

FINAL REPORT

**VOLUME II OF VII
SECONDARY BENCHMARK GPS STATIC
SURVEY**

**MISSISSIPPI RIVER REINTRODUCTION
INTO MAUREPAS SWAMP PROJECT
PO-29**

Louisiana Department of Natural Resources
U.S. Environmental Protection Agency

April 6, 2005

URS Corporation
Evans-Graves Engineers, Inc.
3001, Inc.

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METHODOLOGY REPORT

PRE-PLANNING THE GPS NETWORK

An initial search of the NGS database was done in order to find the available control in the project area. These points were sorted according to their order/class, so that the highest order control could be utilized. A preliminary plan was put together to allow the field personnel to perform the monument reconnaissance, and find the most suitable control marks to use in each area. After this was complete, the monuments to be included in the control network were selected based on both the order/class of the point, and the distribution and location of the monuments.

GPS STATIC SURVEY

The GPS control network plan was designed to maximize the use of the highest order control points in the area of interest, and to optimize the spatial distribution of geodetic control across the network. This GPS network plan was approved by Louisiana Department of Natural Resources before any collection began.

Also included is the simultaneous occupation of points designed to provide redundant vectors and loop closures, as well as a collection of a superfluity of points to compare observed values against published values of geodetic control points.

In addition, the static GPS network was established to verify the compatibility and correlation of existing published NGS controls in the project area. Horizontal and vertical constraints were selected based on the order of accuracy and correlation of the controls selected.

Each monument in the GPS network was occupied a minimum of three times, for two hours. The GPS was collected using six Trimble 4000 SSE receivers, and six Compact L1/L2 antennas with ground plane.

PROCESSING AND ADJUSTMENT PROCEDURES

Preliminary Analysis

The baselines were processed using WAVE (*Weighted Ambiguity Vector Estimator*), which is a baseline-processing module in Trimble Geomatics Office. Ionosphere-free fixed solutions were found to provide the best results. Preliminary blunder detections were undertaken using “Redundant Vectors” and Global Network Closures and any extremely large errors were eliminated.

Minimally Constrained Adjustment

The data are then processed using a minimally constrained geodetic control network to test the network internally, without external constraints, and produce a statistical summary. The statistics from this process are required to be within the tolerance outlined in the Geometric

Geodetic Accuracy Standards and Specifications for using GPS Relative Positioning Techniques, published by the FGCC. These tolerances are represented as ellipsoids showing the margin of error value on a graph of the theoretical points, covariance values that indicate the degree of error of the vectors relative to the other vectors in the network, and a chi-squared test that compares the predicted variance determined through a least-squares analysis to the observed variance. The summary is evaluated to eliminate vectors that are outside of the error tolerances to be replaced with redundant vectors that are within the tolerances until all tolerances are met.

Fully Constrained Adjustment

The quality of the existing horizontal controls is assessed before undertaking the constrained adjustment. Geodetic inverses between the published NAD83 Coordinates of existing stations were compared with the geodetic inverses derived from the minimally constrained least square adjustment results. This distance analysis is especially useful, since it provides a datum invariant means of comparison.

Once the minimally constrained network satisfies the requirements of the above tests, the highest order control points in the control network are selected with an optimum spatial relationship to fully constrain the network to known control points, and have their published values entered as the position for those points and the network re-adjusted. The same statistical tests are rerun on the adjusted network, as well as visually comparing adjusted values of geodetic control points to published values of control points not used as constraints. Again, the summary is evaluated to identify vectors outside of the tolerances and constraining points reselected to obtain the best fit to the geoid where all vectors are within the prescribed tolerances.

GPS NETWORK ACCURACY RESULTS

The results from the final adjustment can be seen in the adjustment report. The adjustment results show that the a posteriori variance factor of the network was close to 1.0 as should be desired, and passed the χ^2 test. None of the residual components in the network were flagged for possible rejection under the τ -max test at the 0.05 level of significance. The relative confidence ellipses reveal that the horizontal positional accuracy between all directly connected pairs of stations in the network were better than (1:100,000) at the 95% level of confidence.



C. R. Dixon
Professional Licensed Surveyor
State of Louisiana, No. L-4474



Station Name: PO29-SM-01

Location: Monument is a steel rod with brass cap, located in the median of I-10, 0.26 miles east of LA 641 overpass.

Monument Description: NGS style floating sleeve monument, datum point set on 9/16" stainless steel sectional rods driven to 60 feet, set in sand filled 6" PVC pipe with access cover set in concrete, flush with ground.

Stamping: S1

Installation Date: 9/29/2003 **Date of Survey:** 11/26/2003

Monument Established By: 3001, Inc.

For: Louisiana Department of Natural Resources, CRD

Adjusted NAD 83 Geodetic Position

Lat. 30°07'22.66228"N

Long. 90°40'38.67010"W



Adjusted NAD 83 Datum LSZ (1702) Feet

N= 590802.774

E= 3488197.410



Adjusted NAVD88 Height

Elevation = 5.85 feet (1.78 mtrs)

Geoid99 Height = -26.66 mtrs.

Ellipsoid Height = -24.87 mtrs.



Station Name: PO29-SM-02

Location: Monument is a steel rod with brass cap, located in the median of I-10, 2.51 miles east of LA 641 overpass. It is 50 feet east of the Hope Canal.

Monument Description: NGS style floating sleeve monument, datum point set on 9/16" stainless steel sectional rods driven to 56 feet, set in sand filled 6" PVC pipe with access cover set in concrete, flush with ground.

Stamping: S2

Installation Date: 9/29/2003 **Date of Survey:** 10/3/2003

Monument Established By: 3001, Inc.

For: Louisiana Department of Natural Resources, CRD

Adjusted NAD 83 Geodetic Position

Lat. 30°07'10.70126"N
Long. 90°38'24.50670"W

Adjusted NAD 83 Datum LSZ (1702) Feet

N= 589663.911
E= 3499986.360

Adjusted NAVD88 Height

Elevation = 11.35 feet (3.46 mtrs)

Geoid99 Height = -26.63 mtrs.
Ellipsoid Height = -23.17 mtrs.





Station Name: PO29-SM-03

Location: Monument is a steel rod with brass cap, located in the median of I-10, 6.07 miles east of LA 641 overpass. It is 50 feet east of the Mississippi Bayou.

Monument Description: NGS style floating sleeve monument, datum point set on 9/16" stainless steel sectional rods driven to 52 feet, set in sand filled 6" PVC pipe with access cover set in concrete, flush with ground.

Stamping: S3

Installation Date: 9/30/2003 **Date of Survey:** 12/4/2003

Monument Established By: 3001, Inc.

For: Louisiana Department of Natural Resources, CRD

Adjusted NAD 83 Geodetic Position

Lat. 30°06'51.58457"N
Long. 90°34'51.13428"W

Adjusted NAD 83 Datum LSZ (1702) Feet

N= 587850.954
E= 3518737.047

Adjusted NAVD88 Height

Elevation = 12.30 feet (3.75 mtrs)

Geoid99 Height = -26.59 mtrs.

Ellipsoid Height = -22.84 mtrs.





Station Name: PO29-SM-04

Location: Monument is a steel rod with brass cap, located at the intersection of Blind River and Alligator Bayou. On point of land in front of camp 621, on the east bank of Blind River and north bank of Alligator Bayou.

Monument Description: NGS style floating sleeve monument, datum point set on 9/16" stainless steel sectional rods driven to 64 feet, set in sand filled 6" PVC pipe with access cover set in concrete, rising approximately 6" above ground.

Stamping: S4

Installation Date: 10/1/2003 **Date of Survey:** 12/4/2003

Monument Established By: 3001, Inc.

For: Louisiana Department of Natural Resources, CRD

Adjusted NAD 83 Geodetic Position

Lat. 30°12'48.27090"N
Long. 90°36'41.07027"W



Adjusted NAD 83 Datum LSZ (1702) Feet

N= 623820.574
E= 3508855.138

Adjusted NAVD88 Height

Elevation = 2.04 feet (0.62 mtrs)



Geoid99 Height = -26.77 mtrs.
Ellipsoid Height = -26.15 mtrs.



Station Name: PO29-SM-05

Location: Monument is a steel rod with brass cap, located at the mouth of Reserve Canal, at Lake Maurepas, on western most point of land.

Monument Description: NGS style floating sleeve monument, datum point set on 9/16" stainless steel sectional rods driven to 72 feet, set in sand filled 6" PVC pipe with access cover set in concrete, rising approximately 6" above ground.

Stamping: S5

Installation Date: 10/1/2003 **Date of Survey:** 10/2/2003

Monument Established By: 3001, Inc.

For: Louisiana Department of Natural Resources, CRD

Adjusted NAD 83 Geodetic Position

Lat. 30°10'06.79108"N
Long. 90°32'57.92108"W

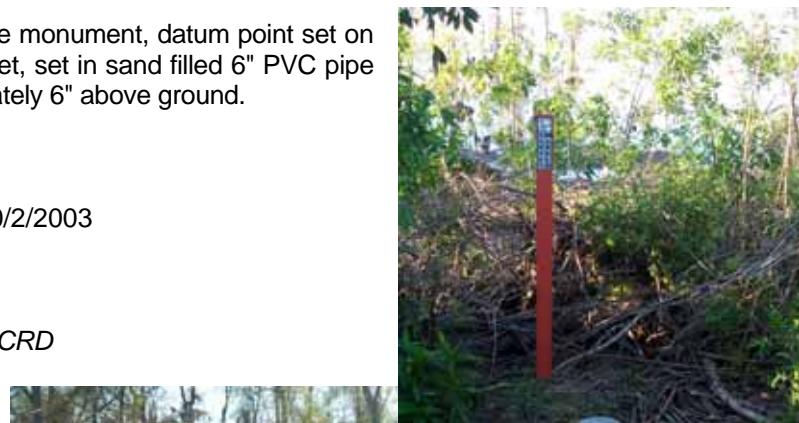
Adjusted NAD 83 Datum LSZ (1702) Feet

N= 607636.818
E= 3528544.839

Adjusted NAVD88 Height

Elevation = 4.80 feet (1.46 mtrs)

Geoid99 Height = -26.67 mtrs.
Ellipsoid Height = -25.20 mtrs.





Station Name: **PO29-SM-06**

Location: Located on River Road, LA 44

Monument Description: Existing NGS Deep Rod Monument

Stamping: U379

Installation Date: NA **Date of Survey:** 11/26/03

Monument Established By: NA

For: NGS

Adjusted NAD 83 Geodetic Position

Lat. $30^{\circ}03'21.32319''N$

Long. $90^{\circ}39'28.98859''W$

No Photograph Available

Adjusted NAD 83 Datum LSZ (1702) Feet

N= 566459.016

E= 3494460.208

Adjusted NAVD88 Height

Elevation = 15.82 feet (4.82 mtrs)

Geoid99 Height = -26.51 mtrs.

Ellipsoid Height = -21.69 mtrs.



Station Name: PO29-SM-07

Location: Located on River Road, LA 45

Monument Description: Existing NGS Deep Rod Monument

Stamping: T379

Installation Date: NA **Date of Survey:** NA

Monument Established By: NA

For: NGS

Adjusted NAD 83 Geodetic Position

Lat. 30°03'16.73594"N
Long. 90°35'16.62458"W

No Photograph Available

Adjusted NAD 83 Datum LSZ (1702) Feet

N= 566133.104
E= 3516639.593

Adjusted NAVD88 Height

Elevation = 16.19 feet (4.94 mtrs)

Geoid99 Height = -26.47 mtrs.

Ellipsoid Height = -21.54 mtrs.

Monument Information

	Date established	To reach description	Rod Depth (ft)
S1	9/29/2003	Monument is a steel rod with brass cap, located in the median of I-10, 0.26 miles east of LA 641 overpass.	60

	Date established	To reach description	Rod Depth (ft)
S2	9/29/2003	Monument is a steel rod with brass cap, located in the median of I-10, 2.51 miles east of LA 641 overpass. It is 50 feet east of the Hope Canal.	56

	Date established	To reach description	Rod Depth (ft)
S3	9/30/2003	Monument is a steel rod with brass cap, located in the median of I-10, 6.07 miles east of LA 641 overpass. It is 50 feet east of the Mississippi Bayou.	52

	Date established	To reach description	Rod Depth (ft)
S4	10/1/2003	Monument is a steel rod with brass cap, located at the intersection of Blind River and Alligator Bayou. On point of land in front of camp 621, on the east bank of Blind River and north bank of Alligator Bayou.	64

	Date established	To reach description	Rod Depth (ft)
S5	10/1/2003	Monument is a steel rod with brass cap, located at the mouth of Reserve Canal, at Lake Maurepas, on western most point of land.	72

Adjusted Grid Coordinates

DNR SECONDARY CONTROL MONUMENTS										
Station Name	Northing (ft)	Easting (ft)	Latitude	Longitude	Elev. (ft)	Elev. (m)	Geoid Ht. (m)	Ellip Ht. (m)	Description	Location
PO29-SM-01	590802.774	3488197.410	30°07'22.66228"N	90°40'38.67010"W	5.85	1.78	-26.66	-24.87	Mon . Set (Deep Rod Mark)	LA Hwy. 641 Exit @ I-10
PO29-SM-02	589663.911	3499986.360	30°07'10.70126"N	90°38'24.50670"W	11.35	3.46	-26.63	-23.17	Mon . Set (Deep Rod Mark)	Hope Canal @ I-10
PO29-SM-03	587850.954	3518737.047	30°06'51.58457"N	90°34'51.13428"W	12.30	3.75	-26.59	-22.84	Mon . Set (Deep Rod Mark)	Mississippi Bayou @ I-10
PO29-SM-04	623820.574	3508855.138	30°12'48.27090"N	90°36'41.07027"W	2.04	0.62	-26.77	-26.15	Mon . Set (Deep Rod Mark)	Blind River
PO29-SM-05	607636.818	3528544.839	30°10'06.79108"N	90°32'57.92108"W	4.80	1.46	-26.67	-25.20	Mon . Set (Deep Rod Mark)	Reserve Canal @ Maurepas
PO29-SM-06	566459.016	3494460.208	30°03'21.32319"N	90°39'28.98859"W	15.82	4.82	-26.51	-21.69	NGS Vert.Mon. (Deep Rod Mark)	River Road (LA 44)
PO29-SM-07	566133.104	3516639.593	30°03'16.73594"N	90°35'16.62458"W	16.19	4.94	-26.47	-21.54	NGS Vert.Mon. (Deep Rod Mark)	River Road (LA 44)

PRIMARY CONTROL STATIONS (NGS Published Monuments)

Station Name	Northing (ft)	Easting (ft)	Latitude	Longitude	Elev. (ft)	Elev. (m)	Geoid Ht. (m)	Ellip Ht. (m)	Description	Location
ENG2	504231.416	3721732.320	29°52'45.04454"N	89°56'31.48457"W	29.04	8.85	-25.95	-17.10	CORS Station	
HAMM	733115.673	3553447.204	30°30'47.05164"N	90°28'03.42873"W	112.90	34.41	-27.03	7.38	CORS Station	
NDBC	679146.209	3824268.684	30°21'22.59138"N	89°36'36.97624"W	55.65	16.96	-27.15	-10.19	CORS Station	
G275	651873.898	3574804.168	30°17'21.24967"N	90°24'06.83178"W	5.51	1.68	-26.78	-25.10	NGS Mon.	DNR Primary Control Station
3H019	601931.396	3446047.665	30°09'14.96990"N	90°48'38.05889"W	27.14	8.27	-26.80	-18.53	NGS Mon.	DNR Primary Control Station
LAF2	427060.757	3669372.099	29°40'07.05098"N	90°06'35.59622"W	1.85	0.56	-25.34	-24.77	NGS Mon.	DNR Primary Control Station
ALCO	557299.690	3667048.472	30°01'36.52281"N	90°06'46.21009"W	6.59	2.01	-26.38	-24.37	NGS Mon.	DNR Primary Control Station

TEMPORARY CONTROL SET ALONG US HIGHWAY 61 (set by 3001, Inc.)

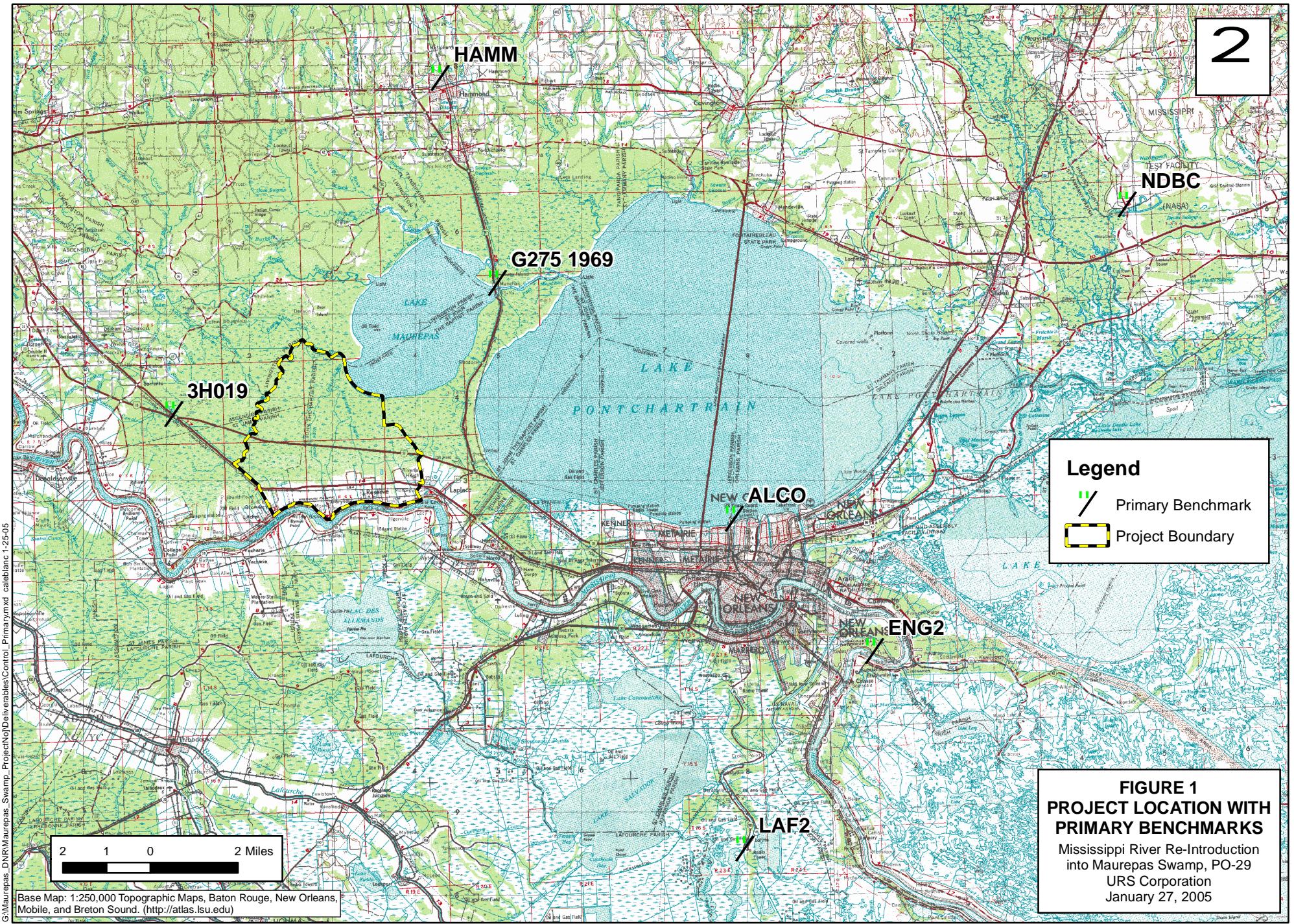
Station Name	Northing (ft)	Easting (ft)	Latitude	Longitude	Elev. (ft)	Elev. (m)	Geoid Ht. (m)	Ellip Ht. (m)	Description	Location
HOPE	573724.235	3504766.284	30°04'32.62605"N	90°37'31.20056"W	6.13	1.87	-26.54	-24.67	1/2 Iron Rod @ Airline & Hope Canal	US 61 @ Hope Canal
MSBA	574247.637	3520173.185	30°04'36.83245"N	90°34'35.80518"W	5.52	1.68	-26.73	-25.04	1/2 Iron Rod @ Airline & Miss. Bayou	US 61 @ Mississippi Bayou
RESR	574956.306	3529884.939	30°04'43.19977"N	90°32'45.21282"W	3.13	0.95	-26.50	-25.55	1/2 Iron Rod @ Airline & Reserve Canal	US 61 @ Reserve Canal
RAMP	582827.414	3469773.113	30°06'04.71183"N	90°44'08.94383"W	2.94	0.90	-26.65	-25.76	1/2 Iron Rod @ St. James Boat Launch	US 61 @ Blind River

OPUS Comparisons

GPS Adjustment Values							
Station Name	Northing (ft)	Easting (ft)	Latitude	Longitude	Elev. (ft)	Description	Location
PO29-SM-01	590802.774	3488197.410	30°07'22.66228"N	90°40'38.67010"W	5.85	Mon . Set (Deep Rod Mark)	LA Hwy. 641 Exit @ I-10
PO29-SM-02	589663.911	3499986.360	30°07'10.70126"N	90°38'24.50670"W	11.35	Mon . Set (Deep Rod Mark)	Hope Canal @ I-10
PO29-SM-03	587850.954	3518737.047	30°06'51.58457"N	90°34'51.13428"W	12.30	Mon . Set (Deep Rod Mark)	Mississippi Bayou @ I-10
PO29-SM-04	623820.574	3508855.138	30°12'48.27090"N	90°36'41.07027"W	2.04	Mon . Set (Deep Rod Mark)	Blind River
PO29-SM-05	607636.818	3528544.839	30°10'06.79108"N	90°32'57.92108"W	4.80	Mon . Set (Deep Rod Mark)	Reserve Canal @ Maurepas

OPUS values							
Station Name	Northing (m)	Easting (m)	Latitude	Longitude	Elev. (ft)	Description	Location
PO29-SM-01	180077.035	1063204.662	30°07'22.66196"N	90°40'38.67143"W	5.70	Mon . Set (Deep Rod Mark)	LA Hwy. 641 Exit @ I-10
PO29-SM-02	179729.916	1066797.950	30°07'10.70164"N	90°38'24.50768"W	11.10	Mon . Set (Deep Rod Mark)	Hope Canal @ I-10
PO29-SM-03	179177.305	1072513.148	30°06'51.58381"N	90°34'51.13612"W	12.21	Mon . Set (Deep Rod Mark)	Mississippi Bayou @ I-10
PO29-SM-04	190140.888	1069501.175	30°12'48.27080"N	90°36'41.07067"W	1.79	Mon . Set (Deep Rod Mark)	Blind River
PO29-SM-05	185208.061	1075502.617	30°10'06.79070"N	90°32'57.92114"W	4.78	Mon . Set (Deep Rod Mark)	Reserve Canal @ Maurepas

Compare Values									
	GPS Adjustment			OPUS (converted to feet)			Comparisons		
Station Name	Northing (ft)	Easting (ft)	Elev. (ft)	Northing (ft)	Easting (ft)	Elev. (ft)	Delta Northing (ft)	Delta Easting (ft)	Delta Elev. (ft)
PO29-SM-01	590802.774	3488197.410	5.85	590802.733	3488197.260	5.70	-0.041	-0.150	-0.15
PO29-SM-02	589663.911	3499986.360	11.35	589663.893	3499986.239	11.10	-0.018	-0.121	-0.25
PO29-SM-03	587850.954	3518737.047	12.30	587850.869	3518736.851	12.21	-0.085	-0.196	-0.09
PO29-SM-04	623820.574	3508855.138	2.04	623820.557	3508855.069	1.79	-0.017	-0.069	-0.25
PO29-SM-05	607636.818	3528544.839	4.80	607636.774	3528544.800	4.78	-0.044	-0.039	-0.02



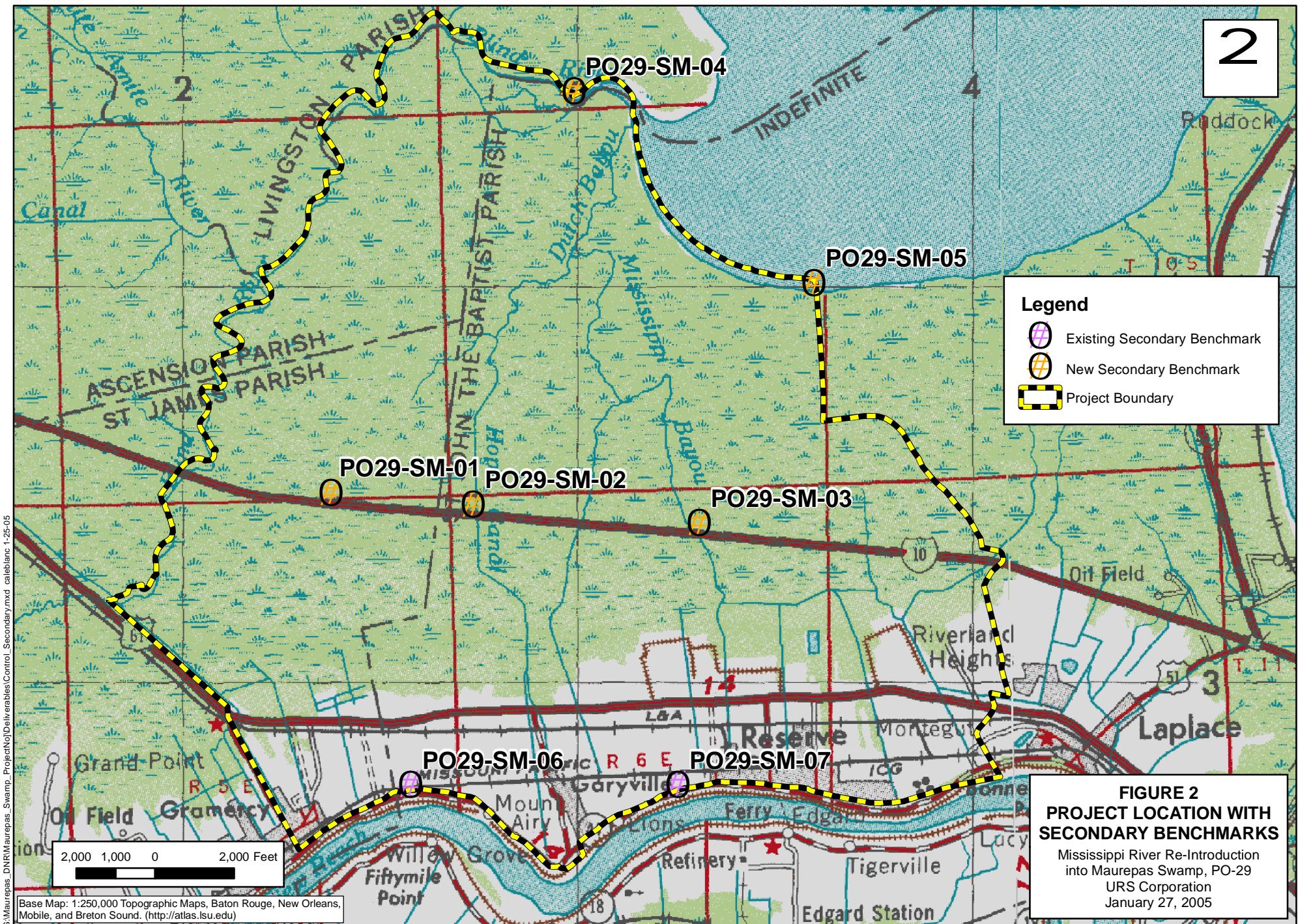


FIGURE 2
**PROJECT LOCATION WITH
SECONDARY BENCHMARKS**

Mississippi River Re-Introduction
into Maurepas Swamp, PO-29
URS Corporation
January 27, 2005

02131 - 02

0
2
1
3
-
0
2

MAUREPAS DIVERSION
HYDRAULIC FEASIBILITY
STUDY

SET MONUMENTS

NATIONAL
420
DUPLICATING TRANSIT
BOOK

Property of _____

Address _____

Telephone _____

This Book is manufactured of a High Grade
50% Rag Paper having a Water Resisting
Surface, and is sewed with Nylon Water-
proof Thread.

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TITLE PAGE

JOB #: MAUREPAS DIVERSION
HYDRAULIC FEASIBILITY
STUDY

JOB #: 02131-02

3001 INC
H. STEPHENS
E. JOHNSON

1

2 MAUREPAS DIVERSION FEASIBILITY STUDY

MON "1S"

MONUMENT WAS SET
IN THE MEDIUM OF
I-10, APPROXIMATELY
1400 FEET EAST OF
LA 641 OVERPASS,
ABOUT 3 FEET WEST
OF A WITNESS POST.

MONUMENT IS A STANDARD
NYS STYLE FLOATING SLEEVE
AND PROTECTIVE COVER
W/ 15 - 4 FEET X $\frac{1}{16}$ " SS
RODS DRIVEN TO REFUSAL
TOTAL DEPTH = 60 FEET

MONUMENT SLEEVE AND
COVER ARE FLUSH
WITH GROUND.

CREWS: H. STEPHENS
E. JOHNSON

9-29-032

CLEAR-Cool

WOODS

EXIT 94
Hwy 641

To BENTON ROSE

I-10 WEST

157 WITNESS
Post

To NEW ORLEANS

I-10 EAST

WOODS

3 Maurepas Diversion Feasibility Study

Mon "23"

MONUMENT WAS SET IN THE MEDIAN OF I-10, APPROXIMATELY 2.5 MILES EAST OF LA 641 OVERPASS, ABOUT 50 FEET EAST OF THE Hore CANAL.

MONUMENT IS A STANDARD NGS STYLE FLOATING SLEEVE AND PROTECTIVE COVER W/ 14 - 4 FEET X $\frac{7}{16}$ " SS RODS DRIVEN TO REFUSAL.

TOTAL DEPTH = 56 FEET

MONUMENT SLEEVE AND COVER ARE FLUSH WITH GROUND.

CREW: H. STEPHENS
E. JOHNSON

9-29-03 3

CLEAR Cool

A
N

To BATON Rouge

I-10 WEST

GARDEN

2S

To NEW ORLEANS

I-10 EAST

CABIN

W

O

E

4 Maurepas Diversion Feasibility Study

Mag "35"

MONUMENT WAS SET IN
THE MEDIAN OF I-10,
APPROXIMATELY 6. MILES
EAST OF LA 641 OVERPASS,
ABOUT 50 FEET
OF THE MISSISSIPPI RIVER.

MONUMENT IS A STANDARD
NGS STYLE FLOATING SLEEVE
AND PROTECTIVE COVER
W/ 13 - 4 FEET X $\frac{9}{16}$ " SS
RODS DRIVEN TO REFUSAL.
TOTAL DEPTH = 12 FEET

MONUMENT SLEEVE AND
COVER ARE FLUSH WITH
GROUND.

CELEMS: H. STEPHENS

E. Johnson

9-30-03⁴

CLEAR-COOL

LA 641

To
Region Ridge

10 West

To
New Orleans

10 East

MISSISSIPPI RIVER

5 Moultons Diversion Feature Line

Mon "45"

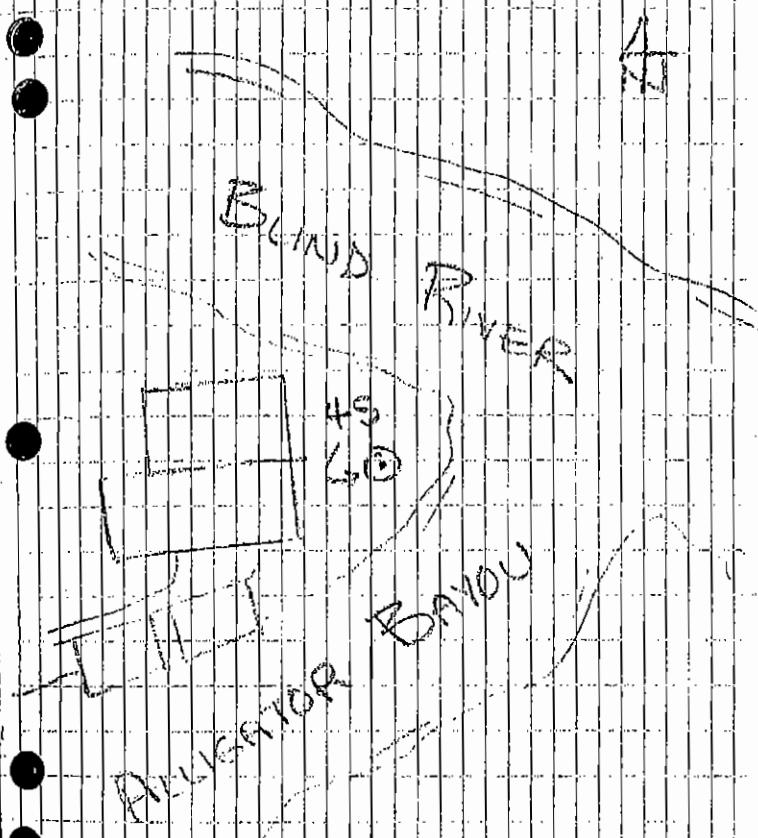
MONUMENT WAS SET
AT THE INTERSECTION
OF GAME RIVER RD.
ACROSS FROM BAYOU, ONE
POINT OF LAND IN FRONT
OF CAMP 621, ON EAST
BANK OF BLIND RIVER AND
NORTH BANK OF Moulton
BAYOU.

MONUMENT IS A STANDARD
NGS STYLE FLOATING SLEEVE
AND PROTECTIVE COVER
W/ 16 - 4 FEET X $\frac{9}{16}$ " SS
RODS DRIVEN TO REUSAL
TYPICAL DEPTH = 6 FT DEEP

MONUMENT SLEEVE
AND COVER ARE FLUSH
WITH GROUND.

CPIER: H. STEPHENS
E. Johnson

10-1-03 5



6 MAUREPAS DIVERSION TERRASSITY 2001

MON "SS"

MONUMENT WAS SET
AT THE MOUTH OF THE
PIERRENE CHANAL, AT
LAKE MAUREPAS, ON
WEST BANK OF REEFER
CANAL.

MONUMENT IS A STANDARD
NGS STYLE FLOATING SLEEVE
AND PROTECTIVE COVER
W/ 18 - 4 FEET * $\frac{7}{16}$ " SS
RODS DRIVEN TO REFUSAL
TILL DEPTH OF 12 FEET

MONUMENT SLEEVE AND
COVER ARE FLUSH WITH
GROUND.

CREW: H. STEPHENS
E. JONES

10-10-06

LAKE MAUREPAS

SS

REFEE CANAL

DNR - MAUREPAS DIVERSION CHANNEL SECONDARY NETWORK - PASS ONE

Day 1	Session 1	Session 2	Session 3	Session 4	Session 5	Session 6
Start Time	10:00	2:00				
End Time	12:00	4:00				
Receiver 1	Lafitte 2	Lafitte 2				
Receiver 2	ALCO	ALCO				
Receiver 3	G-275	G-275				
Receiver 4	3HO19	3HO19				
Receiver 5	3-S					
Receiver 6	5-S	2-S				

Day 2	Session 1	Session 2	Session 3	Session 4	Session 5	Session 6
Start Time	7:00	11:00	3:00			
End Time	9:00	1:00	5:00			
Receiver 1	Lafitte 2	Lafitte 2	Lafitte 2			
Receiver 2	ALCO	ALCO	ALCO			
Receiver 3	G-275	G-275	G-275			
Receiver 4	3HO19	3HO19	3HO19			
Receiver 5	1-S	3-S	2-S			
Receiver 6	U379	T379	4-S			

Day 3	Session 1	Session 2	Session 3	Session 4	Session 5	Session 6
Start Time	7:00	11:00	3:00			
End Time	9:00	1:00	5:00			
Receiver 1	Lafitte 2	Lafitte 2	Lafitte 2			
Receiver 2	ALCO	ALCO	ALCO			
Receiver 3	G-275	G-275	G-275			
Receiver 4	3HO19	3HO19	3HO19			
Receiver 5	T379	U379	5-S			
Receiver 6	4-S	1-S	3-S			

I.3 Typical GPS Log Sheet for Fixed Height Tripods

USE THIS FORM IS USING FIXED HEIGHT TRIPODS			
GPS LOG SHEET			
02131-02	Contractor JOHN PURPERA		
EVANS-GRAVES	Job Description MAUREPAS		
MEDIAN OF I-10, NEAR EXIT 94			
SESSION INFO			
Station ID 001S	Antenna ID 329	Session No. 1	
Line ID 1-S			
Antenna Description DEEP Rod IN 6" PVC			
Trimble 4000S 3343A04300			
COMPACT 4/2 w/ GROUP 0220010015			
Vertical Measurement: 2.000 Meters			
Horizontal Measurement: 6.562 Feet/Units			
Reading: 14:37 15:37 2:00			
Time	Pdop	Satellites in View	
14:39	2.5	1,2,3,16,20,25	
15:10	2.5	1,2,3,15,16,20,25	
15:36	2.5	1,2,3,13,16,20,25	
Time	Note any Power Failures, Weather Conditions, etc.		
USE BACK OF THIS SHEET TO TAKE STATION SKETCHES, REFERENCE TIES & DESCRIPTION			

I.3 Typical GPS Log Sheet for Fixed Height Tripods

USE THIS FORM IS USING FIXED HEIGHT TRIPODS

GPS LOG SHEET

Job No.	02131-02	Operator	HAYS STEPHENS
Client	EVANS-GRAVES	Job Description	MAUREPAS
Location	MEDIAN of I-10 / HOPE CANAL		
SESSION INFO			
Station No.	0025	Julian Date	278
Long Name	2-S		
Monument Description	DEEP ROD IN 6" PVC		
Receiver Type	TRIMBLE 4000 SSE	Receiver Serial No.	3343A04302
Antenna Type	COMPACT 4 1/2 /GP	Ant. Serial No.	0220010019
Antenna Height Measurement is TRUE VERTICAL to Bottom of Antenna Mount. Using Fixed Height tripod.			
Reading 1	NA	Meters	Fixed Hgt.2 Meter Tripod 2.000 Meters
Reading 2	NA	Meters	Check Reading 6.562 Feet/Tenths
Reading 3	NA	Meters	Note: Record all readings on log sheet prior to antenna in receiver.
Start Time	19:03	Stop Time	21:00 Session Time 1:57
Time	Pdop	Satellites in View	
19:05	4.3	2, 3, 14, 22, 25	
20:00	1.8	1, 2, 3, 13, 14, 15, 17, 22, 25	
21:00	2.3	1, 2, 3, 13, 15, 17, 22, 25	
Time Note any Power Failures, Weather Conditions, etc.			

USE BACK OF THIS SHEET TO MAKE STATION SKETCH, REFERENCE TIES & DESCRIPTION

I.3 Typical GPS Log Sheet for Fixed Height Tripods

USE THIS FORM IS USING FIXED HEIGHT TRIPODS

GPS LOG SHEET

USE BACK OF THIS SHEET TO MAKE STATION SKETCH, REFERENCE TIES & DESCRIPTION

I.3 Typical GPS Log Sheet for Fixed Height Tripods

USE THIS FORM IS USING FIXED HEIGHT TRIPODS

GPS LOG SHEET

Job No.	02131-02	Operator	JAN PUERERA
Client	EVANS - GRAVES	Job Description	MAUREPAS
Location	BLIND RIVER / ALLIGATOR BAYOU		
SESSION INFO			
Station No.	0045	Julian Date	328
Log Name	4-5	Session No.	1
Monument Description	PEEP ROD IN 6" PVC		
Receiver Type	TRIMBLE 4300 SSE	Receiver Serial No.	3343A04300
Antenna Type	COMPACT "K2 / GP	Ant. Serial No.	0220010015
Antenna Height Measurement is TRUE VERTICAL to Bottom of Antenna Mount if Using Fixed Height Tripod			
Reading 1	NA	Meters	Fixed Hgt. / Meter Tripod 2.000 Meters
Reading 2	NA	Meters	Check Reading 6.562 Feet/Tenths
Reading 3	NA	Meters	Note: Record all readings on log sheet prior to entering in receiver
Start Time	12:57	Stop Time	15:00 Session Time 2:03
Time	Pdop	Satellites in View	
13:10	3.3	3,11,22,27,31	
14:00	3.5	3,11,21,22,27,31	
15:00	3.5	3,8,11,27,31	
Time	Note any Power Failures, Weather Conditions, etc.		

USE BACK OF THIS SHEET TO MAKE STATION SKETCH, REFERENCE TIES & DESCRIPTION

I.3 Typical GPS Log Sheet for Fixed Height Tripods

USE THIS FORM IS USING FIXED HEIGHT TRIPODS

GPS LOG SHEET

USE BACK OF THIS SHEET TO MAKE STATION SKETCH, REFERENCE TIES & DESCRIPTION

Network Adjustment Report

Project Marapas3

Project name Marapas3
Coordinate Units US survey feet
Distance Units US survey feet
Height Units US survey feet
Date printed 10/7/03 8:23:02 AM
Coordinate System US State Plane 1983 **Zone** Louisiana South 1702
Datum NAD 1983 (Conus) **Geoid model** GEOID99 (Conus)

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Statistical Summary

Number of Iterations

Successful Adjustment in 1 iteration(s)

Global Statistics

Network Reference Factor : 0.21
Chi Square Test ($\alpha=95\%$) : PASS
Degrees of Freedom : 131.00

GPS Observation Statistics

Reference Factor : 0.21
Redundancy Number (r) : 128.01

Geoid Model Statistics

Reference Factor : 0.10
Redundancy Number (r) : 2.99

Weighting Strategies

GPS Observations

Default Scalar Set Applied to All Observations
Scalar : 1.00

Geoid Observations

Default Scalar Set Applied to All Observations
Scalar : 1.00

Set-up Errors

Error in Height of Antenna : 0.060sft
Centering Error : 0.100sft

Individual GPS Observation Statistics

Observation ID	Reference Factor	Redundancy Number
B3	0.14	2.36
B4	0.04	2.48
B5	0.17	2.36
B7	0.20	2.36
B9	0.13	1.37
B10	0.09	1.37
B11	0.15	1.37
B15	0.13	1.37
B16	0.09	1.37
B17	0.15	1.37
B18	0.29	1.91

B19	0.32	1.92
B21	0.38	2.08
B22	0.39	2.09
B23	0.18	1.74
B24	0.02	1.77
B25	0.07	2.36
B27	0.06	1.78
B35	0.04	2.37
B39	0.10	2.36
B48	0.03	1.67
B71	0.06	1.80
B73	0.19	1.78
B80	0.08	1.74
B83	0.16	2.26
B88	0.09	2.37
B94	0.17	2.37
B101	0.11	2.16
B109	0.29	2.15
B128	0.14	2.54
B129	0.19	2.51
B134	0.35	2.48
B136	0.14	2.54
B137	0.18	2.50
B142	0.05	2.28
B143	0.08	2.47
B159	0.16	2.55
B160	0.24	2.50
B166	0.43	2.30
B171	0.30	2.51
B180	0.33	2.28
B181	0.16	2.51
B189	0.26	1.95
B208	0.06	2.44
B209	0.07	2.47
B210	0.16	2.47

B214	0.08	2.02
B215	0.16	2.43
B216	0.19	2.63
B217	0.36	2.63
B218	0.23	2.63
B219	0.31	2.63
B220	0.24	2.57
B221	0.18	2.57
B222	0.41	2.57
B223	0.14	2.51
B226	0.05	2.53
B227	0.13	2.53

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Adjusted Coordinates

Adjustment performed in **NAD 1983 (Conus)**

Number of Points : 17

Number of Constrained Points : 6

Elevation Only : 3

Horizontal and Height Only : 3

Adjusted Grid Coordinates

Errors are reported using 1.96σ .

Point Name	Northing	N error	Easting	E error	Elevation	e error	Fix
S1	590802.774sft	0.032sft	3488197.410sft	0.032sft	5.848sft	0.525sft	
3H019	601931.396sft	0.036sft	3446047.665sft	0.036sft	27.143sft	0.525sft	
S2	589663.911sft	0.027sft	3499986.360sft	0.027sft	11.348sft	0.525sft	
S3	587850.954sft	0.027sft	3518737.047sft	0.027sft	12.299sft	0.525sft	
HOPE	573724.235sft	0.047sft	3504766.284sft	0.047sft	6.126sft	0.525sft	
MSBA	574247.637sft	0.047sft	3520173.185sft	0.047sft	4.822sft	0.525sft	
RESR	574956.306sft	0.047sft	3529884.939sft	0.047sft	3.125sft	0.525sft	
S4	623820.574sft	0.044sft	3508855.138sft	0.044sft	2.039sft	0.525sft	

S5	607636.818sft	0.038sft	3528544.839sft	0.038sft	4.801sft	0.525sft	
T379	566133.104sft	0.042sft	3516639.593sft	0.042sft	16.194sft	0.525sft	
U379	566459.016sft	0.044sft	3494460.208sft	0.044sft	15.821sft	0.525sft	
LAF2	427060.757sft	0.036sft	3669372.099sft	0.036sft	1.850sft	0.000sft	e
ALCO	557299.690sft	0.021sft	3667048.472sft	0.021sft	6.588sft	0.000sft	e
eng2	504231.416sft	0.000sft	3721732.320sft	0.000sft	29.043sft	0.524sft	N E h
HAMM	733115.673sft	0.000sft	3553447.204sft	0.000sft	112.901sft	0.524sft	N E h
ndbc	679146.209sft	0.000sft	3824268.684sft	0.000sft	55.649sft	0.524sft	N E h
G275 1969	651873.898sft	0.021sft	3574804.168sft	0.021sft	5.512sft	0.000sft	e

Adjusted Geodetic Coordinates

Errors are reported using 1.96σ .

Point Name	Latitude	N error	Longitude	E error	Height	h error	Fix
S1	30°07'22.66228"N	0.032sft	90°40'38.67010"W	0.032sft	-81.607sft	0.029sft	
3H019	30°09'14.96990"N	0.036sft	90°48'38.05890"W	0.036sft	-60.782sft	0.031sft	
S2	30°07'10.70176"N	0.027sft	90°38'24.50670"W	0.027sft	-76.015sft	0.026sft	
S3	30°06'51.58457"N	0.027sft	90°34'51.13428"W	0.027sft	-74.926sft	0.026sft	
HOPE	30°04'32.62605"N	0.047sft	90°37'31.20056"W	0.047sft	-80.932sft	0.037sft	
MSBA	30°04'36.83245"N	0.047sft	90°34'35.80518"W	0.047sft	-82.162sft	0.036sft	
RESR	30°04'43.19977"N	0.047sft	90°32'45.21282"W	0.047sft	-83.824sft	0.035sft	
S4	30°12'48.27090"N	0.044sft	90°36'41.07027"W	0.044sft	-85.784sft	0.031sft	
S5	30°10'06.79108"N	0.038sft	90°32'57.92108"W	0.038sft	-82.689sft	0.029sft	
T379	30°03'16.73594"N	0.042sft	90°35'16.62458"W	0.042sft	-70.658sft	0.034sft	
U379	30°03'21.32319"N	0.044sft	90°39'28.98859"W	0.044sft	-71.163sft	0.036sft	
LAF2	29°40'07.05097"N	0.036sft	90°06'35.59622"W	0.036sft	-81.280sft	0.041sft	e
ALCO	30°01'36.52281"N	0.021sft	90°06'46.21010"W	0.021sft	-79.947sft	0.020sft	e
eng2	29°52'45.04454"N	0.000sft	89°56'31.48457"W	0.000sft	-56.102sft	0.000sft	Lat Long h
HAMM	30°30'47.05164"N	0.000sft	90°28'03.42872"W	0.000sft	24.213sft	0.000sft	Lat Long h
ndbc	30°21'22.59139"N	0.000sft	89°36'36.97625"W	0.000sft	-33.432sft	0.000sft	Lat Long h
G275 1969	30°17'21.24967"N	0.021sft	90°24'06.83178"W	0.021sft	-82.363sft	0.016sft	e

Coordinate Deltas

Point Name	ΔNorthing	ΔEasting	ΔElevation	ΔHeight	ΔGeoid Separation
S1	0.000sft	0.000sft	0.000sft	0.000sft	0.000sft

3H019	0.000sft	0.000sft	0.000sft	0.000sft	0.000sft
S2	0.000sft	0.000sft	0.000sft	0.000sft	0.000sft
S3	0.000sft	0.000sft	0.000sft	0.000sft	0.000sft
HOPE	0.000sft	0.000sft	0.000sft	0.000sft	0.000sft
MSBA	0.000sft	0.000sft	0.000sft	0.000sft	0.000sft
RESR	0.000sft	0.000sft	0.000sft	0.000sft	0.000sft
S4	0.000sft	0.000sft	0.000sft	0.000sft	0.000sft
S5	0.000sft	0.000sft	0.000sft	0.000sft	0.000sft
T379	0.000sft	0.000sft	0.000sft	0.000sft	0.000sft
U379	0.000sft	0.000sft	0.000sft	0.000sft	0.000sft
LAF2	0.000sft	0.000sft	0.000sft	0.000sft	0.000sft
ALCO	0.000sft	0.000sft	0.000sft	0.000sft	0.000sft
eng2	0.000sft	0.000sft	0.000sft	0.000sft	0.000sft
HAMM	0.000sft	0.000sft	0.000sft	0.000sft	0.000sft
ndbc	0.000sft	0.000sft	0.000sft	0.000sft	0.000sft
G275 1969	0.000sft	0.000sft	0.000sft	0.000sft	0.000sft

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Adjusted Observations

Adjustment performed in NAD 1983 (Conus)

GPS Observations

GPS Transformation Group: <GPS Default>

Deflection in Longitude	: 0?00'00.0458"	(1.96 σ) : 0?00'00.0150"
Deflection in Latitude	: -0?00'00.0287"	(1.96 σ) : 0?00'00.0294"
Azimuth Rotation	: 0?00'00.0000"	(1.96 σ) : 0?00'00.0193"
Network Scale	: 1.00000009	(1.96 σ) : 0.00000009

Number of Observations : 58

Number of Outliers : 0

Observation Adjustment (Critical Tau = 3.57). Any outliers are in red.

Observation ID	From Point	To Point	Observations	A-posteriori Error (1.96 σ)	Residual	Std. Residual

B3	S1	3H019	Az.	285? 07'05.3796"	0?00'00.1246"	0? 00'00.0796"	0.65
			ΔHt.	20.832sft	0.016sft	-0.006sft	-0.38
			Dist.	43597.235sft	0.026sft	0.023sft	0.88
B4	S2	S3	Az.	95?52'09.0029"	0?00'00.2596"	-0? 00'00.0327"	-0.11
			ΔHt.	1.084sft	0.014sft	-0.003sft	-0.21
			Dist.	18839.490sft	0.024sft	-0.006sft	-0.24
B5	S2	3H019	Az.	283? 09'35.3229"	0?00'00.0979"	-0? 00'00.0767"	-0.80
			ΔHt.	15.242sft	0.016sft	-0.014sft	-0.88
			Dist.	55320.084sft	0.026sft	-0.022sft	-0.87
B7	S2	3H019	Az.	283? 09'35.3229"	0?00'00.0979"	0? 00'00.0371"	0.39
			ΔHt.	15.242sft	0.016sft	0.013sft	0.87
			Dist.	55320.084sft	0.026sft	0.036sft	1.39
B9	S2	HOPE	Az.	163? 39'13.9270"	0?00'00.5205"	-0? 00'00.1987"	-0.82
			ΔHt.	-4.916sft	0.025sft	-0.002sft	-0.18
			Dist.	16642.155sft	0.042sft	0.013sft	0.68
B10	S2	MSBA	Az.	127? 42'53.2731"	0?00'00.3409"	0? 00'00.0000"	-0.02
			ΔHt.	-6.149sft	0.025sft	0.008sft	0.64
			Dist.	25402.036sft	0.042sft	0.008sft	0.42
B11	S2	RESR	Az.	116? 32'23.5027"	0?00'00.2599"	0? 00'00.0141"	0.12
			ΔHt.	-7.814sft	0.025sft	-0.008sft	-0.70
			Dist.	33322.672sft	0.042sft	0.020sft	1.01
B15	HOPE	S3	Az.	45?02'09.4359"	0?00'00.4358"	0? 00'00.2013"	0.99
			ΔHt.	6.001sft	0.025sft	-0.002sft	-0.18
			Dist.	19869.676sft	0.042sft	0.008sft	0.39
B16	S3	MSBA	Az.	174? 20'58.8851"	0?00'00.6331"	0? 00'00.0939"	0.32
			ΔHt.	-7.234sft	0.025sft	-0.008sft	-0.64
			Dist.	13679.913sft	0.042sft	-0.005sft	-0.28
				139?		0?	

B17	S3	RESR	Az.	31'53.7729"	0?00'00.5081"	00'00.0684"	0.29
			ΔHt.	-8.898sft	0.025sft	0.008sft	0.70
			Dist.	17046.696sft	0.042sft	-0.019sft	-0.98
B18	S4	3H019	Az.	251? 08'49.8562"	0?00'00.1061"	0? 00'00.0325"	0.45
			ΔHt.	25.019sft	0.021sft	-0.033sft	-2.31
			Dist.	66517.121sft	0.034sft	0.018sft	0.78
B19	S4	3H019	Az.	251? 08'49.8562"	0?00'00.1061"	-0? 00'00.0407"	-0.57
			ΔHt.	25.019sft	0.021sft	0.037sft	2.55
			Dist.	66517.121sft	0.034sft	-0.018sft	-0.79
B21	S5	3H019	Az.	266? 26'09.8260"	0?00'00.0782"	-0? 00'00.1086"	-1.80
			ΔHt.	21.926sft	0.019sft	-0.032sft	-2.22
			Dist.	82700.054sft	0.031sft	-0.037sft	-1.53
B22	S5	3H019	Az.	266? 26'09.8260"	0?00'00.0782"	0? 00'00.0556"	0.92
			ΔHt.	21.926sft	0.019sft	0.046sft	3.08
			Dist.	82700.054sft	0.031sft	-0.013sft	-0.52
B23	T379	3H019	Az.	297? 15'47.2852"	0?00'00.0962"	0? 00'00.0000"	-0.05
			ΔHt.	9.886sft	0.024sft	-0.019sft	-1.38
			Dist.	79155.844sft	0.037sft	0.014sft	0.65
B24	U379	3H019	Az.	306? 34'06.1350"	0?00'00.1251"	0? 00'00.0000"	-0.04
			ΔHt.	10.386sft	0.022sft	-0.001sft	-0.08
			Dist.	60021.554sft	0.036sft	0.004sft	0.18
B25	S1	3H019	Az.	285? 07'05.3796"	0?00'00.1246"	0? 00'00.0000"	-0.08
			ΔHt.	20.832sft	0.016sft	0.009sft	0.59
			Dist.	43597.235sft	0.026sft	0.002sft	0.07
B27	U379	S1	Az.	345? 54'37.1403"	0?00'00.2986"	-0? 00'00.0389"	-0.21
			ΔHt.	-10.446sft	0.022sft	-0.004sft	-0.33
			Dist.	25138.288sft	0.036sft	0.006sft	0.26
B35	LAF2	S2	Az.	314? 26'26.1789"	0?00'00.0229"	0? 00'00.0071"	0.31

			ΔHt.	5.280sft	0.016sft	0.000sft	0.02
			Dist.	234817.035sft	0.026sft	-0.004sft	-0.14
B39	LAF2	S2	Az.	314? 26'26.1789"	0?00'00.0229"	0? 00'00.0000"	-0.13
			ΔHt.	5.280sft	0.016sft	-0.001sft	-0.04
			Dist.	234817.035sft	0.026sft	-0.021sft	-0.80
B48	LAF2	S4	Az.	321? 24'12.7571"	0?00'00.0308"	0? 00'00.0000"	-0.03
			ΔHt.	-4.496sft	0.023sft	0.003sft	0.24
			Dist.	253947.151sft	0.038sft	-0.003sft	-0.12
B71	ALCO	T379	Az.	273? 58'17.2892"	0?00'00.0498"	0? 00'00.0000"	-0.51
			ΔHt.	9.320sft	0.023sft	-0.001sft	-0.04
			Dist.	150679.209sft	0.036sft	0.002sft	0.10
B73	LAF2	T379	Az.	312? 55'50.8331"	0?00'00.0363"	0? 00'00.0053"	0.24
			ΔHt.	10.636sft	0.023sft	-0.019sft	-1.31
			Dist.	206577.516sft	0.036sft	0.019sft	0.84
B80	LAF2	U379	Az.	309? 09'51.9531"	0?00'00.0340"	0? 00'00.0000"	-0.06
			ΔHt.	10.137sft	0.022sft	-0.006sft	-0.41
			Dist.	223680.584sft	0.037sft	0.011sft	0.51
B83	LAF2	S1	Az.	312? 43'03.3401"	0?00'00.0238"	0? 00'00.0000"	-0.17
			ΔHt.	-0.309sft	0.017sft	0.019sft	1.24
			Dist.	244221.363sft	0.028sft	0.014sft	0.57
B88	LAF2	ALCO	Az.	359? 35'22.5917"	0?00'00.0411"	0? 00'00.0000"	-0.22
			ΔHt.	1.316sft	0.016sft	-0.001sft	-0.06
			Dist.	130268.671sft	0.026sft	0.018sft	0.69
B94	LAF2	ALCO	Az.	359? 35'22.5917"	0?00'00.0411"	0? 00'00.0271"	0.66
			ΔHt.	1.316sft	0.016sft	0.002sft	0.11
			Dist.	130268.671sft	0.026sft	-0.032sft	-1.22
B101	ALCO	eng2	Az.	134? 45'04.6553"	0?00'00.0644"	-0? 00'00.0289"	-0.40
			ΔHt.	23.840sft	0.025sft	0.000sft	-0.01

			Dist.	76206.438sft	0.024sft	0.019sft	0.73
B109	ALCO	eng2	Az.	134? 45'04.6553"	0?00'00.0644"	0? 00'00.0101"	0.14
			ΔHt.	23.840sft	0.025sft	0.000sft	-0.03
			Dist.	76206.438sft	0.024sft	0.060sft	2.27
B128	S2	HAMM	Az.	20?47'07.5445"	0?00'00.0297"	0? 00'00.0332"	0.92
			ΔHt.	100.195sft	0.014sft	0.012sft	0.76
			Dist.	153098.513sft	0.022sft	0.001sft	0.03
B129	HAMM	S3	Az.	193? 52'18.1513"	0?00'00.0319"	0? 00'00.0471"	1.28
			ΔHt.	-99.111sft	0.014sft	0.015sft	0.91
			Dist.	149362.639sft	0.023sft	-0.004sft	-0.13
B134	ALCO	HAMM	Az.	327? 44'33.9022"	0?00'00.0230"	0? 00'00.0065"	0.25
			ΔHt.	104.159sft	0.015sft	-0.043sft	-2.67
			Dist.	209336.565sft	0.023sft	0.032sft	1.21
B136	S2	HAMM	Az.	20?47'07.5445"	0?00'00.0297"	-0? 00'00.0323"	-0.89
			ΔHt.	100.195sft	0.014sft	-0.008sft	-0.52
			Dist.	153098.513sft	0.022sft	0.013sft	0.49
B137	HAMM	S3	Az.	193? 52'18.1513"	0?00'00.0319"	0? 00'00.0129"	0.35
			ΔHt.	-99.111sft	0.014sft	-0.024sft	-1.47
			Dist.	149362.639sft	0.023sft	0.005sft	0.19
B142	S1	HAMM	Az.	24?57'31.6852"	0?00'00.0364"	0? 00'00.0062"	0.18
			ΔHt.	105.785sft	0.017sft	-0.005sft	-0.31
			Dist.	156567.233sft	0.028sft	0.004sft	0.17
B143	ALCO	HAMM	Az.	327? 44'33.9022"	0?00'00.0230"	0? 00'00.0000"	-0.22
			ΔHt.	104.159sft	0.015sft	0.002sft	0.10
			Dist.	209336.565sft	0.023sft	-0.018sft	-0.66
B159	S2	HAMM	Az.	20?47'07.5445"	0?00'00.0297"	0? 00'00.0000"	-0.09
			ΔHt.	100.195sft	0.014sft	0.022sft	1.36
			Dist.	153098.513sft	0.022sft	-0.004sft	-0.14

B160	S3	HAMM	Az.	13?48'52.3674"	0?00'00.0318"	-0? 00'00.0611"	-1.66
			ΔHt.	99.111sft	0.014sft	0.019sft	1.17
			Dist.	149362.640sft	0.023sft	0.007sft	0.28
B166	ndbc	S3	Az.	254? 13'37.2428"	0?00'00.0175"	0? 00'00.0151"	0.91
			ΔHt.	-41.414sft	0.017sft	0.054sft	3.52
			Dist.	318900.721sft	0.027sft	0.014sft	0.56
B171	ALCO	ndbc	Az.	52?50'01.9218"	0?00'00.0227"	-0? 00'00.0289"	-1.04
			ΔHt.	46.463sft	0.015sft	-0.036sft	-2.25
			Dist.	198922.364sft	0.022sft	-0.015sft	-0.54
B180	S1	ndbc	Az.	75?35'53.3718"	0?00'00.0164"	0? 00'00.0007"	0.05
			ΔHt.	48.089sft	0.017sft	0.041sft	2.69
			Dist.	347511.368sft	0.028sft	-0.023sft	-0.90
B181	ALCO	ndbc	Az.	52?50'01.9218"	0?00'00.0227"	0? 00'00.0000"	-0.05
			ΔHt.	46.463sft	0.015sft	0.004sft	0.28
			Dist.	198922.364sft	0.022sft	-0.034sft	-1.28
B189	S5	ndbc	Az.	76?47'47.4097"	0?00'00.0228"	0? 00'00.0000"	-0.64
			ΔHt.	49.183sft	0.021sft	-0.008sft	-0.55
			Dist.	304266.228sft	0.034sft	-0.047sft	-2.01
B208	S1	G275 1969	Az.	55?08'16.2880"	0?00'00.0482"	0? 00'00.0000"	-0.12
			ΔHt.	-0.784sft	0.015sft	-0.006sft	-0.38
			Dist.	105980.806sft	0.025sft	0.007sft	0.26
B209	S3	G275 1969	Az.	41?35'08.7618"	0?00'00.0579"	0? 00'00.0387"	0.61
			ΔHt.	-7.458sft	0.015sft	-0.002sft	-0.12
			Dist.	85108.414sft	0.024sft	0.001sft	0.04
B210	S3	G275 1969	Az.	41?35'08.7618"	0?00'00.0579"	0? 00'00.0059"	0.09
			ΔHt.	-7.458sft	0.015sft	0.021sft	1.34
			Dist.	85108.414sft	0.024sft	0.001sft	0.04
		G275				-0?	

B214	S5	1969	Az.	46°40'18.6914"	0°00'00.1050"	00'00.0372"	-0.48
			ΔHt.	0.310sft	0.020sft	-0.005sft	-0.32
			Dist.	64010.841sft	0.033sft	0.009sft	0.36
B215	S1	G275 1969	Az.	55°08'16.2880"	0°00'00.0482"	0? 00'00.0316"	0.62
			ΔHt.	-0.784sft	0.015sft	-0.019sft	-1.20
			Dist.	105980.806sft	0.025sft	0.004sft	0.15
B216	ALCO	G275 1969	Az.	316? 19°30.1196"	0°00'00.0310"	-0? 00'00.0318"	-0.75
			ΔHt.	-2.410sft	0.012sft	0.022sft	1.36
			Dist.	132120.121sft	0.020sft	-0.009sft	-0.35
B217	ALCO	G275 1969	Az.	316? 19°30.1196"	0°00'00.0310"	0? 00'00.0584"	1.37
			ΔHt.	-2.410sft	0.012sft	0.044sft	2.65
			Dist.	132120.121sft	0.020sft	-0.013sft	-0.48
B218	ALCO	G275 1969	Az.	316? 19°30.1196"	0°00'00.0310"	0? 00'00.0473"	1.11
			ΔHt.	-2.410sft	0.012sft	-0.026sft	-1.60
			Dist.	132120.121sft	0.020sft	-0.005sft	-0.19
B219	ALCO	G275 1969	Az.	316? 19°30.1196"	0°00'00.0310"	0? 00'00.0000"	-0.24
			ΔHt.	-2.410sft	0.012sft	0.033sft	2.01
			Dist.	132120.121sft	0.020sft	0.046sft	1.70
B220	ndbc	G275 1969	Az.	264? 37°28.3741"	0°00'00.0174"	0? 00'00.0032"	0.14
			ΔHt.	-48.873sft	0.014sft	0.028sft	1.76
			Dist.	250965.526sft	0.021sft	0.026sft	0.96
B221	ndbc	G275 1969	Az.	264? 37°28.3741"	0°00'00.0174"	0? 00'00.0000"	-0.49
			ΔHt.	-48.873sft	0.014sft	-0.023sft	-1.44
			Dist.	250965.526sft	0.021sft	0.000sft	-0.01
B222	ndbc	G275 1969	Az.	264? 37°28.3741"	0°00'00.0174"	0? 00'00.0000"	-0.44
			ΔHt.	-48.873sft	0.014sft	-0.055sft	-3.44
			Dist.	250965.526sft	0.021sft	0.001sft	0.04
B223	HAMM	G275 1969	Az.	165? 42°14.0125"	0°00'00.0556"	0? 00'00.0579"	0.88

			ΔHt.	-106.569sft	0.014sft	0.009sft	0.56
			Dist.	84006.208sft	0.023sft	0.016sft	0.59
B226	S2	G275 1969	Az.	50°36'11.6111"	0°00'00.0475"	0°00'00.0188"	0.33
			ΔHt.	-6.374sft	0.014sft	-0.004sft	-0.24
			Dist.	97309.141sft	0.022sft	0.002sft	0.09
B227	S2	G275 1969	Az.	50°36'11.6111"	0°00'00.0475"	0°00'00.0291"	-0.51
			ΔHt.	-6.374sft	0.014sft	-0.016sft	-0.98
			Dist.	97309.141sft	0.022sft	-0.002sft	-0.06

Geoid Observations

Number of Observations : 17

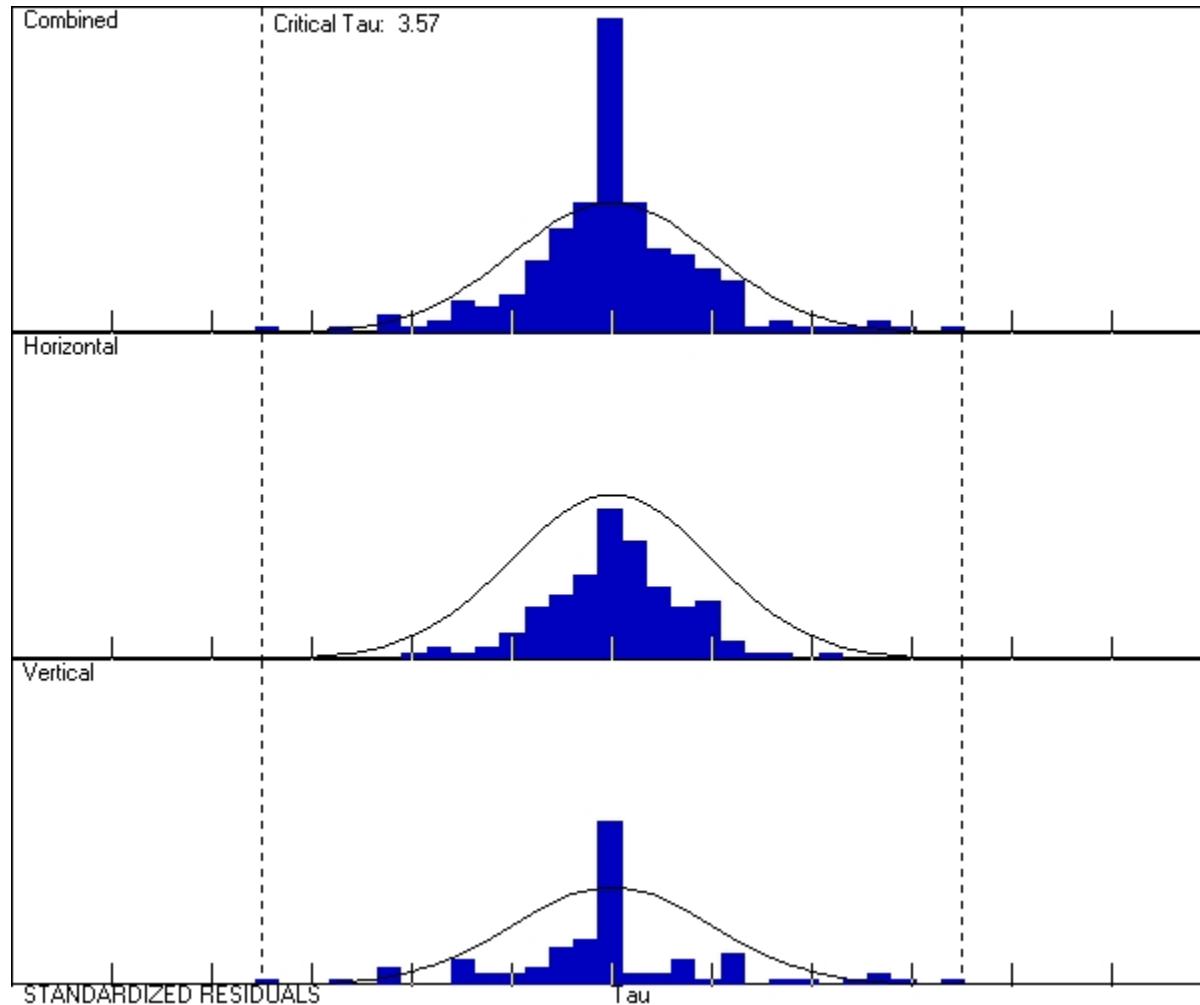
Number of Outliers : 0

Observation Adjustment (Critical Tau = 3.57). Any outliers are in red.

Observation ID	Point Name	Separation	A-posteriori Error (1.96σ)	Residual	Std. Residual
G1	S1	-87.455sft	0.524sft	0.000sft	0.00
G2	3H019	-87.925sft	0.524sft	0.000sft	0.00
G3	S2	-87.362sft	0.524sft	0.000sft	0.00
G4	S3	-87.226sft	0.524sft	0.000sft	0.00
G5	HOPE	-87.058sft	0.524sft	0.000sft	0.00
G6	MSBA	-86.983sft	0.524sft	0.000sft	0.00
G7	RESR	-86.950sft	0.524sft	0.000sft	0.00
G8	S4	-87.824sft	0.524sft	0.000sft	0.00
G9	S5	-87.490sft	0.524sft	0.000sft	0.00
G10	T379	-86.852sft	0.524sft	0.000sft	0.00
G11	U379	-86.984sft	0.524sft	0.000sft	0.00
G12	LAF2	-83.130sft	0.041sft	-0.007sft	-0.03
G13	ALCO	-86.535sft	0.020sft	-0.191sft	-0.72
G14	eng2	-85.145sft	0.524sft	0.000sft	0.00
G15	HAMM	-88.688sft	0.524sft	0.000sft	0.00
G16	ndbc	-89.080sft	0.524sft	0.000sft	0.00
G17	G275 1969	-87.875sft	0.016sft	-0.107sft	-0.40

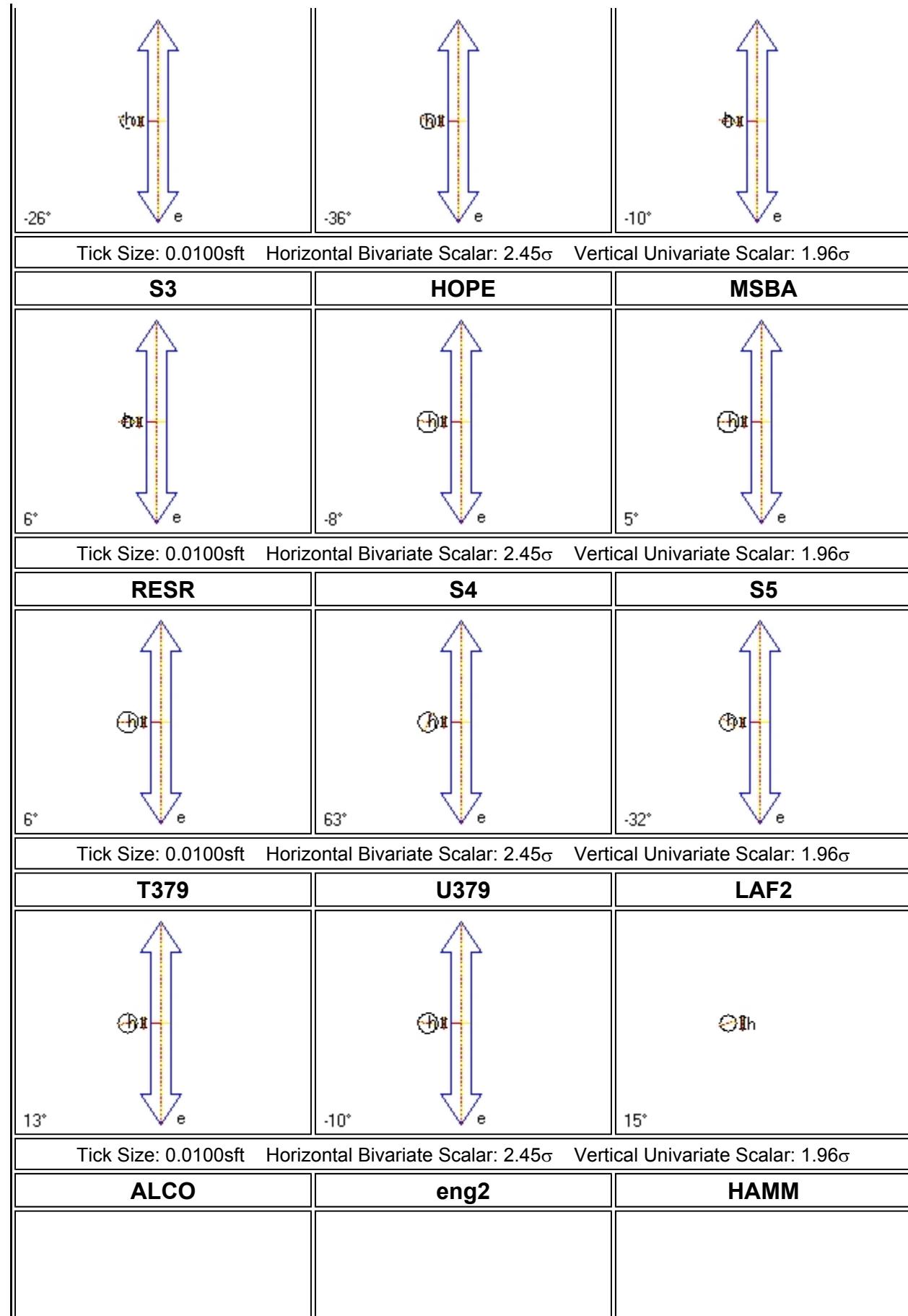
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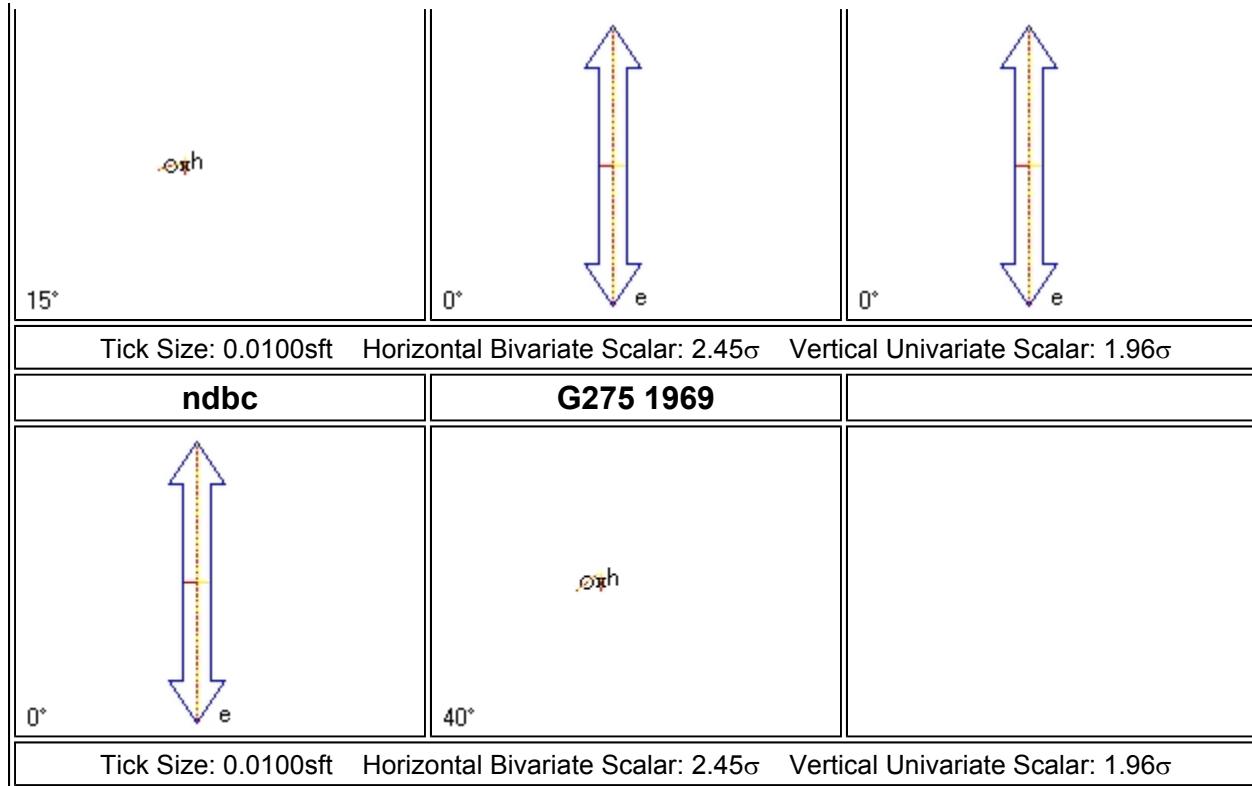
Histograms of Standardized Residuals

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Point Error Ellipses

S1	3H019	S2





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Covariant Terms

Adjustment performed in NAD 1983 (Conus)

From Point	To Point	Components	A-posteriori Error (1.96 σ)	Horiz. Precision (Ratio)	3D Precision (Ratio)
S1	3H019	Az.	285°07'05.3947"	0°00'00.1258"	1:1638120
		ΔHt.	20.824sft	0.016sft	
		Dist.	43597.231sft	0.027sft	
S1	U379	Az.	165°54'02.2205"	0°00'00.2994"	1:689486
		ΔHt.	10.444sft	0.022sft	
		Dist.	25138.286sft	0.036sft	
S1	LAF2	Az.	132°26'05.0234"	0°00'00.0309"	1:6679737
		ΔHt.	0.326sft	0.026sft	
		Dist.	244221.343sft	0.037sft	
S1	HAMM	Az.	24°57'31.7002"	0°00'00.0423"	1:4866975
		ΔHt.	105.819sft	0.029sft	

		Dist.	156567.220sft	0.032sft		
S1	ndbc	Az.	75?35'53.3871"	0?00'00.0191"	1:10789139	1:21146713
		ΔHt.	48.175sft	0.029sft		
		Dist.	347511.338sft	0.032sft		
S1	G275 1969	Az.	55?08'16.3031"	0?00'00.0515"	1:4001773	1:7843476
		ΔHt.	-0.757sft	0.020sft		
		Dist.	105980.797sft	0.026sft		
3H019	S2	Az.	103?04'27.2930"	0?00'00.1026"	1:2008680	1:3937014
		ΔHt.	-15.232sft	0.017sft		
		Dist.	55320.079sft	0.028sft		
3H019	S4	Az.	71?02'49.3869"	0?00'00.1079"	1:1910094	1:3743785
		ΔHt.	-25.002sft	0.022sft		
		Dist.	66517.115sft	0.035sft		
3H019	S5	Az.	86?18'17.4805"	0?00'00.0784"	1:2630558	1:5155893
		ΔHt.	-21.907sft	0.019sft		
		Dist.	82700.047sft	0.031sft		
3H019	T379	Az.	117?09'05.3185"	0?00'00.0979"	1:2107347	1:4130402
		ΔHt.	-9.876sft	0.024sft		
		Dist.	79155.837sft	0.038sft		
3H019	U379	Az.	126?29'30.7434"	0?00'00.1267"	1:1628905	1:3192655
		ΔHt.	-10.380sft	0.022sft		
		Dist.	60021.549sft	0.037sft		
S2	S3	Az.	95?52'09.0181"	0?00'00.2602"	1:792040	1:1552399
		ΔHt.	1.088sft	0.014sft		
		Dist.	18839.488sft	0.024sft		
S2	HOPE	Az.	163?39'13.9422"	0?00'00.5209"	1:396005	1:776171
		ΔHt.	-4.917sft	0.025sft		
		Dist.	16642.154sft	0.042sft		
S2	MSBA	Az.	127?42'53.2883"	0?00'00.3415"	1:604004	1:1183847
		ΔHt.	-6.147sft	0.025sft		
		Dist.	25402.034sft	0.042sft		
S2	RESR	Az.	116?32'23.5178"	0?00'00.2606"	1:791465	1:1551273
		ΔHt.	-7.809sft	0.025sft		
		Dist.	33322.669sft	0.042sft		

S2	LAF2	Az.	134?10'34.7823"	0?00'00.0281"	1:7365937	1:14437237
		ΔHt.	-5.266sft	0.024sft		
		Dist.	234817.015sft	0.032sft		
S2	HAMM	Az.	20?47'07.5595"	0?00'00.0357"	1:5761898	1:11293321
		ΔHt.	100.227sft	0.026sft		
		Dist.	153098.500sft	0.027sft		
S2	G275 1969	Az.	50?36'11.6262"	0?00'00.0487"	1:4229687	1:8290188
		ΔHt.	-6.349sft	0.018sft		
		Dist.	97309.132sft	0.023sft		
S3	HOPE	Az.	225?03'29.7140"	0?00'00.4364"	1:472825	1:926738
		ΔHt.	-6.006sft	0.025sft		
		Dist.	19869.674sft	0.042sft		
S3	MSBA	Az.	174?20'58.9002"	0?00'00.6334"	1:325694	1:638362
		ΔHt.	-7.235sft	0.025sft		
		Dist.	13679.912sft	0.042sft		
S3	RESR	Az.	139?31'53.7881"	0?00'00.5084"	1:405694	1:795162
		ΔHt.	-8.898sft	0.025sft		
		Dist.	17046.695sft	0.042sft		
S3	HAMM	Az.	13?48'52.3824"	0?00'00.0369"	1:5568189	1:10913652
		ΔHt.	99.139sft	0.026sft		
		Dist.	149362.627sft	0.027sft		
S3	ndbc	Az.	73?44'17.7310"	0?00'00.0173"	1:11880919	1:23286601
		ΔHt.	41.495sft	0.026sft		
		Dist.	318900.694sft	0.027sft		
S3	G275 1969	Az.	41?35'08.7769"	0?00'00.0595"	1:3464712	1:6790836
		ΔHt.	-7.437sft	0.018sft		
		Dist.	85108.407sft	0.025sft		
S4	LAF2	Az.	141?09'11.6305"	0?00'00.0365"	1:5677030	1:11126979
		ΔHt.	4.504sft	0.034sft		
		Dist.	253947.130sft	0.045sft		
S5	ndbc	Az.	76?47'47.4250"	0?00'00.0256"	1:8056972	1:15791666
		ΔHt.	49.258sft	0.029sft		
		Dist.	304266.201sft	0.038sft		
S5	G275 1969	Az.	46?40'18.7066"	0?00'00.1077"	1:1916695	1:3756722

		ΔHt.	0.326sft	0.022sft	
		Dist.	64010.836sft	0.033sft	
T379	LAF2	Az.	132?41'33.9270"	0?00'00.0417"	1:4967161 1:9735637
		ΔHt.	-10.622sft	0.029sft	
		Dist.	206577.499sft	0.042sft	
T379	ALCO	Az.	93?44'01.0405"	0?00'00.0529"	1:3899886 1:7643777
		ΔHt.	-9.288sft	0.026sft	
		Dist.	150679.196sft	0.039sft	
U379	LAF2	Az.	128?53'29.3715"	0?00'00.0393"	1:5260810 1:10311188
		ΔHt.	-10.118sft	0.028sft	
		Dist.	223680.565sft	0.043sft	
LAF2	ALCO	Az.	359?35'22.6067"	0?00'00.0468"	1:4411945 1:8647413
		ΔHt.	1.334sft	0.026sft	
		Dist.	130268.660sft	0.030sft	
ALCO	eng2	Az.	134?45'04.6706"	0?00'00.0569"	1:3634738 1:7124087
		ΔHt.	23.844sft	0.020sft	
		Dist.	76206.431sft	0.021sft	
ALCO	HAMM	Az.	327?44'33.9171"	0?00'00.0206"	1:9986594 1:19573724
		ΔHt.	104.159sft	0.020sft	
		Dist.	209336.547sft	0.021sft	
ALCO	ndbc	Az.	52?50'01.9369"	0?00'00.0217"	1:9480680 1:18582133
		ΔHt.	46.515sft	0.020sft	
		Dist.	198922.346sft	0.021sft	
ALCO	G275 1969	Az.	316?19'30.1346"	0?00'00.0354"	1:5824455 1:11415931
		ΔHt.	-2.417sft	0.015sft	
		Dist.	132120.110sft	0.023sft	
HAMM	G275 1969	Az.	165?42'14.0278"	0?00'00.0525"	1:3933067 1:7708812
		ΔHt.	-106.576sft	0.016sft	
		Dist.	84006.201sft	0.021sft	
ndbc	G275 1969	Az.	264?37'28.3891"	0?00'00.0176"	1:11746269 1:23022689
		ΔHt.	-48.932sft	0.016sft	
		Dist.	250965.505sft	0.021sft	

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