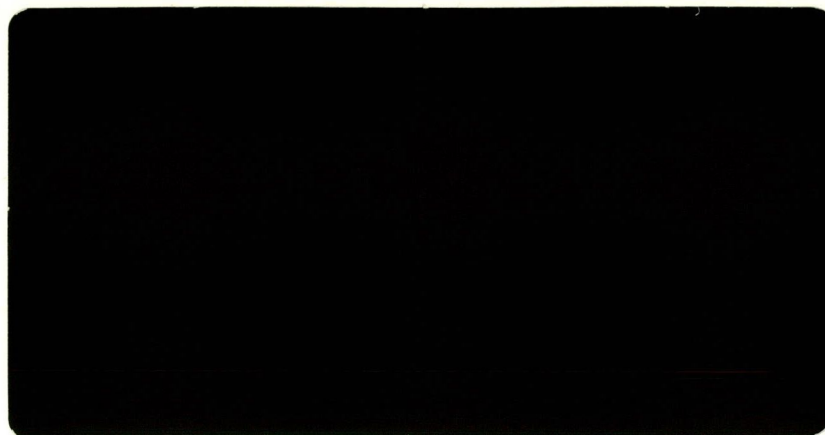


CANADA LANDS SURVEYS RECORDS
F.B. 3 3 5 4 7
DATE 18 DEC. 1987.



CANADA LANDS SURVEYS RECORDS
F.B. 3 3 5 4 7



Nortech
Surveys

SURVEY REPORT FOR
POSITIONING OF SEDCO 709
AT SHELL-P.C.I. ET AL
GLENELG E-58

PREPARED FOR:
SHELL CANADA RESOURCES LTD.
400 - 4TH AVENUE S.W.
CALGARY, ALBERTA

PREPARED BY:
NORTECH SURVEYS (CANADA) INC.
95 AKERLEY BLVD.
DARTMOUTH, NOVA SCOTIA

Our Reference 2420
s2215

FB 33547

OFFSHORE EXPLORATION DRILLING

Survey Positioning Report for:

Shell-P.C.I. et al Glenelg E-58

Latitude 43° 37' 17".512 North

Longitude 60° 08' 51".625 West

Operator and/or Permittee

Shell Canada Resources Ltd.

400 - 4th Avenue S.W.

P.O. Box 100

Calgary, Alberta

Canada Oil and Gas

Land Regulations,

Exploration Agreement No. 121

Drilling Vessel

Sedco 709

Survey Accountable

W. Dabbs, C.L.S.

Survey Personnel

G. Palmatary

S. McCarron

D. McGibbon

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1. INTRODUCTION

Shell Canada Resources Ltd., the operator for the Glenelg E-58 exploratory well contracted Nortech Surveys (Canada) Inc. to position the semi-submersible drilling rig, Sedco 709, on location. The positioning was carried out using a Sercel Syledis medium range radio positioning system with shore stations established on Sable Island. As there was some difficulty with the Sercel system, it has been decided to use this as the confirmation position. Legal position was established by translocation doppler methods with a monitor established on Sable Island.

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2. PLAN

The survey plan contains the legal and confirmation coordinates for the well location together with parameters and constants employed during the survey. Survey plans of the Syledis shore stations are registered in the Canada Land Survey Records or the Land Registration and Information Service.

Geographic coordinates are based on 1927 North American Datum. Plane coordinates are in metres and based on the Universal Transverse Mercator projection, Zone 20 Central Meridian 63° West longitude. Positions obtained from satellite observations have been transformed to the 1927 North American Datum.

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3. LEGAL POSITION AND ACCURACY

The legal position for the semi-submersible Sedco 709, used on the Shell et al Glenelg E-58 offshore well was conducted using Doppler Satellite techniques.

Two JMR Doppler receivers were employed, one at station Vern LRIS 226791 on Sable Island with the second being situated on the drilling vessel (see detail A). Four days of data were collected at each station to be used for the final confirmation of position, yielding 19 common passes used in a final solution.

The legal position as determined by Doppler Satellite technique is:

	<u>Latitude</u>	<u>Longitude</u>
Glenelg E-58	43° 37' 17.512" N	60° 08' 51.625"

The legal position of the Glenelg E-58 well was determined with accuracy of $\sigma_{lat} = 0.42m$; $\sigma_{lon} = 0.77$ at 1 sigma. This yielded an accuracy of 1.93 m at 2 sigma (95%).

The required third order accuracy according to "Specifications and Recommendations for Control Surveys and Survey Markers", Surveys and Mapping Branch, Energy Mines and Resources, Canada was determined under the formula:

$$r = C (d + 0.2) \text{ cm}$$

where C = 12 for third order surveys

d = 35.537 km (distance between the satellite receivers)

r = the maximum dimension (semi-major axis) in cm.

$$r = 12 (35.537 + 0.2) = 426 \text{ cm}$$

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The doppler data were checked for blunders in GEODOP processing.

The doppler results were obtained with high redundancy and accuracy with 19 common passes between the master and remote unit.

The accuracy ratio is 1:184212

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4. CONFIRMATION POSITION

The navigation of the drilling rig, onto location, and the confirmation of the position were carried out using the Sercel Syledis radio positioning system. The system was owned by McElhanney Services Ltd. and leased from them by Shell Canada.

4.1 CALIBRATION

The system was calibrated over a known over seawater base line between survey control marks at Lawrencetown and Camperdown. The calibration constants were added to the ranges in the software rather than by the setting of switches in the receiver.

The calibration was carried out by McElhanney personnel and was supervised by Mr. K. Simpson of Shell Canada.

4.2 SHORE STATIONS

Two separate Syledis chains were used to obtain the confirmation position. The first chain operated at a frequency of 436 ^M kHz and had the following shore stations: *WWE*

<u>Name</u>	<u>C.L.S. or L.R.I.S. #</u>	<u>Latitude</u>	<u>Longitude</u>
Lance SY		43° 59' 00".003 N	59° 45' 05".262 W
H58 SY		43° 57' 27".390 N	60° 07' 39".178 W
King	LRIS 226808	43° 56' 08".083 N	59° 56' 01".395 W

The second chain operated on a frequency of 442 ^M kHz and used the following shore stations:

<u>Name</u>	<u>C.L.S. or L.R.I.S. #</u>	<u>Latitude</u>	<u>Longitude</u>
West Spit	LRIS 226789	43° 58' 03".058 N	60° 08' 59".099 W
Lock O/S	Awaiting Registration	43° 57' 32".570 N	59° 46' 50".020 W
809	LRIS 226809	43° 56' 06".893 N	59° 59' 25".778 W

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4.3 POSITIONS

The confirmation position was obtained by taking a mean of 673 independent fixes of the Syledis. The result from each chain was meaned to obtain the final confirmation position. The means obtained on each chain are shown below.

<u>Frequency</u>	<u># Of Fixes</u>	<u>Latitude</u>	<u>Longitude</u>
442	449	43° 37' 17".164	-60° 08' 51".105
436	224	43° 37' 17".207	-60° 08' 51".255
Mean	673	43° 37' 17".186	-60° 08' 51".180

The confirmed position of Glenelg E-58 was determined with accuracy of (1 σ) 6.51m in Latitude and (1 σ) 18.15m in Longitude.

The coordinates obtained from Doppler Satellite system (translocated) and those obtained by Syledis positioning system are within 10m in latitude and 9.7m in longitude.

4.4 PROBLEMS ENCOUNTERED

The Syledis ranges proved to be very "noisy" which lead to the decision to use both available Syledis chains to ensure that no systematic error existed in the system.

The source of this noise was investigated by McElhanney personnel but no clear indication of the cause of the problem was found. The amount of drift in the ranges is similar to that noticed by Nortech Surveys during the Uniacke G-72 rig move.

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5. DATA PROCESSING

The Doppler data reductions were performed using the GEODOP series of programs. The following is the logical sequence of data reduction to a final position:

- (1) Data Validation and Majority Voting
- (2) PREDOP
- (3) MERGE
- (4) GEODOP

(1) Data Validation and Majority Voting

The majority vote process reads each recorded satellite pass from field digital cassettes. Redundant information and passes with insufficient or erroneous data are rejected. The remaining data is reformatted and transferred to magnetic tape cartridges for later input to subsequent programs.

(2) PREDOP

Reads and decodes the formatted majority voted input data (a series of satellite passes). A first order ionospheric refraction correction is done on the doppler counts and variable and fixed parameters are decoded. A curve is fitted to each of the three variable parameters, then these smoothed functions and fixed parameters are used to compute the satellite orbit which is transformed into a terrestrial coordinate system. An eighth order polynomial is fitted to represent the x, y, z's. Finally, the Dopplers were compared to theoretical values and edited appropriately before being written out with the interpolated meteorological data.

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(3) MERGE

In the mode used for this project, PREDOP outputs from the rig site and the monitor station that were observed during the time span that the drilling vessel was at final location were consolidated as an input to program GEODOP.

(4) GEODOP

Accepts satellite receiver data in the form of doppler counts and associated satellite positions. Two stations were processed simultaneously in one figure for a solution of station position, frequency offsets, receiver delays, orbital and refraction biases. The program GEODOP was designed to yield the most reliable relative positions for groups of stations occupied simultaneously and this is the mode in which it was used. GEODOP employs a phase adjustment approach where by each pass is added to the cumulative solution of all preceding passes after surviving the built-in statistical tests.

5.1 CONSTANTS & CONSTRAINTS

The GEODOP system of processing Doppler Satellite data requires manual input of some constants and constraints. Those used for Shell-P.C.I. Glenelg E-58 are given below:

- (1) Passes with maximum elevation less than 14.5 degrees not used.
- (2) Doppler counts recorded below 7.5 degrees not used.
- (3) Passes with less than 3 dopplers not used.
- (4) Hopfield refraction model used.
- (5) Apriori variance factor for statistical testing = 1.4 cycles².

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(6) Orbital constraints along track = 26m 1σ
across track = 5m 1σ
out of plane = 10m 1σ

(7) Weight of a doppler count for editing (1σ)

Vern = 20

Sedco 709 = 15

(8) Receiver Delay - calibrated by JMR Canada

Vern = 350

Sedco 709 = 350

(9) Average meteorological data for the survey area was used.

5.2 ADJUSTMENT PROCEDURES

These offsets were applied in processing and in the final adjustment. This consisted of adjusting the derived coordinates at the Vern antenna to the published value coordinates and thus shifting the derived rig coordinates to its final absolute value.

Approximately 3 days of data were used in processing for the legal position. This data was collected while the rig was on final location (30" casing and guide base cemented on bottom). A total of 19 acceptable passes, common at the two stations was used for the final confirmation position.

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6. ANTENNA OFFSETS

The offset distances from the Kelley Bushing to the antennas for the Syledis and doppler satellite were measured by steel tape as shown on the plan. Check measurements were also made to confirm the offsets.

GYRO CORRECTION

As no survey vessel was involved in the positioning, it was impossible to check the gyro by the usual means. The gyro compass was checked by the alignment of a survey vessel with the legs of the rig prior to the last positioning of the Sedco 709 (Alma G-72) and the correction obtained then was used.

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APPENDIX A

MERGE LISTING

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STATUS REQUEST FOR MERGE

ASS	1	TIME	189	11	28	SAT	13	FIT	0	DOPS	0	32	0	0	0
PASS	2	TIME	189	18	2	SAT	20	FIT	0	DOPS	0	32	0	0	0
PASS	3	TIME	189	18	38	SAT	11	FIT	0	DOPS	0	32	0	0	0
PASS	4	TIME	189	19	50	SAT	20	FIT	0	DOPS	0	32	0	0	0
PASS	5	TIME	189	21	32	SAT	48	FIT	0	DOPS	32	32	0	0	0
PASS	6	TIME	189	23	22	SAT	48	FIT	0	DOPS	32	32	0	0	0
PASS	7	TIME	190	5	4	SAT	20	FIT	0	DOPS	32	32	0	0	0
PASS	8	TIME	190	5	48	SAT	11	FIT	0	DOPS	32	32	0	0	0
PASS	9	TIME	190	6	48	SAT	20	FIT	0	DOPS	32	32	0	0	0
PASS	10	TIME	190	7	34	SAT	11	FIT	0	DOPS	32	32	0	0	0
PASS	11	TIME	190	8	50	SAT	13	FIT	0	DOPS	32	32	0	0	0
PASS	12	TIME	190	9	48	SAT	48	FIT	0	DOPS	32	32	0	0	0
PASS	13	TIME	190	10	38	SAT	13	FIT	0	DOPS	32	32	0	0	0
PASS	14	TIME	190	11	38	SAT	48	FIT	0	DOPS	32	0	0	0	0
PASS	15	TIME	190	16	56	SAT	20	FIT	0	DOPS	32	0	0	0	0
PASS	16	TIME	190	17	48	SAT	11	FIT	0	DOPS	32	32	0	0	0
PASS	17	TIME	190	18	40	SAT	20	FIT	0	DOPS	32	32	0	0	0
PASS	18	TIME	190	19	36	SAT	11	FIT	0	DOPS	32	32	0	0	0
PASS	19	TIME	190	20	52	SAT	13	FIT	0	DOPS	32	32	0	0	0
PASS	20	TIME	190	21	10	SAT	48	FIT	0	DOPS	32	32	0	0	0
PASS	21	TIME	190	22	40	SAT	13	FIT	0	DOPS	32	32	0	0	0
PASS	22	TIME	190	23	0	SAT	48	FIT	0	DOPS	32	32	0	0	0
PASS	23	TIME	191	4	58	SAT	11	FIT	0	DOPS	32	0	0	0	0
PASS	24	TIME	191	5	40	SAT	20	FIT	0	DOPS	32	0	0	0	0
PASS	25	TIME	191	6	44	SAT	11	FIT	0	DOPS	32	32	0	0	0
PASS	26	TIME	191	7	26	SAT	20	FIT	0	DOPS	32	32	0	0	0
PASS	27	TIME	191	9	26	SAT	48	FIT	0	DOPS	32	0	0	0	0
PASS	28	TIME	191	9	46	SAT	13	FIT	0	DOPS	32	0	0	0	0
PASS	29	TIME	191	11	16	SAT	48	FIT	0	DOPS	32	0	0	0	0
PASS	30	TIME	191	11	34	SAT	13	FIT	0	DOPS	32	0	0	0	0
PASS	31	TIME	191	17	0	SAT	11	FIT	0	DOPS	32	0	0	0	0
PASS	32	TIME	191	17	32	SAT	20	FIT	0	DOPS	32	32	0	0	0
PASS	33	TIME	191	18	46	SAT	11	FIT	0	DOPS	32	0	0	0	0
PASS	34	TIME	191	19	16	SAT	20	FIT	0	DOPS	32	32	0	0	0
PASS	35	TIME	191	20	52	SAT	48	FIT	0	DOPS	32	0	0	0	0
PASS	36	TIME	191	21	48	SAT	13	FIT	0	DOPS	32	32	0	0	0
PASS	37	TIME	191	23	36	SAT	13	FIT	0	DOPS	0	32	0	0	0
PASS	38	TIME	192	5	56	SAT	11	FIT	0	DOPS	32	32	0	0	0
PASS	39	TIME	192	6	16	SAT	20	FIT	0	DOPS	32	0	0	0	0
PASS	40	TIME	192	7	42	SAT	11	FIT	0	DOPS	32	0	0	0	0
PASS	41	TIME	192	8	2	SAT	20	FIT	0	DOPS	32	0	0	0	0
PASS	42	TIME	192	8	58	SAT	13	FIT	0	DOPS	32	32	0	0	0
PASS	43	TIME	192	10	44	SAT	13	FIT	0	DOPS	32	32	0	0	0
PASS	44	TIME	192	17	58	SAT	11	FIT	0	DOPS	32	32	0	0	0
PASS	45	TIME	192	19	46	SAT	11	FIT	0	DOPS	32	32	0	0	0
PASS	46	TIME	192	20	26	SAT	48	FIT	0	DOPS	32	32	0	0	0
PASS	47	TIME	192	20	58	SAT	13	FIT	0	DOPS	32	0	0	0	0
PASS	48	TIME	192	22	14	SAT	48	FIT	0	DOPS	32	32	0	0	0
PASS	49	TIME	192	22	44	SAT	13	FIT	0	DOPS	32	32	0	0	0
PASS	50	TIME	193	0	4	SAT	48	FIT	0	DOPS	32	32	0	0	0
PASS	51	TIME	193	5	10	SAT	11	FIT	0	DOPS	0	32	0	0	0
PASS	52	TIME	193	6	52	SAT	20	FIT	0	DOPS	32	0	0	0	0
PASS	53	TIME	193	8	8	SAT	13	FIT	0	DOPS	32	0	0	0	0
PASS	54	TIME	193	9	54	SAT	13	FIT	0	DOPS	32	0	0	0	0
PASS	55	TIME	193	10	30	SAT	48	FIT	0	DOPS	0	32	0	0	0
PASS	56	TIME	193	11	40	SAT	13	FIT	0	DOPS	32	0	0	0	0

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APPENDIX B

GEODOP SUMMARY

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NB: uses UTM long to →
derive true ϕ , λ effects.
~~wave~~

DIRECTIVE NS = 2
 DIRECTIVE PS = 4
 DIRECTIVE PR = 5
 DIRECTIVE AR = 5
 DIRECTIVE AW = 5

MS UNIT STDAY STMIN ENDDAY ENDMIN
 4 1 0 366 2359

MR UNIT RFLAG STDAY STMIN ENDDAY ENDMIN
 4 0 1 0 366 2359

MI STDAY STMIN ENDDAY ENDMIN SAT1 SAT2 SAT3 SAT4 SAT5
 1 0 366 2359 0 0 0 0 0

MO MSTN STDAY STMIN ENDDAY ENDMIN SAT1 SAT2 SAT3 SAT4 SAT5
 2 1 0 366 2359 0 0 0 0 0

GO SIGA CORRC ACC ALG ACR OUT
 1.40 0.00 25.00 26.00 5.00 10.00

EL ANOT BNOT DX DY DZ
 6378145.00 6356759.77 0.00 0.00 0.00

SL	STN	LATDEG	LATMIN	LATSEC	LONGDG	LONGMN	LONGSC	HEIGHT
	1	43.000	56.000	12.647	299.000	55.000	32.046	-1.030
	2	43.000	37.000	17.329	299.000	51.000	10.440	-21.190

SN STN = 1 STATION NAME = 226791

SN STN = 2 STATION NAME = SED709

S1	STN	TIMEF	RCRWT	RCRDL	FOFHZ	FOFSG	FOFDR	TBIAS
	1	0.00	20.00	350.00	2.00	1.00	0.00	1.00
	2	0.00	15.00	350.00	0.00	1.00	0.00	1.00

S2	STN	FREQF	HOREL	PASSEL	SIGC	SIGF	TRIM	S150/400
	1	0.00	7.50	14.50	100.00	2.00	1.00	1 / 1
	2	0.00	7.50	14.50	100.00	2.00	1.00	1 / 1

SA	STN	ATPHI	ATLAM	ATHT
	1	0.00	0.00	2.14
	2	1.70	-34.20	24.00

MT	STN	METN	HOUR	MIN	DAY	PRESS	DRY	DRYWT
	1	1	19	0	189	1026.0	18.5	1.0
	1	2	18	0	190	1026.0	19.1	1.7
	1	3	18	0	191	1022.7	20.2	1.4
	1	4	18	0	192	1019.0	20.2	1.4
	1	5	18	0	193	1016.3	17.5	.2
	1	6	13	0	194	1011.9	15.2	.9

MT	STN	METN	HOUR	MIN	DAY	PRESS	DRY	DRYWT
	2	1	0	0	1	1017.0	17.0	1.0
	2	2	0	0	365	1017.0	17.0	1.0
	2	0	0	0	0	0.0	0.0	0.0
	2	0	0	0	0	0.0	0.0	0.0
	2	0	0	0	0	0.0	0.0	0.0

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GEODOP PHASE

OPTIONS USED FOR THIS RUN ARE

ITG = 1

HOR = 7.5 DEGREES HORIZON CUT-OFF CRITERIA

ACC = 25.0 INITIAL COORDINATE ESTIMATION ACCURACY

SIGM = 1.4 APRIORI VARIANCE FACTOR

TE = 14.5 PASS ELEV CUTOFF

RT = 0.00 CORRELATION COEFFICIENT

ALONG= 26.0 ORBIT CONSTRAINTS 1 SIG. (METRES)

ACCRS= 5.0 METRES

OUT = 10.0 METRES

REFERENCE ELLIPSOID

SEMI-MAJ. A =6378145.00 M

SEMI-MIN. B =6356759.77

DATUM SHIFT (METRES)

DX= 0.00

DY= 0.00

DZ= 0.00

ST.NAME	CODE	WGHT	DELY	T.B.	FREQ.	STD.	DRIFT	LATITUDE	LONGITUDE	HEIGHT
LAT/LONG/HGT	ANT	SHIFT	X	Y	Z					
226791	0	20.0	350	1.0	2.0	1.0	0.0	43 56	12.647 299 55	32.046 -1.
0.0	0.0	2.1	2294999.1	-3987007.5	4403045.5					
SED709	0	15.0	350	1.0	0.0	1.0	0.0	43 37	17.329 299 51	10.440 -21.
1.7-34.2	24.0	2302001.0	-4010928.8	4377732.5						

VPV = 0.000

DEGREES OF FREEDOM = -6

48 189 21 32 PASS= 1 IEND= 0

ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y

Z USED DOPPLERS

ED709 2138 1015. 20.0 13.6 .76 357 13.2 47.0 2301302.2 -4010781.4

.377338.5 0000 0000 0000 0200 1200 1230 1234 1000

0 +++++ ABOVE PASS REJECTED AT 99% PROB.LEVEL - REJECTION NO. = 1

ORB BIASES(M) ACCR= 16.3 ALG= 146.9 OUT= 60.0 VPV= 0.0000 DTVPV=1166

.53 DF= -6 SO= 1.000

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0 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y
 Z USED DOPPLERS
 26791 2326 1026. 18.6 17.8 .27 351 100.4 33.9 2295130.4 -3987037.0
 403127.1 0030 1234 1034 1234 1234 1234 1234 1000
 SED709 2326 1015. 20.0 13.6 -.68 352 6.0 33.8 2301978.5 -4010959.3
 4377786.9 0000 0034 1200 0004 0000 1000 0000 0000

++++ ABOVE PASS REJECTED AT 99% PROB.LEVEL - REJECTION NO. = 2

ORB BIASES(M) ACCR= 11.1 ALG= 35.3 OUT= -14.9 VPV= 0.0000 DTVPV= 252
 18 DF= -6 SO= 1.000

20 190 5 4 PASS= 3 IEND= 0
 0 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y
 Z USED DOPPLERS
 26791 5 8 1026. 18.8 18.1 1.24 351 -5.6 20.9 2294997.7 -3986997.5
 403060.2 0034 1234 1234 1234 1234 1230 0000 0000

ORB BIASES(M) ACCR= -.3 ALG= 13.3 OUT= -1.2 VPV= 6.3026 DTVPV= 6
 30 DF= 14 SO= .671

11 190 5 48 PASS= 4 IEND= 0
 0 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y
 Z USED DOPPLERS
 26791 552 1026. 18.8 18.1 1.58 348 .7 50.6 2294996.6 -3987006.6
 403061.0 1234 1234 1234 1234 1234 1034 1230 0000
 SED709 552 1015. 20.0 13.6 -.15 351 -8.2 50.3 2301975.3 -4010963.2
 4377765.5 1200 1234 1200 1234 1200 1030 1004 0000

ORB BIASES(M) ACCR= 4.4 ALG= .1 OUT= 6.3 VPV= 39.0450 DTVPV= 32
 74 DF= 56 SO= .835

20 190 6 48 PASS= 5 IEND= 0
 0 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y
 Z USED DOPPLERS
 26791 652 1026. 18.8 18.1 1.41 373 -8.7 72.8 2294996.5 -3986997.2
 403060.8 0034 1234 1234 1234 1234 1234 1234 1200
 SED709 654 1015. 20.0 13.6 -.42 328 -6.8 73.0 2301976.7 -4010952.3
 4377764.0 1204 1000 1200 0034 0034 1000 0000 0000

ORB BIASES(M) ACCR= -3.6 ALG= 17.9 OUT= .9 VPV= 57.9666 DTVPV= 18
 92 DF= 93 SO= .789

11 190 7 34 PASS= 6 IEND= 0
 0 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y
 Z USED DOPPLERS
 26791 738 1026. 18.8 18.2 2.21 237 -74.7 28.9 2295057.3 -3986989.0
 4403013.7 0000 0004 0000 1234 1004 1230 1200 0000
 SED709 742 1015. 20.0 13.6 .28 464 -49.8 28.8 2302036.0 -4010945.9
 4377719.3 0000 0034 1004 0000 1030 0000 0000 0000

++++ ABOVE PASS REJECTED AT 99% PROB.LEVEL - REJECTION NO. = 3

ORB BIASES(M) ACCR= -1.2 ALG= -46.1 OUT= -134.5 VPV= 57.9666 DTVPV= 517
 33 DF= 93 SO= .889

13 190 8 50 PASS= 7 IEND= 0
 0 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y
 Z USED DOPPLERS
 26791 854 1026. 18.9 18.2 1.80 365 -5.8 27.5 2294997.6 -3986998.6
 4403058.5 0004 1234 1234 1234 1234 1234 1000 0000
 SED709 854 1015. 20.0 13.6 -.20 332 -15.5 27.3 2301978.5 -4010953.6
 4377761.6 0004 0234 1230 0204 1000 0200 0230 0000

ORB BIASES(M) ACCR= -1.1 ALG= -23.8 OUT= -.3 VPV= 69.6669 DTVPV= 11

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48 190 9 48 PASS= 8 IEND= 0

13 190 10 38 PASS= 9 IEND= 0

0 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y

Z USED DOPPLERS

226791 1042 1026. 18.9 18.3 1.89 329 5.5 53.0 2294997.6 -3986997.9
4403059.0 0234 1234 1234 1034 1234 1234 1200 0000
SED709 1044 1015. 20.0 13.6 -.24 365 -1.6 53.0 2301980.5 -4010950.2
4377761.1 1200 1200 0200 1234 1004 1030 0000 0000

ORB BIASES(M) ACCR= 1.0 ALG= -3.6 OUT= -5.1 VPV= 86.1400 DTVPV= 16

47 DF= 161 SO= .731

11 190 17 48 PASS= 10 IEND= 0

0 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y

Z USED DOPPLERS

226791 1752 1026. 19.1 18.7 2.39 468 .5 53.3 2294999.4 -3986997.6
4403060.7 0004 1234 1034 1234 1234 1234 1230
SED709 1754 1015. 20.0 13.6 -.09 228 -.5 52.8 2301980.5 -4010949.3
4377763.5 0234 1200 0034 1234 1230 1204 1000 0000

ORB BIASES(M) ACCR= 2.0 ALG= 1.7 OUT= 12.5 VPV= 114.9237 DTVPV= 28

78 DF= 204 SO= .751

20 190 18 40 PASS= 11 IEND= 0

0 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y

Z USED DOPPLERS

226791 1846 1026. 19.1 18.8 2.13 468 -2.7 81.0 2295002.3 -3986998.9
4403055.9 1234 1034 1004 1234 1234 1234 0000 0000
SED709 1844 1015. 20.0 13.6 -.37 244 -2.1 81.0 2301982.9 -4010949.2
4377758.8 0230 0030 1230 0004 0234 1034 1234 0000

ORB BIASES(M) ACCR= -1.6 ALG= 14.7 OUT= 1.6 VPV= 146.7785 DTVPV= 31

.85 DF= 240 SO= .782

11 190 19 36 PASS= 12 IEND= 0

0 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y

Z USED DOPPLERS

226791 1940 1026. 19.2 18.8 2.24 411 72.1 28.1 2294990.2 -3987005.0
4403061.2 0004 1234 1234 1234 1234 1234 1004 0000
SED709 1940 1015. 20.0 13.6 -.31 289 55.3 28.1 2301970.1 -4010955.3
4377764.7 0000 1234 0200 1204 1230 1230 1030 0000

0 ++++ ABOVE PASS REJECTED AT 99% PROB.LEVEL - REJECTION NO. = 4

ORB BIASES(M) ACCR= 2.9 ALG= 40.3 OUT= -58.6 VPV= 146.7785 DTVPV= 261

.64 DF= 240 SO= .884

13 190 20 52 PASS= 13 IEND= 0

0 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y

Z USED DOPPLERS

226791 2056 1026. 19.2 18.9 2.35 329 7.0 28.5 2295002.4 -3986999.0
4403056.0 0034 1234 1230 1234 1234 1234 1230 0000
SED709 2056 1015. 20.0 13.6 -.24 369 5.9 28.2 2301982.5 -4010949.7
4377758.6 0000 1034 0000 1234 1230 1234 1200 0000

ORB BIASES(M) ACCR= 1.8 ALG= -8.1 OUT= -1.9 VPV= 175.5129 DTVPV= 28

3 DF= 278 SO= .795

48 190 21 10 PASS= 14 IEND= 0

0 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y

Z USED DOPPLERS

226791 2114 1026. 19.2 19.0 2.15 332 58.7 35.3 2295001.9 -3986999.5
4403057.0 0000 1234 1234 1234 1234 1234 1200

FB 33547

++++ ABOVE PASS REJECTED AT 99% PROB.LEVEL - REJECTION NO. = 5

ORB BIASES(M) ACCR= 12.8 ALG= 12.2 OUT= 12.9 VPV= 175.5129 DTVPV= 176
93 DF= 278 SO= .891

13 190 22 40 PASS= 15 IEND= 0
0 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y
Z USED DOPPLERS
226791 2244 1025. 19.3 19.1 2.41 386 10.6 52.7 2295000.5 -3986999.5
4403057.8 0234 1230 1234 1234 1234 1234 1000 0000
SED709 2244 1015. 20.0 13.6 -.22 313 18.2 52.9 2301980.9 -4010949.6
4377760.5 0230 1234 0000 1030 0034 1234 1000 0000

ORB BIASES(M) ACCR= .9 ALG= 4.1 OUT= -6.6 VPV= 196.5313 DTVPV= 21
02 DF= 314 SO= .791

48 190 23 0 PASS= 16 IEND= 0
ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y
Z USED DOPPLERS
226791 23 4 1025. 19.3 19.1 2.17 277 107.8 45.2 2295000.3 -3987000.5
4403060.0 0234 1234 1234 1234 1234 1230 1230 0000
SED709 23 4 1015. 20.0 13.6 -.48 424 82.2 45.1 2301981.0 -4010949.9
4377763.0 0234 1234 1004 1234 1204 0004 0200 0000

++++ ABOVE PASS REJECTED AT 99% PROB.LEVEL - REJECTION NO. = 6

ORB BIASES(M) ACCR= 18.6 ALG= 14.5 OUT= -.0 VPV= 196.5313 DTVPV= 331
25 DF= 314 SO= .889

11 191 6 44 PASS= 17 IEND= 0
ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y
Z USED DOPPLERS
226791 648 1024. 19.7 19.8 2.78 418 1.2 60.3 2295000.7 -3986999.9
4403057.3 0004 1234 1000 1034 1234 0034 1234 1230
SED709 650 1015. 20.0 13.6 .10 279 -3.1 60.3 2301981.2 -4010950.1
4377759.7 0034 0204 1230 0200 0000 0004 0000 0000

ORB BIASES(M) ACCR= 1.6 ALG= -2.5 OUT= 1.6 VPV= 215.7723 DTVPV= 19
24 DF= 343 SO= .793

20 191 7 26 PASS= 18 IEND= 0
ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y
Z USED DOPPLERS
226791 730 1024. 19.7 19.8 2.54 279 -17.6 37.7 2295002.3 -3986999.5
4403056.0 1234 1234 1204 1234 1234 1234 1200 0000
SED709 730 1015. 20.0 13.6 -.15 418 -6.5 37.7 2301983.1 -4010949.4
4377758.6 1030 0034 0034 1234 1234 0234 1200 0000

ORB BIASES(M) ACCR= .4 ALG= -20.7 OUT= -17.0 VPV= 270.0779 DTVPV= 54
31 DF= 385 SO= .838

20 191 17 32 PASS= 19 IEND= 0
ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y
Z USED DOPPLERS
226791 1736 1023. 20.2 20.7 2.68 298 18.3 36.3 2294999.2 -3987000.0
4403056.3 0034 1234 0234 1234 1234 1234 1000 0000
SED709 1736 1015. 20.0 13.6 -.16 397 12.5 35.9 2301980.5 -4010949.8
4377758.8 0204 1234 0030 0000 0000 0000 0000 0000

ORB BIASES(M) ACCR= 8.2 ALG= -26.4 OUT= -26.7 VPV= 310.4766 DTVPV= 40
30 DF= 412 SO= .868

20 191 19 16 PASS= 20 IEND= 0

FB 33547

USED DOPPLERS

226791 1920 1022. 20.2 20.7 2.63 453 12.9 42.5 2295001.7 -3987007.3
 4403049.8 0034 1234 1234 1234 1234 1234 1234 1000
 SED709 1926 1015. 20.0 13.6 -.23 263 9.0 42.6 2301981.7 -4010957.9
 4377753.1 0234 0234 1204 0034 1000 0000 0000 0000

ORB BIASES(M) ACCR= 9.5 ALG= -2.0 OUT= -22.6 VPV= 392.2839 DTVPV= 81
 .1 DF= 449 SO= .935

13 191 21 48 PASS= 21 IEND= 0
 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y
 Z USED DOPPLERS
 226791 2152 1022. 20.2 20.7 2.91 459 -4.5 75.7 2295001.0 -3987006.8
 4403049.6 0234 1234 1234 1000 0234 1234 1234 1000
 SED709 2152 1015. 20.0 13.6 .01 239 -6.2 75.3 2301980.7 -4010957.2
 4377753.2 0030 0000 1234 1230 0204 0004 1030 1000

ORB BIASES(M) ACCR= -1.3 ALG= -9.4 OUT= -3.2 VPV= 424.2383 DTVPV= 31
 .95 DF= 485 SO= .935

11 192 5 56 PASS= 22 IEND= 0
 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y
 Z USED DOPPLERS
 226791 6 0 1021. 20.2 20.7 3.11 365 -5.2 66.6 2295002.6 -3987009.5
 4403046.3 0234 1234 1234 1234 1234 1034 1234 1000
 SED709 6 4 1015. 20.0 13.6 .16 317 -13.5 66.2 2301981.6 -4010960.1
 4377749.6 1230 1234 1234 0034 1230 1000 0000 0000

ORB BIASES(M) ACCR= .7 ALG= -4.5 OUT= 3.1 VPV= 456.6664 DTVPV= 32
 43 DF= 527 SO= .931

13 192 8 58 PASS= 23 IEND= 0
 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y
 Z USED DOPPLERS
 226791 9 2 1020. 20.2 20.7 2.97 474 6.6 35.1 2295002.1 -3987009.4
 4403046.5 0234 1234 1234 1234 1234 1234 0000 0000
 SED709 9 2 1015. 20.0 13.6 .00 227 12.1 34.8 2301981.7 -4010960.2
 4377749.6 0234 1234 1230 1204 1234 0234 1000 0000

ORB BIASES(M) ACCR= 3.5 ALG= 20.4 OUT= 4.6 VPV= 508.0395 DTVPV= 51
 .37 DF= 569 SO= .945

13 192 10 44 PASS= 24 IEND= 0
 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y
 Z USED DOPPLERS
 226791 1048 1020. 20.2 20.7 2.96 390 4.3 41.5 2295001.5 -3987007.5
 4403048.2 0234 1234 1234 1234 1004 1234 1230 0000
 SED709 1052 1015. 20.0 13.6 .01 326 3.6 41.5 2301980.4 -4010958.9
 4377751.4 0234 1234 1234 1034 1000 0000 0000 0000

ORB BIASES(M) ACCR= 2.3 ALG= 30.6 OUT= 1.1 VPV= 551.7396 DTVPV= 43
 .70 DF= 606 SO= .954

11 192 17 58 PASS= 25 IEND= 0
 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y
 Z USED DOPPLERS
 226791 18 2 1019. 20.2 20.7 3.14 469 -2.5 69.6 2295001.5 -3987007.7
 403047.9 0234 1034 1234 1234 1234 1234 1234 0000
 SED709 18 2 1015. 20.0 13.6 .18 229 -12.9 69.0 2301980.2 -4010959.0
 4377751.4 1034 0000 1000 0030 1200 1234 0200 0000

ORB BIASES(M) ACCR= 1.1 ALG= -5.5 OUT= -2.7 VPV= 596.1462 DTVPV= 44
 41 DF= 642 SO= .964

11 192 19 46 PASS= 26 IEND= 0

FB 33547

USED DOPPLERS

226791 1950 1019. 20.0 20.6 3.13 313 13.1 21.4 2295001.8 -3987007.3
 4403048.0 0034 1234 1234 1234 1234 1200 0000 0000
 SED709 1950 1015. 20.0 13.6 .19 386 -11.4 21.4 2301981.1 -4010958.2
 4377751.2 0034 0004 0030 1000 0234 1234 0000 0000

ORB BIASES(M) ACCR= .7 ALG= 3.9 OUT= 9.2 VPV= 650.2053 DTVPV= 54
 .6 DF= 672 SO= .984

48 192 20 26 PASS= 27 IEND= 0
 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y
 Z USED DOPPLERS
 226791 2030 1019. 19.9 20.6 2.83 349 -6.9 19.5 2295000.5 -3987008.6
 4403047.1 0000 0034 1000 0000 0234 1000 0000 0000

ORB BIASES(M) ACCR= 2.3 ALG= 8.1 OUT= 27.8 VPV= 664.1169 DTVPV= 13
 91 DF= 678 SO= .990

48 192 22 14 PASS= 28 IEND= 0
 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y
 Z USED DOPPLERS
 226791 2218 1019. 19.7 20.5 2.79 364 79.1 79.5 2295000.9 -3987008.8
 4403047.8 0034 1234 1234 1234 1234 1234 1200 0000
 SED709 2218 1015. 20.0 13.6 -.17 337 51.9 79.9 2301980.3 -4010959.6
 4377751.0 0004 1234 1230 1234 1234 0034 0200 0000

++++ ABOVE PASS REJECTED AT 99% PROB.LEVEL - REJECTION NO. = 7

ORB BIASES(M) ACCR= 20.5 ALG= 17.5 OUT= -1.4 VPV= 664.1169 DTVPV= 223
 35 DF= 678 SO= .995

13 192 22 44 PASS= 29 IEND= 0
 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y
 Z USED DOPPLERS
 226791 2248 1018. 19.7 20.5 3.08 321-108.4 41.3 2295003.9 -3987006.1
 4403044.8 0000 1034 1234 1234 1230 1234 1004 1000
 SED709 2248 1015. 20.0 13.6 .09 387 -64.8 41.4 2301983.7 -4010956.8
 4377748.0 0000 0000 0230 1034 0030 1030 0004 1200

++++ ABOVE PASS REJECTED AT 99% PROB.LEVEL - REJECTION NO. = 8

ORB BIASES(M) ACCR= -7.7 ALG= 52.2 OUT= 55.8 VPV= 664.1169 DTVPV= 333
 28 DF= 678 SO= .997

48 193 0 4 PASS= 30 IEND= 0
 ST.NO H MN PRESS TEMP PWP FREQ. DELAY TROP& ELEV X Y
 Z USED DOPPLERS
 226791 0 8 1018. 19.5 20.4 1.94 366 159.1 14.8 2294966.9 -3987006.4
 4403073.2 0000 0034 1234 1234 0004 0000 0000 0000
 SED709 0 8 1015. 20.0 13.6 -1.00 331 91.7 14.7 2301946.0 -4010956.6
 4377775.7 0000 0004 1230 1204 1004 0000 0000 0000

++++ ABOVE PASS REJECTED AT 99% PROB.LEVEL - REJECTION NO. = 9

ORB BIASES(M) ACCR= -28.2 ALG= 174.7 OUT= 493.2 VPV= 664.1169 DTVPV=3404
 35 DF= 678 SO= .999

PHASE SOLUTION - SUMMARY

COVARIANCE MATRIX OF X, Y, Z

5.06 -.93-2.87 4.92-1.09-2.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 5.59 4.20 -.99 5.70 3.99 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

FB 33547

FB 33547