Subject: Kajakai Dam Survey Report
Date: 3-12-05 to 3-14-05
Surveyors: Jerry Holtz and William Matias
Project Manager: Al Bruns

Scope of Work:
1. Survey the crest of the dam including the edges and centerline. Determine crest elevations along the dam.
2. Survey the centerline and toe of walls in the emergency spillway.
3. Survey the service outlet works. Take shots on major concrete and pictures of the condition. Determine service gate structure elevations.
4. Determine the water surface elevation during the survey.
5. Set a reference benchmark on the bridge downstream of the powerhouse to be used for stage readings of the river.
6. Recover the benchmark on the tower and use it's elevation as a basis for the survey.

Basis of Survey:

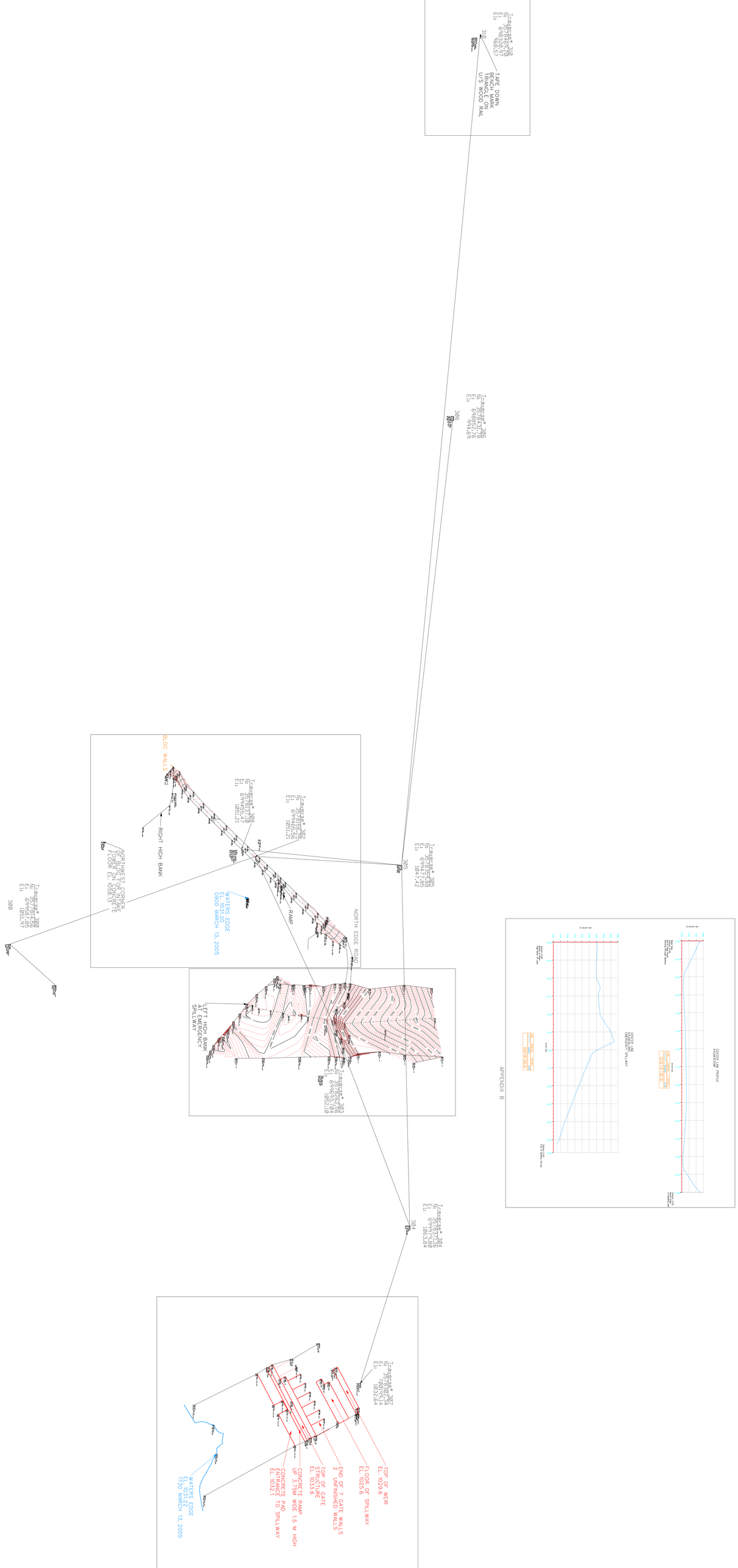
Horizontal Control WGS84 GPS coordinates UTM 41N Units Meters
The horizontal controls for the survey were established by GPS method using a handheld Trimble GeoXT Explorer. The accuracy for this equipment is +/- 2 meters with occasional accuracies less than 1 meter when satelite configurations are ideal. For the purposes of this survey the accuracy horizontally was less critical than determining vertical elevations of particular features of the reservoir. Several GPS shots were taken two seperate days on three control points, (CP) Ledge, Temporary Point (TP) 1 and CP Dam. (CP's named by Surveyors). Electronic Distance Measurements (EDM) shots were taken between the points and best fit methods were used to determine the tightest control network possible. Coordinates for these control points were adjusted and should be accurate to +/- 2 feet. This is more than adequate for the scale of the mapping available as base reference for the survey. Control points are referenced in this report to the nearest centimeter. This is not adequate for construction surveying. This survey is not intended to establish survey quality control for the use of future survey work. Contractors should re-survey and establish a horizontal and vertical network from more accurate methods, EX. survey grade GPS equipment and GPS static collection methods with differential corrections.

Vertical Control Based on 1955 survey by L.J. Snell for USGS Gaging Station Kajakai. The USGS gaging report references mean sea level elevations established by Morrison-Knudsen-Afghanistan, INC 1953.
Referenced benchmark on irrigation intake tower is a painted X on the curb of the upstream side of concrete gate control tower and the elevation recorded 1050.15 meters. This elevation was used to transfer elevations to the horizontal control for the purposes of the scope and is the basis of all elevations in the survey.

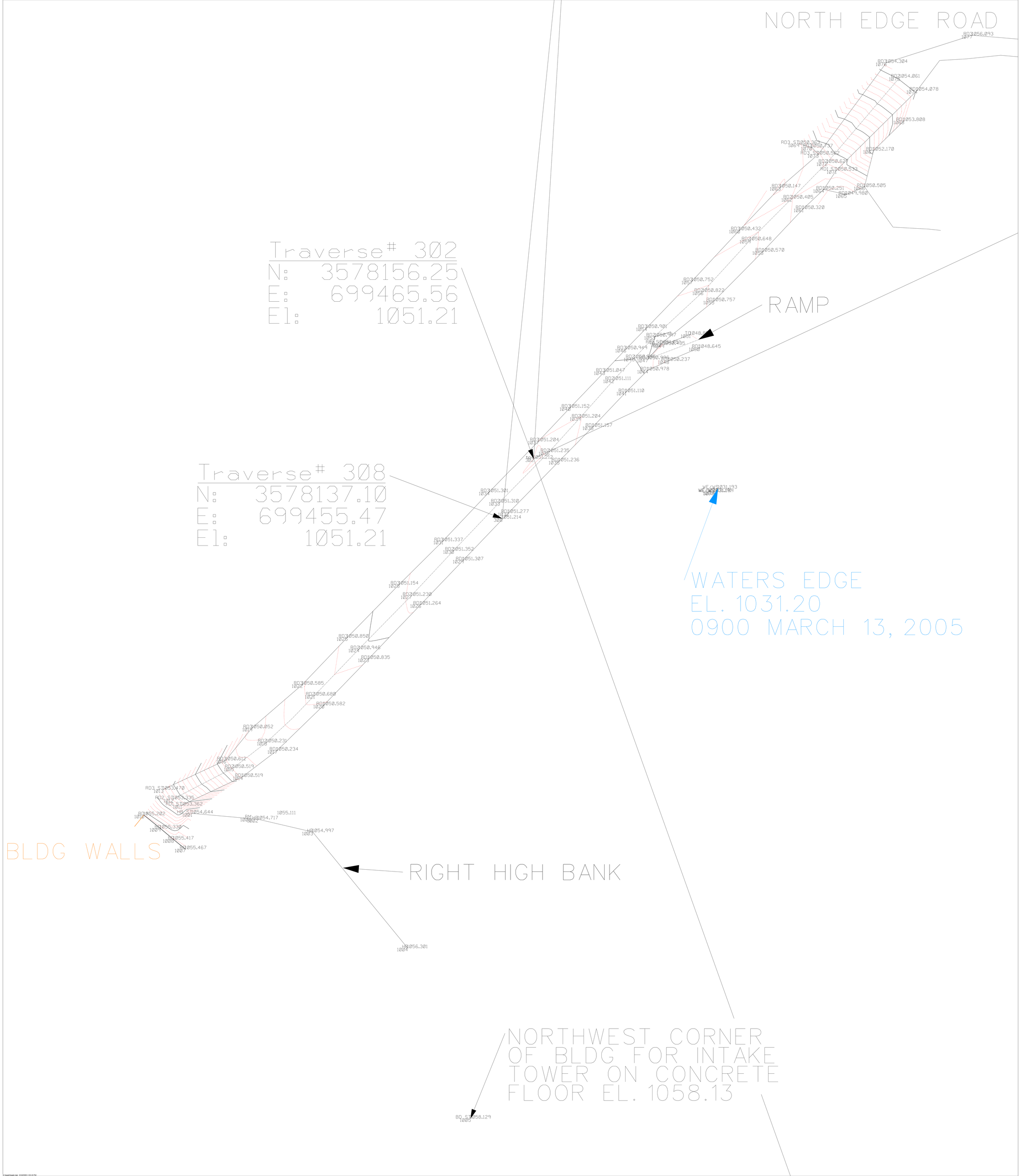
Instrumentation: Trimble GeoXT Explorer Handheld GPS, Sokkia Set 3 Total Station, and a single prism with prism pole were used to determine horizontal and vertical control. NO DIFFERENTIAL LEVELING WAS PERFORMED.

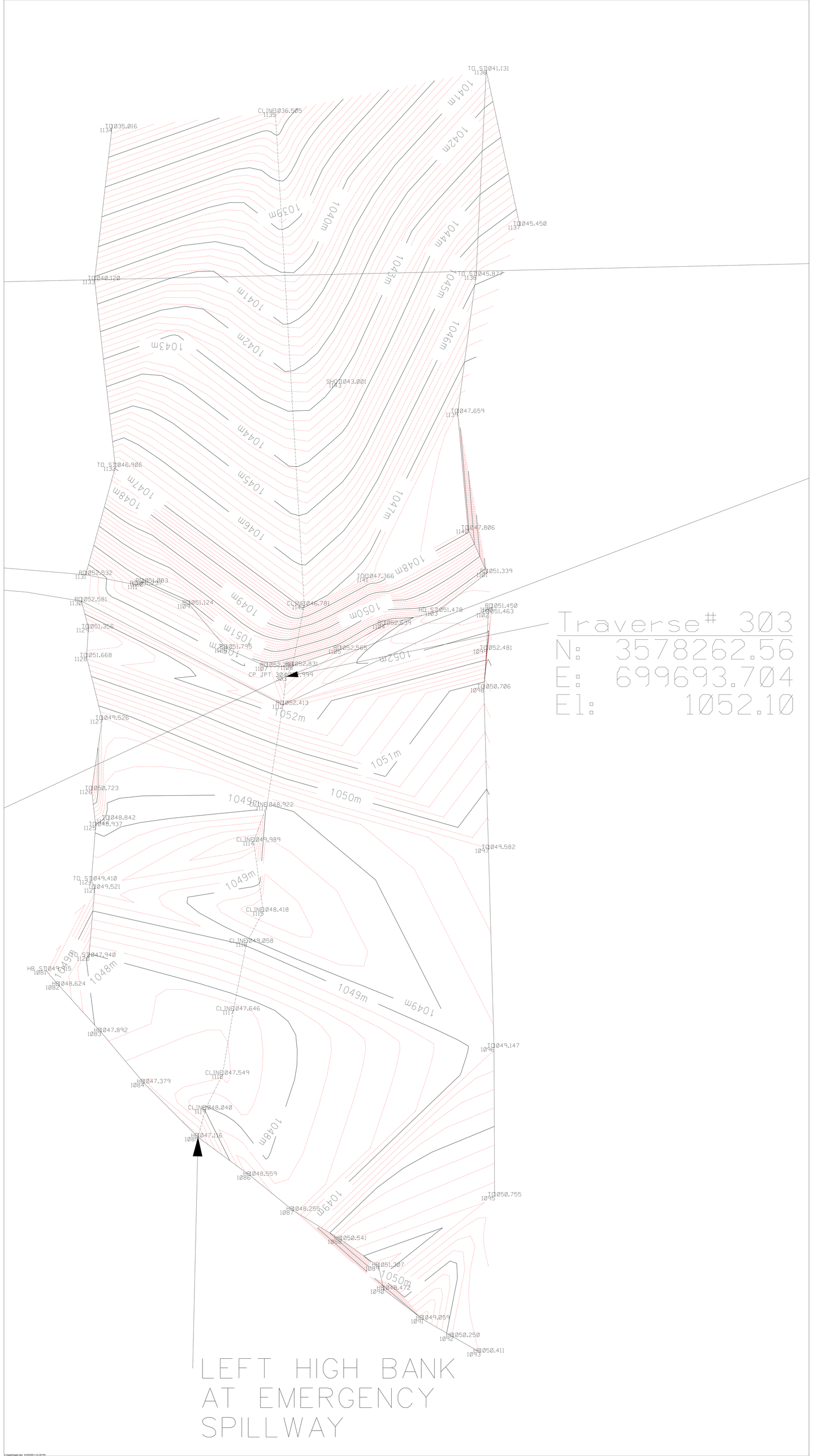
Closures: A traverse was run from TP-1 through TP-4 and tied back.
Horizontal closure was within 2 cm. Vertical closure was 9 cms.
This was acceptable for the purposes of the scope and the time constraints to perform the work. If vertical accuracies of 3rd order or better are required in the future than a mean sea level reference benchmark accurate to millimeters is required and differential levels must be run.

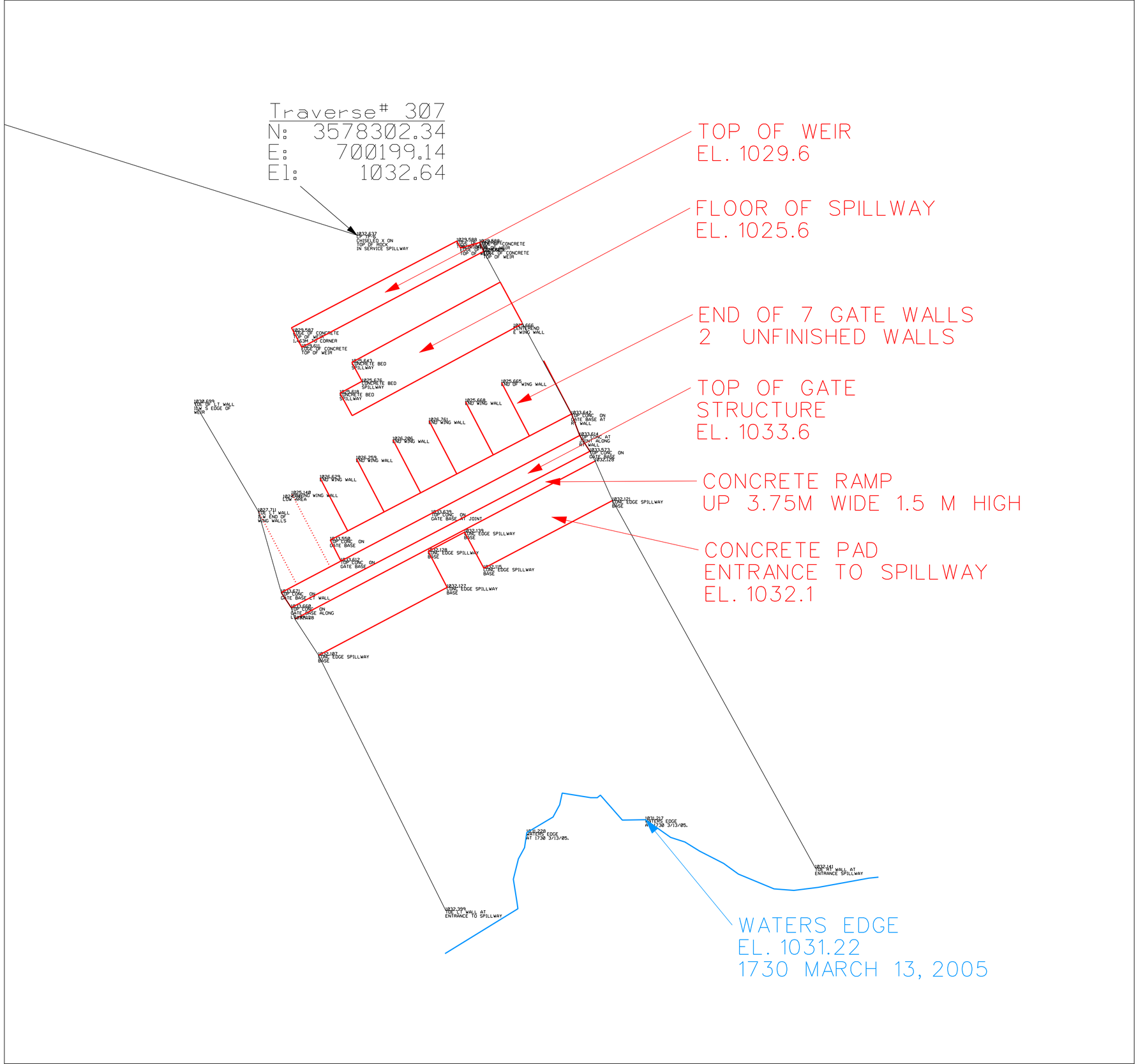
Survey Summary:
1. Made an initial site recon and recovered survey control.
2. Established UTM 41N coordinates on CP LEDGE (rebar in concrete near catwalk of irrigation intake tower) and CP Dam (rebar in concrete u/s side of Dam).
2. Used benchmark Tower as a backsight for Total Station setup on CP Ledge and set TP-1 on Dam.
3. Performed topographic survey of top of Dam, including reference features such as high banks, bldg walls, and a shot on NW corner of Intake Tower bldg.
Elevation on concrete floor at Intake Building wall 1058.1. Elevations for top of dam range from 1050.2 to 1050.8.
4. Set TP 2 to the middle of the emergency spillway on a rock on the east-west road. From TP-2 performed topographic survey of the emergency spillway.
Specific shots at right high bank of lake at Emergency Spillway entrance.
Elevations range at high bank between 1047.5-1049 meters.
Elevations of E-W road in the back of the spillway ranged in elevation from 1051.5 to 1052.5. Surveyed north of road in spillway to a low point of Elev. 1035.
5. Set TP 3 and TP 6 for survey of Service Spillway. From TP-6 surveyed limited shots on the gate structures, spillway floor, entrance concrete to spillway and water surface. Water surface elevation 1031.2 at 1730 13-Mar-05. Water running into the sinkhole. Lake is rising.
6. Set TP 4. Shot Benchmark on the u/s wooden rail of bridge entering the village downstream of the outlet works. Elevation of Triangle on rail 968.57m
7. The survey on all parts of the scope were completed the evening of the 13th March 2005. Quality check of the data was performed on the 14th.


Traverse# 310
N: 3578239.49
E: 694197.43
El: 968.57
310
TAPE DOWN
BENCHMARK
TRIANGLE ON
U/S WOOD RAIL
Traverse# 306
N: 3578231.37
E: 694234.29
El:
306
Traverse# 305
N: 3578235.88
E: 694172.72
El: 1047.72
305
Traverse# 302
N: 3578152.26
E: 694651.56
El: 1031.27
Traverse# 300
N: 3578137.18
E: 694651.47
El: 1031.27
BLDG WALLS
RIGHT HIGH BANK
RAMP
WATERS EDGE
EL 1031.20
0900 MARCH 13, 2005
NORTHWEST CORNER
OF BLDG W/ CONCRETE
FLOOR ELL 1028.57
NORTH EDGE ROAD
Traverse# 303
N: 3578237.04
E: 694637.04
El: 1052.10
LEFT HIGH BANK
AT EMERGENCY
SPILLWAY
Traverse# 304
N: 3578237.16
E: 694637.84
El: 1023.84
304
Traverse# 307
N: 3578237.34
E: 694637.84
El: 1023.84
307
TOP OF WEIR
EL. 1029.6
FLOOR OF SPILLWAY
EL. 1025.6
END OF 7 GATE WALLS
2 UNFINISHED WALLS
TOP OF GATE
STRUCTURE
EL. 1033.6
CONCRETE RAMP
UP 3.75M WIDE 1.5 M HIGH
CONCRETE PAD
ENTRANCE TO SPILLWAY
EL. 1032.1
WATERS EDGE
EL. 1031.5
1730 MARCH 13, 2005
Traverse# 308
N: 3578208.18
E: 694608.95
El: 1028.57
320

APPENDIX B
Elevation
COUNTER LINE
EMERGENCY SPILLWAY
Elevation


NORTH EDGE ROAD
Traverse# 302
N: 3578156.25
E: 699465.56
El: 1051.21
RAMP
Traverse# 308
N: 3578137.10
E: 699455.47
El: 1051.21
WATERS EDGE
EL. 1031.20
0900 MARCH 13, 2005
BLDG WALLS
RIGHT HIGH BANK
NORTHWEST CORNER
OF BLDG FOR INTAKE
TOWER ON CONCRETE
FLOOR EL. 1058.13


Traverse# 303
N: 3578262.56
E: 699693.704
El: 1052.10
LEFT HIGH BANK
AT EMERGENCY
SPILLWAY


Traverse# 307
N: 3578302.34
E: 700199.14
El: 1032.64
TOP OF WEIR
EL. 1029.6
FLOOR OF SPILLWAY
EL. 1025.6
END OF 7 GATE WALLS
2 UNFINISHED WALLS
TOP OF GATE
STRUCTURE
EL. 1033.6
CONCRETE RAMP
UP 3.75M WIDE 1.5 M HIGH
CONCRETE PAD
ENTRANCE TO SPILLWAY
EL. 1032.1
WATERS EDGE
EL. 1031.22
1730 MARCH 13, 2005

Traverse# 310

N: 3578469.20

E: 698320.97

El: 968.57

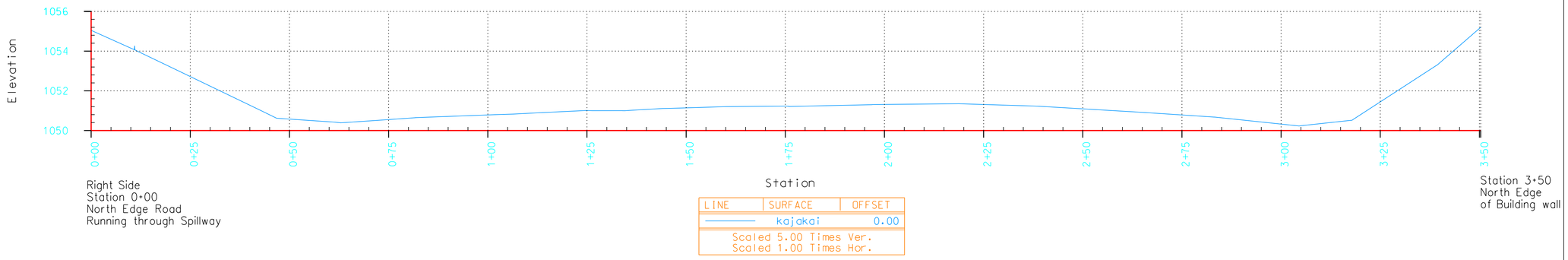
310

968.584

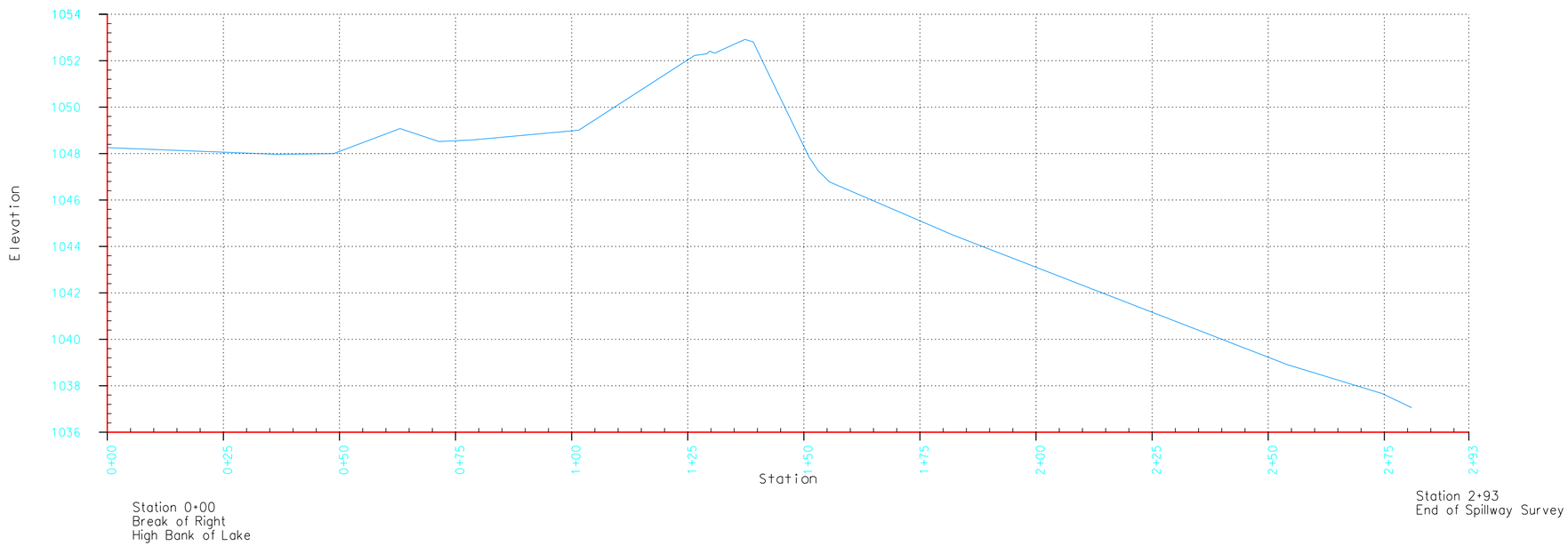
BRIDGE BM
BENCH ON WOODEN
U/S RAIL OF BRIDGE
PER AL BRUNS
POOR REFERENCE
TEMPORARY AND MOVING

TAPE DOWN
BENCH MARK
TRIANGLE ON
U/S WOOD RAIL

CENTER LINE PROFILE
KAJAKAI DAM



CENTER LINE
KAJAKAI LAKE
EMERGENCY SPILLWAY



9-197
(May 1949)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

File No. Washington
Field

Description Prepared 3-28-55
by: L. J. Snell

Description of Gaging Station on Kajakai Reservoir
~~near~~ Afghanistan
near Kajakai

Prepare description in accordance with outline on back of Form 9-277. Plot cross section to scale. Use Form 9-213A for sketch and cross section. Initial and date all sheets.

Location. Water-stage recorder, lat. 32°19' N, long. 65°07'E, at gate control tower near left end of Kajakai dam, about 3 kilometers upstream from village of Kajakai, about 40 kilometers upstream from mouth of MusaQala River, about 75 kilometers northeast of Girishk, and about 125 kilometers upstream from Arghandab River.

Establishment. Established Jan. 31, 1953 by Morrison-Knudsen-Afghanistan, Inc.

Drainage Area.- 15,400 square miles (from MKA data based on Survey of India maps).

Records Available. Jan. 28, 1953 to

Gage. Stevens Type A-35 water-stage recorder in metal box shelter over 20-inch steel pipe well on gate control tower. Bottom of well is at elevation 1006.32 meters (minimum elevation of recorder operation); water enters well through holes near bottom of well. Recording gage is referred to reference point on steel plate recorder shelf at elevation 1050.34 meters. A seperate tape gage mounted on recorder shelf affords direct reading of reservoir elevation. Elevations are to mean sea level (from MKA surveys based on Survey of India datum).

History. Since Mar. 23, 1953, records are from gage described under "Gage" above. Prior to Mar. 23, 1953, records are from levels to water surface.

Bench Marks. B.M. #1 is painted X on curb of upstream side of concrete gate control tower on which gage is mounted. Elevation is 1050.15 meters above mean sea level (from MKA surveys).

Regulation and Diversion. Reservoir is formed by earth-fill dam; storage began Jan. 28, 1953; dam completed November 1953. Capacity, 1,495,000 acre-feet below elevation 1033.5 meters (crest of ungated spillway); elevation of top of dam is 1050.0 meters. No dead storage; center-line of irrigation conduit inlet is at elevation 965.0 meters; elevation of stream-bed at about 962 meters. Ungated spillway is 100 meters in length in rock cut, with low concrete weir constructed to accommodate spillway gates at a future date; capacity with future gated spillway at elevation 1045.0 meters is 2,300,000 acre-feet. Records represent total contents.
Reservoir releases are through three hollow jet valves; three 34-inch roto-valves and two vertical-lift gates complete the control apparatus.

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Maximum valve release at full reservoir elevation of 1045.0 meters is 8400 cfs; spillway design capacity is 350,000 cfs.
Water is stored to supplement low water flow of Helmand River for irrigation of about 600,000 acres and a future power installation at dam of 120,000 KW.

Accuracy. Records should be excellent.

Cooperation. The Helmand Valley Authority with assistance from the U. S. Geological Survey and Foreign Operations Administration (formerly, Technical Cooperation Administration) operates the station. Prior to May 1953 the station was operated by Morrison-Knudsen-Afghanistan, Inc.

ASIF