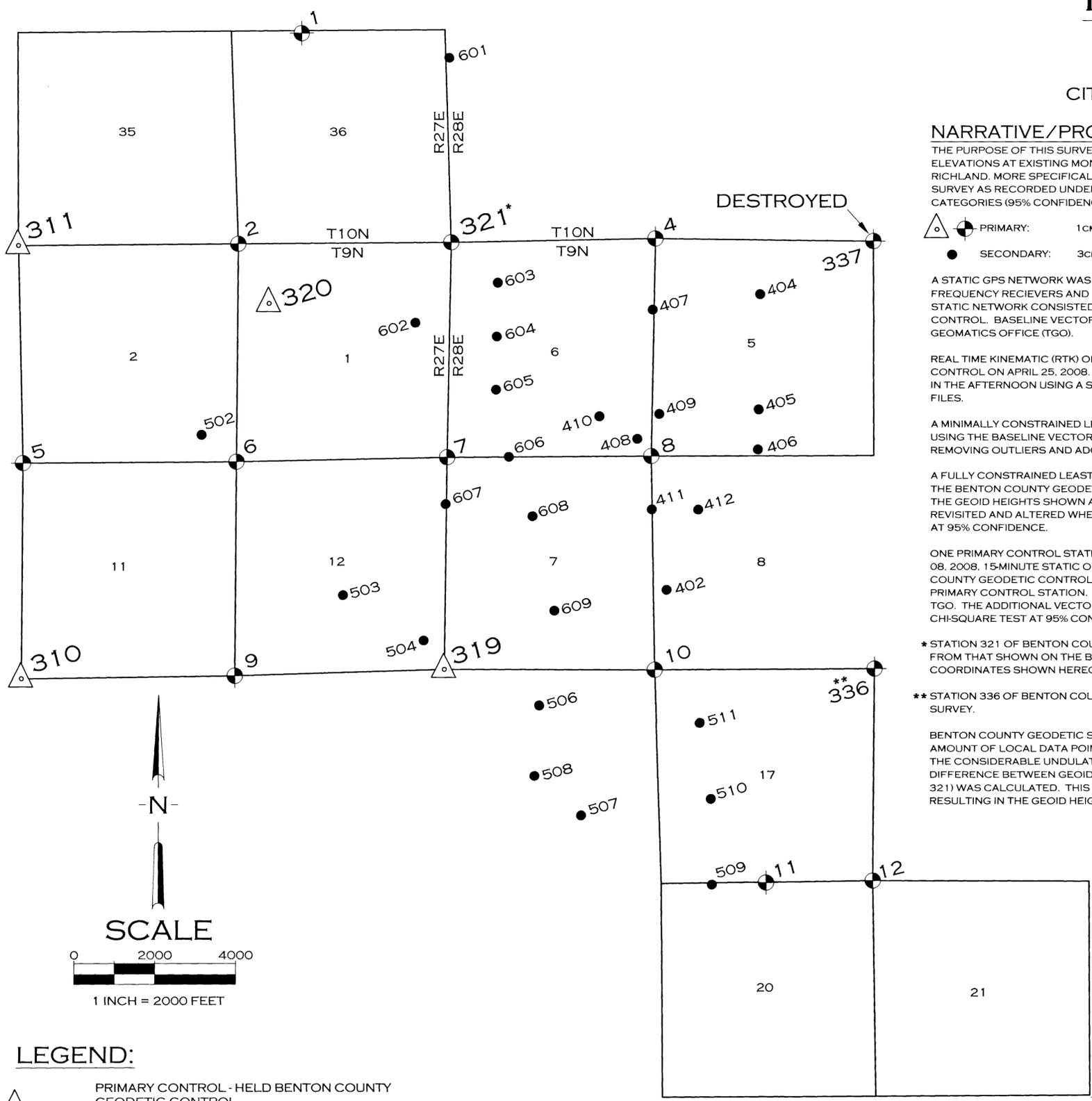


5, 6, 7, 17, 20, 21-9-28 $\frac{1}{2}$ 1, 2, 11, 12-9-27 $\frac{1}{2}$ 35, 36-10-27

3910 $\frac{1}{2}$

RECORD OF SURVEY

GEODETIC CONTROL SURVEY
 IN PORTIONS OF TOWNSHIPS 9 & 10 NORTH,
 RANGES 27 & 28 EAST, WILLAMETTE MERIDIAN
 CITY OF WEST RICHLAND, BENTON COUNTY, WASHINGTON



NARRATIVE/PROCEDURE:

THE PURPOSE OF THIS SURVEY WAS TO ESTABLISH WASHINGTON SOUTH STATE PLANE (NAD 83/91) COORDINATES AND NAVD88 ELEVATIONS AT EXISTING MONUMENTS OF THE USPLSS, AND MONUMENTS MARKING ROAD CENTERLINES IN THE CITY OF WEST RICHLAND. MORE SPECIFICALLY, THE OBJECTIVE WAS TO ADJUST OUR OBSERVATIONS TO THE BENTON COUNTY GEODETIC CONTROL SURVEY AS RECORDED UNDER VOLUME 1 OF SURVEYS, PAGE 1970. GEODETIC CONTROL NETWORK CONSISTS OF TWO ACCURACY CATEGORIES (95% CONFIDENCE):

- PRIMARY: 1cm HORIZONTAL 2cm VERTICAL
- SECONDARY: 3cm HORIZONTAL 6cm VERTICAL

A STATIC GPS NETWORK WAS PERFORMED TO OBSERVE BASELINES FOR THE PRIMARY CONTROL (STATIONS 1-12) UTILIZING DUAL FREQUENCY RECEIVERS AND DOUBLE OCCUPANCY OF EACH POINT DURING TWO SEPARATE DAYS (APRIL 01, & APRIL 15, 2008). THE STATIC NETWORK CONSISTED OF OBSERVATIONS AT STATIONS 310, 311, 319, 320 & 321 OF THE BENTON COUNTY GEODETIC CONTROL. BASELINE VECTORS WERE PROCESSED USING THE PRECISE EPHEMERIS AND LOOP CLOSURES CHECKED IN TRIMBLE GEOMATICS OFFICE (TGO).

REAL TIME KINEMATIC (RTK) OBSERVATIONS WERE MADE TO THE SECONDARY CONTROL (STATIONS 402-609) AND SELECT PRIMARY CONTROL ON APRIL 25, 2008. EACH POINT WAS OBSERVED TWICE FOR A MINIMUM OF 3 MINUTES; ONCE IN THE MORNING, AND ONCE IN THE AFTERNOON USING A SEPARATE CONTROL STATION FOR THE BASE RECEIVER SETUP. TGO WAS USED TO CREATE BASELINE FILES.

A MINIMALLY CONSTRAINED LEAST SQUARES ADJUSTMENT, HOLDING THE POSITION OF STATION 311, WAS PERFORMED IN STAR*NET USING THE BASELINE VECTORS FROM THE STATIC NETWORK AND THE RTK SESSIONS. THE OBSERVATIONS WERE SCRUTINIZED, REMOVING OUTLIERS AND ADOPTING APPROPRIATE WEIGHTING STRATEGIES.

A FULLY CONSTRAINED LEAST SQUARES ADJUSTMENT WAS PERFORMED IN STAR*NET, HOLDING STATIONS 310, 311, 319 & 320 FROM THE BENTON COUNTY GEODETIC CONTROL SURVEY. THE NATIONAL GEODETIC SURVEY (NGS) GEOID '03 MODEL WAS UTILIZED, AND THE GEOID HEIGHTS SHOWN AT EACH STATION ON BENTON COUNTY GEODETIC SURVEY WERE HELD. ADJUSTMENT STRATEGIES WERE REVISITED AND ALTERED WHEREAS THE NETWORK BEST FIT THE EXISTING GEODETIC CONTROL, WHILE PASSING THE CHI-SQUARE TEST AT 95% CONFIDENCE.

ONE PRIMARY CONTROL STATION AND SEVERAL SECONDARY CONTROL STATIONS DID NOT MEET THE ACCURACY CRITERIA. ON MAY 08, 2008, 15-MINUTE STATIC OBSERVATIONS WERE MADE AT THE STATIONS THAT DID NOT MEET ACCURACY CRITERIA AND TO BENTON COUNTY GEODETIC CONTROL STATIONS. ON JUNE 23, 2008, TWO 30 MINUTE STATIC OBSERVATIONS WERE MADE TO AN ADDITIONAL PRIMARY CONTROL STATION. THE BASELINES WERE PROCESSED USING THE PRECISE EPHEMERIS AND LOOP CLOSURES CHECKED IN TGO. THE ADDITIONAL VECTORS WERE INCLUDED IN THE LEAST SQUARES ADJUSTMENT AS DESCRIBED ABOVE AND PASSED THE CHI-SQUARE TEST AT 95% CONFIDENCE.

* STATION 321 OF BENTON COUNTY WAS ALSO OBSERVED DURING THE STATIC NETWORK, BUT THE POSITION OBSERVED DIFFERED FROM THAT SHOWN ON THE BENTON COUNTY CONTROL SURVEY TO THE EXTENT THAT IT COULD NOT BE HELD IN THE ADJUSTMENT. COORDINATES SHOWN HEREON FOR STATION 321 ARE DIFFERENT THAN THOSE SHOWN ON BENTON COUNTY GEODETIC CONTROL.

** STATION 336 OF BENTON COUNTY WAS NOT OBSERVED. THE DATA SHOWN IN FROM THE BENTON COUNTY GEODETIC CONTROL SURVEY.

BENTON COUNTY GEODETIC SURVEY REPORTS HIGH RESIDUALS IN GEOID HEIGHT (+0.09' TO +0.21'), LIKELY DUE TO THE SMALL AMOUNT OF LOCAL DATA POINTS USED IN CREATING THE GEOID MODEL (BENTON COUNTY SURVEY UTILIZED GEOID '93) RELATIVE TO THE CONSIDERABLE UNDULATION. TO CALCULATE GEOID HEIGHTS THAT FIT THE BENTON COUNTY GEODETIC CONTROL, THE MEAN DIFFERENCE BETWEEN GEOID '03 GEOID HEIGHTS AND BENTON COUNTY CONTROL GEOID HEIGHTS AT STATIONS (310, 311, 319, 320 & 321) WAS CALCULATED. THIS VALUE WAS APPLIED TO ALL GEOID '03 GEOID HEIGHTS FROM THE FULLY CONSTRAINED ADJUSTMENT, RESULTING IN THE GEOID HEIGHTS AND ELEVATIONS SHOWN HEREON.

AUDITOR'S CERTIFICATE:

FILED FOR RECORD THIS 24th DAY OF July, 2008,
 AT 14 MINUTES PAST 2:00 P.M. AND RECORDED IN
 VOLUME 1 OF SURVEYS, PAGE 3910, AT THE REQUEST OF
 MACKAY & SPOSITO, INC.

Bobbie Gagner by Amanda Chumbley 2008-021941
 BENTON COUNTY AUDITOR Dep. Aud. FEE NUMBER

RECORD SURVEY NUMBER XXXXXX/XX01

LEGEND:

- PRIMARY CONTROL - HELD BENTON COUNTY GEODETIC CONTROL RECORD OF SURVEY VOLUME 1, PAGE 1970
- PRIMARY CONTROL
- SECONDARY CONTROL



SURVEYOR'S CERTIFICATE:

THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECTION IN CONFORMANCE WITH THE REQUIREMENTS OF THE SURVEY RECORDING ACT, AT THE REQUEST OF THE CITY OF WEST RICHLAND IN APRIL, 2008.

Mackay & Sposito, Inc.

ENGINEERS SURVEYORS PLANNERS

1325 SE TECH CENTER DRIVE, SUITE 140 VANCOUVER, WA 98683
 (360) 695-3411 (503) 289-6726 PTLD FAX (360) 695-0833

CALC. BY: <u>CCS</u>	DRAWN BY: <u>CCS</u>	JOB NO.: <u>14883</u>
CHECKED BY: <u>JMY</u>	DWG. NAME: <u>14883RS1</u>	SHEET 1 OF 2

2008-021941 B: 01 P: 3910 SUR
 07/24/2008 02:14:41 PM Pages: 2 Fee: \$113.00
 Benton County Auditor's Office
 Benton County, Washington

RECORD OF SURVEY

GEODETIC CONTROL SURVEY
 IN PORTIONS OF TOWNSHIPS 9 & 10 NORTH,
 RANGES 27 & 28 EAST, WILLAMETTE MERIDIAN
 CITY OF WEST RICHLAND, BENTON COUNTY, WASHINGTON

NAD 83/91 WASHINGTON SOUTH (3602) STATE PLANE
 COORDINATES (US SURVEY FEET), NAVD88 ELEVATIONS

STA	NORTHING	EASTING	ELIPSOID HT	GEOID HT	ORTHO EL	CSF	CONV ANGLE	AGENCY	MONUMENT TYPE	MARKED AS
1	359977.86	1923038.72	500.53	-69.47	570.00	0.99990174	0-48-45	DNR	3" BRASS CAP	1/4 CORNER
2	354759.87	1921486.74	392.71	-69.39	462.10	0.99990809	0-48-28	UNKNOWN	3" BRASS CAP	SEC. CORNER
3	333703.76	1942902.85	524.34	-69.46	593.80	0.99990736	0-52-06	UNKNOWN	3" BRASS CAP	SEC. CORNER
4	354851.30	1931763.88	340.45	-69.57	410.02	0.99991060	0-50-15	UNKNOWN	3" BRASS CAP	SEC. CORNER
5	349366.19	1916173.30	494.23	-69.25	563.48	0.99990453	0-47-32	UNKNOWN	1/2" REBAR	UNMARKED
6	349393.61	1921458.75	443.66	-69.34	513.00	0.99990695	0-48-27	UNKNOWN	1" IRON PIPE	UNMARKED
7	349505.18	1926663.24	583.49	-69.42	652.91	0.99990026	0-49-21	UNKNOWN	3" BRASS CAP	SEC. CORNER
8	349542.47	1931693.86	549.80	-69.50	619.30	0.99990188	0-50-13	UNKNOWN	3" BRASS CAP	SEC. CORNER
9	344090.66	1921430.03	570.18	-69.27	639.45	0.99990226	0-48-26	WSRS	3" BRASS CAP	SEC. CORNER
10	344248.85	1931796.83	513.42	-69.44	582.86	0.99990497	0-50-13	UNKNOWN	1" IRON PIPE	UNMARKED
11	338997.52	1934550.41	527.75	-69.40	597.15	0.99990569	0-50-41	UNKNOWN	3" BRASS CAP	1/4 CORNER
12	339049.85	1937200.55	504.15	-69.45	573.60	0.99990681	0-51-08	WSRS	3" BRASS CAP	SEC. CORNER
310	344021.17	1916149.93	619.37	-69.19	688.56	0.99989991	0-47-31	WSRS	3" BRASS CAP	SEC. CORNER
311	354722.39	1916047.41	468.33	-69.30	537.65	0.99990447	0-47-32	UNKNOWN	3" BRASS CAP	SEC. CORNER
319	344252.33	1926608.12	478.23	-69.35	547.55	0.99990663	0-49-20	WSRS	3" BRASS CAP	SEC. CORNER
320	353297.77	1922252.66	412.72	-69.39	482.11	0.99990748	0-48-36	NGS	3" BRASS CAP	BENCHMARK M322
* 321	354798.67	1926750.53	390.24	-69.48	459.73	0.99990821	0-49-23	DNR	3" ALUMINUM CAP	SEC. CORNER
** 336	344271.26	1937211.63	484.96	-69.47	554.43	0.99990634	0-51-09	DNR	BRASS CAP	SEC. CORNER
402	346233.78	1932094.35	535.74	-69.47	605.21	0.99990339	0-50-17	UNKNOWN	3" BRASS CAP	UNMARKED
404	353544.97	1934374.55	311.51	-69.60	381.11	0.99991230	0-50-41	UNKNOWN	2" BRASS CAP	UNMARKED
405	350690.08	1934342.48	359.74	-69.50	429.30	0.99991069	0-50-41	UNKNOWN	3" BRASS CAP	UNMARKED
406	349712.64	1934331.54	407.24	-69.55	476.79	0.99990866	0-50-40	UNKNOWN	3" BRASS CAP	UNMARKED
407	353137.14	1931720.77	363.80	-69.55	433.35	0.99990989	0-50-14	UNKNOWN	3" BRASS CAP	UNMARKED
408	349960.35	1931375.32	556.18	-69.50	625.68	0.99990147	0-50-10	UNKNOWN	3" BRASS CAP	UNMARKED
409	350532.99	1931896.11	539.14	-69.52	608.66	0.99990215	0-50-15	UNKNOWN	3" BRASS CAP	UNMARKED
410	350526.03	1930425.58	563.89	-69.50	633.39	0.99990096	0-50-00	UNKNOWN	3" BRASS CAP	UNMARKED
411	348218.69	1931719.49	533.64	-69.49	603.13	0.99990298	0-50-13	UNKNOWN	2" BRASS CAP	UNMARKED
412	348214.17	1932888.22	523.35	-69.51	592.86	0.99990348	0-50-25	UNKNOWN	2-1/2" BRASS CAP	UNMARKED
502	350044.03	1920557.17	466.03	-69.33	535.36	0.99990572	0-48-18	UNKNOWN	3" BRASS CAP	LS 28240
503	346027.37	1924125.58	483.78	-69.34	553.12	0.99990589	0-48-54	UNKNOWN	3" BRASS CAP	UNMARKED
504	344945.86	1926086.88	495.02	-69.35	564.37	0.99990564	0-49-14	UNKNOWN	3" BRASS CAP	UNMARKED
506	343371.27	1928981.32	484.89	-69.38	554.27	0.99990655	0-49-44	UNKNOWN	3" BRASS CAP	UNMARKED
507	340649.27	1930006.54	542.91	-69.36	612.27	0.99990450	0-49-54	UNKNOWN	3" BRASS CAP	UNMARKED
508	341592.84	1928884.94	508.12	-69.35	577.47	0.99990591	0-49-43	UNKNOWN	3" BRASS CAP	UNMARKED
509	338971.77	1933225.17	549.90	-69.38	619.28	0.99990463	0-50-27	UNKNOWN	3" BRASS CAP	1/16
510	341063.24	1933200.99	500.08	-69.42	569.50	0.99990645	0-50-27	UNKNOWN	3" BRASS CAP	UNMARKED
511	342953.08	1932929.59	495.77	-69.44	565.21	0.99990615	0-50-25	UNKNOWN	3" BRASS CAP	UNMARKED
601	359365.38	1926694.60	360.95	-69.53	430.48	0.99990856	0-49-23	UNKNOWN	3" BRASS CAP	UNMARKED
602	352838.40	1925875.85	567.78	-69.45	637.23	0.99990020	0-49-13	UNKNOWN	3" BRASS CAP	UNMARKED
* 603	353811.94	1927907.36	562.70	-69.49	632.43	0.99990021	0-49-34	UNKNOWN	3" BRASS CAP	UNMARKED
604	352489.36	1927891.12	571.03	-69.48	640.51	0.99990013	0-49-34	UNKNOWN	3" ALUMINUM CAP	UNMARKED
605	351166.94	1927874.43	580.54	-69.46	650.00	0.99990000	0-49-34	UNKNOWN	3" ALUMINUM CAP	UNMARKED
606	349516.44	1928223.97	583.32	-69.45	652.77	0.99990027	0-49-37	UNKNOWN	3" BRASS CAP	UNMARKED
607	348337.94	1926650.95	570.58	-69.41	639.99	0.99990117	0-49-21	UNKNOWN	3" BRASS CAP	UNMARKED
608	348037.87	1928786.15	557.14	-69.44	626.58	0.99990190	0-49-43	UNKNOWN	3" BRASS CAP	UNMARKED
609	345709.50	1929335.71	535.59	-69.42	605.01	0.99990352	0-49-48	UNKNOWN	3" BRASS CAP	UNMARKED

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Bobbie Gagner by Amanda Chambers
 BENTON COUNTY AUDITOR *Dep. Aud.* 2008-021941
 FEE NUMBER

RECORD SURVEY NUMBER XXXXXX/XX01

* Affidavit of Correction. Monument destroyed & replaced. Filed under Auditor Fee # 2009-032895 on 11-05-2009. l.s.s.

Mackay & Sposito, Inc.

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