful that the farmers living within these areas would be financially able to reconstruct the dikes. With government assistance it would require at least from six to eight months to rebuild. In this length of time the ebb and flow of tides would do considerable harm to the land, principally from salt and erosion. It is reasonable to assume that no crops would be raised the following season after the failure of the dikes. Special crops, such as seed cabbage, seed turnips, alfalfa, fall grain, etc. would be damaged by flood water regardless of the failure of the salt water dikes, since these crops are in the ground during the winter flood period. No salt water damage has been included for these crops as the damage to them has been taken into consideration previously under general flood damages. However, in the event of the failure of the salt water dikes, there could be no planting of crops within the zone affected by tide waters for at least one season. Therefore, salt water crop damage would be the loss of one crop classified as "Ordinary", such as spring planted grain, vegetables, hay, etc. This crop damage has been designated as "Salt Water Damage" in the notes on the "Section Summary - Land and Crops" form.

47. Extent and Character of Area Appraised: The area appraised to 1815 H.W. limits extends from the section line between section 19 and 20 and 29 and 30 in T35N-R5E, located on the east side of Sedro Woolley to the mouth of the Skagit River. It includes all the Skagit River Delta, all of the Samish River Delta, and Nookachamps Creek lower valley (see map on page 106 this volume for boundaries of appraised area). Roughly, the area is 13 mis. wide and 17 mis. long.

(a) Area: The total area including Nookachamps Creek and Clear Lake area to 1815 H.W. limits is 79,802 acres.

(b) The area to 1815 H.W. limits, exclusive of Nookachamps and Clear Lake areas, and exclusive of all of T34N-R5E, all of sections 1,2,3,10,11,12,13,14,15 & 23 in T34N-R4E and exclusive of all of sections 26,35 & 36 in T35N-R4E, is 75,555 acres.

(c) The 1921 H.W. area has been estimated as 40% of 79,802 = 31,921 acres.

48. Character: The Skagit and Samish River Deltas have an extremely flat floor. The sides of the deltas are either bordered by tide water or by moderately steep hill slop There are several island-like hills rising up out of the flat delta land. Some of the "islands" are small and have abrupt slopes, others are quite large, namely, Bayview Ridge and Pleasant Ridge, and have more moderate slopes. All of them project above th 1815 H.W. appraisal elevation. These high areas would afford some protection to flood refugees and livestock in a maximum flood.

49. Value and Productivity: The Skagit River Delta is considered as one of the most highly productive agricultural regions in the state of Washington. Practically all of the flat land is cleared and farmed. Originally some of the area was marsh land. According to information furnished by several of the oldest settlers, a heavy stand of cedar and spruce timber extended from the road between Fredonia and Pleasant Ridge to Mount Vernon.

50. Land values have been compiled and summarized by Diking Districts. The values are present market value. The tabulations are shown on page 35 to 36 this volume.

51. Increased Value of Land if Protected: (Potential Higher Value Land) No attempt has been made to determine the increase in value of land should complete protection be afforded. Nearly all land suitable for cultivation is utilized at the present time. Land classified and summarized under the heading of "Potential Higher Value Land" consists of the total of all tillable land, both Ordinary and Special It does not include waste land or non-tillable other than waste land. The total number of acres of Potential Higher Value Land is 64,299 acres. This total includes the Nookachamps Creek and Clear Lake Areas.

52. Industries: Dairying, poultry and stock raising, agriculture, fruit and vegetable canning, butter and cheese production, milk canning, fruit and vegetable packing and freezing, lumber and shingle manufacturing are the principal industries. Dairying is the leading and most profitable agricultural industry at present.

53. Agriculture: The principal agricultural crops are hay and pasture, oats, canning peas, potatoes, corn, berries, seed turnips, rutabagas, cabbage, and miscellaneous crops such as sugar beets, garden truck, fruit, wheat, etc. The importance of the crops is in the order named.

54. Soil: Most of the delta bottom land of both the Skagit and Samish Rivers is composed of a fine silt loam developed from deposited river alluvium. The top soil extends to a depth of 4' in many localities, particularly at the lower edges of the deltas. It is generally of uniform texture and high in moisture retention ability. The soil in the Skagit River area ranks among the highest of the state in productive ability. It is not necessary to practice irrigation since there is ample rainfall and moisture to produce crops.

55. Damages: A recapitulation of damages of the entire area appraised, including Clear Lake and Nookachamps Valley areas is shown on page 23 . A recapitulation has also been made of the same area, but exclusive of Clear Lake and Nookachamps Valley as well as other areas on the Skagit River that would not be directly benefited by the Avon By-Pass and Extension of Dikes to Sedro Woolley. This latter recapitulation is shown on page 25 .

56. Damage Relationship Curves for both the above recapitulations have been drawn and included on page 22 . These curves show the relationship between damages and discharge of the Skagit River near Sedro Woolley.

EROSION
1815 OR MAXIMUM H.W.

In this appraisal the damages resulting from all forms of erosion have been combined, i.e., complete loss of soil, bank cutting and land severance due to erosion have been combined with land scouring, erosion of top soil and deposition of sand and gravel. The cause of these various forms of erosion may be either flood waters sweeping down from the mountains, or tidal floods due to the failure of the salt water dikes surrounding the extreme lower reaches of the Skagit River and Samish River deltas. The salt water dikes would be demolished by the run-off from the mountain flood water, which would then allow the tides to flow over land below high tide elevation. The areas below high tide protected by dikes on both the Skagit and Samish Rivers are considerable. On these lower areas, where the slope gradient is slight, the damages caused by erosion from mountain flood waters, except the breaking down of the dikes, are comparatively slight. On the other hand, the erosion damages caused by the ebb and flow of tides would increase as the dikes are approached. In order to more fully explain the erosion damages created by mountain flood water and those created by tidal flood water, each subject is dealt with separately, altho the damages of both have been combined.

Mountain Flood Water Erosion: The erosion damages caused by flood water sweeping down from the mountains would naturally be greatest near the Skagit River in the vicinity of Sedro Woolley, which is at the eastern limits of the area appraised. Here the Valley has a gradient of approximately 0.1%. As the lower edges of the delta are approached, the gradient flattens out to approximately 0.02%. Erosion damages for all tillable land have been averaged for each sect and vary from $1 to $15 per acre, depending upon the location of the section.

In the vicinity of Sedro Wooley, bank cutting, complete loss of soil and land severance by the forming of new river channels, would be heaviest, whereas in the lower reaches of the delta area, the deposition of sand and silt would be greatest. Over much of the lower area it is likely that the benifits due to the deposition of silt and humous matter, or enrichment of the soil, would outweigh the damages due to deposition of sand only. Due consideration has been given this feature in calculating erosion damage factors. Taken as a whole, over the entire area, the severest damage to the land, perhaps, would be the cutting of small channels and gullies formed by the draining off of such a vast amount of flood water. The removal of top soil of newly plowed fields would also be extensive.

Tidal Erosion: In addition to the erosion damages caused by flood water sweeping down from the mountains, the erosion created by tidal flooding of the lower areas must also be taken into account. As previously stated, much of the lower delta land lies below high tide and is protected from salt water by dikes. These dikes are 6' to 8' high and are about 3' wide on top.

On October 29, 1940, high tide at the foot of Washington Street in La Conner was 7.93' ~~Mean Sea Level~~ M.L.L.W. This was an actual wye level determination, using the U.S.C.&G.S. 1933 Tidal Bench Mark #2, elevation 11.03' M.L.L.W, located at the La Conner Bank, as the datum. The elevation of high tide on this day (10/29/40) was 1.2' below the highest tide for the year of 1940 IN SEATTLE. (SEE DIAGRAM PAGE 16.)

The top of the salt water dikes in most districts ise 8.0' to 9.0' M.S.L., while the land protected by them is frequently only 0.5' M.S.L. The average land elevation directly behind the dikes, however, is about 2.0' M.S.L. The elevation of ordinary high tide is 7.0' M.S.L. The average distance inland from the salt water dikes to the 7' contour on the Skagit River Delta is 2¾ miles, while on the Samish River Delta it is 2½ miles.

It is estimated that 60% of all these dikes along salt water would fail in a flood with as great a volume as that of the 1815 flood. It should be remembered that these dikes average but 3' on top, are 6' to 8' high, and have slopes of about 1½' to 1'.

After the failure of the dikes, salt water would have an unrestricted movement with the ebb and flow of the tide over these areas back as far inland to elevation 7.0', which would be an ordinary high tide. The damage to these lands by tidal erosion, especially over newly plowed fields, would be considerable. It is not at all unlikely that many months would elapse before the dikes would be reconstructed. In the meantime, damage to the land by the tides would continue until the dikes were rebui the highest damage occurring at the lowest elevations. It is estimated that the erosion damages for lands thus affected would average $2 to $20 per acre for the section, depending upon the location. This does not include damage and loss of crops, etc., due to salt water infiltration of the soil. These are shown with the crop damages and an explanation of them appears on page 18.

RECAPITULATION OF DAMAGES
SKAGIT AND SAMISH RIVERS FROM SEDRO WOOLLEY WEST
(Includes Nookachamps Creek and Clear Lake Areas)
1921 H.W. and 1815 H.W.(Max.)

	% of 1815 H.W.	1921 H.W. Damages	1815 H.W. Damages
1. Navigation. Opening Skagit River for navigation from mouth of river to Mt. Vernon.			
(a). Dredging sand & silt deposited in channel by flood	40%	$ 7,500	$ 18,750
(b). Removing snags, logs & debris from channel	60%	12,600	21,000
2. Damage to Dikes & Levees	5%	26,787	535,746
3. " " Drainage Systems & Tide Gates			
(a) Drainage Systems	5%	3,955	79,090
(b) Tide or Flood Gates	6%	1,050	17,500
4. Damage to Bridges			
(a) Highway Bridges	5%	16,378	327,558
(b) Railroad "	5%	7,209	144,182
5. Damage to Highways & Roads	8%	6,565	82,062
6. Damage to Railroads	8%	5,557	69,457
7. Traffic Interruptions			
(a) Highways	4%	16,869	421,720
(b) Stage Lines	4%	198	4,949
(c) Auto Freight Lines	4%	264	6,600
(d) Railroads	4%	4,153	103,830
8. Damage to Wire Lines	3%	2,189	72,959
9. Weed Damage to 64,299 acres 1815 H.W.	40%	5,144	12,860
10. Damage to Livestock	1%	9,908	970,182
11. Summary of Damages by Townships (see next page)			

		1921 H.W.		1815 H.W.
		% of 1815 H.W.	Damages	Damages
11.	Summary of Damages by Townships			
	(a) T33N-R2E	0%	0	$ 4,919
	(b) T33N-R3E	24.4%	95,823	392,717
	(c) T33N-R4E (Exclusive of Conway)	29.8%	41,448	139,086
	Town of Conway - Sec. 18 & 19	95.0%	39,592	41,664
	(d) T34N-R2E (Exclusive of La Conner)	35.0%	21,368	61,051
	Town of La Conner - Sec. 36	0%	0	47,033
	(e) T34N-R3E (Exclusive of Avon)	27.2%	194,008	713,263
	Town of Avon - Sec. 2,11 & 12	9.0%	2,678	27,453
	(f) T34N-R4E (Exclusive of Mt Vernon, Clear Lake, & Part of Burlington)	26.0%	121,649	~~467,882~~ 465,52
	Town Clear Lake - Sec.1 & 12	2.4%	4,040	~~165,787~~ 168,14
	Town of Burlingtom -Sec.5 & 6	24.5%	18,481	75,230
	Town of Mount Vernon - Sec. 17, 18,19,20,29,30,31, & 32	5.0%	95,530	1,920,290
	(g) T34N-R5E- Nookachamps Creek	10.0%	7,666	76,665
	(h) T35N-R2E	0%	0	8,343
	(i) T35N-R3E	21.9%	97,297	444,278
	(j) T35N-R4E (Exclusive of Sedro Woolley & Burlington)	15.0 %	75,877	~~505,848~~ 464,0
	Town of Sedro Woolley-Sec. 23, 24 & 25	0%	0	~~574,763~~ 616,60
	Town of Burlington - Sec. 31 & 32	16.8%	84,433	501,464
	(k) T35N-R5E - Sedro Woolley	0%	0	86,330
	(l) T36N-R3E (Exclusive of Blanchard and Edison)	2.6%	2,330	89,608
	Town of Blanchard - Sec. 22	0%	0	5,699
	Town of Edison - Sec. 33	16.8%	5,521	32,985
	GRAND TOTAL	11.2-%	$1,034,067	$9,270,803

RECAPITULATION OF DAMAGES
SKAGIT AND SAMISH RIVERS FROM SEDRO WOOLLEY WEST
(Exclusive of Nookachamps Creek and Clear Lake Areas)
1921 H.W. and 1815 H.W. (Max.)

	% of 1815 H.W.	1921 H.W. Damages	1815 H.W. Damages
1. Navigation: Opening Skagit River for navigation from mouth of river to Mt. Vernon.			
(a) Dredging sand & silt deposited in channel by flood	40%	$ 7,500	$ 18,750 -
(b) Removing snags, logs & debris from channel	60%	12,600	21,000 -
2. Damage to Dikes & Levees	5%	26,787	535,746 -
3. Damage to Drainage Systems & Tide Gates		[illegible]	[illegible]
(a) Drainage Systems	5%	3,955	79,090 -
(b) Tide or Flood Gates	6%	1,050	17,500 -
4. Damage to Bridges			
(a) Highway Bridges	5%	16,109	322,188 -
(b) Railroad Bridges	5%	6,650	132,995 -
5. Damage to Highways & Roads	8%	6,244	78,062 -
6. Damage to Railroads	8%	4,917	61,457
7. Traffic Interruptions			
(a) Highways	4%	16,589	414,720
(b) Stage Lines	4%	178	4,449
(c) Auto Freight Lines	4%	248	6,200
(d) Railroads	4%	4,153	103,830
8. Damage to Wire Lines	3%	2,141	71,359 -
9. Weed Damage 1815 H.W. to 61,730 acres of Tillable Land	40%	4,938	12,346 -
10. Damage to Livestock	1%	9,408	960,182
		123 467	1,839,874
11. Summary of Damages by Townships (See next page)			
		269 702	5,959,285

	1921 H.W. % of 1815 H.W.	1921 H.W. Damages	1815 H.W. Damages
11. Summary of Damages by Townships			
(a) T33N-R2E	0%	0	$ 4,919
(b) T33N-R3E	24.4%	95,823	392,717
(c) T33N-R4E (Exclusive of Conway)	29.8%	41,448	139,086
Town of Conway - Sec. 18 & 19	95.0%	39,592	41,664
(d) T34N-R2E (Exclusive of La Conner)	35.0%	21,368	61,051
Town of La Conner - Sec. 36	0%	0	47,033
(e) T34N-R3E (Exclusive of Avon)	27.2%	194,008	713,263 711,005
Town of Avon - Sec. 2, 11 & 12,13a14	~~9.0%~~	2,678	~~27,453~~ 29,711
(f) T34N-R4E (Exclusive of Mount Vernon, Clear Lake & Part of Burlington, also all of Sec. 1,2,3,10,11,12,13, 14,15 & 23)	26.0%	80,831	~~310,889~~ 329,130
Town of Burlington - Sec. 5 & 6	24.5%	18,461	75,230
" " Mount Vernon - Sec. 17, 18,19,20,29,30,31 & 32	5.0%	95,530	1,920,290
(g) T34N-R5E - not included -			
(h) T35N-R2E	0%	0	8,343
(i) T35N-R3E	21.9%	97,297	~~444,~~278
(j) T35N-R4E (Exclusive of Sedro Woolley & Burlington, also all of Sec. 26,35 & 36)	15.0%	69,601	~~464,005~~ 422,167
Town of Sedro Woolley-Sec. 23,24, & 25	0%	0	~~574,763~~ 616,600
Town of Burlington - Sec. 31 & 32	16.8%	84,433	501,464
(k) T35N-R5E - Sedro Woolley	0%	0	~~86,330~~ 7202
Exclusive of Sedro Woolley	0%	0	1430
(l) T36N-R3E (Exclusive of Blanchard & Edison)	2.6%	2,330	~~89,608~~
Town of Blanchard - Sec. 22	0%	0	5,699
Town of Edison - Sec. 33	16.8%	5,521	32,985
GRAND TOTAL	11.1-%	$972,408	$8,780,944 8,799,1

Towns 3,342,711

Farms 2,526,166

DIKING DISTRICTS ANNUAL ASSESSMENT DATA FOR YEARS 1921 AND 1922
USED AS A GUIDE IN DETERMINING 1921 H.W. PER CENT OF 1815 H.W.
(See page)

1 Twp. Range	2 Dist. No.	3 Acres in District	4 Acres of District in Twp.	5 Assessment Increase Per Acre 1921-1922	6 Per Cent of Increase in Assess.	7 1921 Per Cent of 1815 H.W.	8 Acres in Col. 4 Increased by 1921 Per Cent of 1815 H.W.	
33-3	1	8,668	1,472	.85	50.6	20	1,766	
	2	2,632	2,497	.95	100.0	25	3,121	
	9	1,419	350	.50	710.0	50	525	
	13	1,870	1,869	1.76	429.2	40	2,617	
	15	886	885	.46	11.5	15	1,018	
	18	576	576	.39	12.9	15	662	
	21	391	391			0	391	
	22	8,970	399			0	799	
			8,762				10,899	
Township Average 1921 Per Cent of 1815 H.W. = (10,899-8,762) ÷ 8762 =								24.4%
33-4	22	2,632	151	.95	100.0	25	189	
	3	6,366	4,286	2.91	184.2	30	5,572	
			4,437				5,761	
Township Average 1921 Per Cent of 1815 H.W. = (5,761 - 4,437) ÷ 4,437 =								29.8%
34-2	12	13,392	861	.62	295.2	35		
Township Average 1921 Per Cent of 1815 H.W. =								35%
34-3	1	8,268	6,503	.85	50.6	20	7,804	
	2	2,632	21	.95	100.0	25	26	
	3	6,366	154	2.91	184.2	30	200	
	8	631	556			0	556	
	9	1,419	1,069	.50	710.0	50	1,603	
	12	13,392	5,208	.62	295.2	35	7,031	
	17	1,263	337	.30	7.6	15	388	
			13,848				17,608	
Township Average 1921 Per Cent of 1815 H.W. = (17,608 - 13,848) ÷ 13,848 =								27.2%
34-4	1	8,268	289	.85	50.6	20	347	
	3	6,366	1,925	2.91	184.2	30	2,502	
	12	13,392	2,041	.62	295.2	35	2,755	
	17	1,263	926	.30	7.6	15	1,065	
	20	537	537			0	537	
			5,718				7,206	
Township Average 1921 Per Cent of 1815 H.W. = (7,206 - 5,718) ÷ 5,718 =								26.0%
35-2	5	2,847	397			0		
35-3	5	2,847	2,450			0	2,450	
	8	631	76			0	76	
	12	13,392	3,810	.62	295.2	35	5,146	
	19	1,960	1,780	.18	22.5	25	2,225	
			8,116				9,897	
Township Average 1921 Per Cent of 1815 H.W. = (9,897 - 8,116) ÷ 8,116 =								21.9%
35-4	12	13,392	1,458	.62	295.2	35		35.0%
36-3	4	1,577	1,577				1,577	
	19	1,960	181	.18	22.5	25	266	
			1,758				1,803	
Township Average 1921 Per Cent of 1815 H.W. = (1,803 - 1,758) ÷ 1,758 =								2.6%

DAMAGE TO HIGHWAY BRIDGES
1815 H.W.

Location	Elev. Top of Deck	Apprais. Elev.	Year Built	Bridge Cost	% Dep.	Deprec. Value	Probability of Loss. %	Damage	LIF Sx
T33N-R3E									
Deer Slough	b11.0	10.0	31	$1,800	30	$1,260	80	$1,008	
" "	b11.0	10.0	31	1,600	25	1,200	80	960	
" "	a10.0	10.0	1935	c3,405	17	2,826	90	2,543	
N. Fork Skagit River	29.7	14.6	1911	d48,000	72	13,440	10	1,344	
Browns Slough	a11.5	10.0	28	d6,000	40	3,600	60	2,860	
" "	a12.5	10.0	1939	c2,864	3	2,778	75	2,083	
" "	b11.0	10.0	31	1,200	30	840	90	756	
Dry Slough	b13.0	11.0	1931	c6,960	30	4,872	75	3,654	
" "	b13.0	11.0	1940	c5,350	0	5,350	75	4,013	
" "	b13.0	11.0	28	1,000	40	600	80	460	
T33N-R4E									
S. Fork Skagit River	a23.5	14.0	(1914	d40,000					
T34N-R3E			(1938	d11,674	35	33,588	20	6,718	
Indian Slough	b10.0	10.0	31	1,200	30	840	100	840	
Sullivan Slough	a10.5	11.0	28	4,160	40	2,496	100	2,496	
Higgins " nr Fredonia	b12.0	18.0	31	3,500	10	3,150	100	3,150	
T34N-R4E									
Skagit River-Mt Vernon	41.6	50.7	(1909	d45,000					
			(1928	d28,736		34,655	40	13,862	
" " Hiway U.S.#99	45.7	37.5	1939	504,000	0	504,000	40	201,600	
500' N. of Skagit River Hiway U.S. #99	32.9	37.0	1939	4,000	0	4,000	100	4,000	
Slough on Co. Rd. Sec.8	31.0	38.5	32	2,000	60	800	100	800	
" Hiway 99 S. of Burlington	31.0	38.5	1939	27,000	0	27,000	100	27,000	
Nookachamps Creek	b40.0	46.0	32	3,200	25	2,400	100	2,400	
" "	b42.0	47.0	32	3,000	25	2,250	100	2,250	
Slough W. of Clear Lake	b30.0	51.0	28	1,200	40	720	100	720	
T35N-R3E									
Joe Leary Slough Sec.18	b7.4	10.0	31	1,200	30	840	100	840	
" " " " 17	b7.5	10.5	28	1,200	40	720	100	720	
" " " " 17	b7.5	10.5	31	1,000	30	700	100	700	
" " " " 16	b8.0	13.0	34	800	20	640	100	640	
" " " " 16	b12.5	15.0	32	900	25	675	100	675	
Samish River Sec. 5	b10.5	9.0	31	6,000	30	4,200	90	3,780	
" " " 8	b10.0	11.0	34	2,100	20	1,680	90	1,512	
" " " 15	b16.0	18.0	31	1,500	30	1,050	100	1,050	
" " " 14	b27.0	25.0	32	4,000	25	3,000	80	2,400	
T35N-R4E									
Skagit River Sedro Woolley	61.4	55.7	1911	d69,000	72	19,320	100	19,320	
Slough S. of " "	48.8	55.8	32	10,000	25	7,500	100	7,500	
T36N-R3E									
Edison Slough	b6.5	9.0	31	2,000	30	1,400	100	1,400	
" "	b7.0	9.0	28	1,000	40	600	100	600	
" "	b13.0	11.5	34	1,200	20	960	90	864	
TOTAL DAMAGES								$327,558	

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See note on prefixes next page

Note: a. See Bridge Elevations below
b. " " " "
c. " " Costs "
d. " " " "

BRIDGE ELEVATIONS: All elevations are Mean Sea Level. All elevations without prefix letter have been determined by means of wye level and are on U.S.C& G.S. datum.

a. Elevation marked with prefix letter "a" has been determined from high tide by measurement.

b. Elevation marked with prefix letter "b" has been estimated from meager existing data.

APPRAISAL ELEVATIONS: The appraisal elevations of all main bridges over Skagit River below Burlington are one foot below the elevation of the top of the dikes at the bridge. In past floods the dikes usually failed when water reached to within one foot of the top of them. All other appraisal elevations of bridges have been determined from the grid profiles. See pages to . Also see map sheets 1 to 8. File no. E-6-6-1.

BRIDGE COSTS:
c. Bridge costs marked with prefix letter "c" have been supplied by Lee Wright, Asst. Co. Engr.

d. Bridge costs marked with prefix letter "d" are estimates supplied by T.D. McNeil, who was county engineer during the construction of these bridges. Official records could not be found by Mr Wright, present Asst. County Engineer.

All other bridge costs are rough estimates, except the state highway bridge over Skagit River, located between Mount Vernon and Burlington, whose costs were supplied by the State Highway Dept.

DEPRECIATION: The depreciation of county timber bridges is based on an expected life of thirty years. On county steel bridges the expected life is assumed to be forty years. The annual depreciation, therefore, is 3.3% and 2.5%, respectively. 75% is the maximum depreciation used, as long as the bridge is maintained and kept in use, regardless of age.

DAMAGE TO RAILROAD BRIDGES

1815 H.W.

Great Northern R.R: Skagit River Crossing between Mount Vernon and Burlington. Steel span draw bridge. Concrete piers.

Top of tie, span deck	48.3'
Clearance elevation	43.2'
Appraisal elevation	39.0'

Bridge built 1891. No cost figures were available. The estimated cost in 1891 was $81,400. The relative construction value if built in 1940 would have been $220,000, since the difference in construction cost and material between the years 1891 and 1940 is 63%. On the basis of present replacement value of $220,000, the depreciated value would be $55,000 or 75% of $220,000. (The depreciation is computed at 1.67% per annum on an expected life of 60 years up to and including a maximum of 75% depreciation, as long as the bridge is maintained and kept in use.)

Probability of loss of the bridge due to flood is estimated at 50%. 50% of $55,000 = $27,500 = damage.

Great Northern R.R. Double track timber-piling trestle over slough between Burlington and Skagit River Crossing. Approximate length 400'. Cost at $42 per lin. ft. $16,800. Depreciation 40%. Depreciated value = $10,080.

Top of tie, bridge deck	34.8'
Appraisal elevation	40.5'

Probability of loss is estimated at 100% or $10,080 = damage.

Northern Pacific R.R: Skagit River Crossing south of Sedro Woolley. Steel span draw bridge. Concrete piers.

Top of tie, span deck	63.0'
Clearance elevation	58.0'
Appraisal elevation	54.6'

Bridge originally built in 1908. Additions built 1915. No cost figures were available. The estimated cost in 1915 is $110,000. The relative construction value if built in 1940 would have been $200,000, since the difference in construction cost and material between the years 1915 and 1940 is 45%. On the basis of present replacement value of $200,000, the depreciated value would be 42% of $200,000 or $84,000. (The depreciation has been estimated at 1.67% per annum on an expected life of 60 yrs.)

Probability of loss of the bridge, due to flood, is estimated at 100% or $84,000= dam

Northern Pacific R.R. bridge over slough approx. 1000' north of Skagit River Crossing 1-40' I-beam, through girder span with timber, piling bent approaches. Total length of approaches approx. 300'. Cost estimated at $21 per lin. ft. for approaches = $6,300. Cost of steel span estimated at $8,000. Total cost $14,300. Depreciation 40% = $8,580.

Top of tie of bridge	56.8'
Appraisal elevation	54.6'

Probability of loss estimated at 100% or $8,580 = damage.

Northern Pacific R.R. Timber, piling bent, trestle over slough located 4000' north of Skagit River Crossing: Approx. length 225'. Cost at $21 per lin. ft. = $4,725. Depreciation 40% = $2,835.

Top of tie 52.7'
Appraisal elevation 54.6'

Probability of loss is estimated at 100% or $2,835 = damage.

Northern Pacific R.R. Timber, piling bent trestle over slough located 1000' south of Skagit River Crossing: Approx. length 250'. Cost at $21 per lin. ft. = $5,250. Depreciation 40% = $3,150.

Top of tie approx. 57.0'
Appraisal elevation 54.6'

Probability of loss is estimated at 90%. 90% of $3,150 = $2,835 = damage.

Puget Sound & Cascade Railway trestle over West Fork Nookachamps Creek: Untreated trestle. 1900 lin. ft. piling bents at an average cost of $15.70 per lin. ft. Depreciation 60%. Probability of loss 70%.

1900' x 15.70 x .40 x .70 = $8,352 = damage

SUMMARY OF DAMAGES. RAILROAD BRIDGES

G.N.R.R.	Skagit River Bridge	$27,500
"	Trestle over Slough	10,080
N.P.R.R.	Skagit River Bridge	84,000
"	Trestle over Slough	8,580
"	" " "	2,835
"	" " "	2,835
P.S. & C.R.R.	" " Nookachamps	8,352
Total Damages		$144,182

DAMAGE TO HIGHWAYS AND ROADS
1815 H.W.

There is a total of 81.8 miles of paved roads and 137.2 miles of gravel roads in the appraised area, exclusive of streets within the towns. The paved roads include concrete, macadam, oiled surface and asphalt. These are state highways as well as county roads. The gravel roads are improved graded and drained county roads. The average damage per mile of concrete roads is estimated at $500 per mi., while the damage on gravel roads is estimated at $300 per mile.

Following is a tabulation of roads by townships: (It does not include town or city streets)

Township	Range	Miles Paved Roads	Miles Gravel Roads	Damages in Township
33	2	.0	.0	$ 0
33	3	5.8	20.5	$9,050
33	4	10.0	21.0	11,300
34	2	.0	1.0	300
34	3	29.0	26.7	22,510
34	4	7.5	14.5	8,100
34	5	.0	3.0	900
35	3	7.0	29.0	12,200
35	4	18.5	19.5	15,100
36	3	4.0	2.0	2,600
TOTAL		81.8	137.2	$82,060

DAMAGE TO RAILROADS OTHER THAN BRIDGES
1815 H.W.

There are four steam railroads serving the appraised area. They are the Northern Pacific Railway, the Great Northern Railway (Seattle-Vancouver Main Line & Anacortes Branch), the Puget Sound & Baker River R.R. and the Puget Sound & Cascade R.R. The last two are logging railroads. The Puget Sound & Baker River R.R. operates over the Anacortes Branch of the Great Northern R.R. thru the appraised area.

Northern Pacific R.R: Extends from Seattle to Sumas with a branch line to Bellingham. The N.P.R.R. crosses the Skagit River about 1 mi. south of Sedro Woolley. The distance across the appraised area in the Skagit Valley and Nookachamps Valley is approximately 7½ mis. Since the Skagit Valley is constricted in the vicinity of Sedro Woolley, the damages to the N.P.R.R. can be expected to be heavy in that portion which crosses the Skagit Valley. For a distance of 1½ mis. the railroad is built on a fill averaging 12' high.

Valuation and damages of the railroad are as follows:

7800 lin. ft. fill. Average 12' high. Roadbed 16' wide. Cost of fill 50¢ per cu. yd. Material, ballast & labor of laying steel at $2.24 per lin. ft. Probable loss 30%.

$\frac{34 \times 12}{27 \times 2} + 2.24 = \$9.79$ cost per lin. ft.

7800' x 9.79 x .30 = $22,898 = damage

Damage to 6 mis of railroad, mostly in Nookachamps Valley, will average $1200 per mi. 1200 x 6 = $7,200 = damage

Total damage N.P.R.R. = $30,098

Great Northern R.R. Seattle-Vancouver Main Line: This railroad crosses the Skagit River flood area via the towns of Burlington and Mount Vernon. The distance across is 19½ mis. For a distance of 1¼ mis. north of the Skagit River Bridge the railroad grade is on a fill averaging 10' high.

Valuation and estimated damages of the railroad are as follows:

6600 lin. ft. fill. Average height 10'. Roadbed 16' wide. Cost of fill 50¢ per cu. yd. Material, ballast &labor of laying steel at $2.24 per lin. ft. Probable loss 20%.

$\frac{31 \times 10}{27 \times 2} + 2.24 = \$7.98$ cost per lin. ft.

6600 x 7.98 x .20 = $10,534 = damage

The estimated damage for the balance of the distance of 18¼ mis. will average $900 per mi. 900 x 18.25 = $16,425 = damage

Total damage = $26,959

Great Northern R.R. Anacortes Branch: This brance line extends thru the appraised area from Secro Woolley west to Swinomish Slough, a distance of 13 mis. The average damage per mile is estimated at $800.

800 x 13 = $10,400 = damage

Puget Sound & Cascade R.R: Is a logging railroad and is not in operation at the present time. It extends thru the flood area on Nookachamps Creek, a distance of 4 mis. The average damage per mile is estimated at $500 per mi.

$500 x 4 = $2,000 = damage

SUMMARY OF DAMAGES TO RAILROADS

Northern Pacific R.R.	$30,098	7½
Great Northern R.R. Seattle-Vancouver Main Line	26,959	14½
Great Northern Anacortes Branch	10,400	13
Puget Sound & Cascade R.R.	2,000	1
		44
Total Damages	$69,457	

TRAFFIC INTERRUPTIONS. HIGHWAYS.
1815 H.W.

Highway traffic has been divided into two classes, thru traffic and local traffic. Thru traffic takes into consideration all thru traffic between Bellingham and Everett, and also between Everett and Anacortes. All other traffic thruout the appraised area is shown under the heading of "Local Traffic."

The average cost of operating automobiles over detours, including driver's time at 50¢ per hr., is 12¢ per mile.

See page 44 for damage to bridges and the percent of "Probability of Loss" of bridges.

All roads within the flooded area would be impassable for at least 30 days after a flood of maximum proportions.

River ferries could be put into operation at any and all Skagit River bridges in thirty days, should the bridge be lost.

THRU TRAFFIC

U.S. Highway #99: This highway would be impassable for at least thirty days, regardless of whether or not the Skagit River bridge would go out. However, should the Skagit River bridge be lost, a river ferry could be put into operation in thirty days.

The average annual 24 hr. thru traffic on U.S. Highway #99 is 1,950 autos. Normal winter traffic is estimated at 70% of the annual average 24 hr. traffic, or 1,365 autos. Abnormal traffic due to storm conditions, inconvenience, and added cost of driving over detours, would cut the traffic to 50% of the normal WINTER traffic, or 682 autos.

The detour route, in order to avoid the Skagit River flood area, would be from Everett to Bellingham via Mukilteo ferry to Whidby Island, Highway 1-D to Anacortes, and ferry from Anacortes to Chuckanut. The average cost per car to ferry from Mukilteo to Whidby Island, taking into account the proportion of passenger cars to trucks, is 80¢ per auto. And, likewise, the cost to ferry from Anacortes to Chuckanut is estimated at $2.75 per auto. The total time consumed in ferrying would be 2 hrs., and at 50¢ per hr. for driver's time, the additional expense would be $1.00 per auto.

The added cost of operating autos over the detour for 30 das. and a 40% probability of ferrying across the Skagit River near U.S. Highway #99, in the event of the loss of the bridge for an additional 240 das., is computed as follows:

$$(.80 + 2.75 + 1.00)(682 \text{ autos})(30 \text{ das.}) = \$93,090 = \text{damage}$$

The added cost of maintaining a river ferry and time lost in negotiating passage is estimated at 25¢ per auto. Upon the installation of a ferry, traffic would increase to the normal winter traffic of 1,365 autos per 24 hrs.

($.25 ferrying cost)(1,365 autos)(240 das)(40%) = $32,760 = damage

Total damage = $125,850

Everett to Anacortes: The average annual 24 hr. traffic over the Mount Vernon-Anacortes highway is 1,400 autos. The normal winter traffic is estimated at 80% of the annual average 24 hr. traffic, or 1,120 autos. Abnormal traffic would cut this to 60% of the normal winter traffic, or 672 autos. Of this mount, it is estimated that 30% of the traffic originates from Everett or south. 30% of 672 autos = 202 autos per 24 hrs.

The detour route from Everett is via Mukilteo-Whidby Island ferry to Anacortes, a detour distance of 64 miles. The direct distance via U.S. Highway #99 and State Highway #1 is 52 mis. The average cost to ferry, including driver's time, from Mukilteo to Whidby Island, is 95¢ per auto.

This detour would be necessary for at least 30 das. After 30 das. there is a 40% probability that traffic would be ferried across the Skagit River near the Mount Vernon bridge, since the probability of loss of the Mount Vernon bridge west of Mount Vernon is 40%. The added cost of operating autos over the detour and ferrying across Skagit River is as follows:

Detour; [(12 mis)(12¢ per mi.) + .95](202 autos)(30 das) = $14,483 = damages

Skagit River Ferry: Normal winter traffic is 672 autos per 24 hrs.
($.25 ferrying cost)(672 autos)(240 das)(40%) = $16,128 = damage

Total damage = $30,611

LOCAL TRAFFIC

A maximum flood would cause the evacuation of a large per cent of the people living within the flood plane. The average length of time that these people would be forced to remain away from their homes is estimated at 15 das. The cost of sheltering them, computed at $1 per day, has been included in the Section Summaries of the notes under "Refugees". At the end of 15 das., traffic would be gradually restored to normal, but only to the extent permitted by repairs of washed out roads and bridges.

It would require at least 30 das. to repair the approaches to bridges, whether the bridge structure proper would be lost or not. Since homes and farms would be abandoned for an average period of 15 das., interruption of traffic has been computed on a basis of 15 das. This is the approximate length of time it would take to complete repairs on roads and bridge approaches after the return of the refugees to their homes. Traffic interruption damages due to the loss of bridges have been computed as the per cent of probability of loss of the bridge, and are in addition to traffic interruption damages of roads during the previously mentioned period of 15 das.

Local Traffic over Skagit River Bridge U.S. Highway #99: The total annual average 24 hr. traffic over this bridge is 3,900 autos. Thru traffic is 1,950 aut and local traffic is also 1,950. Normal winter traffic is estimated at 70% of the annual average 24 hr. traffic, or 1,365 autos. Abnormal driving donditions would further reduce the traffic 90%, or a remaining total of 136 autos.

The detour distance from Mount Vernon via Everett, Mukilteo-Whidby Island ferry, Anacortes-Chuckanut ferry to Burlington, is 112 miles. The total cost of ferrying, including 2 hrs. driver's time at 50¢ per hr. is $4.55. The direct distance between Mount Vernon and Burlington is 4 mis. The difference between direct and detour distance is 108 mis.

The calculation of the damages is as follows:

Detour: [(108 mis.)(12¢ (17.5¢) per mi.) + 4.55](136 autos)(15 das) = $35,720 = damage

Normal winter traffic = 1,365 autos per 24 hrs.
(.25 ferrying cost)(1,365 autos)(240 das.)(40%) = $32,760 = damage

Total damage = $68,480

Traffic over Sedro Woolley Bridge: The total annual average 24 hr. traffic over the bridge is 1,000 autos. Normal winter traffic is estimated at 70% of the annual 24 hr. traffic, or 700 autos. Abnormal driving conditions would further reduce the traffic 90% to a remaining total of 70 autos.

The detour distance from Mount Vernon to Sedro Woolley via Everett, Mukilteo-Wh Island ferry, Anacortes-Chuckanut ferry is 116 miles. The direct distance is [illegible]s. The difference between the detour and the direct distance is 106 mis.

The calculations of the damages are as follows:

Detour: [(106mis)(12¢ per mi.) + 4.55](70 autos)(15 das) = $18,133 = damage

Skagit River Ferry: Normal winter traffic is 700 autos per 24 hrs.
(.25 ferry cost)(700 autos)(240 das)(40%) = $16,800 = damage

Total damage = $34,933

Traffic over Mount Vernon Bridge: The total annual average 24 hr. traffic over this bridge is 2,570 autos. Normal winter traffic is 80% or 2,056 autos. Abnormal driving conditions would further reduce the traffic 75% to a remaining total of 514 autos. Of this amount 202 autos are Everett-Anacortes thru traffic. (See "Thru Traffic. Everett to Anacortes".) The balance or 312 autos would also have to detour via Everett, and Mukilteo-Whidby Island ferry. The detour distance to Bayview Road from Mount Vernon is 100 mis. The direct distance from Mount Vernon is 7 mis. The difference between detour and direct distance is 93 mis.

The calculations of the damages are as follows:

Detour: (93mis)(12¢ per mi.) +.95(312 autos)(15 das.) = $56,670 = damage
Skagit River Ferry: Normal winter traffic = 1,439 autos per 24 hrs.
(.25 ferrying cost)(1,439 autos)(240 das.)(40%) = $34,536 = damage

Total damage = $91,206

Traffic over South Fork Bridge West of Conway: The total annual average 24 hr. traffic over this bridge is 600 autos. Normal winter traffic is 70% or 420 autos. Abnormal driving conditions would further reduce the traffic 80% to a remaining total of 84 autos.

The detour distance from Everett to La Conner via Mukilteo-Whidby Island ferry is 67 mis. The direct distance via Conway is 39 mis. The difference between the detour and direct distance is 28 mis.

The probability of loss of the bridge across Deer Slough and Browns Slough is 90%. The detour would be necessary for 100 additional days if one or both of the bridges were washed out.

Detour: (28 mis.)(12¢ per mi.) + .95(84 autos)(15 das.) = $5,431 = damage
(28 mis)(12¢ per mi.)+ .95(84 autos)(100 das.)(90%) = $32,584

Skagit River Ferry: Normal winter traffic is 420 autos per 24 hrs. Total time detour would be necessary is 115 das. The estimated time required to reconstruct South Fork Bridge is 240 das. The number of das. the Skagit River Ferry would be required in the event of a loss of the South Fork Bridge is 240-115 or 125 das. The cost of ferrying is calculated as follows:

(.25 ferrying cost)(420 autos)(125 das)(20%) = $2,625 = damage

Total Damage = $40,640

Miscellaneous Traffic: Includes traffic interruptions over various roads in the delta area not previously considered. Numerous detours would be necessary on these roads. The total damages over a wide area is estimated at $30,000.

SUMMARY OF DAMAGES - INTERRUPTION OF HIGHWAY TRAFFIC

Thru Traffic	U.S. Highway #99	$125,850
" "	Everett to Anacortes	30,611
Local Traffic	Skagit River Bridge on U.S. Hwy #99	68,480
" "	Sedro Woolley Bridge	34,933
" "	Mount Vernon Bridge	91,206
" "	South Fork Bridge	40,640
" "	Miscellaneous	30,000
Total Damages		$421,720

TRAFFIC INTERRUPTIONS - STAGE AND AUTO FREIGHT LINES
1815 R.W.

The North Coast Stage Lines and five principal auto freight line serve the Skagit River Area.

North Coast Lines: Maintain passenger service consisting of 14 daily stages in both directions across the flood area on U.S. Highway #99. In addition, 6 daily stages operate between Mount Vernon, La Conner and Anacortes. Six daily stages also operate between Mount Vernon and Sedro Woolley.

North Coast Lines Thru Passengers: It would be necessary for thru passengers between Seattle and Vancouver, B.C. to detour via C.P.R.R. steamships operating between Seattle and Vancouver. It is estimated that there are on an average 25 passengers per day in each direction between the above points. The added cost to passengers per day is $1.50. The estimated time the detour would be necessary is 20 das. and a 50% possibility of 15 additional days in the event of the loss of U.S. Highway #99 Skagit River bridge. The damage is calculated as follows:

$$2(25)(\$1.50)(20 \text{ das.} + \frac{15 \text{ das.}}{2}) = \$2,062 = \text{damage}$$

North Coast Lines Local Passengers: There are no alternate routes or detours possible for local traffic since this traffic is wholly within the flood area. The number of passengers is estimated at 30 per day. The added cost of providing accomodations for these travelers is $3.50 per day and the damages are calculated as follows:

$$(30 \text{ passengers})(\$3.50 \text{ per da.})(20 \text{ das.} + \frac{15 \text{ das.}}{2}) = \$2,887 = \text{damage}$$

Total Damage = $4,949

Auto Freight Lines: The loss of profits and loss of wages of employes to the five principal auto freight lines hauling both local and thru freight is estimated at $240 per day. The damage is calculated as follows:

$$(\$240)(20 \text{ das.} + \frac{15 \text{ das.}}{2}) = \$6,600 = \text{damage}$$

INTERRUPTION OF TRAFFIC - RAILROADS
1815 H.W.

There are four railroads crossing the appraised area, all of which are steam railroads. They are the Great Northern Railway Seattle-Vancouver Main Line, the Anacortes Branch of the Great Northern, the Puget Sound & Baker River R.R., which operates over the Anacortes Branch of the Great Northern, the Northern Pacific R.R. and the Puget Sound & Cascade R.R. The Puget Sound & Cascade R.R. is not at the present time in operation.

Great Northern R.R. Seattle-Vancouver Main Line: Freight service consists of one thru freight train in each direction daily except Saturday. The average number of cars is 70. There is also one local freight between Burlington and Everett. This train is also daily except Saturday, and averages 70 cars.

Passenger service consists of 2 trains daily each direction, and all trains average 7 cars each.

There are two alternate routes that Seattle-Vancouver freight traffic could be routed over in the event of interrupted traffic across the Skagit River flood plane. One route would be via Spokane and Grand Forks, B.C., the other via train ferry from Seattle to Bellingham.

At the present time the Milwaukee R.R. operates a tri-weekly train ferry from Seattle to Bellingham. The equipment consists of car barges #7 and #8 and the tug Milwaukee. The capacity of barge #7 is 12 cars, and of #8, 15 cars. The tonnage is 828 and 993 tons respectively. The time required to ferry either barge from Seattle to Bellingham, a distance of 96 mis., is from 11 to 14 hrs., depending upon tides and tonnage. One barge or both are ferried simultaneously as the freight demands. Ferrying both simultaneously requires from 15 to 17 hrs. The personnel required to operate this service is 2 men on each barge and 6 men on the tug, with from 8 to 10 deck hands.

Cost of ferrying barges #7 and #8 from Seattle to Bellingham, a distance of 96 mis:

Salaries per day for trip of 16 hrs.	$118
Fuel oil	22
Maintenance of equipment	6
Total operation cost	$146

$146 ÷ 96 = $1.52 = cost per mi. for 27 cars

This equipment could also be made available to the Great Northern R.R. in case of emergency at an estimated rental of $50 per day.

It is assumed that 65% of the Great Northern freight traffic for Vancouver originates either in Seattle or south of Seattle, while the balance or 35% originates east of Seattle. The cost of ferrying 65% of the traffic or 45 cars each way for a distance of 96 mis. is $242. The cost of operating a full train of 70 cars is $1.50 per train mile, and the cost of a 45 car train $1.25 per train mile. The cost direct from Seattle to Bellingham would, therefore, be $120 each way for a distance of 96 mis. The estimated time that the detour would be necessary is 20 das., provided the Skagit River bridge would not go out. Should this bridge be lost, it would require at least 15 additional days to build a temporary crossing over the river. Since there would be a 50% probability of losing the bridge, 50% of the cost of operating 15 additional days over the detour has been included in the damages.

The added cost of operating over the detour has been calculated as follows:

Train ferry Seattle to Bellingham:

$$2(\$242 - \$120) + \$50\left(20 \text{ das.} + \frac{15 \text{ das.}}{2}\right) = \$8,085 = \text{damage}$$

It is estimated that 35% of the Great Northern R.R. freight traffic for Vancouver, B.C. originates east of Seattle, while the balance or 65% originates either in Seattle or south of Seattle. Therefore, in estimating traffic interruption damages, it would be necessary to consider 35% of the traffic as detouring from Spokane via Grand Forks, B.C. to Vancouver, a distance of 559 mis. Of this distance 419 mis. would be over the Canadian Pacific R.R.

The direct distance from Spokane to Vancouver over the Great Northern R.R. via Seattle is 484 mis. The difference between the direct and detour distance is 75 mis. 35% of the daily traffic of 70 cars, or, 25 cars in each direction, would be routed over this detour. The cost of operating a full train of 70 cars is $1.50 per train mile. A 25 car train at $1.00 per train would be $75 for a distance of 75 mis. In addition, an estimated charge of 25¢ per train mile for operating over the C.P.R.R. for a distance of 419 mis. or $105 has been included. The length of time that this detour would be necessary, as previously mentioned, is 20 das, and 15 additional das. should the Skagit River bridge be lost. There is a 50% probability that the bridge would be lost.

The added cost of operating over the detour is calculated as follows:

$$2(75 + 105)\left(20 \text{ das.} + \frac{15 \text{ das.}}{2}\right) = \$9,900$$

Local Freight Service Great Northern R.R: Consists of 70 cars, operating daily except Saturday between Everett and Burlington. Since the local freight terminals within the flood plane, no alternate or detour routes are possible. The loss, therefore, due to inability to operate is estimated at $250 per day. This loss consists chiefly of the loss of profits to the railroad company, as well as loss of wages to railroad employes for a period of 20 das. and a 50% probability of 15 additional das. in the event of the loss of the Skagit River bridge.

$$\$250 \times \left(20 \text{ das.} + \frac{15 \text{ das.}}{2}\right) = \$6,875 = \text{damage}$$

Passenger Service Great Northern R.R. Seattle-Vancouver Main Line: Consists of two trains of 7 cars each in both directions. It would be necessary for thru passengers between Seattle and Vancouver to travel via steamship.

It is estimated that the total number of passengers per day in each direction for both trains will average 80. Of these 60% or 48 passengers are thru passengers, and the balance of 32 are local passengers. The added cost to thru passengers due mostly to the increased time required by steamship transportation is estimated at 75¢ per day per passenger. The cost to local passengers would be at the rate of $3.50 per day, which is the average cost of staying at a hotel during the flood period. The damages are computed as follows:

Thru Passengers: $2(48 \text{ passengers})(.75 \text{ per da.})\left(20 \text{ das.} + \frac{15 \text{ das.}}{2}\right) = \$1,980$ dam

Local Passengers: $2(32 \text{ pass.})(3.50 \text{ per da.})\left(20 \text{das.} + \frac{15 \text{ das.}}{2}\right) = \$6,160 =$ dama

Total damages Great Northern R.R. Seattle-Vancouver Main Line = $8,090

Anacortes Branch Line & Rockport Branch of Great Northern R.R: The service from Burlington to Anacortes consists of 1 daily except Sunday freight train in both directions. The trains average 50 cars.

The service from Burlington to Rockport consists of 1 daily except Sunday freight train in both directions. The trains average 35 cars.

The Puget Sound & Baker River also operates over these tracks between Hamilton Junction and Whitmarsh Junction. The service consists of 1 log train daily except Sunday, the average number of cars being 60.

Since all the above service is almost entirely within the flooded area, no detour or alternate routes are possible. The damages, therefore, have been computed on the basis of inability to operate.

The loss due to inability to operate consists of loss of profits to the Great Northern R.R. Company, logging firms, and sawmills dependent upon a log supply from the Skagit River watershed. The loss also includes the loss of wages of the employes of both railroads as well as the other above firms. This loss is estimated at $1,550 per day for a period of 30 das.

$1,550 x 30 = $46,500 = damage

No passenger service is maintained over the above branch lines.

Northern Pacific R.R. Thru Freight Service: This service is daily except Saturday from Auburn to Sumas, and consists of 40 cars in both directions. The loss due to interruption of traffic has been computed at $324 per day for a period of 60 das.

$324 x 60 = $19,440 = damage

Northern Pacific R.R. Local Freight Service: Consists of one daily except Saturday freight train composed of 10 cars operating in both directions between Bellingham and Sedro Woolley.

Since this service terminates within the flood plane, no alternate or detour routes are possible. The loss, therefore, due to inability to operate is estimated at $80 per day for a period of 60 das.

$80 x 60 = $4,800 = damage

Total damages Northern Pacific R.R. = $24,240

The Northern Pacific R.R. does not maintain passenger service over this railroad.

SUMMARY OF DAMAGES
INTERRUPTION OF RAILROAD TRAFFIC

Great Northern R.R. Seattle-Vancouver Main Line	$33,090
Great Northern R.R. Anacortes & Rockport Branch Lines	46,500
Northern Pacific R.R.	24,240
Total Damages	$103,830

Flood Damage Appraisal

Flood Heights

Bench Marks:

X6 (U.S.C.&G.S.) = 35B (U.S.G.S.) 36.09 ft. (U.S.C.&G.S.) = 35.75 U.S.G.S.
¼ mile east of G.N. Ry., at N.W. corner of Fairhaven and Regent Ave, 30 ft. north the southeast corner of a school yard. A U.S.G.S. standard cap stamped "35 8" riveted on top of a 3½-inch iron pipe.

D 13 (U.S.C.&G.S.) 36.545 Ft. (U.S.C.&G.S.)
At N.W. corner of intersection of Regent St. & Rio Vista Ave, 45 yards from ℄ Regent St., 17 yards from ℄ of Rio Vista Ave, on lot 18, Block 78. A standard disk stamped "D 13 1922" set in the top of a concrete post.

E 13 (U.S.C.&G.S.) 33.773 (U.S.C.&G.S.)
At Burlington National Bank, in the center of the foundation facing Fairhaven Ave., and about 3 inches above the sidewalk. A standard disk stamped "E 13 1922" and set vertically.

Flood Stages

Flood	G.N. Datum	U.S.C.&G.S.	
1815	145.0	48.1	
1856	141.4	44.5	
1921	137.1	40.2	36.5 COR. HOLLY & FAIRHAVEN
1932	135.7	38.8	

Mount Vernon
Flood Damage Appraisal

Flood Heights

Bench Marks:

Y 6 U.S.C.&G.S = 24 U.S.G.S. 24.25 U.S.C.&G.S. = 24.08 U.S.G.S.
2 blocks west & 1 block north of G.N.Ry. Station, at the National Bank, at the south side of the vestibule entrance, and in the doorsill, 8 inches east and 6 inches north of the outside edge of the brick wall. A U.S.G.S. standard disk stam "24. Wash. 1909."

Z 6 U.S.C.&G.S = 20 U.S.G.S 23.84 U.S.C.&G.S.
160 ft. southwest of the G.N.Ry. Station, and 120 ft. west of the track. A U.S.G.S. Standard cap stamped "20" and riveted on the top of a 3½-inch iron pipe

Flood Stages:

Flood	Stage G.N. Datum	U.S.G.S.	U.S.C.&G.S.
1815	132.4		35.5
1856	128.9		32.0
1921	125.4	29.0±	28.5
1932		28.0	

Flood Heights.

Bench Marks:

U.S.C.&G.S. Q 61 — 55.26 ft. (U.S.C.&G.S.)
7 rails west of G. N. Ry. Station, 48 ft. west of Metcalf St. crossing, 6 ft we of W. edge of sidewalk, 12 ft. south of track at a diamond crossing. Standard disk, stamped "Q 61 1934" set in top of a concrete post.

U.S.G.S. 56 — 56.12 ft. (U.S.C.&G.S.) = 55.977 U.S.G.S. (from 1130.1/120)
At Wixon Hotel on Metcalf St., south of the main entrance and in the top of the concrete sill of the first window. A U.S.G.S. standard disk stamped "56 1917".

Flood Stages:

Flood	Crest Stage U.S.C.&G.S.
1815	54.6
1856	51.1
1909	47.6
1897	46.0
1896	45.9
1906	45.8
1921	45.4
1917	45.2
1932	42.2

LEVELS. MOUNT VERNON-BURLINGTON AREA

LOCATION	Adjusted Elevations U.S.C.& G.S. Datum	C.N.R.R. Datum	Elevation Equation
Great Northern Skagit River Bridge. North end of draw span on east side of bridge		(From blue print profile)	
Top of tie	48.23	145.15	96.92
Bottom of chord	43.15	140.06	96.91
Top of cap stand	41.05	137.97	96.92
Center of draw span on east side of bridge Top of cap stand	40.67	137.72	97.05
Zero of gage on south side of draw fender pier west of bridge	8.43	105.45	97.02
1921 H.W. mark on third pier north of steel truss	37.4	134.7	97.3
1924 H.W. mark same location as above	34.1	130.9	96.8
		U.S.E.D. Elevation	
U.S.E.D. monument A-400 Located on top of dike 1½ mis. upstream from Great Northern draw bridge	41.634		
U.S.E.D. monument A-410 Located on top of dike 1000' west of Skagit River bridge - Highway U.S. #99	36.960	36.90 Long Survey 1920 (.060 ~~Long Survey~~ +2.80)	
		UNADJUSTED TO N.AMER. 1929 NET. Elevation Stamped on bronze cap	
U.S.G.S. bench mark X-6 in Burlington ~~This bench mark has apparently been disturbed.~~ The correct elevation was obtained by a closed loop from U.S.C.& G.S. B.M. E-13, also located in Burlington. E-13 was tied in to U.S.C. & G.S. B.M. D-13 in Burlington.	36.135	36.086	.049

P 001986

H.R.M.

102A

Pedro Woolley Wash.
Oct 23-1940

Mr. W. R. Madison
U.S. Engr Dist Office
Pierce Arcade Bldg
Mt Vernon, Wash.

Dear Mr. Madison:

Just returned to Pedro Woolley. Hence the delay in sending you these elevations.

Following is third order work using gyro rods, principal, reading 3 wires:

S.B.M. at north end of Northern Pacific Railway bridge over Skagit River, 15 miles south of Pedro Woolley. t.p. north end of concrete head wall; chiseled square. Elev 62.243

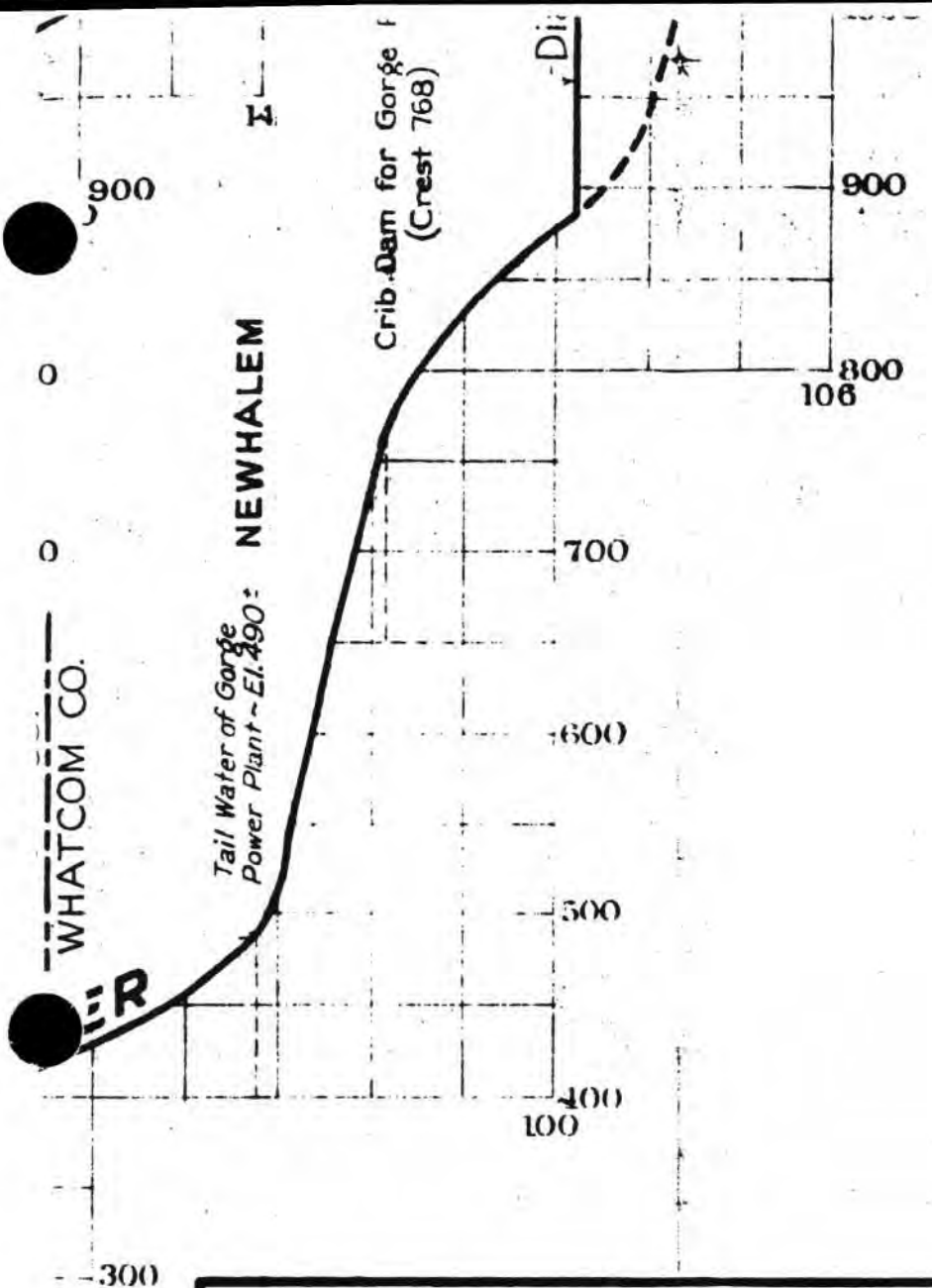
P.B.M. In northern end of Clear Lake, in northwest angle of cross roads, 173 feet north of centerline intersection of X-roads, 17 feet west of centerline of highway, in top of concrete post; a standard tablet stamped "TTRS 1940" Elev 41.057

These are unadjusted and unchecked elevations, as we have several miles ahead, and up to 3500 feet and down again, for a closure several miles south of here

P 001087

Yours R V B Steele
U.S. Geological Survey

(B.M. 851 Marysville Quad.)



SKAGIT RIVER
WASHINGTON

P 001988

In One Sheet

Scales: As shown

U.S. Engineer Office, Seattle, Washington, January 30, 1936.

Submitted:

H. M. Baker
Senior Engineer

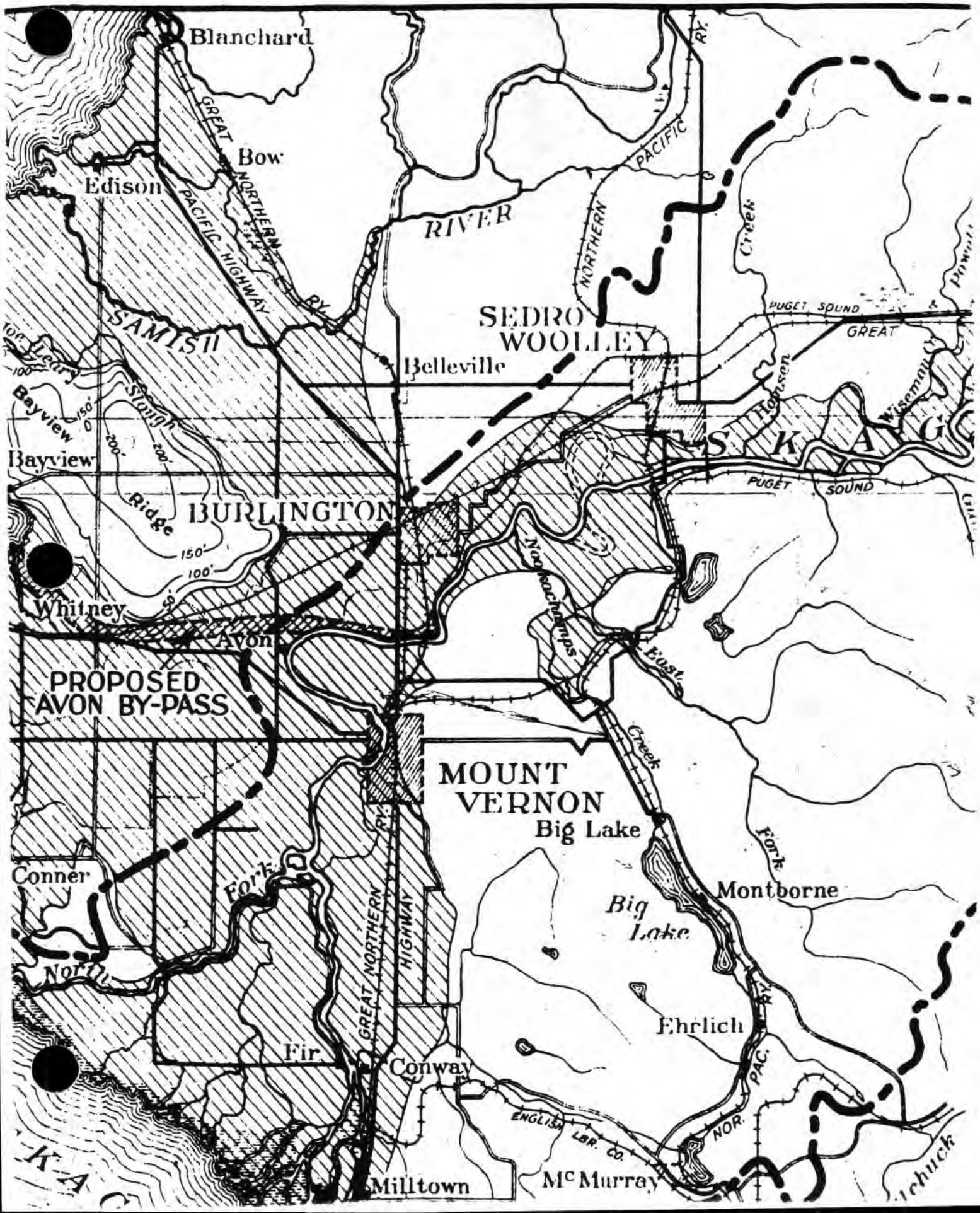
Approved:

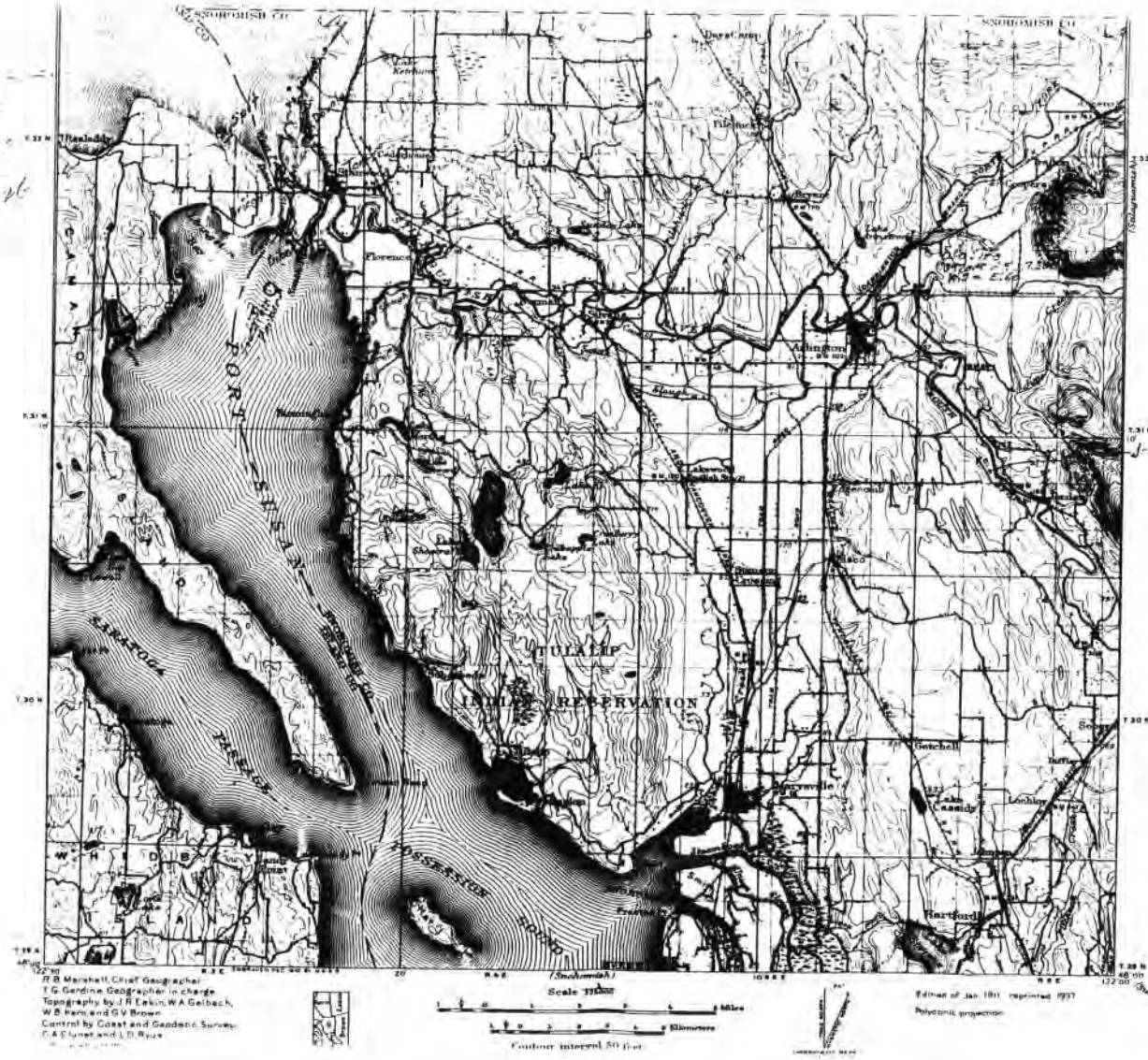
R. J. Wold
Lt. Col, Corps of Engineers

DRAWN BY A.E.MS

FILE NO. E-6-4-28

Transmitted with report dated January 30, 1936.

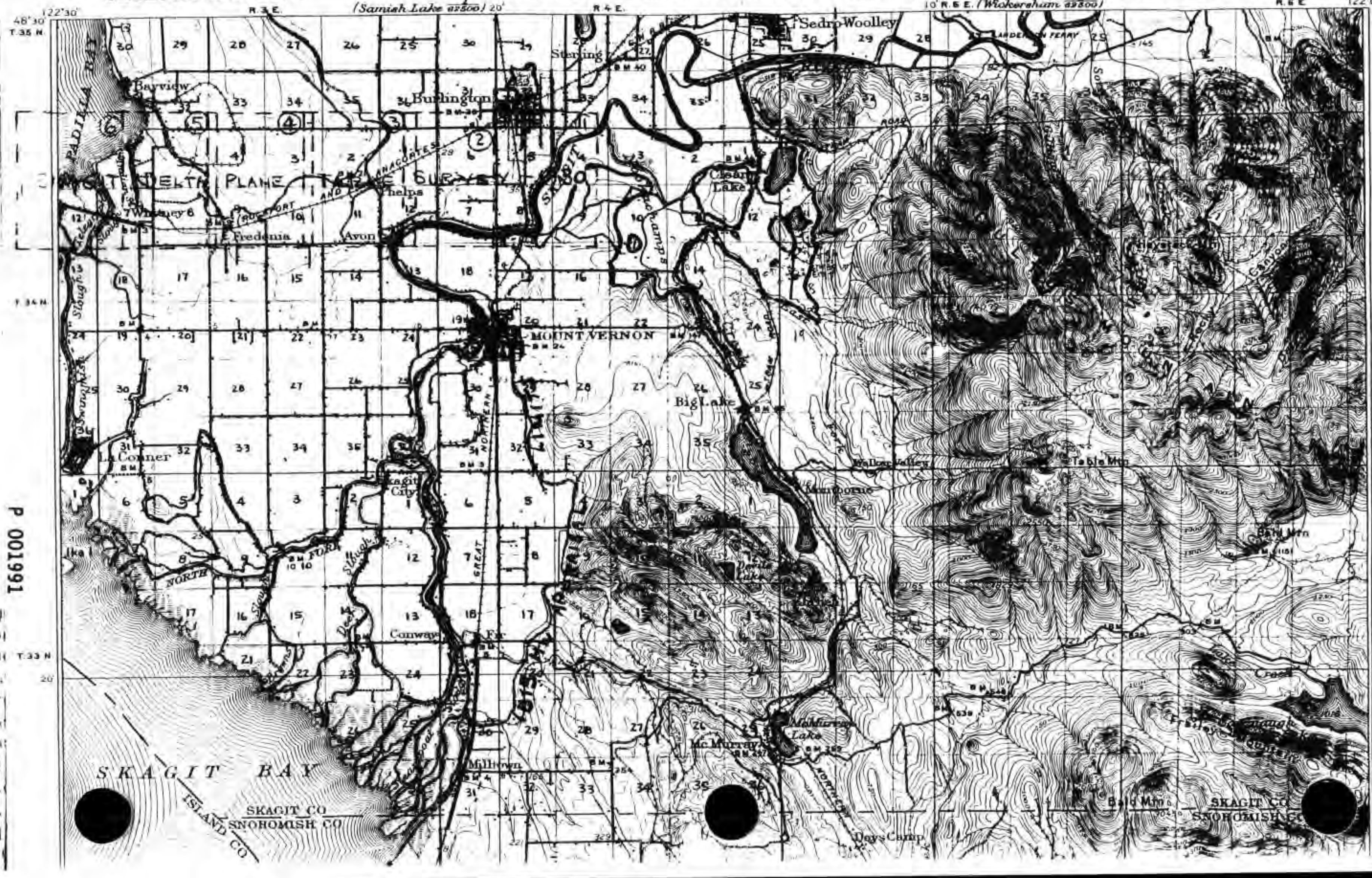



SNOHOMISH CO
SNOHOMISH CO
PORT SUSAN
SARATOGA PASSAGE
POSSESSION SOUND
TULALIP
INDIAN RESERVATION
Everett
Marysville
Hartford
Scale 1:62500
Contour interval 50 feet
Edition of Jan 1911 reprinted 1937
Polyconic projection

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF WASHINGTON
REPRESENTED BY THE
DEPARTMENT OF CONSERVATION AND DEVELOPMENT

WASHINGTON
MOUNT VERNON QUADRANGLE



SKAGIT BA

TRUE NORTH

LEGEND

Drainage Ditch

Diking district boundary

Dike shown thus

Paved road

Other road

Topography shown thus taken from U.S.G.S. Quadrangle sheets.

Distance in miles from mouth of North Fork ④→

SKAGIT RIVER, WASHINGTON
RIVER TOPOGRAPHY

In 2 Sheets Sheet No. 2 Scale 1/31680

1 0 1 2 MILES

U.S. Engineer Office, Seattle, Wash., May 18, 1932

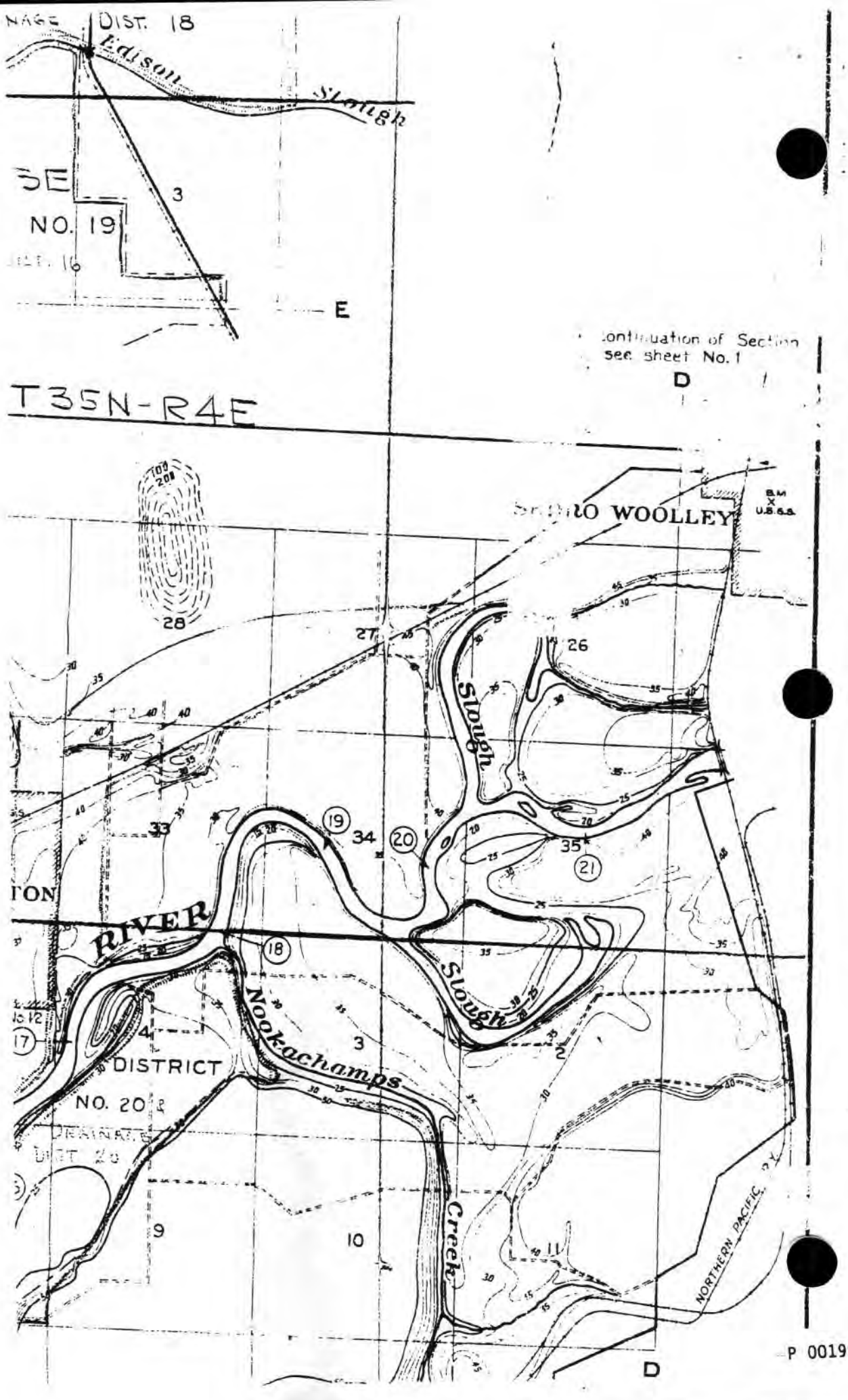
Submitted:
E. J. Pease
Electrical Engineer

Approved:
C. L. Sturdevant
Lt.Col., Corps of Engineers
Transmitted with report dated May 18, 1932

Drawn by L.S.M.
Traced by A.E.Mc
File No. K/2/107

PLATE NO. 3

P 001992


DIST. 18
Edison
Slough
3
NO. 19
E
Continuation of Section
see sheet No. 1
D
T35N-R4E
WOOLLEY
28
27
26
Slough
33
34
35
RIVER
Nookachamps
Slough
DISTRICT
NO. 20
4
3
2
9
10
Creek
NORTHERN PACIFIC
D

ne taken from U

SKAGIT BA

TRUE NORTH

LEGEND

Drainage Ditch —·—·—·—·—·—

Diking district boundary — — — —

Dike shown thus

Paved road ————————

Other road =========

Topography shown thus ~~~~~ taken from U.S.G.S. Quadrangle sheets.

Distance in miles from mouth of North Fork ④→

SKAGIT RIVER, WASHINGTON
RIVER TOPOGRAPHY

In 2 Sheets & 2A Sheet No. 2 Scale 1/31680

1 0 1 2 MILES

U.S. Engineer Office, Seattle, Wash., May 18, 1932

Submitted:
E. J. Pearce
Electrical Engineer

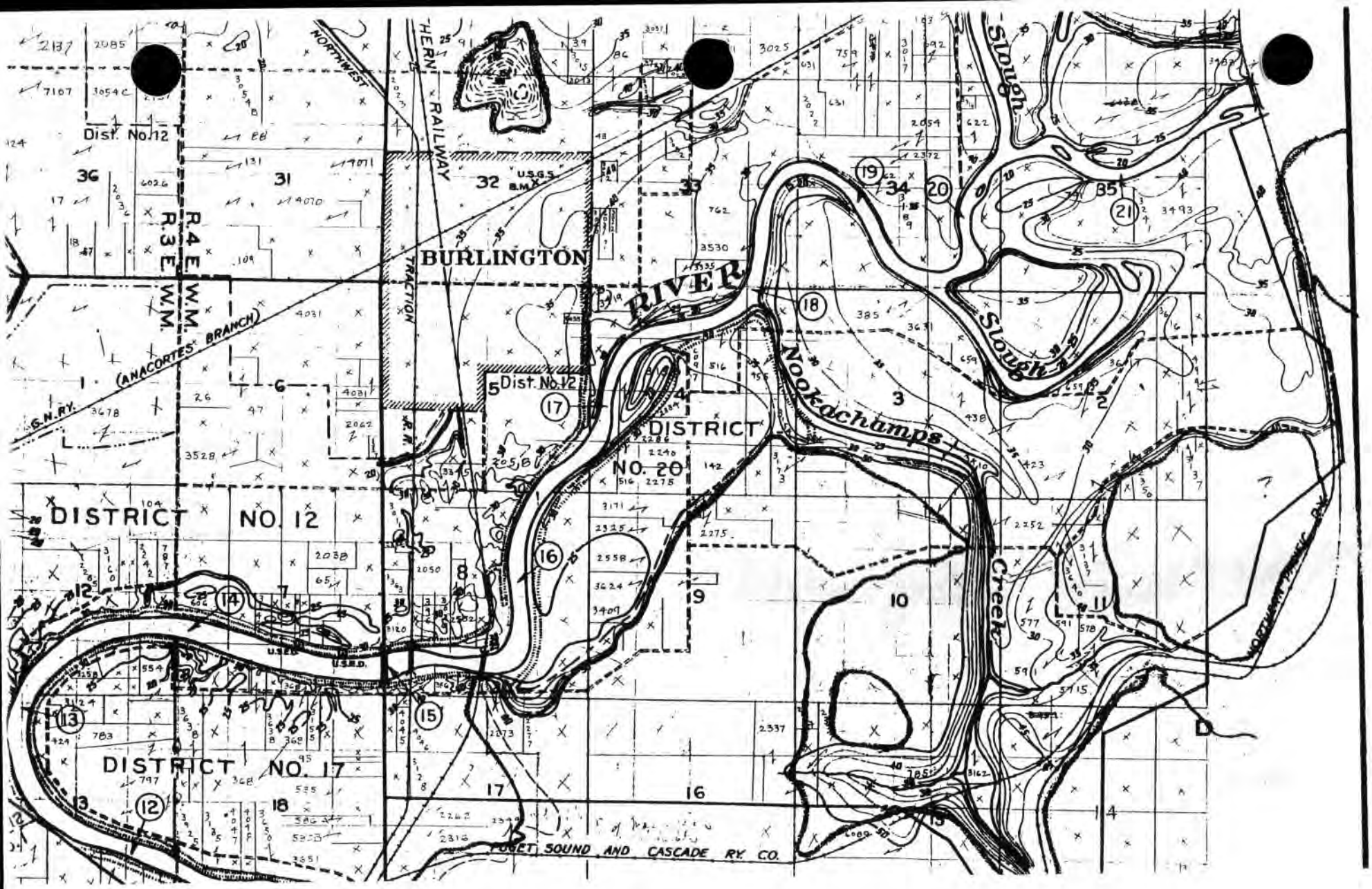
Approved:
C. L. Sturdevant
Lt. Col., Corps of Engineers
Transmitted with report dated May 18, 1932

Drawn by L.S.M.
Traced by A.E.M.
File No. K/2/107

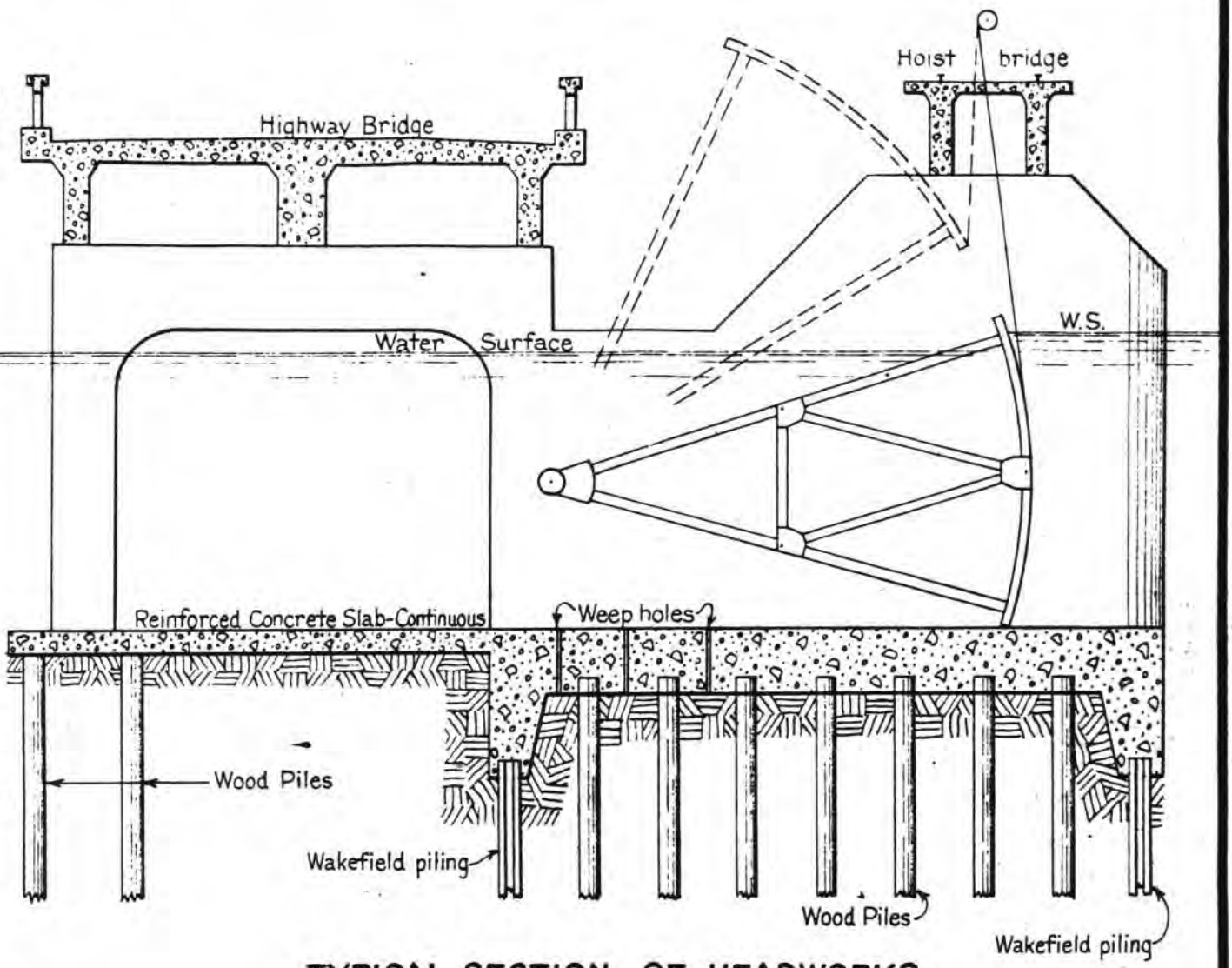
K/2/107

PLATE NO. 3

P 001994


Dist. No. 12
R. 4 E. W.M.
R. 3 E. W.M.
NORTHWESTERN RAILWAY
TRACTION
BURLINGTON
(ANACORTES BRANCH)
G.N.RY.
U.S.G.S. B.M.
RIVER
Nookachamps
Slough
Slough
Creek
DISTRICT NO. 20
DISTRICT NO. 12
DISTRICT NO. 17
PUGET SOUND AND CASCADE RY. CO.
NORTHERN PACIFIC RY.
U.S.E.D.
U.S.R.D.

P 001995



TYPICAL SECTION OF HEADWORKS

1 0 5 10 FT.

SKAGIT RIVER
WASHINGTON
AVON BY-PASS

FOR RIGHT-OF-WAY APPRAISAL,

In One Sheet

Scale: 1/31,680

1 MILE ½ MILE 0 1 MILE

U.S. Engineer Office, Seattle, Wash., Oct. 16, 1936.

Submitted:

H.M. Bakes
Senior Engineer

Approved:

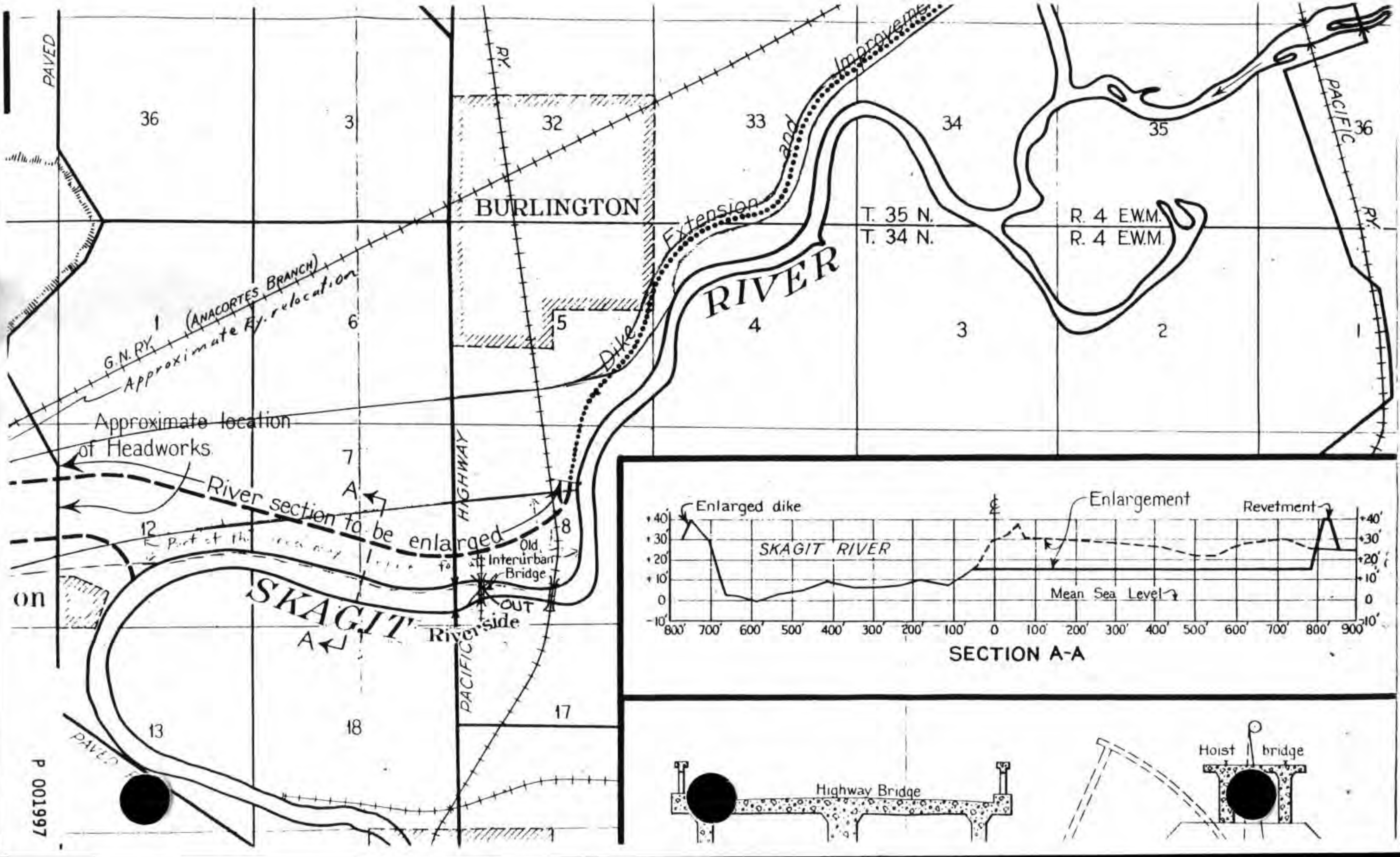
H. J. Wilder
Lt. Col., Corps of Engineers

DRAWN BY A.E.M.S

FILE Nº E-6-4-30

Transmitted with letter dated December 15, 1936.

P 001996



PAVED
36
31
32
33
34
35
36
BURLINGTON
RY.
PACIFIC RY.
G.N. RY. (ANACORTES BRANCH)
Approximate Ry. relocation
Dike Extension and Improvement
T. 35 N.
T. 34 N.
R. 4 E.W.M.
R. 4 E.W.M.
RIVER
1
6
5
4
3
2
1
Approximate location of Headworks
7
HIGHWAY
A
River section to be enlarged
12
8
Old Interurban Bridge
OUT
SKAGIT
Riverside
PACIFIC
A
13
18
17
PAVED
Enlarged dike
Enlargement
Revetment
SKAGIT RIVER
Mean Sea Level
+40'
+30'
+20'
+10'
0
-10'
800' 700' 600' 500' 400' 300' 200' 100' 0 100' 200' 300' 400' 500' 600' 700' 800' 900'
SECTION A-A
Hoist bridge
Highway Bridge

P 001997

P 001998

G.N. RY CO.

WESTERN DIST. — CASCADE DIV.

PROFILE

OF HIGH AND LOW WATER IN

SKAGIT RIVER

FROM SEDRO WOOLLEY HIGHWAY BRIDGE TO
2.6 MILES BELOW MtVERNON CITY BRIDGE

HORIZ. SCALE: 1" = 2000'
VERT. SCALE: 1" = 6'

OFFICE OF DIST. ENG'R
SEATTLE, WN.

SEPT. 22, 1920

TRACED BY D.L.C.
9-10-40

2. Woolley bridge 46.86 HW

60

50

40

Ex 66 Flood

666100 d

G.N. RY CO

WESTERN DIST. CASCADE DIV.

PROFILE

OF HIGH AND LOW WATER IN

SKAGIT RIVER

FROM SEDRO WOOLLEY HIGHWAY BRIDGE TO

2.6 MILES BELOW MEVERNON CITY BRIDGE

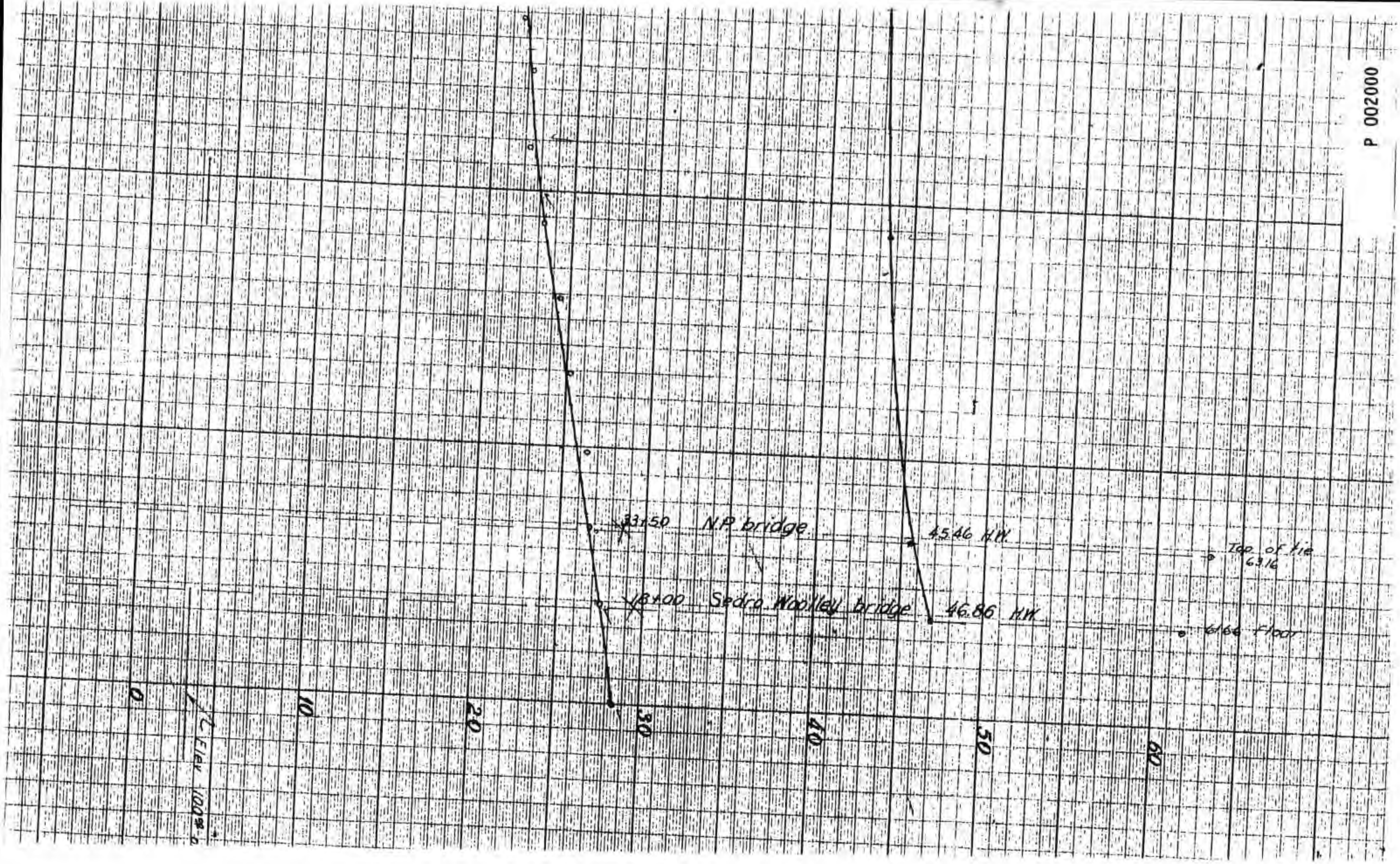
HORIZ. SCALE: 1" = 2000'
VERT SCALE: 1" = 6'

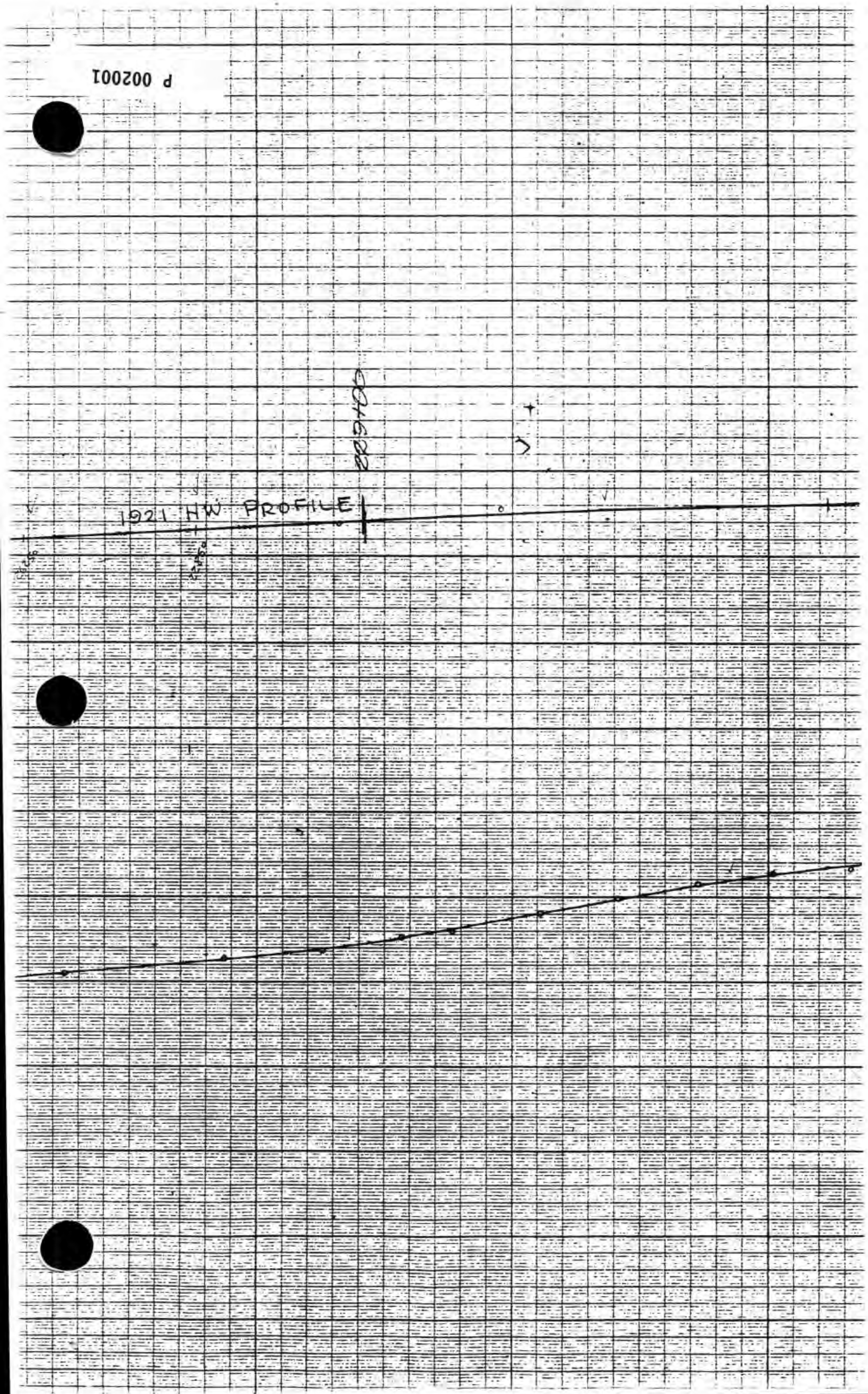
OFFICE OF DIST. ENG'R

SEATTLE WN. SEPT 22 1922

TRACED BY DLC
9-10-40

100 on G.N. Ry data = 336 U.S.G.S. data.


33+50
N.P. bridge
45.46 H.W.
Top of tie
63.16
18+00
Sedro Woolley bridge
46.86 H.W.
61.66 Floor
0
10
20
30
40
50
60
℄ Elev 100

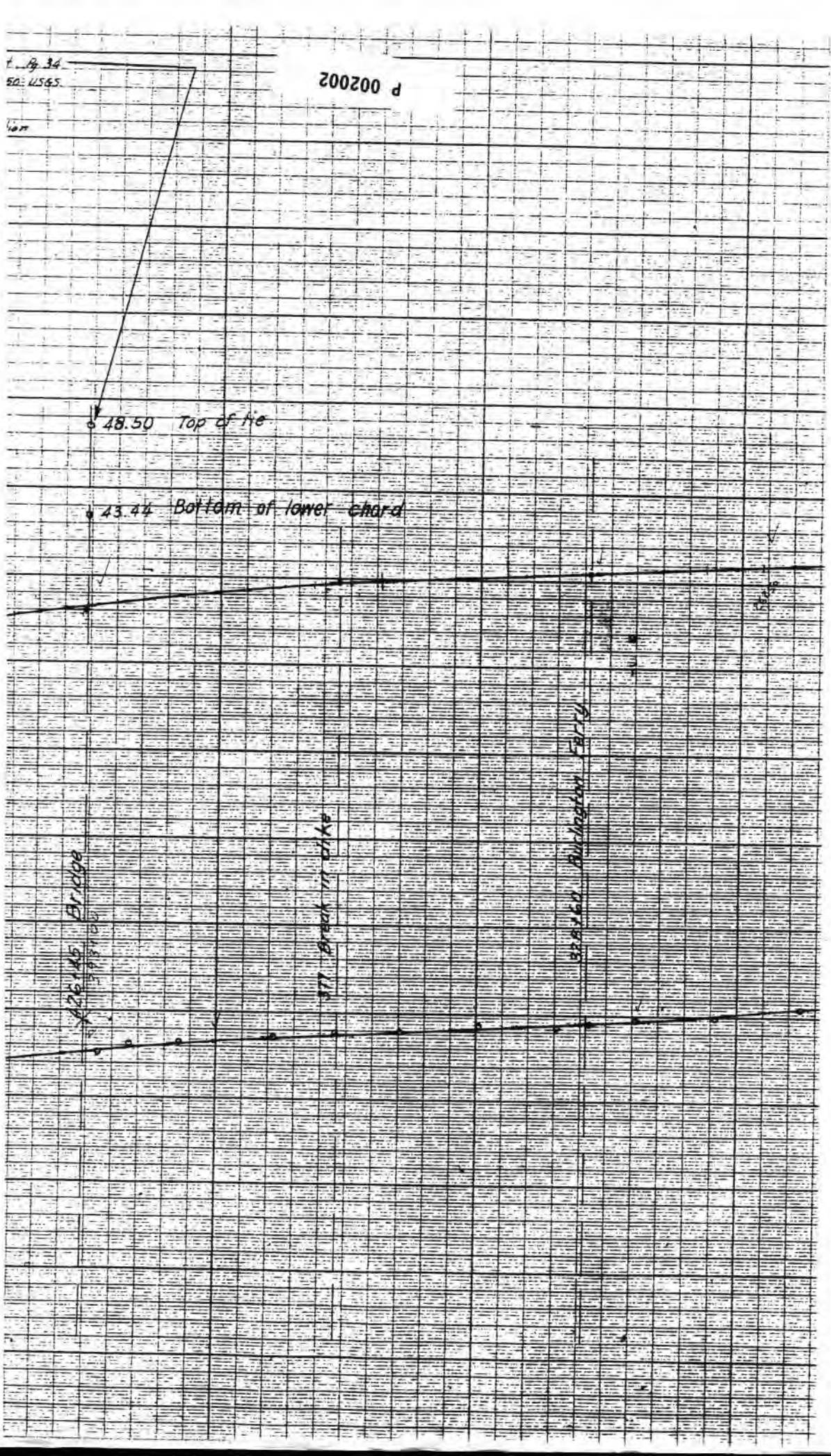


t. Pg 34
50: USGS
lem

P 002002

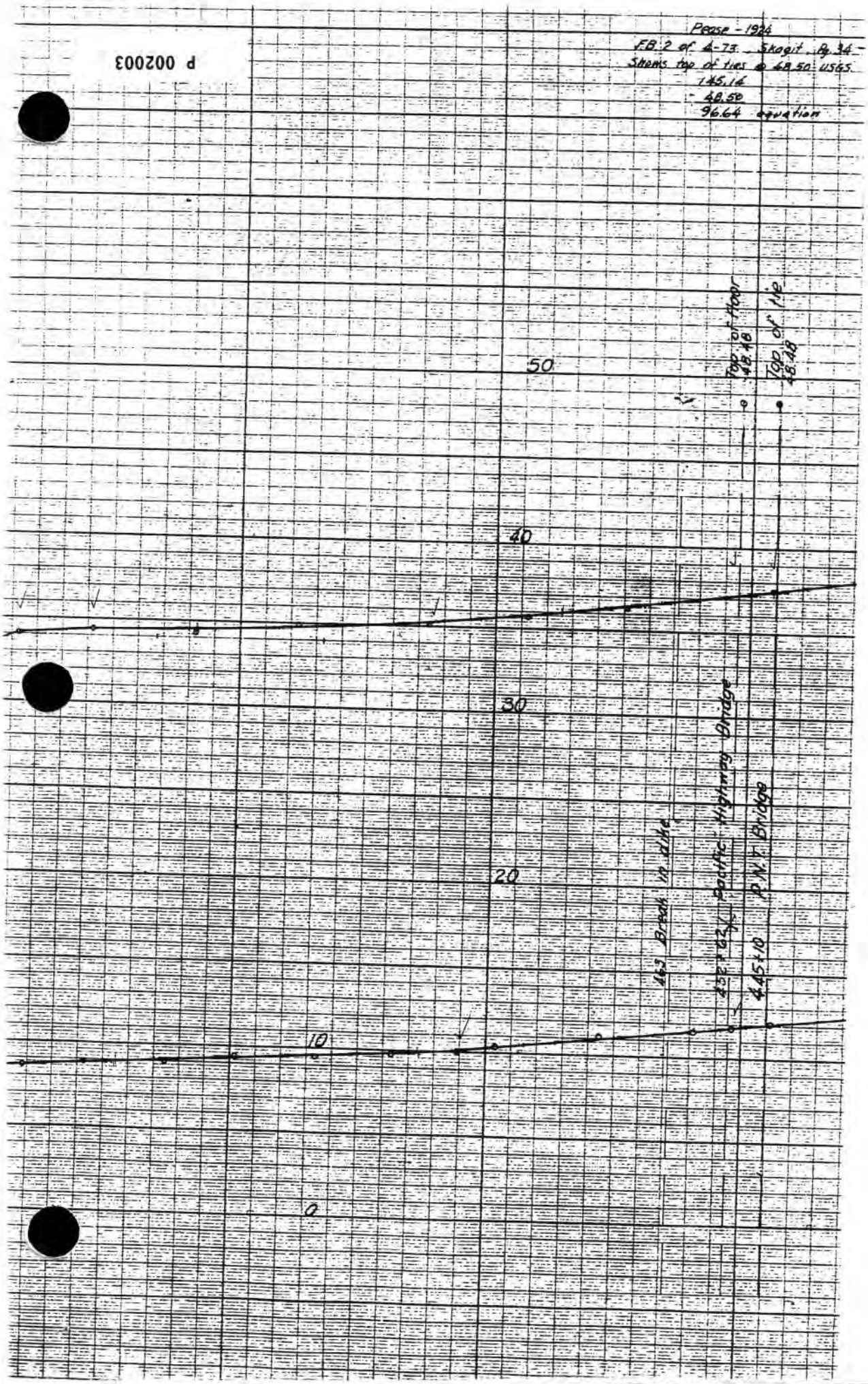
48.50 Top of tie

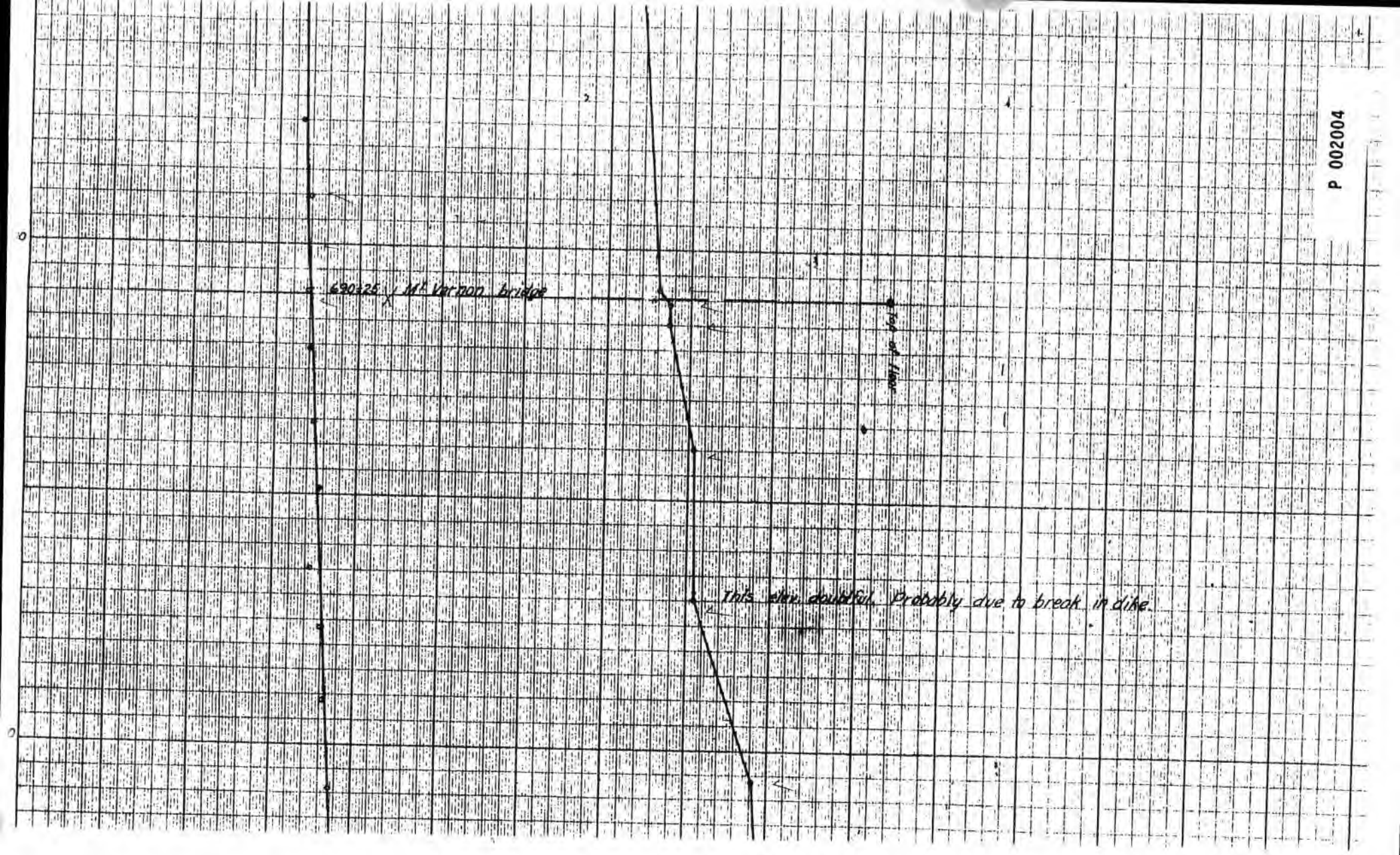
43.44 Bottom of lower chord



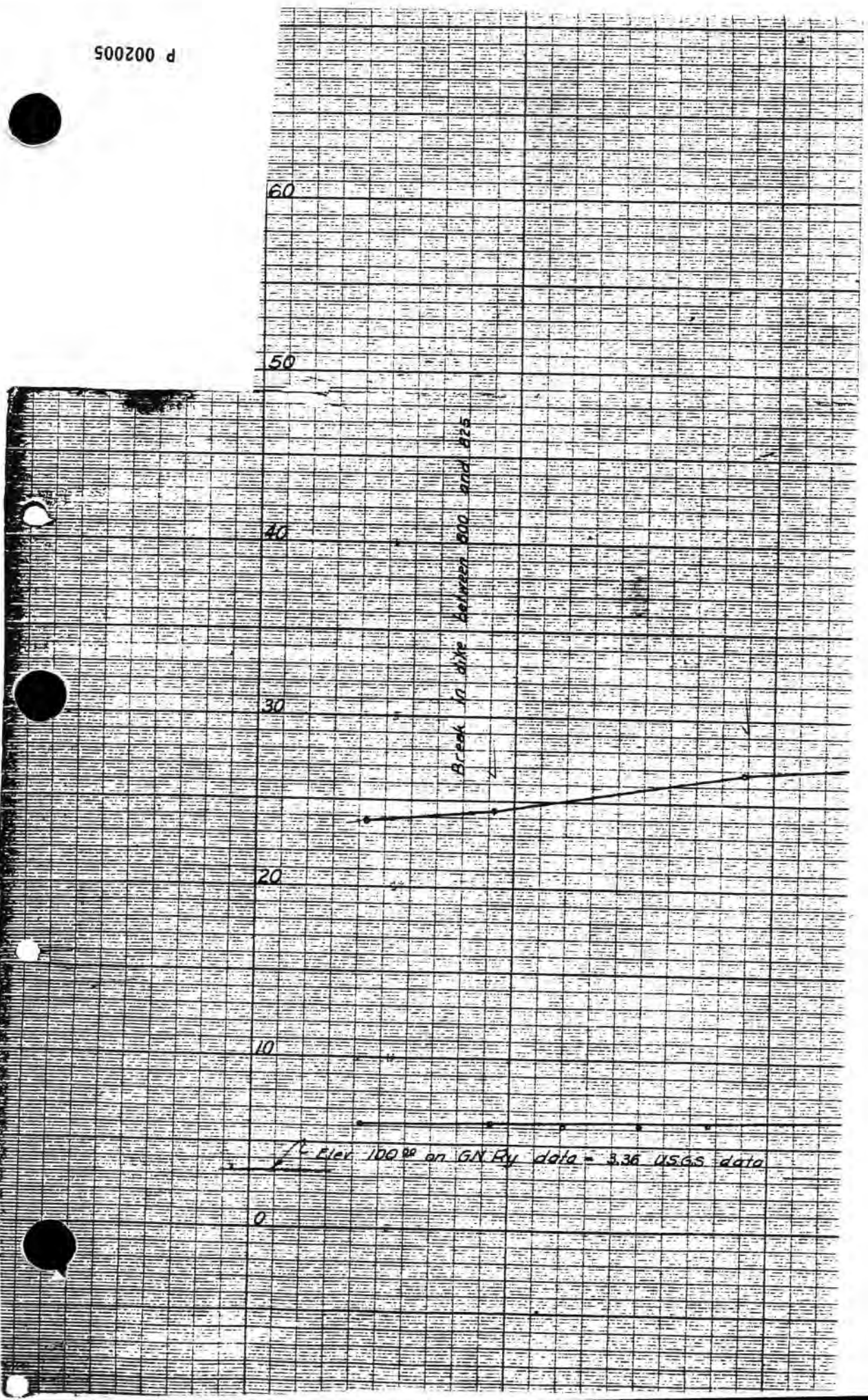
P 002003

Pease - 1924
FB 2 of 4-73 - Skagit - Pg 34 -
Shows top of ties @ 48.50 USGS
145.14
- 48.50
96.64 equation




P 002004
630±25 Mt. Vernon bridge
Top of floor
This elev. doubtful. Probably due to break in dike.

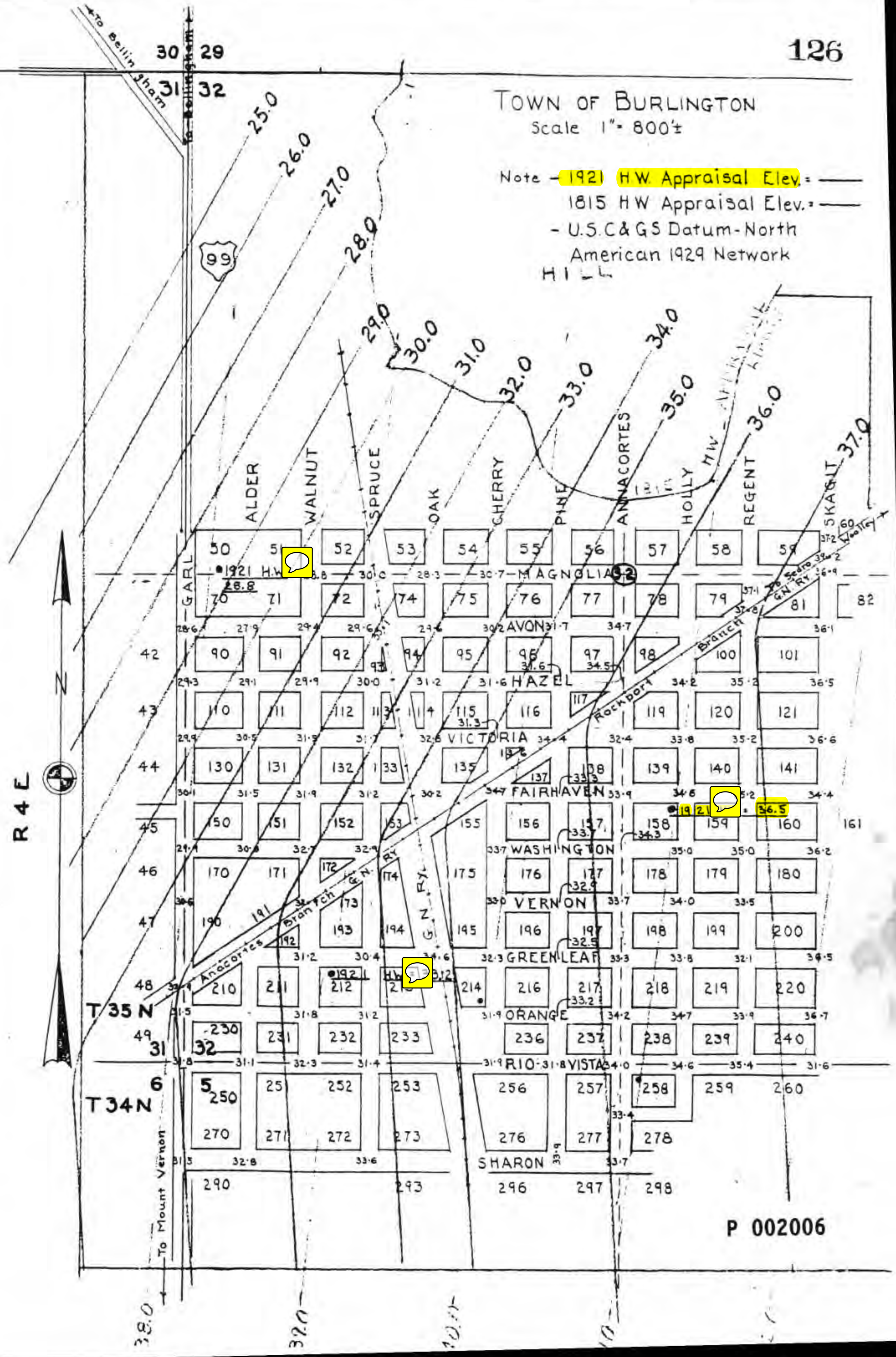
P 002005


60
50
40
30
20
10
0
Break in dike between 800 and 825
Elev 100 ft on GN Ry data - 3.36 USGS data

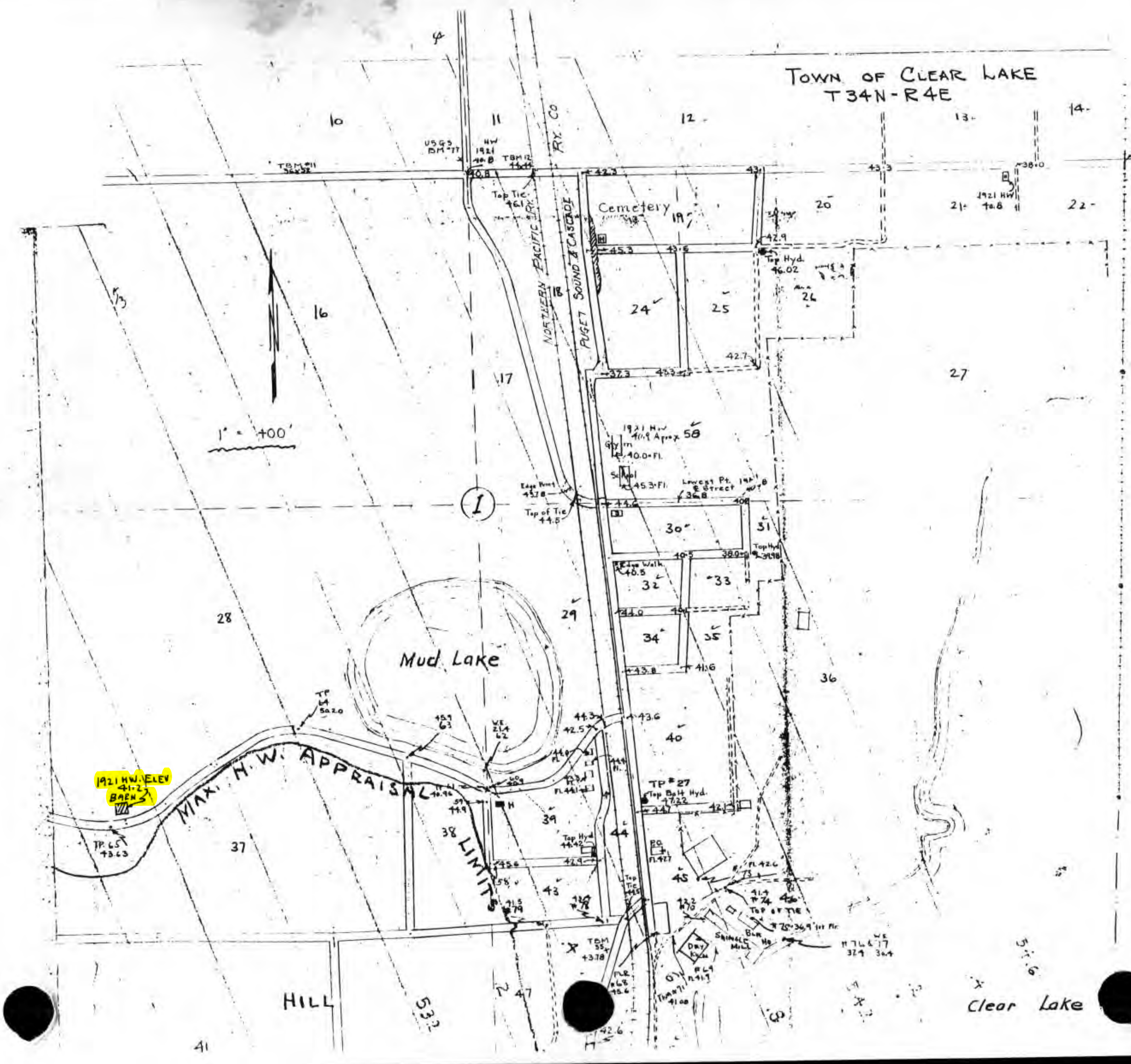
TOWN OF BURLINGTON

Scale 1" = 800'±

Note – 1921 H.W. Appraisal Elev. = ——
1815 H.W. Appraisal Elev. = ——
– U.S.C.&G.S. Datum – North American 1929 Network



P 002006


TOWN OF CLEAR LAKE
T34N-R4E
Cemetery
NORTHERN PACIFIC RR.
PUGET SOUND & CASCADE RY. CO
1" = 400'
Mud Lake
MAX. H.W. APPRAISAL LIMIT
1921 HW. ELEV 41.2
BARN
HILL
Clear Lake
Top Hyd. 46.02
TP #27
School
Lowest Pt. E Street 36.8
Top of Tie 44.5
TP. 65 43.63