MEMORANDUM

To: Sinker Creek Water District #57D
From: J. Westra
D. Nelson, Western Region
Date: 3/2/01

RE: Nahas Reservoir--Re-establishment of full storage level.
Reference: 4/14/92 Survey Report by Cindy Hodges.

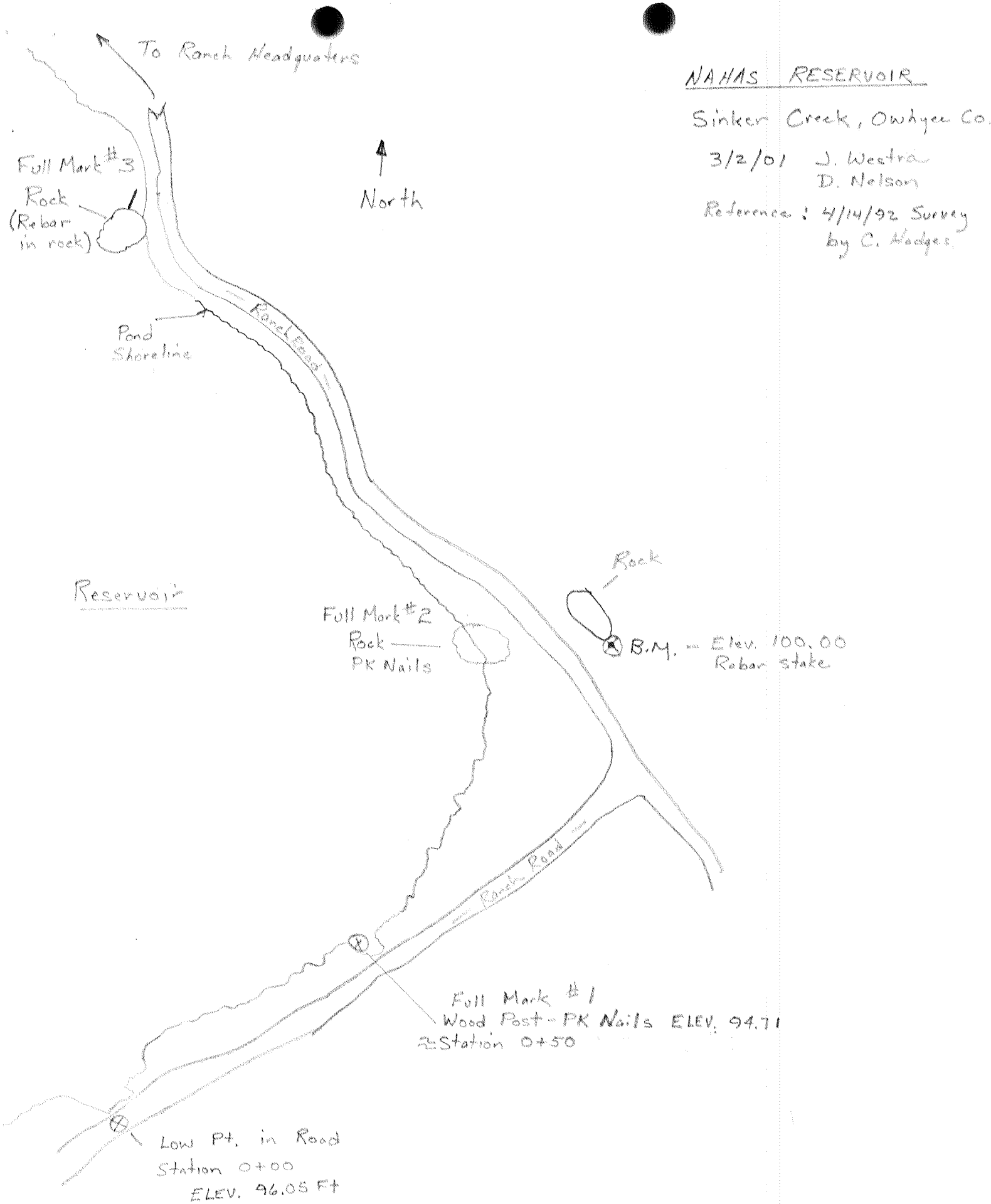
On 3/2/01 Dan Nelson and I met Craig Baker at the Nahas Ranch to re-establish the full level at the reservoir, and determine the amount of storage needed to fill the reservoir this spring. The stake that had been previously utilized for the full mark was gone.

The BM rebar stake (by large rock SW corner of reservoir) established by the 1992 survey was located. The previous survey established reservoir elev. 94.09 ft as the full mark. When surveyed in, this elevation did not correspond to high watermarkings on the reservoir shoreline or low shoreline area elevation at the road (station 0+00, southwest side of reservoir). The present elevation of the low area in the road is 96.05 ft. The elevation discrepancy can be due to a number of things, such as the BM being disturbed, road grading/raising, etc. After a discussion, it was agreed the full reservoir level would be the low shoreline area at the road 96.05 ft less 1.34 ft for wave height (see 1992 report).

The following were established:

Bench mark (Top of rebar stake)	Elev.	100.00 ft.	
* Full Reservoir Mark	Elev.	94.71 ft.	
Present Reservoir Level	Elev.	95.51 ft.	(1.2 ft to full)

*Full Reservoir Mark Locations:
#1 wood fence post in reservoir southwest shore—2 PK stainless nails in post (station 0+50 ft)
#2 Large rock along shoreline across road from BM—2 PK stainless nails in rock
#3 Large rock along east shoreline/road—rebar driven horizontally in rock (north of BM approx. 900 ft on road curve)


To Ranch Headquarters
NAHAS RESERVOIR
Sinker Creek, Owhyee Co.
3/2/01 J. Westra
D. Nelson
Reference: 4/14/92 Survey by C. Hodges
Full Mark #3
Rock
(Rebar in rock)
North
Pond Shoreline
Ranch Road
Reservoir
Rock
Full Mark #2
Rock
PK Nails
B.M. - Elev. 100.00
Rebar stake
Ranch Road
Full Mark #1
Wood Post - PK Nails ELEV. 94.71
Station 0+50
Low Pt. in Road
Station 0+00
ELEV. 96.05 Ft

RESULTS OF NAHAS LAKE SURVEY

Survey by: Cindy Hodges and John Westra, 4/14/92

Report by: Cindy Hodges, 4/28/92

OBJECTIVES:

1. Determine the lowest spot in the lake road, which would limit the actual capacity of the lake.

2. Establish a permanent benchmark which may be used to gauge future lake levels.

3. Assess freeboard requirements of the lake.

4. Calculate the drawdown which has occurred since pumping began.

5. Measure the current elevation of the lake and calculate capacity elevation, pre- and the post-fill elevations relative to the benchmark measure. Refine calculations for acre-feet needed to fill, based on pre-fill elevation and required freeboard.

CONCLUSIONS:

1. Testimony by R.T. Nahas during the decree trial states that the low spot in the lake road is the historical fill level of Nahas Lake. John Richard showed me a rebar pin in the bank just below the road at that presumed low spot. Survey of the road relative to the established benchmark shows that a point in the road at the SE end of the lake, near the fence, is a actually a fraction of an inch lower than the road by the rebar stake. For continuity, all road measurements were taken in the wheel track closest to the lake.

2. A permanent benchmark was established by driving a rebar stake next to a lone vertical rock near the SE end of the lake. The rock is situated immediately across the road from the lake. The benchmark siting was taken off the top of the stake.

3. Freeboard requirements were assessed by using the wave height formula found in the dam safety rules and regulations (8,1,6,1):

$$H = 1.95 \ (F^{\frac{1}{2}})$$

Where:
H = Wave height, feet
F = Fetch, the distance in miles across the lake, measured perpendicular to the lowest shore elevation

Since there are two points where low shore elevations are equal, F was determined for the longer of the two distances (.18 miles and .47 miles).

$H = 1.95\ (.47)^{\frac{1}{2}}$
$= \underline{1.34 \text{ feet}}$

In fact, on the day of the survey, prevailing winds were from a north/northwesterly direction, approximately 20-25 mph, and were blowing along the length of the lake (.47 miles) perpendicular to the low shore elevation at the SE end of the lake.

4. Volume of water removed from Nahas Lake as of 4/14/92:

a. On 3/30/92, pump was on for 4 hours to pressurize lines while awaiting repair of Snake River pump.

227 nozzles @ 4 gpm = 908 gpm = 2.02 cfs
2.02 cfs X 1.9835 = 4 AF/day X 1 day/24 hrs X 4 hrs = .7 AF

b. Pump turned on for the season Monday, 4/6/92.

227 nozzles @ 4gpm = 908 gpm = 2.02 cfs
1 rainbird gun, est. 20 gpm = .05 cfs
2.07 cfs X 1.9835 X 9 days = **37 AF**

TOTAL:

37 + .7 = 37.7 AF = **.7 FT Drawdown** (8.4")
53 AC
(average surface area over depth)

5. If benchmark siting is assumed to be 100, the following calculations can be made from all assembled data:

Low shore elevation	95.43
Water level elevation, day of survey	92.93 Measure
Pre-fill lake elevation (see pg.3)	90.86
Capacity lake elevation (shore less freeboard)	94.09 - Full Est.
Post-fill lake elevation (current plus drawdown)	93.63
Total fill, feet	2.77
Total fill, AF	146.81
Short of capacity, feet	0.46
Short of capacity, AF	24.38

Acre-feet required to fill:

On 2/10/92, water level was 2.07' below base of stake. On 4/14/92, base of stake was measured at 2.5' below low shore elevation. Thus, pre-fill water level was 4.57' below low shore elevation, or 90.86' relative to benchmark. Subtracting for required freeboard:

	4.57	
-	1.34	
	3.23	feet to fill
X	53	Acres (average surface area over depth)
	171	AF to fill

8,1,5,3. Perforated drain pipes must have a minimum of six inches of drain material around the pipe. The maximum particle size shall not exceed 1/2 inch unless the layer thickness is increased at the rate of one inch per foot of filter. Underdrains and collection pipes must be constructed of noncorrosive material.

8,1,6. Freeboard
The elevation of the top of the embankment shall be constructed and maintained above the flood surcharge level to prevent the dam from overtopping during passage of the inflow design flood and to provide freeboard for wind generated waves. Camber shall be included in the design and incorporated in the construction of the top of the embankment, unless waived by the Director. Camber may be estimated by multiplying the structural height of the dam by 5 percent.

8,1,6,1. The height of wind generated waves (H) moving across a surcharged reservoir can be estimated by the following equation:

$H = 1.95 (F^{1/2})$ where F = fetch, the distance in miles across the reservoir, measured perpendicular to the major axis of the dam.

8,1,6,2. For large, high risk dams the minimum freeboard shall be 2 feet plus wave height during passage of the one percent flood or equal to the surcharge elevation of the reservoir during passage of the inflow design flood whichever is greater.

8,1,6,3. Estimation of the height of the wind generated wave using the empirical equation in Rule 8,1,6,1. shall not preclude a more conservative design including consideration of fill materials, embankment zoning, slope surface protection, drainage or other safety factors.

DATE: 4/14/92 Location: NAHAS RESERVOIR
Owyhee Co.

C. Hodges
J. Westra

STA.	B.S.	H.I.	F.S.	ELEV
#1 B		101.93	8.82	[illegible].11
#1 A		101.93	6.45	95.48
T.P.2	5.23	101.93	5.36	96.70
#2		102.06	5.82	96.24
T.P.1	5.13	102.06	6.20	96.93
BM1	3.13	103.13		100.00
#3 - 00+00		103.13	7.70	95.43
#3 - 00+50		103.13	7.59	95.54
#3 - 1+00		103.13	7.12	96.01
#3 - 1+50		103.13	7.23	95.90
WATER LEVEL		103.13	10.2	92.93

No

DATE: 4/14/92

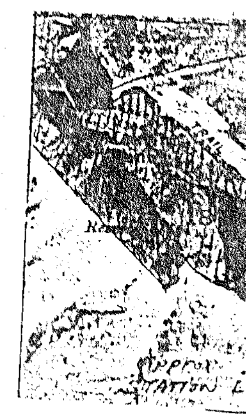
Station
#1B Rebar stake top,
low point in the

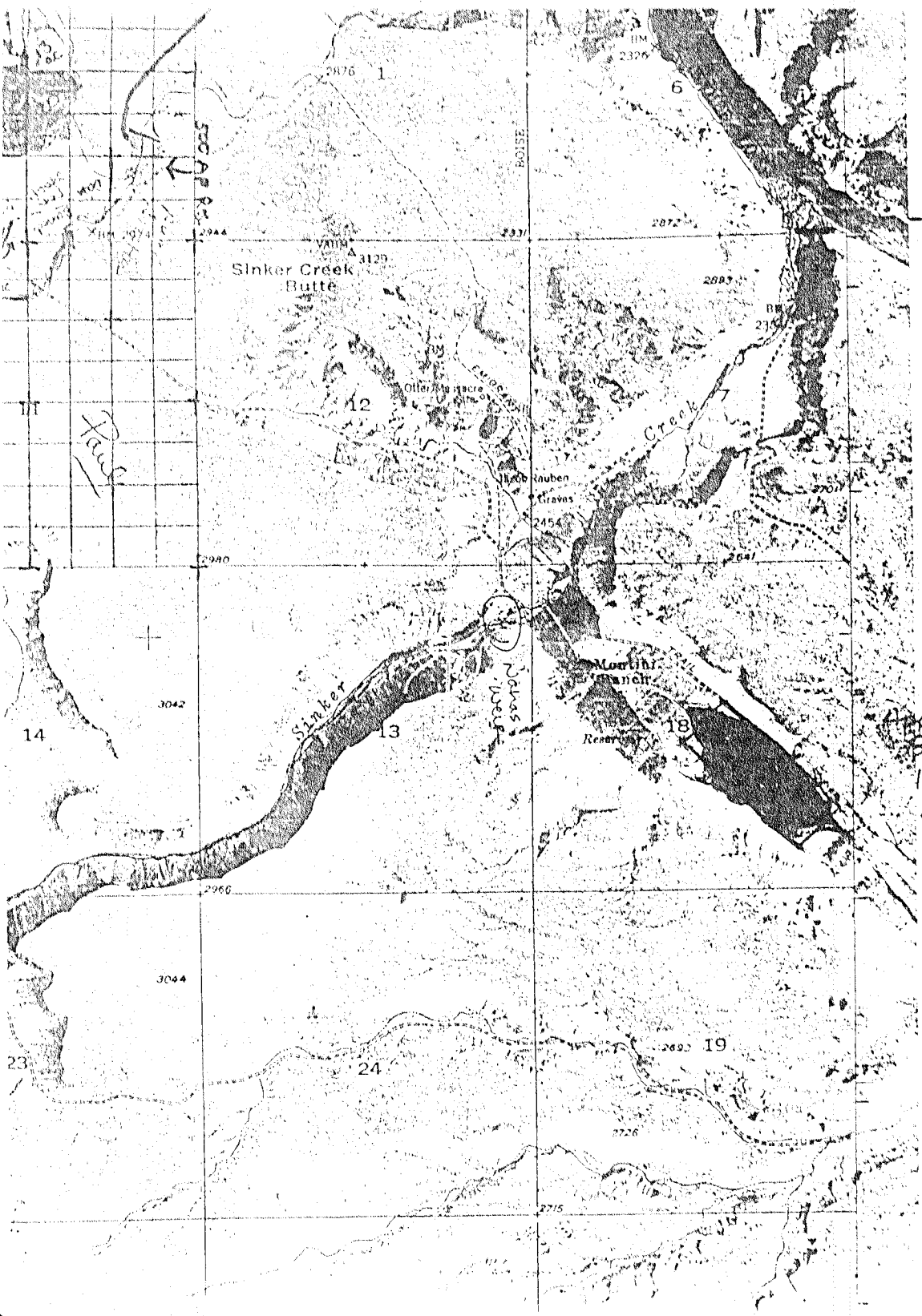
#1A Road wheel track

#2 Low area in the
just after last road

BM Rebar stake (TOP) near
SE corner of re
the reservoir.

#3 Low point on th
of reservoir; s





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Approx road
fighting
locations
4/14/92

ACRES

ACRES

ion: NAHAS RESERVOIR C Hodges
Owyhee Co. J. Westra

S.	HI	F.S.	ELEV
	101.93	8.82	93.11
	101.93	6.45	95.48
	101.93	5.36	96.70
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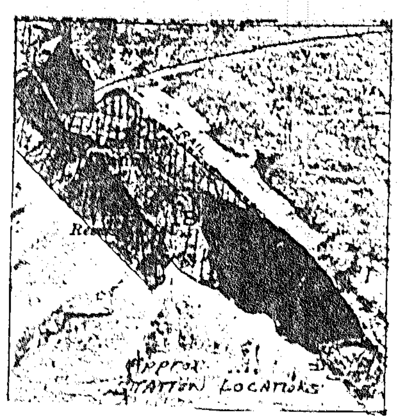
3	103.13		100.00
	103.13	7.70	95.93
	103.13	7.59	95.54
	103.13	7.12	96.01
	105.13	7.23	95.90
	103.13	10.2	92.93

NOTES

DATE: 4/14/92 NAHAS RESERVOIR

WEATHER: Clear - 60's windy

Station	
#1B	Rebar stake top, Located at the Res. edge low point in the road NE side of Res.
#1A	Road wheel track adjacent rebar stake.
#2	Low area in the road NE side of Res. just after last road bend heading South.
BM	Rebar stake (TOP) near lone large vertical rock SE corner of res. across the road opposite the reservoir.
#3	Low point on the road, south west end of reservoir; stations head easterly.



STATION DIAGRAM
NAHAS LAKE
4/14/92

C. Hodges
J. Westra