

## DCN 008 – Task 1 - Confirmation of Existing Control Levels

PREPARED FOR: Eric Forster, PE, PLS/City of Bend

COPY TO: Brady Fuller/CH2M HILL, file

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REVIEWED BY: Brady Fuller, PE/CH2M HILL

DATE: September 10, 2014

PROJECT NUMBER: 240191.14.A1.05

On September 2, 2014, CH2M HILL (CH2M) field crew ran three digital level loops over a combination of OTAK and CH2M control points in the vicinity of Schedules F and G of the Bend Southeast Interceptor Project (SEI). OTAK performed field surveying as subconsultant to CH2M HILL during Final Design of Segments 1 through 5 of the SE Interceptor. Basis for elevations is the monument designated "BM349", a 2-inch diameter brass cap in a monument box on the east side of 15<sup>th</sup> Street and the south side of the COID Canal, at the south end of the guard rail. The OTAK control points were established for the SEI Project, and their elevations are based on BM349 and two other Deschutes County bench marks, BM351 and BM354. The CH2M control points were established for the Murphy Road Project (circa 2006), and their elevations are based on vertical control different from the OTAK vertical control.

### Analysis of level data

The three digital level loops surveyed on September 2 were reduced and adjusted by the method of Least Squares in Listech's LISCAD Version 9.0 surveying software. The surveyed elevations were compared with the record elevations shown on the construction plans, and the results were found to be consistent with the previous conclusions. The measured versus record elevations of the OTAK points are well within acceptable limits for construction control, while the measured elevations of the CH2M points are consistently higher than the record elevations by approximately 0.17 foot. See the attached Exhibit 1 for a tabulation of field results.

### Condition of Control

As noted in the attached Exhibit 1, two OTAK and four CH2M control points were not found, having been apparently destroyed by construction or other activity. OTAK Point 20023 was originally a magnetized (MAG) nail in the asphalt path along the south side of the COID Canal. The nail had been removed, but the hole was intact. A MAG nail was reset into the hole before measuring the elevation, and the measured elevation agrees with the record. CH2M Point 535 is described as a plastic cap on a 5/8" iron rod, and is actually a plastic cap on a 1/2" iron rod. The descriptions of all other found points are correct. All found points were marked with wooden lath painted with fluorescent pink or pink paint as appropriate.

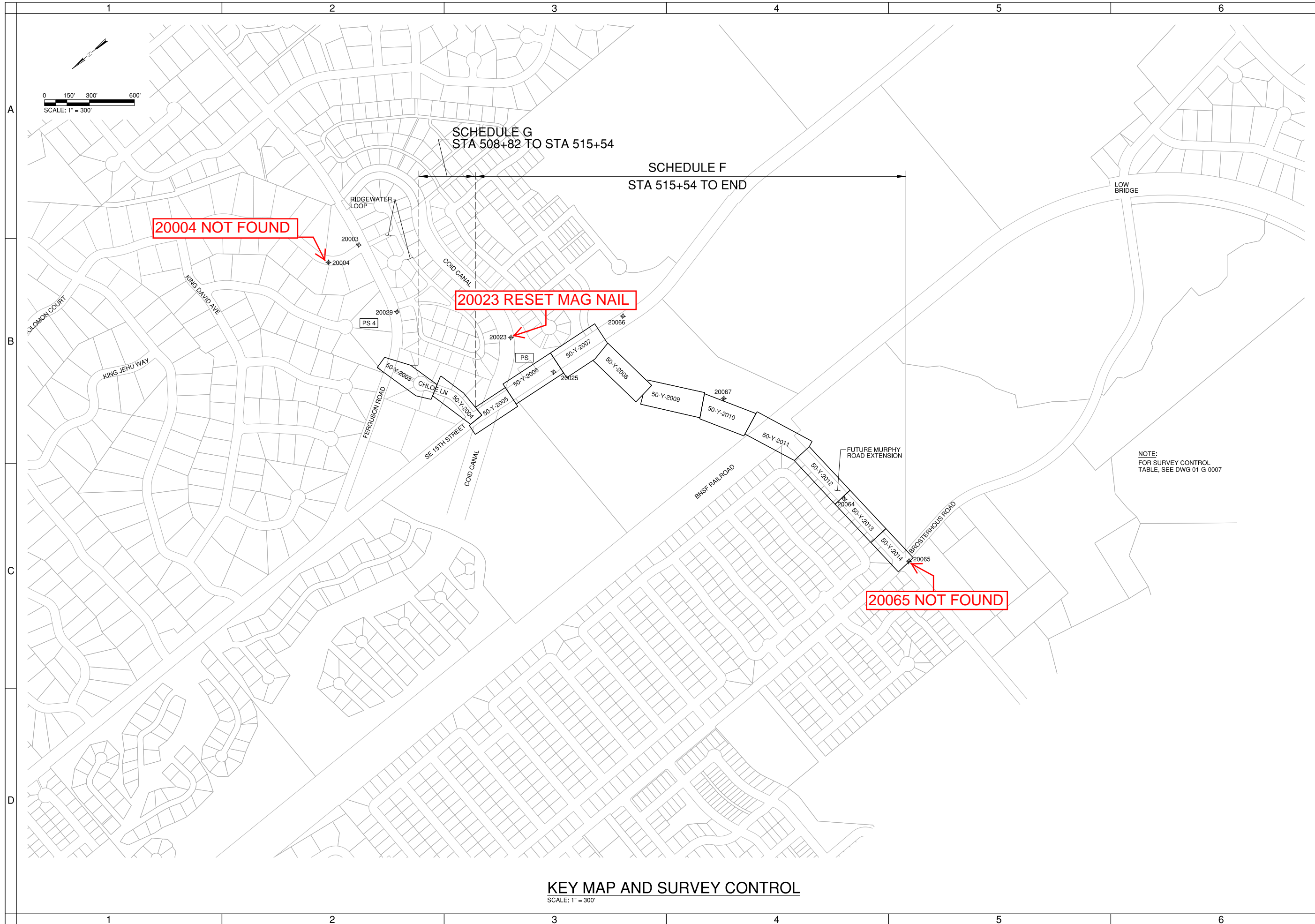
### Recommendation

CH2M HILL recommends that the contractor use only OTAK control points for construction staking, in order to avoid confusion and to minimize staking errors. This approach is already the basis of bid, and only the OTAK control points are referenced on Drawing 01-G-0007 from the Schedule F and G bid package. Using only OTAK control will require the setting of additional control by Contractor as needed. This augmentation of existing control is clearly assigned as the Contractor's responsibility in the ODOT Construction Surveying Manual for Contractors (Section 1.6). Contractor should exercise an appropriate level of care and diligence in determining the elevations of any additional control points set by Contractor.

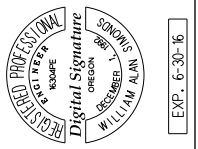
Further, CH2M HILL recommends that the updated control elevations shown in Exhibit 1 be incorporated into the contract documents by change order and used as the basis of construction.

## EXHIBIT 1

POINT	OWNER	ELEV-PLANS	ELEV-LEVELS	DIFF	COMMENTS
20003	OTAK NORTH	3707.80	3707.82	-0.02	Found
20023	OTAK NORTH	3718.93	3718.94	-0.01	Found hole-reset MAG nail
20025	OTAK NORTH	3716.50	3716.53	-0.03	Found
20029	OTAK NORTH	3701.38	3701.39	-0.01	Found
20030	OTAK NORTH	3715.93	3715.97	-0.04	Found
20064	OTAK NORTH	3755.27	3755.34	-0.07	Found
20066	OTAK NORTH	3733.77	3733.81	-0.04	Found
20067	OTAK NORTH	3746.25	3746.37	-0.12	Found
530	CH2M SOUTH	3754.22	3754.40	-0.18	Found W&H PACIFIC YPC
535	CH2M SOUTH	3741.56	3741.71	-0.15	1/2" IR - Not 5/8"
705	CH2M SOUTH	3736.88	3737.04	-0.16	Found
CH100	CH2M SOUTH	3734.57	3734.74	-0.17	Found
CH90	CH2M SOUTH	3716.79	3716.94	-0.15	Found
20004	OTAK NORTH		0.00		Not found
20065	OTAK NORTH		0.00		Not found
540	CH2M SOUTH		0.00		Not found
700	CH2M SOUTH		0.00		Not found
710	CH2M SOUTH		0.00		Not found
CH85	CH2M SOUTH		0.00		Not found



**KEY MAP AND SURVEY CONTROL**  
SCALE: 1" = 300'



**BEND SE INTERCEPTOR  
KEY MAP AND SURVEY CONTROL  
SOUTH - SCHEDULES F AND G**  
DESCHUTES COUNTY, OREGON



REVISIONS:

1.	
2.	
3.	

**CH2MHILL**  
1000 NE CIRCLE BLVD,  
BLDG 10, SUITE 10350  
CORVALLIS, OR 97330

DESIGNED BY: T. LANEY  
CHECKED BY: B. SIMONDS  
APPROVED BY: B. FULLER  
SCALE: AS SHOWN  
FILE: 01-G-0006-SW0707  
DATE: **JULY 2014**

VERIFY SCALES  
0 1"  
BAR EQUALS ONE INCH  
ON ORIGINAL DRAWING

DWG: **01-G-0006A**

SHEET: **5**

COB # **SW0707**

# SURVEY CONTROL TABLE

## NORTH SURVEY CONTROL

POINT NO.	NORTHING	EASTING	ELEVATION	CODE
20003	372898.85	3301182.04	3707.80	BCPKW
20004	373129.02	3301222.09	3706.75	BCPKW
20023	372519.64	3300056.84	3718.93	BCPKW
20025	372448.65	3299697.83	3716.50	BCROCC
20029	372990.48	3300675.59	3701.38	BCPKW
20064	371508.83	3297802.83	3755.27	BCROCC
20065	371446.62	3297208.92	3746.81	BCPKW
20066	371856.75	3299685.80	3733.77	BCPKW
20067	371693.83	3298833.70	3746.25	BCROCC

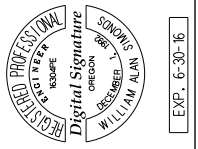
**SURVEY CONTROL CODES:**

ROCC: 5/8" x 30" IRON ROD W/ 1-1/4" RED PLASTIC CAP STAMPED "OTAK CONTROL"  
 PKW: PK NAIL W/ 1-1/2" BRASS WASHER STAMPED "OTAK CONTROL"  
 BC: 1-1/8" BRASS CAP STAMPED "OTAK CONTROL"  
 HTP: PLASTIC HUB AND TACK

**SURVEY CONTROL NOTES:**

- HORIZONTAL COORDINATES ARE CENTRAL OREGON COORDINATE SYSTEM  
VERTICAL DATUM IS NGVD29
- ELEVATIONS ON NORTH SURVEY CONTROL WERE ESTABLISHED BY OTAK  
HOLDING DESCHUTES COUNTY BENCHMARKS 349, 351, AND 354.
  - BENCHMARK 349  
NAME: 18121000  
ELEVATION: 3718.16  
DESC: 2" BRASS CAP
  - BENCHMARK 351  
NAME: 18121040  
ELEVATION: 3709.93  
DESC: 2-1/2" BRASS CAP
  - BENCHMARK 354  
NAME: 18121140  
ELEVATION: 3705.54  
DESC: 2" BRASS CAP
- CONTRACTOR SHALL VERIFY CONTROL ELEVATIONS AT BEGINNING OF  
CONSTRUCTION AND NOTIFY ENGINEER OF ANY DIFFERENCES.

**RECOMMEND  
REPLACING  
ELEVATIONS  
WITH EXHIBIT 1  
ELEVATIONS**



**BEND SE INTERCEPTOR  
SURVEY CONTROL  
TABLE**

DESCHUTES COUNTY, OREGON



REVISIONS:

1.	_____
2.	_____
3.	_____

**CH2MHILL**  
 1000 NE CIRCLE BLVD,  
 BLDG 10, SUITE 10350  
 CORVALLIS, OR 97330

DESIGNED BY: T. LANEY  
 CHECKED BY: B. THOMPSON  
 APPROVED BY: B. FULLER  
 SCALE: NTS  
 FILE: 01-G-0007-SW0707  
 DATE: **JULY 2014**

VERIFY SCALES  
 0 \_\_\_\_\_ 1"  
 BAR EQUALS ONE INCH  
 ON ORIGINAL DRAWING

DWG: **01-G-0007**

SHEET: **6**

COB # **SW0707**