

DGMC 20 DESCHUTES 09 REPORT June 2009

(superseded by Deschutes 13-see DGMC 21)

Survey Purpose:

The purpose of this project is to provide a method to transform positions from NAD83 (CORS96)(Epoch 2002.0) as broadcast by the Oregon Real Time GPS Network (ORGN) to the Central Oregon Coordinate System (COCS). This transformation will be known as the "Deschutes09" transformation and will allow users to utilize the ORGN as a source for providing COCS positions without the need to do a 'local transformation' sometimes called a "calibration" for each individual project.

Background information:

The COCS is a low distortion projection developed by the Deschutes County Surveyors office in 199X and has been adopted and used by many local surveyors over the intervening years. The COCS was designed to reduce the distortion between ground distances and grid distances and is defined as follows:

Linear unit: International foot (ift)

Geodetic datum: North American Datum of 1983 (1991)

Vertical datum: National Geodetic Vertical Datum of 1929 (NGVD29)

System: Central Oregon Coordinate System

Projection: Transverse Mercator

Latitude of grid origin: 43° 00' 00" N

Longitude of central meridian: 121° 17' 00"W

Northing at grid origin: 0.000 ft

Easting at central meridian: 3,000,000.000 ift

Scale factor on central meridian: 1.00016 (exact)

Solution:

In order to utilize Real Time network GNSS technology broadcasting data on newer datum's (in this case the ORGN), a transformation is needed to obtain legacy values that are compatible with the many existing surveys and monuments.

A Classical 3D transformation approach (3D similarity transformation) consisting of three translations, three rotations and one scale factor was selected as the transformation method utilizing the Molodensky-Badekas model (transformation model where the rotation origin is the centre of gravity of the common points of system A, in this case the ORGN derived positions). The transformation was performed within the Leica GNSS suite of software using Leica Geo Office (LGO) version 7.0.

In order to utilize this type of transformation, a number of common points must be included, for this project 14 points were selected that were approximately randomly distributed across the original extent of the COCS, favoring those points that were considered to be solid primary points in both the horizontal and vertical components from the original 1990's surveys. The following table lists those 14 points along with their record position per the Deschutes County Surveyor's Office (DCSO), note that the National Geodetic Survey (NGS) geoid model

Compiled by Shelby Griggs, PLS
of OrbiTech Inc.

GEOID03 was utilized to provide the shown (ellipsoid) heights by adding the geoid height to the published NGVD29 heights. It should be noted that these “ellipsoid heights” are really more of a pseudo ellipsoid height due to the fact that the NGS developed geoid models are developed to work with NAD83 and NAVD88, NOT NGVD29. The original COCS mark information sheets as published by DCSO also DID NOT have correct **NAD83** ellipsoid heights published, users who wish to obtain measured NAD83 ellipsoid heights on a mark can do so by measuring a point with no transformation selected in either their hardware or software.

Local Grid Record:

	Easting [fti]	Northing [fti]	Hgt [fti]
15	3335307.37270	460142.99049	2980.72766
22	3298007.26010	406494.95620	3369.25758
24	3277347.23760	371925.73389	3812.32320
35	3347502.39239	427162.52589	3173.67782
38	3230007.21171	224792.26949	4198.11808
39	3193020.89469	249030.75541	4284.85463
42	3263078.83701	305308.04760	4139.91995
48	3480331.81401	297435.91719	4569.79137
49	3366970.98241	344328.12490	3558.93442
54	3228634.98848	476139.61982	3104.03018
550	3340484.50591	595755.78940	2172.72208
6	3287432.44491	471204.52851	2972.54629
62	3306786.19268	378026.98179	3634.99675
9	3329305.45400	492326.38369	2797.67231

Each of the 14 points was occupied multiple times by dual frequency Leica GNSS receivers in June of 2009. Using the mean measured positions of these 14 occupations as obtained from a network solution from the ORGN served as the basis of the resulting transformation.

The transformation was then computed from the 14 measured points to the record positions of those same points with the resulting parameters as shown below:

3D-Helmert transformation

Number of common points: 14
 Sigma a priori: 1.0000
 Sigma a posteriori: 0.0120
 Transformation model: Molodensky-Badekas
 Rotation origin: X0: -7814871.89688 fti
 Y0: -12873216.84364 fti
 Z0: 14484760.14636 fti

No.	Parameter	Value	rms
1	Shift dX	1.32438 fti	0.01050 fti
2	Shift dY	2.19400 fti	0.01050 fti
3	Shift dZ	-2.83717 fti	0.01050 fti
4	Rotation about X	-0.42109 "	0.02497 "
5	Rotation about Y	0.11105 "	0.02313 "
6	Rotation about Z	-0.17474 "	0.02613 "
7	Scale	-0.0385 ppm	0.0867 ppm

Individual point residuals for the 14 points are as follows:

Grid:

System A	System B	Point type	dE [fti]	dN [fti]	dHgt [fti]
15	15	Position + height	0.02313 fti	-0.00472 fti	-0.07644 fti
22	22	Position + height	-0.00584 fti	0.00276 fti	-0.02628 fti
24	24	Position + height	0.01870 fti	0.01086 fti	-0.02037 fti
35	35	Position + height	0.02539 fti	-0.01624 fti	0.04259 fti
38	38	Position + height	-0.02070 fti	0.05049 fti	-0.06027 fti
39	39	Position + height	-0.06135 fti	0.05315 fti	0.00253 fti

42	42	Position + height	-0.00751 fti	-0.04485 fti	0.07552 fti
48	48	Position + height	0.03832 fti	0.00131 fti	0.01175 fti
49	49	Position + height	0.02402 fti	0.00223 fti	0.02510 fti
54	54	Position + height	0.01283 fti	-0.03543 fti	0.06158 fti
550	550	Position + height	-0.06637 fti	-0.00604 fti	-0.00751 fti
6	6	Position + height	-0.04072 fti	-0.05085 fti	-0.01529 fti
62	62	Position + height	0.03940 fti	-0.01509 fti	-0.01460 fti
9	9	Position + height	0.02070 fti	0.05240 fti	0.00171 fti

Testing the Deschutes09 transformation:

The Deschutes09 transformation was then utilized to survey a number of points as a field test on the accuracy of the transformation and is summerized as follows:



Classical 3D - Transformation Report

Processed: 06/17/2009 16:17:50

Project Information

	System A	System B
Project name:	DCSO CORS Measured 10-Jun-2009	DCSO Record Positions

Coordinate System Information System B

Coordinate system name:	COCS
Created:	-
Transformation name:	-
Transformation type:	-
Height mode:	-
Residuals:	-
Local Ellipsoid:	GRS 1980
Projection:	COCS
Geoid model:	Geoid03
CSCS model:	-

Transformation details

Height mode:	Ellipsoidal
--------------	-------------

3D-Helmert transformation

Number of common points:	14	
Sigma a priori:	1.0000	
Sigma a posteriori:	0.0120	
Transformation model:	Molodensky-Badekas	
Rotation origin:	X0:	-7814871.89688 fti
	Y0:	-12873216.84364 fti
	Z0:	14484760.14636 fti

No.	Parameter	Value	rms
1	Shift dX	1.32438 fti	0.01050 fti
2	Shift dY	2.19400 fti	0.01050 fti
3	Shift dZ	-2.83717 fti	0.01050 fti
4	Rotation about X	-0.42109 "	0.02497 "
5	Rotation about Y	0.11105 "	0.02313 "
6	Rotation about Z	-0.17474 "	0.02613 "
7	Scale	-0.0385 ppm	0.0867 ppm

Residuals

Cartesian:

System A	System B	Point type	dX [fti]	dY [fti]	dZ [fti]
15	15	Position + height	0.04639 fti	0.03205 fti	-0.05676 fti
22	22	Position + height	0.00581 fti	0.02077 fti	-0.01631 fti
24	24	Position + height	0.02753 fti	0.00925 fti	-0.00633 fti
35	35	Position + height	0.00007 fti	-0.04898 fti	0.01801 fti
38	38	Position + height	0.02323 fti	0.07776 fti	-0.00505 fti
39	39	Position + height	-0.03422 fti	0.06188 fti	0.03996 fti
42	42	Position + height	-0.05095 fti	-0.06913 fti	0.01995 fti
48	48	Position + height	0.02904 fti	-0.02621 fti	0.00886 fti
49	49	Position + height	0.01204 fti	-0.02661 fti	0.01900 fti
54	54	Position + height	-0.02497 fti	-0.06539 fti	0.01768 fti
550	550	Position + height	-0.05620 fti	0.03533 fti	-0.00948 fti
6	6	Position + height	-0.04754 fti	0.00016 fti	-0.04711 fti
62	62	Position + height	0.03369 fti	-0.02044 fti	-0.02103 fti
9	9	Position + height	0.03612 fti	0.01952 fti	0.03862 fti

Grid:

System A	System B	Point type	dE [fti]	dN [fti]	dHgt [fti]
15	15	Position + height	0.02313 fti	-0.00472 fti	-0.07644 fti
22	22	Position + height	-0.00584 fti	0.00276 fti	-0.02628 fti
24	24	Position + height	0.01870 fti	0.01086 fti	-0.02037 fti
35	35	Position + height	0.02539 fti	-0.01624 fti	0.04259 fti
38	38	Position + height	-0.02070 fti	0.05049 fti	-0.06027 fti
39	39	Position + height	-0.06135 fti	0.05315 fti	0.00253 fti

42	42	Position + height	-0.00751 fti	-0.04485 fti	0.07552 fti
48	48	Position + height	0.03832 fti	0.00131 fti	0.01175 fti
49	49	Position + height	0.02402 fti	0.00223 fti	0.02510 fti
54	54	Position + height	0.01283 fti	-0.03543 fti	0.06158 fti
550	550	Position + height	-0.06637 fti	-0.00604 fti	-0.00751 fti
6	6	Position + height	-0.04072 fti	-0.05085 fti	-0.01529 fti
62	62	Position + height	0.03940 fti	-0.01509 fti	-0.01460 fti
9	9	Position + height	0.02070 fti	0.05240 fti	0.00171 fti

Graphical overview:

List of identical points

System A:

WGS 84 Cartesian:

	X [fti]	Y [fti]	Z [fti]
15	-7765427.09587	-12848250.12133	14532893.10876
22	-7816876.70866	-12861094.78865	14494716.70919
24	-7847179.18973	-12871178.76273	14470177.50443
35	-7767010.83383	-12874341.85331	14509374.08730
38	-7940643.97395	-12933831.59278	14364207.16719
39	-7963539.87244	-12900283.46040	14381698.12516
42	-7883488.70804	-12903457.07441	14422411.23294
48	-7700529.30026	-13020739.79288	14416514.99662
49	-7780406.91276	-12933882.90689	14450077.63146
54	-7850800.90925	-12783333.47566	14544366.70699
550	-7711390.73642	-12769284.32608	14629128.68963
6	-7802337.45180	-12816801.88219	14540825.06775
62	-7819755.83737	-12882739.76342	14474448.83415
9	-7758819.02579	-12825816.01033	14555802.18740

Local Grid (Transf.):

	Easting [fti]	Northing [fti]	Hgt [fti]
15	3335307.39583	460142.98579	2980.65121
22	3298007.25427	406494.95896	3369.23130
24	3277347.25630	371925.74478	3812.30282
35	3347502.41778	427162.50968	3173.72044

38	3230007.19098	224792.32001	4198.05781
39	3193020.83337	249030.80853	4284.85715
42	3263078.82946	305308.00276	4139.99551
48	3480331.85233	297435.91850	4569.80315
49	3366971.00643	344328.12713	3558.95951
54	3228635.00135	476139.58435	3104.09177
550	3340484.43953	595755.78337	2172.71457
6	3287432.40417	471204.47762	2972.53100
62	3306786.23209	378026.96670	3634.98215
9	3329305.47470	492326.43609	2797.67398

System B:**Local Cartesian:**

	X [fti]	Y [fti]	Z [fti]
15	-7765425.86686	-12848248.01673	14532890.40407
22	-7816875.40564	-12861092.63793	14494713.91158
24	-7847177.88547	-12871176.57569	14470174.66093
35	-7767009.52365	-12874339.62001	14509371.25466
38	-7940642.55171	-12933829.33465	14364204.14826
39	-7963538.42969	-12900281.24275	14381695.11670
42	-7883487.27087	-12903454.74098	14422408.27953
48	-7700527.84760	-13020737.33077	14416511.91362
49	-7780405.53169	-12933880.58396	14450074.67133
54	-7850799.66677	-12783331.37185	14544364.01401
550	-7711389.52559	-12769282.37851	14629126.12425
6	-7802336.15833	-12816799.79436	14540822.39744
62	-7819754.53287	-12882737.53169	14474445.99633
9	-7758817.81808	-12825813.93524	14555799.43583

Local Grid:

	Easting [fti]	Northing [fti]	Hgt [fti]
15	3335307.37270	460142.99049	2980.72766
22	3298007.26010	406494.95620	3369.25758
24	3277347.23760	371925.73389	3812.32320
35	3347502.39239	427162.52589	3173.67782
38	3230007.21171	224792.26949	4198.11808
39	3193020.89469	249030.75541	4284.85463
42	3263078.83701	305308.04760	4139.91995

48	3480331.81401	297435.91719	4569.79137
49	3366970.98241	344328.12490	3558.93442
54	3228634.98848	476139.61982	3104.03018
550	3340484.50591	595755.78940	2172.72208
6	3287432.44491	471204.52851	2972.54629
62	3306786.19268	378026.98179	3634.99675
9	3329305.45400	492326.38369	2797.67231



Classical 3D - Transformation Report

Processed: 06/17/2009 16:17:50

Project Information

	System A	System B
Project name:	DCSO CORS Measured 10-Jun-2009	DCSO Record Positions

Coordinate System Information System B

Coordinate system name:	COCS
Created:	-
Transformation name:	-
Transformation type:	-
Height mode:	-
Residuals:	-
Local Ellipsoid:	GRS 1980
Projection:	COCS
Geoid model:	Geoid03
CSCS model:	-

Transformation details

Height mode:	Ellipsoidal
--------------	-------------

3D-Helmert transformation

Number of common points:	14
Sigma a priori:	1.0000
Sigma a posteriori:	0.0120
Transformation model:	Molodensky-Badekas
Rotation origin:	X0: -7814871.89688 ft
	Y0: -12873216.84364 ft
	Z0: 14484760.14636 ft

No.	Parameter	Value	rms
1	Shift dX	1.32438 ft	0.01050 ft
2	Shift dY	2.19400 ft	0.01050 ft
3	Shift dZ	-2.83717 ft	0.01050 ft
4	Rotation about X	-0.42109 "	0.02497 "
5	Rotation about Y	0.11105 "	0.02313 "
6	Rotation about Z	-0.17474 "	0.02613 "
7	Scale	-0.0385 ppm	0.0867 ppm

Residuals

Cartesian:

System A	System B	Point type	dX [fti]	dY [fti]	dZ [fti]
15	15	Position + height	0.04639 fti	0.03205 fti	-0.05676 fti
22	22	Position + height	0.00581 fti	0.02077 fti	-0.01631 fti
24	24	Position + height	0.02753 fti	0.00925 fti	-0.00633 fti
35	35	Position + height	0.00007 fti	-0.04898 fti	0.01801 fti
38	38	Position + height	0.02323 fti	0.07776 fti	-0.00505 fti
39	39	Position + height	-0.03422 fti	0.06188 fti	0.03996 fti
42	42	Position + height	-0.05095 fti	-0.06913 fti	0.01995 fti
48	48	Position + height	0.02904 fti	-0.02621 fti	0.00886 fti
49	49	Position + height	0.01204 fti	-0.02661 fti	0.01900 fti
54	54	Position + height	-0.02497 fti	-0.06539 fti	0.01768 fti
550	550	Position + height	-0.05620 fti	0.03533 fti	-0.00948 fti
6	6	Position + height	-0.04754 fti	0.00016 fti	-0.04711 fti
62	62	Position + height	0.03369 fti	-0.02044 fti	-0.02103 fti
9	9	Position + height	0.03612 fti	0.01952 fti	0.03862 fti

Grid:

System A	System B	Point type	dE [fti]	dN [fti]	dHgt [fti]
15	15	Position + height	0.02313 fti	-0.00472 fti	-0.07644 fti
22	22	Position + height	-0.00584 fti	0.00276 fti	-0.02628 fti
24	24	Position + height	0.01870 fti	0.01086 fti	-0.02037 fti
35	35	Position + height	0.02539 fti	-0.01624 fti	0.04259 fti
38	38	Position + height	-0.02070 fti	0.05049 fti	-0.06027 fti
39	39	Position + height	-0.06135 fti	0.05315 fti	0.00253 fti
42	42	Position + height	-0.00751 fti	-0.04485 fti	0.07552 fti
48	48	Position + height	0.03832 fti	0.00131 fti	0.01175 fti
49	49	Position + height	0.02402 fti	0.00223 fti	0.02510 fti
54	54	Position + height	0.01283 fti	-0.03543 fti	0.06158 fti
550	550	Position + height	-0.06637 fti	-0.00604 fti	-0.00751 fti
6	6	Position + height	-0.04072 fti	-0.05085 fti	-0.01529 fti
62	62	Position + height	0.03940 fti	-0.01509 fti	-0.01460 fti
9	9	Position + height	0.02070 fti	0.05240 fti	0.00171 fti

Graphical overview:**List of identical points****System A:****WGS 84 Cartesian:**

	X [fti]	Y [fti]	Z [fti]
15	-7765427.09587	-12848250.12133	14532893.10876
22	-7816876.70866	-12861094.78865	14494716.70919
24	-7847179.18973	-12871178.76273	14470177.50443
35	-7767010.83383	-12874341.85331	14509374.08730
38	-7940643.97395	-12933831.59278	14364207.16719
39	-7963539.87244	-12900283.46040	14381698.12516
42	-7883488.70804	-12903457.07441	14422411.23294

48	-7700529.30026	-13020739.79288	14416514.99662
49	-7780406.91276	-12933882.90689	14450077.63146
54	-7850800.90925	-12783333.47566	14544366.70699
550	-7711390.73642	-12769284.32608	14629128.68963
6	-7802337.45180	-12816801.88219	14540825.06775
62	-7819755.83737	-12882739.76342	14474448.83415
9	-7758819.02579	-12825816.01033	14555802.18740

Local Grid (Transf.):

	Easting [fti]	Northing [fti]	Hgt [fti]
15	3335307.39583	460142.98579	2980.65121
22	3298007.25427	406494.95896	3369.23130
24	3277347.25630	371925.74478	3812.30282
35	3347502.41778	427162.50968	3173.72044
38	3230007.19098	224792.32001	4198.05781
39	3193020.83337	249030.80853	4284.85715
42	3263078.82946	305308.00276	4139.99551
48	3480331.85233	297435.91850	4569.80315
49	3366971.00643	344328.12713	3558.95951
54	3228635.00135	476139.58435	3104.09177
550	3340484.43953	595755.78337	2172.71457
6	3287432.40417	471204.47762	2972.53100
62	3306786.23209	378026.96670	3634.98215
9	3329305.47470	492326.43609	2797.67398

System B:**Local Cartesian:**

	X [fti]	Y [fti]	Z [fti]
15	-7765425.86686	-12848248.01673	14532890.40407
22	-7816875.40564	-12861092.63793	14494713.91158
24	-7847177.88547	-12871176.57569	14470174.66093
35	-7767009.52365	-12874339.62001	14509371.25466
38	-7940642.55171	-12933829.33465	14364204.14826
39	-7963538.42969	-12900281.24275	14381695.11670
42	-7883487.27087	-12903454.74098	14422408.27953
48	-7700527.84760	-13020737.33077	14416511.91362
49	-7780405.53169	-12933880.58396	14450074.67133
54	-7850799.66677	-12783331.37185	14544364.01401
550	-7711389.52559	-12769282.37851	14629126.12425
6	-7802336.15833	-12816799.79436	14540822.39744
62	-7819754.53287	-12882737.53169	14474445.99633
9	-7758817.81808	-12825813.93524	14555799.43583

Local Grid:

	Easting [fti]	Northing [fti]	Hgt [fti]
15	3335307.37270	460142.99049	2980.72766
22	3298007.26010	406494.95620	3369.25758
24	3277347.23760	371925.73389	3812.32320
35	3347502.39239	427162.52589	3173.67782
38	3230007.21171	224792.26949	4198.11808

39	3193020.89469	249030.75541	4284.85463
42	3263078.83701	305308.04760	4139.91995
48	3480331.81401	297435.91719	4569.79137
49	3366970.98241	344328.12490	3558.93442
54	3228634.98848	476139.61982	3104.03018
550	3340484.50591	595755.78940	2172.72208
6	3287432.44491	471204.52851	2972.54629
62	3306786.19268	378026.98179	3634.99675
9	3329305.45400	492326.38369	2797.67231

Deschutes09 3D Transformation- Coordinate Comparison Report



Processed: 06/17/2009 16:32:14

Project Information

Project name:	Project A: DCSO CORS Measured 10-Jun-2009	Project B: DCSO Record Positions
Created:	06/17/2009 16:04:43	06/17/2009 15:57:58
Time zone:	-7h 00'	-7h 00'
Coordinate system name:	Deschutes09	COCS
Application software:	LEICA Geo Office 7.0	
Horizontal tolerance	0.24606 fti	
Vertical tolerance	0.24606 fti	
No. of points with tolerance limit exceeded:	2	

Field Procedures:

- Two Leica Rovers comprised of GX1230 receiver w/ AX1202 antennas and RX1210T controllers on SECO fixed-height aluminum rover rods and adaptor (H.I. of 6.79 feet). Rods plumbed with bi-pods w/ legs sandbagged. Rover firmware Version 7.50.
- RTK correctors using ODOT Oregon Real-time GPS Network (ORGN), MAX solution
- 2 occupations of at least 15 minutes each at each point (longer occupation times for greater distances).
- Second occupations measured on different day

Office Procedures

- 3D Transformation created in Leica Geo Office, Version 7.0
- Only RTK information used in transformation. No post processing performed.
- Only CO Grid points of "Primary" or "High Precision" type were used in the transformation
- Transformation Performed by Shelby Griggs, PLS of OrbiTech, Inc.

Comparison of points used for transformation against record CO Grid data

Key: "Control" = Project B, "Measured" = Project A

Point 15 Mark Name/type: 15131400 (GIS 027)/PRIMARY

Local Coordinates

Point Class	Date/Time	Easting [fti]	Northing [fti]	Ortho. Hgt [fti]	Hor. Diff. [fti]	Vert. Diff. [fti]
Control	06/17/2009 17:06:17	3335307.37270	460142.99049	3049.94419		
Measured	06/02/2009 13:20:15	3335307.38360	460142.99449	3049.94147		
Difference	-	-0.01089	-0.00397	0.00272	0.01158	0.00272
Measured	06/03/2009 11:18:35	3335307.35889	460142.98084	3049.94741		
Difference	-	0.01381	0.00968	-0.00322	0.01686	-0.00322

Point 22 Mark Name/type: BIG FALLS (GIS 033)/HIGH PRECISION

Local Coordinates

Point Class	Date/Time	Easting [fti]	Northing [fti]	Ortho. Hgt [fti]	Hor. Diff. [fti]	Vert. Diff. [fti]
Control	06/17/2009 17:06:17	3298007.26010	406494.95620	3438.36289		
Measured	06/04/2009 11:45:55	3298007.25650	406494.91552	3438.30026		
Difference	-	0.00361	0.04068	0.06263	0.04081	0.06263
Measured	06/08/2009 08:16:50	3298007.26175	406494.96995	3438.38061		
Difference	-	-0.00164	-0.01375	-0.01772	0.01385	-0.01772

Deschutes09 3D Transformation- Coordinate Comparison Report

Point 24 Mark Name/type: GIS 035/PRIMARY

Local Coordinates

Point Class	Date/Time	Easting [fti]	Northing [fti]	Ortho. Hgt [fti]	Hor. Diff. [fti]	Vert. Diff. [fti]
Control	06/17/2009 17:06:17	3277347.23760	371925.73389	3880.67589		
Measured	06/09/2009 10:15:40	3277347.23100	371925.73625	3880.65705		
Difference	-	0.00659	-0.00236	0.01883	0.00699	0.01883
Measured	06/10/2009 07:01:15	3277347.24304	371925.73274	3880.68911		
Difference	-	-0.00545	0.00115	-0.01322	0.00554	-0.01322

Point 35 Mark Name/type: T 463 (GIS 047)/PRIMARY

Local Coordinates

Point Class	Date/Time	Easting [fti]	Northing [fti]	Ortho. Hgt [fti]	Hor. Diff. [fti]	Vert. Diff. [fti]
Control	06/17/2009 17:06:17	3347502.39239	427162.52589	3242.22769		
Measured	06/04/2009 15:52:50	3347502.38999	427162.50144	3242.21171		
Difference	-	0.00240	0.02444	0.01598	0.02457	0.01598
Measured	06/08/2009 13:16:05	3347502.39498	427162.53953	3242.25850		
Difference	-	-0.00256	-0.01365	-0.03081	0.01388	-0.03081

Point 38 Mark Name/type: BEAL RM-1 (GIS 050)/PRIMARY

Local Coordinates

Point Class	Date/Time	Easting [fti]	Northing [fti]	Ortho. Hgt [fti]	Hor. Diff. [fti]	Vert. Diff. [fti]
Control	06/17/2009 17:06:17	3230007.21171	224792.26949	4267.18501		
Measured	06/04/2009 07:26:05	3230007.22106	224792.27818	4267.17159		
Difference	-	-0.00938	-0.00869	0.01342	0.01276	0.01342
Measured	06/08/2009 11:42:05	3230007.19272	224792.23340	4267.20554		
Difference	-	0.01896	0.03609	-0.02054	0.04078	-0.02054

Point 39 Mark Name/type: WICKIUP (GIS 051)/HIGH PRECISION

Local Coordinates

Point Class	Date/Time	Easting [fti]	Northing [fti]	Ortho. Hgt [fti]	Hor. Diff. [fti]	Vert. Diff. [fti]
Control	06/17/2009 17:06:17	3193020.89469	249030.75541	4353.99931		
Measured	06/04/2009 10:19:20	3193020.89465	249030.75062	4353.99813		
Difference	-	0.00003	0.00476	0.00118	0.00476	0.00118
Measured	06/08/2009 10:23:00	3193020.89472	249030.75938	4353.99967		
Difference	-	-0.00003	-0.00400	-0.00036	0.00400	-0.00036

Deschutes09 3D Transformation- Coordinate Comparison Report

Point 42 Mark Name/type: **BNRR STA 369+48.3 (GIS 054)/PRIMARY**

Local Coordinates

Point Class	Date/Time	Easting [fti]	Northing [fti]	Ortho. Hgt [fti]	Hor. Diff. [fti]	Vert. Diff. [fti]
Control	06/17/2009 17:06:17	3263078.83701	305308.04760	4207.77559		
Measured	06/04/2009 08:37:55	3263078.83425	305307.99872	4207.75548		
Difference	-	0.00276	0.04885	0.02011	0.04895	0.02011
Measured	06/08/2009 07:38:50	3263078.83812	305308.06099	4207.79741		
Difference	-	-0.00112	-0.01339	-0.02182	0.01342	-0.02182

Point 48 Mark Name/type: **BROTHERS (GIS 060)/HIGH PRECISION**

Local Coordinates

Point Class	Date/Time	Easting [fti]	Northing [fti]	Ortho. Hgt [fti]	Hor. Diff. [fti]	Vert. Diff. [fti]
Control	06/17/2009 17:06:17	3480331.81401	297435.91719	4634.97379		
Measured	06/02/2009 15:16:00	3480331.81870	297435.89075	4635.04350		
Difference	-	-0.00469	0.02644	-0.06972	0.02687	-0.06972
Measured	06/03/2009 10:19:20	3480331.80951	297435.94537	4634.83018		
Difference	-	0.00446	-0.02818	0.14360	0.02851	0.14360

Point 49 Mark Name/type: **STATE HWY PI (GIS 061)/PRIMARY**

Local Coordinates

Point Class	Date/Time	Easting [fti]	Northing [fti]	Ortho. Hgt [fti]	Hor. Diff. [fti]	Vert. Diff. [fti]
Control	06/17/2009 17:06:17	3366970.98241	344328.12490	3626.44360		
Measured	06/02/2009 08:51:45	3366970.96247	344328.13583	3626.40459		
Difference	-	0.01995	-0.01093	0.03901	0.02274	0.03901
Measured	06/03/2009 12:31:40	3366970.99987	344328.11804	3626.47844		
Difference	-	-0.01749	0.00686	-0.03484	0.01877	-0.03484

Point 50 Mark Name/type: **P-35 RESET87 (GIS 062)/PRIMARY (not held for transformation)**

Local Coordinates

Point Class	Date/Time	Easting [fti]	Northing [fti]	Ortho. Hgt [fti]	Hor. Diff. [fti]	Vert. Diff. [fti]
Control	06/17/2009 17:06:17	3201116.83839	362440.21870	6399.06821		
Measured	06/04/2009 12:54:35	3201116.91293	362440.09780	6399.19298		
Difference	-	-0.07451	0.12090	-0.12477	0.14199	-0.12477
Measured	06/08/2009 08:40:20	3201116.92772	362440.12546	6399.47293		
Difference	-	-0.08930	0.09321	-0.40472	0.12910	-0.40472
Measured	06/10/2009 07:46:45	3201116.93940	362440.13970	6399.38566		
Difference	-	-0.10102	0.07900	-0.31745	0.12825	-0.31745

Deschutes09 3D Transformation- Coordinate Comparison Report

Point 54 Mark Name/type: SISTERS (GIS 066)/HIGH PRECISION

Local Coordinates

Point Class	Date/Time	Easting [fti]	Northing [fti]	Ortho. Hgt [fti]	Hor. Diff. [fti]	Vert. Diff. [fti]
Control	06/17/2009 17:06:17	3228634.98848	476139.61982	3174.05840		
Measured	06/02/2009 16:09:30	3228634.98668	476139.63688	3174.06749		
Difference	-	0.00184	-0.01706	-0.00909	0.01716	-0.00909
Measured	06/03/2009 08:53:25	3228634.99183	476139.59268	3174.04324		
Difference	-	-0.00331	0.02713	0.01516	0.02733	0.01516

Point 550 Mark Name/type: SKY/ HIGH PRECISION

Local Coordinates

Point Class	Date/Time	Easting [fti]	Northing [fti]	Ortho. Hgt [fti]	Hor. Diff. [fti]	Vert. Diff. [fti]
Control	06/17/2009 17:06:17	3340484.50591	595755.78940	2242.61480		
Measured	06/02/2009 08:59:50	3340484.50436	595755.79442	2242.62031		
Difference	-	0.00154	-0.00502	-0.00551	0.00525	-0.00551
Measured	06/03/2009 15:15:40	3340484.51470	595755.75085	2242.59977		
Difference	-	-0.00879	0.03855	0.01503	0.03953	0.01503

Point 6 Mark Name/type: GIS 018/ PRIMARY

Local Coordinates

Point Class	Date/Time	Easting [fti]	Northing [fti]	Ortho. Hgt [fti]	Hor. Diff. [fti]	Vert. Diff. [fti]
Control	06/17/2009 17:06:17	3287432.44491	471204.52851	3042.59190		
Measured	06/02/2009 14:28:35	3287432.45525	471204.52572	3042.57182		
Difference	-	-0.01037	0.00279	0.02008	0.01073	0.02008
Measured	06/03/2009 09:35:10	3287432.42372	471204.53458	3042.63701		
Difference	-	0.02116	-0.00607	-0.04511	0.02201	-0.04511

Point 62 Mark Name/type: STEVENS/PRIMARY

Local Coordinates

Point Class	Date/Time	Easting [fti]	Northing [fti]	Ortho. Hgt [fti]	Hor. Diff. [fti]	Vert. Diff. [fti]
Control	06/17/2009 17:06:17	3306786.19268	378026.98179	3703.46460		
Measured	06/04/2009 16:33:35	3306786.19656	378026.98796	3703.45410		
Difference	-	-0.00387	-0.00617	0.01050	0.00728	0.01050
Measured	06/08/2009 15:27:30	3306786.18780	378026.97001	3703.47395		
Difference	-	0.00492	0.01178	-0.00935	0.01276	-0.00935

Deschutes09 3D Transformation- Coordinate Comparison Report

Point 727 Mark Name/type: **45 OSHD 1927/SECONDARY (not held for transformation)**

Local Coordinates

Point Class	Date/Time	Easting [fti]	Northing [fti]	Ortho. Hgt [fti]	Hor. Diff. [fti]	Vert. Diff. [fti]
Control	06/17/2009 17:06:17	3620839.50879	216679.35751	4622.47051		
Measured	06/02/2009 12:32:20	3620839.54498	216679.34006	4622.17421		
Difference	-	-0.03619	0.01742	0.29629	0.04016	0.29629
Measured	06/03/2009 07:37:20	3620839.51768	216679.32956	4621.84806		
Difference	-	-0.00889	0.02795	0.62244	0.02933	0.62244

Point 9 Mark Name/type: **GIS 021/PRIMARY**

Local Coordinates

Point Class	Date/Time	Easting [fti]	Northing [fti]	Ortho. Hgt [fti]	Hor. Diff. [fti]	Vert. Diff. [fti]
Control	06/17/2009 17:06:17	3329305.45400	492326.38369	2866.99482		
Measured	06/02/2009 12:05:20	3329305.45417	492326.38615	2867.01512		
Difference	-	-0.00016	-0.00246	-0.02031	0.00246	-0.02031
Measured	06/03/2009 13:27:55	3329305.45364	492326.38100	2866.95072		
Difference	-	0.00036	0.00272	0.04409	0.00272	0.04409



Deschutes09 Transformation Parameters

07/10/2009 14:10:09

Job Information

Job name: Z001-CHK-3D
 Created: 06/23/2009 15:58:00
 Description: 6-23-09

 Time zone: -7h 00'
 Coordinate system name: **Deschutes09**
 Application software: LEICA Geo Office 7.0
 Firmware version: 7.50
 Codelist name: DESCHUTES COUNTY
 Average limit (Position): 0.16404 fti
 Average limit (Height): 0.24606 fti

Coordinate System Information

Coordinate system name: Deschutes09
 Created: 06/23/2009 15:49:15
 Transformation name: **Deschutes09**
 Transformation type: Classical 3D
 Height mode: Ellipsoidal
 Residuals: No distribution
 Local Ellipsoid: **GRS 1980**
 Projection: **COCS**
 Geoid model: Deschutes (**Geoid03**)
 CSCS model: -

Transformation details

3D-Helmert transformation

Number of common points: 14
 Transformation model: Molodensky-Badekas
 Rotation origin:

X0:	-7814871.89688 fti
Y0:	-12873216.84364 fti
Z0:	14484760.14636 fti

No.	Parameter	Value
1	Shift dX	1.32438 fti
2	Shift dY	2.19400 fti
3	Shift dZ	-2.83717 fti
4	Rotation about X	-0.42109 "
5	Rotation about Y	0.11105 "
6	Rotation about Z	-0.17474 "
7	Scale	-0.0385 ppm

Residuals

Cartesian:

System A	System B	Point type	dX [fti]	dY [fti]	dZ [fti]
15	15	Position + height	0.04639 fti	0.03205 fti	-0.05676 fti
22	22	Position + height	0.00581 fti	0.02077 fti	-0.01631 fti
24	24	Position + height	0.02753 fti	0.00925 fti	-0.00633 fti
35	35	Position + height	0.00007 fti	-0.04898 fti	0.01801 fti
38	38	Position + height	0.02323 fti	0.07776 fti	-0.00505 fti
39	39	Position + height	-0.03422 fti	0.06188 fti	0.03996 fti
42	42	Position + height	-0.05095 fti	-0.06913 fti	0.01995 fti
48	48	Position + height	0.02904 fti	-0.02621 fti	0.00886 fti
49	49	Position + height	0.01204 fti	-0.02661 fti	0.01900 fti
54	54	Position + height	-0.02497 fti	-0.06539 fti	0.01768 fti
550	550	Position + height	-0.05620 fti	0.03533 fti	-0.00948 fti
6	6	Position + height	-0.04754 fti	0.00016 fti	-0.04711 fti
62	62	Position + height	0.03369 fti	-0.02044 fti	-0.02103 fti
9	9	Position + height	0.03612 fti	0.01952 fti	0.03862 fti

Grid:

System A	System B	Point type	dE [fti]	dN [fti]	dHgt [fti]
15	15	Position + height	0.02313 fti	-0.00472 fti	-0.07644 fti
22	22	Position + height	-0.00584 fti	0.00276 fti	-0.02628 fti
24	24	Position + height	0.01870 fti	0.01086 fti	-0.02037 fti
35	35	Position + height	0.02539 fti	-0.01624 fti	0.04259 fti
38	38	Position + height	-0.02070 fti	0.05049 fti	-0.06027 fti
39	39	Position + height	-0.06135 fti	0.05315 fti	0.00253 fti
42	42	Position + height	-0.00751 fti	-0.04485 fti	0.07552 fti
48	48	Position + height	0.03832 fti	0.00131 fti	0.01175 fti
49	49	Position + height	0.02402 fti	0.00223 fti	0.02510 fti
54	54	Position + height	0.01283 fti	-0.03543 fti	0.06158 fti
550	550	Position + height	-0.06637 fti	-0.00604 fti	-0.00751 fti
6	6	Position + height	-0.04072 fti	-0.05085 fti	-0.01529 fti
62	62	Position + height	0.03940 fti	-0.01509 fti	-0.01460 fti
9	9	Position + height	0.02070 fti	0.05240 fti	0.00171 fti

List of identical points**System A:****WGS 84 Cartesian:**

	X [fti]	Y [fti]	Z [fti]
15	-7765427.09587	-12848250.12133	14532893.10876
22	-7816876.70866	-12861094.78865	14494716.70919
24	-7847179.18973	-12871178.76273	14470177.50443
35	-7767010.83383	-12874341.85331	14509374.08730
38	-7940643.97395	-12933831.59278	14364207.16719
39	-7963539.87244	-12900283.46040	14381698.12516
42	-7883488.70804	-12903457.07441	14422411.23294
48	-7700529.30026	-13020739.79288	14416514.99662
49	-7780406.91276	-12933882.90689	14450077.63146
54	-7850800.90925	-12783333.47566	14544366.70699
550	-7711390.73642	-12769284.32608	14629128.68963
6	-7802337.45180	-12816801.88219	14540825.06775
62	-7819755.83737	-12882739.76342	14474448.83415
9	-7758819.02579	-12825816.01033	14555802.18740

Local Grid (Transf.):

	Easting [fti]	Northing [fti]	Hgt [fti]
15	3335307.39583	460142.98579	2980.65121

22	3298007.25427	406494.95896	3369.23130
24	3277347.25630	371925.74478	3812.30282
35	3347502.41778	427162.50968	3173.72044
38	3230007.19098	224792.32001	4198.05781
39	3193020.83337	249030.80853	4284.85715
42	3263078.82946	305308.00276	4139.99551
48	3480331.85233	297435.91850	4569.80315
49	3366971.00643	344328.12713	3558.95951
54	3228635.00135	476139.58435	3104.09177
550	3340484.43953	595755.78337	2172.71457
6	3287432.40417	471204.47762	2972.53100
62	3306786.23209	378026.96670	3634.98215
9	3329305.47470	492326.43609	2797.67398

System B:**Local Cartesian:**

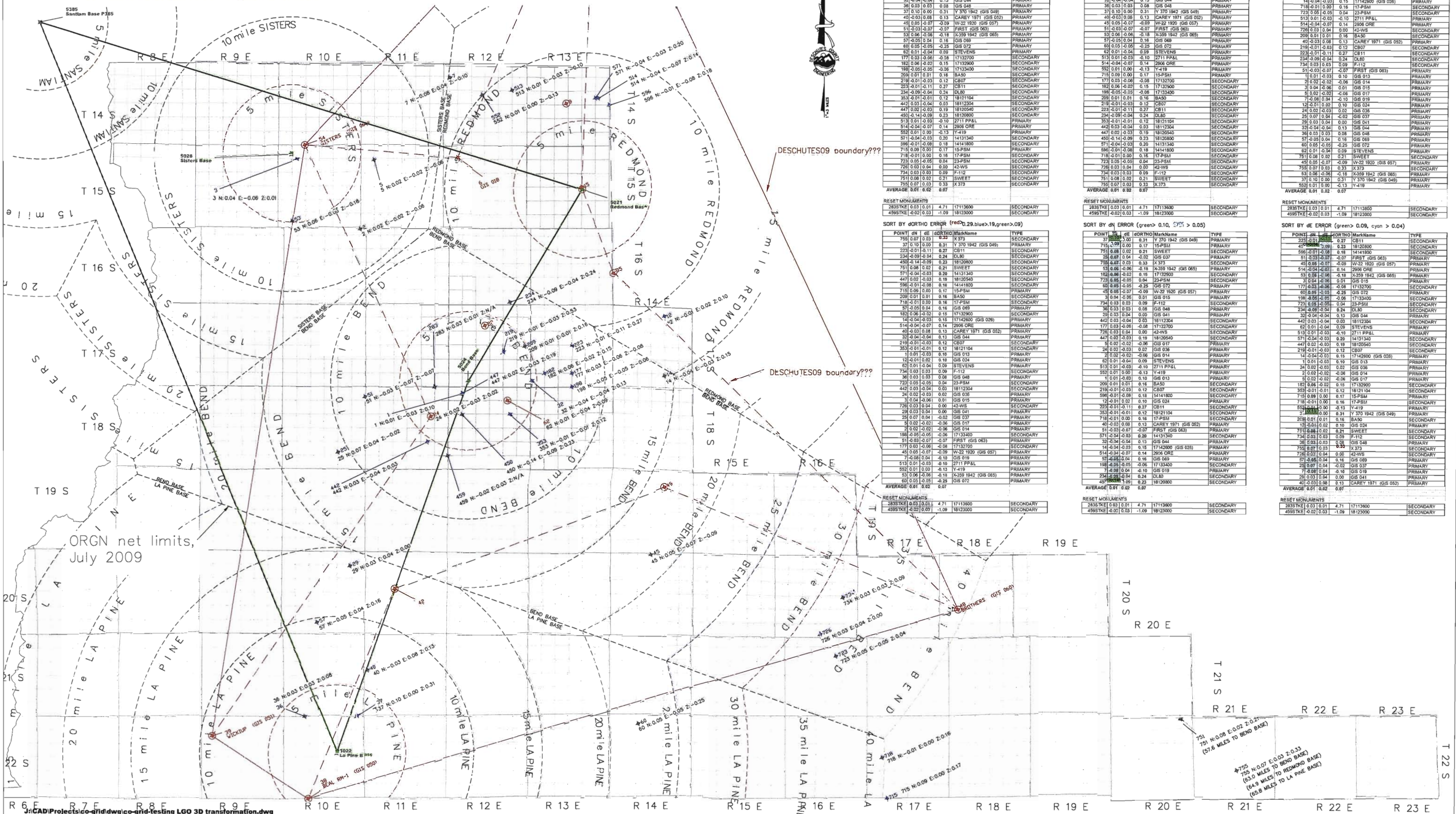
	X [fti]	Y [fti]	Z [fti]
15	-7765425.86686	-12848248.01673	14532890.40407
22	-7816875.40564	-12861092.63793	14494713.91158
24	-7847177.88547	-12871176.57569	14470174.66093
35	-7767009.52365	-12874339.62001	14509371.25466
38	-7940642.55171	-12933829.33465	14364204.14826
39	-7963538.42969	-12900281.24275	14381695.11670
42	-7883487.27087	-12903454.74098	14422408.27953
48	-7700527.84760	-13020737.33077	14416511.91362
49	-7780405.53169	-12933880.58396	14450074.67133
54	-7850799.66677	-12783331.37185	14544364.01401
550	-7711389.52559	-12769282.37851	14629126.12425
6	-7802336.15833	-12816799.79436	14540822.39744
62	-7819754.53287	-12882737.53169	14474445.99633
9	-7758817.81808	-12825813.93524	14555799.43583

Local Grid:

	Easting [fti]	Northing [fti]	Hgt [fti]
15	3335307.37270	460142.99049	2980.72766
22	3298007.26010	406494.95620	3369.25758
24	3277347.23760	371925.73389	3812.32320
35	3347502.39239	427162.52589	3173.67782
38	3230007.21171	224792.26949	4198.11808
39	3193020.89469	249030.75541	4284.85463
42	3263078.83701	305308.04760	4139.91995
48	3480331.81401	297435.91719	4569.79137
49	3366970.98241	344328.12490	3558.93442
54	3228634.98848	476139.61982	3104.03018
550	3340484.50591	595755.78940	2172.72208
6	3287432.44491	471204.52851	2972.54629
62	3306786.19268	378026.98179	3634.99675
9	3329305.45400	492326.38369	2797.67231

RESULTS OF RTK FIELD TESTS OF 3D TRANSFORMATION "DESCHUTES09" USING ORGN NETWORK CORRECTIONS.
 FIELD PROCEDURES: RTK OBSERVATIONS USING 6.79' POLE W/ BI-PODS. ONE 5 MINUTE OCCUPATION FOLLOWED IMMEDIATELY BY A 1 MINUTE OCCUPATION. RESULTING COORDINATES ARE A MEAN OF THE TWO OCCUPATIONS.
 LEGEND:

Green = bases and ORGN full coverage
 red = transformation DESCHUTES09 (two options-dashed and solid?)
 blue = check points using ORGN net and 3D transformation "DESCHUTES09"



SORT BY POINT #

POINT	DN	DE	DO	MarkName	TYPE
11	0.01	0.03	0.10	GIS 013	PRIMARY
2	0.02	0.02	0.06	GIS 014	PRIMARY
3	0.04	0.06	0.21	GIS 015	PRIMARY
5	0.02	0.02	0.08	GIS 017	PRIMARY
7	0.08	0.04	0.10	GIS 019	PRIMARY
12	0.01	0.02	0.10	GIS 021	PRIMARY
14	-0.04	-0.03	0.15	17142600 (GIS 026)	PRIMARY
24	0.02	0.03	0.02	GIS 036	PRIMARY
25	0.07	0.04	0.02	GIS 037	PRIMARY
29	0.03	0.04	0.00	GIS 041	PRIMARY
32	-0.04	-0.04	0.13	GIS 044	PRIMARY
36	0.03	0.03	0.08	GIS 048	PRIMARY
37	0.10	0.00	0.31	Y 370 1942 (GIS 049)	PRIMARY
40	-0.03	0.68	0.13	CAREY 1971 (GIS 052)	PRIMARY
45	0.05	-0.07	-0.09	W-22 1920 (GIS 057)	PRIMARY
51	-0.03	-0.07	-0.07	FRST (GIS 063)	PRIMARY
53	0.06	-0.08	-0.18	X-359 1942 (GIS 065)	PRIMARY
57	-0.05	0.04	0.16	GIS 069	PRIMARY
60	0.05	-0.06	0.23	GIS 072	PRIMARY
62	0.01	-0.04	0.09	STEVENS	PRIMARY
177	0.03	0.66	-0.08	17132700	SECONDARY
182	0.06	-0.02	0.15	17133000	SECONDARY
188	-0.05	-0.05	-0.06	17133400	SECONDARY
209	0.01	0.01	0.16	BA50	SECONDARY
219	-0.01	-0.03	0.12	CB07	SECONDARY
223	-0.11	-0.11	0.37	CB11	SECONDARY
234	-0.09	-0.04	0.24	DL80	SECONDARY
353	-0.01	-0.01	0.12	18121104	SECONDARY
371	-0.03	-0.03	0.15	18122000	SECONDARY
447	0.02	-0.03	0.19	18120540	SECONDARY
450	-0.14	-0.09	0.23	18120800	SECONDARY
515	0.01	-0.03	-0.10	2711 PPAL	PRIMARY
514	-0.04	-0.07	0.14	2906 ORE	PRIMARY
552	0.01	0.00	-0.13	Y-419	PRIMARY
571	-0.04	-0.03	0.20	14131340	SECONDARY
571	-0.04	-0.03	0.20	14131340	SECONDARY
715	0.09	0.00	0.17	15-PSM	SECONDARY
716	-0.01	0.00	0.18	17-PSM	SECONDARY
723	0.05	-0.06	0.08	14131300	SECONDARY
726	0.03	0.04	0.00	42-WS	SECONDARY
734	0.03	0.03	0.09	F-112	SECONDARY
751	0.08	0.02	0.21	SWET	SECONDARY
752	0.07	0.02	0.33	X-373	SECONDARY

SORT BY ORTHO ERROR (red>0.29,blue>0.19,green>0.09)

POINT	DN	DE	DO	MarkName	TYPE
755	0.07	0.03	0.32	X-373	SECONDARY
37	0.10	0.00	0.31	Y 370 1942 (GIS 049)	PRIMARY
223	-0.11	-0.11	0.37	CB11	SECONDARY
234	-0.09	-0.04	0.24	DL80	SECONDARY
450	-0.14	-0.09	0.23	18120800	SECONDARY
751	0.08	0.02	0.21	SWET	SECONDARY
571	-0.04	-0.03	0.20	14131340	SECONDARY
447	0.02	-0.03	0.19	18120540	SECONDARY
596	-0.01	-0.06	0.18	14141800	SECONDARY
715	0.09	0.00	0.17	15-PSM	SECONDARY
209	0.01	0.01	0.16	BA50	SECONDARY
716	-0.01	0.00	0.18	17-PSM	SECONDARY
571	-0.04	-0.03	0.18	14131340	SECONDARY
182	0.06	-0.02	0.15	17133000	SECONDARY
188	-0.05	-0.05	0.06	17133400	SECONDARY
51	-0.03	-0.07	0.10	FRST (GIS 063)	PRIMARY
53	0.06	-0.08	-0.18	X-359 1942 (GIS 065)	PRIMARY
60	0.05	-0.06	0.23	GIS 072	PRIMARY
62	0.01	-0.04	0.09	STEVENS	PRIMARY
177	0.03	0.66	-0.08	17132700	SECONDARY
182	0.06	-0.02	0.15	17133000	SECONDARY
188	-0.05	-0.05	0.06	17133400	SECONDARY
209	0.01	0.01	0.16	BA50	SECONDARY
219	-0.01	-0.03	0.12	CB07	SECONDARY
223	-0.11	-0.11	0.37	CB11	SECONDARY
234	-0.09	-0.04	0.24	DL80	SECONDARY
353	-0.01	-0.01	0.12	18121104	SECONDARY
371	-0.03	-0.03	0.15	18122000	SECONDARY
447	0.02	-0.03	0.19	18120540	SECONDARY
450	-0.14	-0.09	0.23	18120800	SECONDARY
515	0.01	-0.03	-0.10	2711 PPAL	PRIMARY
514	-0.04	-0.07	0.14	2906 ORE	PRIMARY
552	0.01	0.00	-0.13	Y-419	PRIMARY
571	-0.04	-0.03	0.20	14131340	SECONDARY
571	-0.04	-0.03	0.20	14131340	SECONDARY
715	0.09	0.00	0.17	15-PSM	SECONDARY
716	-0.01	0.00	0.18	17-PSM	SECONDARY
723	0.05	-0.06	0.08	14131300	SECONDARY
726	0.03	0.04	0.00	42-WS	SECONDARY
734	0.03	0.03	0.09	F-112	SECONDARY
751	0.08	0.02	0.21	SWET	SECONDARY
752	0.07	0.02	0.33	X-373	SECONDARY

SORT BY PRIMARY/SECONDARY TYPE

POINT	DN	DE	DO	MarkName	TYPE
11	0.01	0.03	0.10	GIS 013	PRIMARY
2	0.02	0.02	0.06	GIS 014	PRIMARY
3	0.04	0.06	0.21	GIS 015	PRIMARY
5	0.02	0.02	0.08	GIS 017	PRIMARY
7	0.08	0.04	0.10	GIS 019	PRIMARY
12	0.01	0.02	0.10	GIS 021	PRIMARY
14	-0.04	-0.03	0.15	17142600 (GIS 026)	PRIMARY
24	0.02	0.03	0.02	GIS 036	PRIMARY
25	0.07	0.04	0.02	GIS 037	PRIMARY
29	0.03	0.04	0.00	GIS 041	PRIMARY
32	-0.04	-0.04	0.13	GIS 044	PRIMARY
36	0.03	0.03	0.08	GIS 048	PRIMARY
37	0.10	0.00	0.31	Y 370 1942 (GIS 049)	PRIMARY
40	-0.03	0.68	0.13	CAREY 1971 (GIS 052)	PRIMARY
45	0.05	-0.07	-0.09	W-22 1920 (GIS 057)	PRIMARY
51	-0.03	-0.07	-0.07	FRST (GIS 063)	PRIMARY
53	0.06	-0.08	-0.18	X-359 1942 (GIS 065)	PRIMARY
57	-0.05	0.04	0.16	GIS 069	PRIMARY
60	0.05	-0.06	0.23	GIS 072	PRIMARY
62	0.01	-0.04	0.09	STEVENS	PRIMARY
177	0.03	0.66	-0.08	17132700	SECONDARY
182	0.06	-0.02	0.15	17133000	SECONDARY
188	-0.05	-0.05	0.06	17133400	SECONDARY
209	0.01	0.01	0.16	BA50	SECONDARY
219	-0.01	-0.03	0.12	CB07	SECONDARY
223	-0.11	-0.11	0.37	CB11	SECONDARY
234	-0.09	-0.04	0.24	DL80	SECONDARY
353	-0.01	-0.01	0.12	18121104	SECONDARY
371	-0.03	-0.03	0.15	18122000	SECONDARY
447	0.02	-0.03	0.19	18120540	SECONDARY
450	-0.14	-0.09	0.23	18120800	SECONDARY
515	0.01	-0.03	-0.10	2711 PPAL	PRIMARY
514	-0.04	-0.07	0.14	2906 ORE	PRIMARY
552	0.01	0.00	-0.13	Y-419	PRIMARY
571	-0.04	-0.03	0.20	14131340	SECONDARY
571	-0.04	-0.03	0.20	14131340	SECONDARY
715	0.09	0.00	0.17	15-PSM	SECONDARY
716	-0.01	0.00	0.18	17-PSM	SECONDARY
723	0.05	-0.06	0.08	14131300	SECONDARY
726	0.03	0.04	0.00	42-WS	SECONDARY
734	0.03	0.03	0.09	F-112	SECONDARY
751	0.08	0.02	0.21	SWET	SECONDARY
752	0.07	0.02	0.33	X-373	SECONDARY

SORT BY DE ERROR (green>0.10, cyan >0.05)

POINT	DN	DE	DO	MarkName	TYPE
37	0.10	0.00	0.31	Y 370 1942 (GIS 049)	PRIMARY
715	0.09	0.00	0.17	15-PSM	SECONDARY
751	0.08	0.02	0.21	SWET	SECONDARY
209	0.01	0.01	0.16	BA50	SECONDARY
755	0.07	0.03	0.32	X-373	SECONDARY
53	0.06	-0.08	-0.18	X-359 1942 (GIS 065)	PRIMARY
182	0.06	-0.02	0.15	17133000	SECONDARY
723	0.05	-0.06	0.08	23-PSM	SECONDARY
60	0.05	-0.06	0.23	GIS 072	PRIMARY
62	0.01	-0.04	0.09	GIS 074	PRIMARY
726	0.03	0.04	0.00	GIS 041	PRIMARY
734	0.03	0.03	0.09	F-112	SECONDARY
751	0.08	0.02	0.21	SWET	SECONDARY
752	0.07	0.02	0.33	X-373	SECONDARY

SORT BY MARK NAME

POINT	DN	DE	DO	MarkName	TYPE
571	-0.04	-0.03	0.20	14131340	SECONDARY
586	-0.01	-0.06	0.18	14141800	SECONDARY
177	0.03	0.66	-0.08	17132700	SECONDARY
182	0.06	-0.02	0.15	17133000	SECONDARY
7	0.08	0.04	0.10	17133400	SECONDARY
442	0.03	0.04	0.03	18122000	SECONDARY
447	0.02	-0.03	0.19	18120540	SECONDARY
450	-0.14	-0.09	0.23	18120800	SECONDARY
353	-0.01	-0.01	0.12	18121104	SECONDARY
715	0.09	0.00	0.17	15-PSM	SECONDARY
14	-0.04	-0.03	0.15	17142600 (GIS 026)	PRIMARY
716	-0.01	0.00	0.18	17-PSM	SECONDARY
723	0.05	-0.06	0.08	23-PSM	SECONDARY
513	0.01	-0.03	-0.10	2711 PPAL	PRIMARY
514	-0.04	-0.07	0.14	2906 ORE	PRIMARY
726	0.03	0.04	0.00	42-WS	SECONDARY
209	0.01	0.01	0.16	BA50	SECONDARY
40	-0.03	0.68	0.13	CAREY 1971 (GIS 052)	PRIMARY
218	-0.01	-0.03	0.12	CB07	SECONDARY
223	-0.11	-0.11	0.37	CB11	SECONDARY
234	-0.09	-0.04	0.24	DL80	SECONDARY
734	0.03	0.03	0.09	F-112	SECONDARY
51	-0.03	-0.07	-0.07	FRST (GIS 063)	PRIMARY
1	0.01	0.03	0.10	GIS 013	PRIMARY
2	0.02	0.02	0.06	GIS 014	PRIMARY
3	0.04	0.06	0.21	GIS 015	PRIMARY
5	0.02	0.02	0.08	GIS 017	PRIMARY
7	0.08	0.04	0.10	GIS 019	PRIMARY
12	0.01	0.02	0.10	GIS 021	PRIMARY
24	0.02	0.03	0.02	GIS 036	PRIMARY
25	0.07	0.04	0.02	GIS 037	PRIMARY
29	0.03	0.04	0.00	GIS 041	PRIMARY
32	-0.04	-0.04	0.13	GIS 044	PRIMARY
36	0.03	0.03	0.08	GIS 048	PRIMARY
37	0.10	0.00	0.31	Y 370 1942 (GIS 049)	PRIMARY
40	-0.03	0.68	0.13	CAREY 1971 (GIS 052)	PRIMARY
45	0.05	-0.07	-0.09	W-22 1920 (GIS 057)	PRIMARY
51	-0.03	-0.07	-0.07	FRST (GIS 063)	PRIMARY
53	0.06	-0.08	-0.18	X-359 1942 (GIS 065)	PRIMARY
57	-0.05	0.04	0.16	GIS 069	PRIMARY
60	0.05	-0.06	0.23	GIS 072	PRIMARY
62	0.01	-0.04	0.09	STEVENS	PRIMARY
177	0.03	0.66	-0.08	17132700	SECONDARY
182	0.06	-0.02	0.15	17133000	SECONDARY
188	-0.05	-0.05	0.06	17133400	SECONDARY
209	0.01	0.01	0.16	BA50	SECONDARY
219	-0.01	-0.03	0.12	CB07	SECONDARY
223	-0.11	-0.11	0.37	CB11	SECONDARY
234	-0.09	-0.04	0.24	DL80	SECONDARY
353	-0.01	-0.01	0.12	18121104	SECONDARY
371	-0.03	-0.03	0.15	18122000	SECONDARY
447	0.02	-0.03	0.19	18120540	SECONDARY
450	-0.14	-0.09	0.23	18120800	SECONDARY
515	0.01	-0.03	-0.10	2711 PPAL	PRIMARY
514					