Attachment 1.
Procedures and Work Instructions

DOE-EM/GJRAC3048

Office of Environmental Management – Grand Junction

UMTRA Project

Moab UMTRA Project
CJ Cell Verification Survey Procedures

Revision 0

February 2021

U.S. Department of Energy

Office of Environmental Management

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Moab UMTRA Project
CJ Cell Verification Survey Procedure

Revision 0

Review and Approval

2/9/2021

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Revision History

Revision	Date	Reason for Revision
0	January 2021	Initial issue.

Contents

Figures

1.0 General

1.1 Purpose

The purpose of this procedure is to provide the methodology to be followed by Quality Control (QC) personnel to perform grade verification surveys for various cell "buyoffs". These verification surveys ensure that the design tolerances for a particular cell feature have been met before building upon the cell feature with the subsequent feature of work. Work features requiring buyoff verification surveys include:

- Cell floor (and associated side slopes)
- Top of Waste Finish Grade
- Top of Interim Cover
- Thickness of Radon Barrier
- Thickness of Bio-intrusion Layer
- Thickness of Frost Protection Layer
- Thickness of Cap Rock

1.2 Scope

This procedure applies to all grade buyoff verification surveys of CJ cell features.

1.3 Definitions

CAD – Computer Aided Design. Software utilized to model or depict topography, create as-builds, or create design models.

GNSS – Global Navigational Satellite System. A satellite navigational system that provides autonomous geo-spatial positioning with global coverage.

TBC–Trimble Business Center. CAD software package used with Trimble hardware for preparing design data or analyzing field data.

Trimble Rover – Equipment consisting of a Trimble GNSS receiver and a Trimble Data Collector. This equipment, when used with a GNSS base station, site calibration (localization) and various designs files is used to capture position data and compare positional data to design grades in real time.

Trimble SCS 900 – Trimble software package utilized on Trimble Data Collectors (TSC2, TSC3, or TSC7).

Trimble TSC2, TSC3, or TSC7 – Trimble data collector utilized as a component of the Trimble Rover.

1.4 Records

All documentation created with this procedure is considered a Project Record and will be managed in accordance with *the Moab UMTRA Project Records Management Manual* (DOE-EM/GJ1545). Moab UMTRA Records are retained and maintained in accordance with federal orders, policies, and regulations.

Following the QA Manager approval of the QC documents, the original documentation shall be transmitted to Records by the QA Manager.

2.0 Responsibilities

2.1 Personnel Duties and Responsibilities

2.1.1 Quality Assurance Manager

The Quality Assurance (QA) Manager is responsible for:

- Implementing and directing Quality Control (QC) activities contained within this procedure.
- Identifying QC problems.
- Initiating, recommending, and/or providing QC solutions.
- Submitting finalized QC documentation to the Client.

2.1.2 Quality Control Representative

The QC Representative is responsible for the proper execution of this procedure and providing the results and associated documentation to the QA Manager.

2.1.3 Operations/Site Manager

The Operations/Site Manager has overall authority and responsibility for the Crescent Junction Project Site. This manager issues directives to all personnel and subcontractors to accomplish the project objectives.

2.1.4 Equipment Operators

Equipment operators are responsible for excavating and placing materials (soil, RRM, cap rock, etc.) in accordance with the specifications and notifying the QC Representative or their supervisor when a work feature is ready for verification.

2.1.5 All Personnel

All employees are responsible for identifying safety hazards and complying with the applicable Radiological Work Permits and Integrated Work Plans. All personnel have a duty and responsibility to stop work in the event they believe a work condition is unsafe for them or their peers.

2.2 Precautions and Limitations

2.2.1 Pause Work

Work shall be immediately terminated by any personnel who believe the activity in progress is unsafe and/or may create an unsafe condition. Work will resume when the condition is corrected.

2.2.2 Safety Protocols

When working around grading or compacting equipment, all personnel shall remain clear of any operating equipment and maintain positive communication with the equipment operator. This communication includes both visual and audio methods.

3.0 Requirements and Procedure

3.1 Tolerances

A. **Cell Floor**
   Compare actual grade (measured to design grade). Acceptable tolerance is +/- 0.1 FT.
B. **RRM**
   Placed to Design grade up to +2" above, no minus tolerance.
C. **Interim Cover**
   Placed to Design grade up to +2" above, no minus tolerance.
D. **Radon Barrier**
   4' Minimum Thickness (As-built Top of Radon Barrier – As-Built Top of Interim Cover must be at least 4.0')
E. **Infiltration and Biointrusion Barrier**
   6" Minimum Thickness (As-built Top of Infiltration and Biointrusion Barrier – As-Built Top of Radon Barrier must be at least 0.5' [6 inches])
F. **Frost Protection Layer**
   3' Minimum Thickness (As-Built Top of Frost Protection Layer – As-Built Top of Infiltration and Biointrusion Barrier must be at least 3.0')
G. **Cap Rock**
   6" Minimum Thickness (As-Built Finish Grade [Top of Rock] – As-Built Top of Frost Protection Layer must be at least 0.5' [6 inches]).

Note: To make thickness comparisons, the as-built points must be collected at the same X&Y coordinates. To accomplish this, the site has an established grid system over the cell which is utilized throughout the project for all verification surveys of all layers.

3.2 Procedure

3.2.1 Field Procedure

Step 1.On the Data Collector open the Site "CRESCENT JUNCTION" and create a new work order (Figure 1).
The work order naming convention is:

Year, Month, Day then the name of what you are doing.
(Example: 20201130 Cell Floor Buyoff).

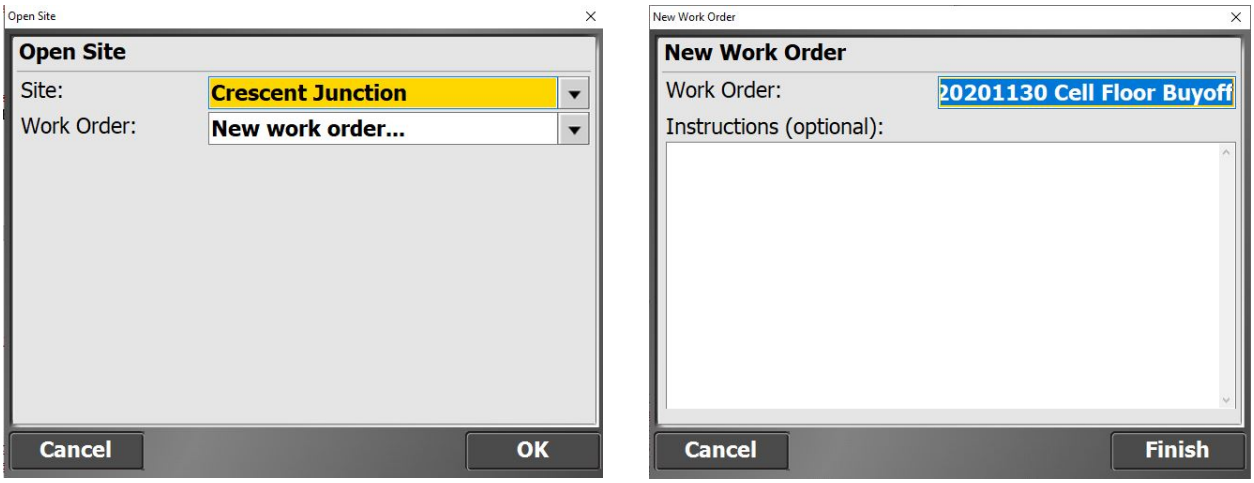


Figure 1. Create New Work Order

Step 2: Select the design associated with the verification buyoff survey you are conducting (Figure 2). Current designs on the data collector include:

- Cell Floor FG
- Cap FG
- Top of Waste
- Interim Cover

Additional designs, such as designs for the bio-intrusion layer, radon barrier, and frost protection layers will be created and installed later, but the methods described herein will be applicable.

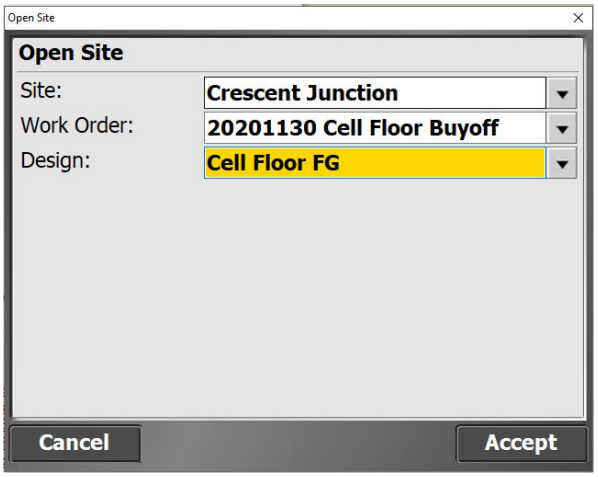


Figure 2. Select Associated Design

Step 3: With the Work Order set up and created, check into a control point to ensure that the rover and base station are reading correctly. To access this function, hit the Home key, then go to GPS and then recheck system (Figure 3).

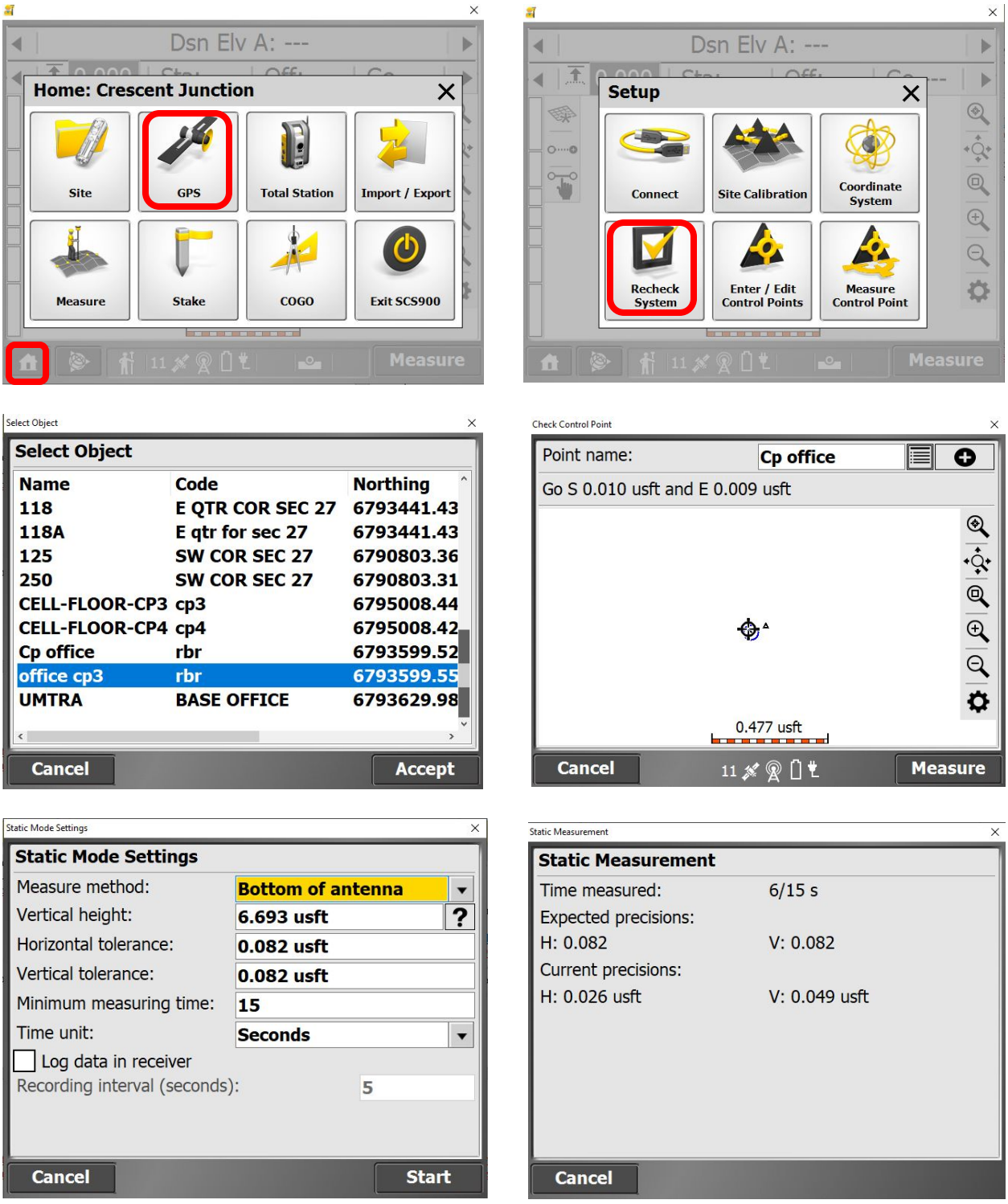


Figure 3. Check Control Point

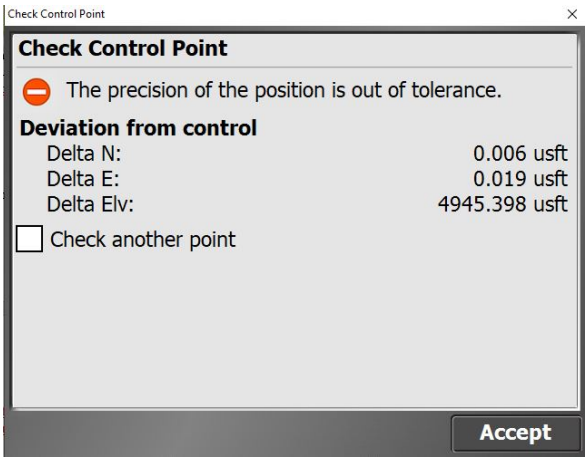


Figure 3. Check Control Point (continued)

This will say “The precision of the position is in tolerance”. This screenshot is from the emulator, which does not have elevation readings, which is why it is off. Ensure all delta readings are less than 0.082 FT (1-inch).

Step 4: Once the rover has been checked into a control point, switch into “Stake” mode. To do so, hit the Home Key, and then select Stake (Figure 4).

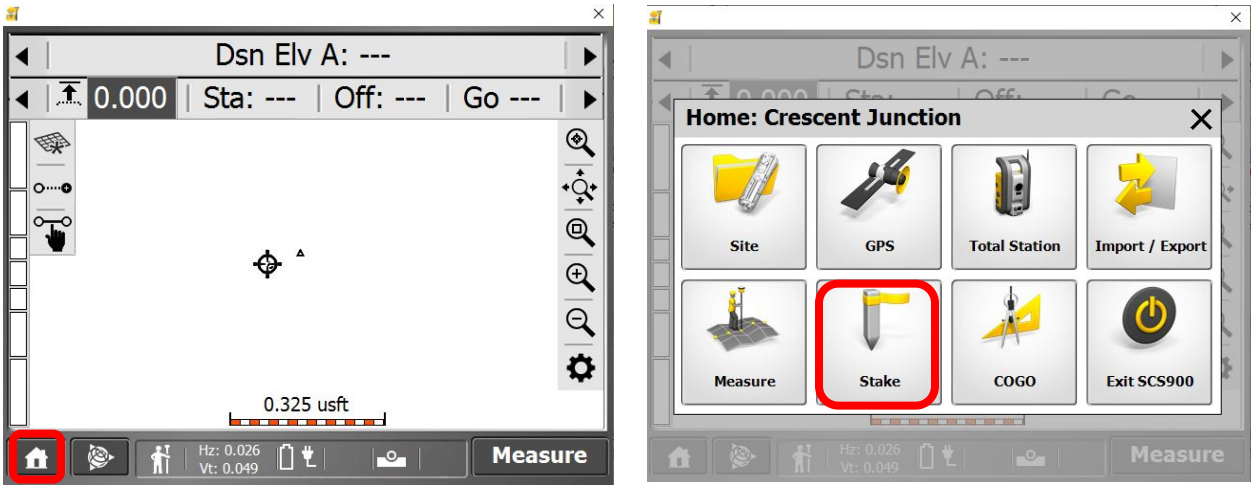


Figure 4. Switch into Stake Mode

Step 5: Once in Stake (stakeout) mode, pick the object to stake. While you may stakeout lines, surfaces, and points, verification occurs on a 50’ x 50’ grid. This same grid is utilized throughout all layers within the cell. As such select points. If no points are showing on the screen they may not be selected for display. The points can be toggled on and off for display using the Gear/Cog on the lower right-hand side of the display. Typically, it is much easier to display just the points without the name, elevation or code displayed. (Figure 5)

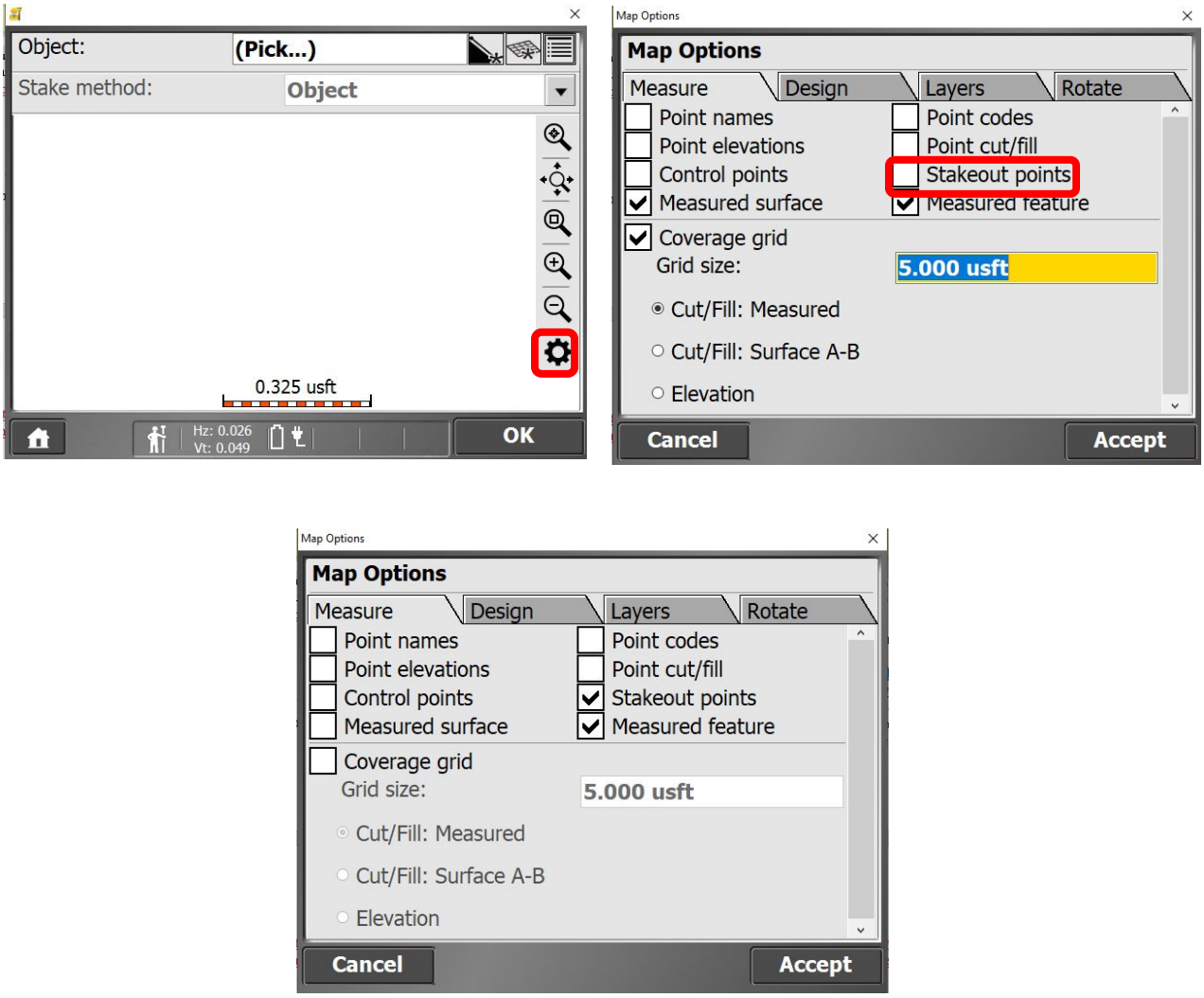


Figure 5. Stakeout Mode

Step 6: Select a point nearby where you are standing (Figure 6). Walk to the point and place the rover rod directly over the point, plumbing up the rod using the level bubble. The residuals (error between your X and Y position and the point location) should be less than 0.082 FT (sub-inch). Once within this range, and with the rod plumb, hit enter to record the point (or hit “stake” on the screen). You don’t need the diagram.

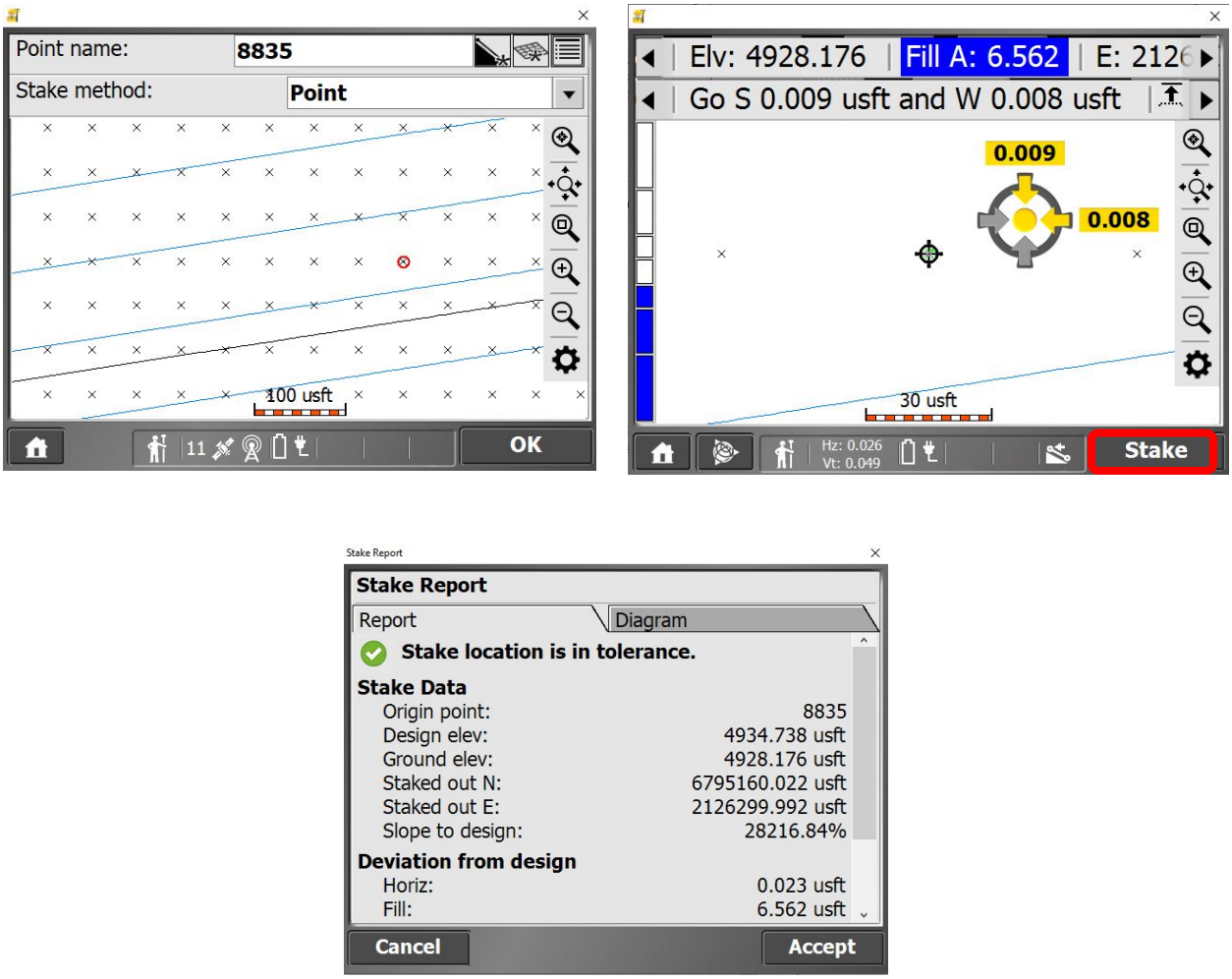


Figure 6. Select Points

Note: The Cut/Fill value should be within the specified grade tolerance. The screenshot is from an emulator that does not contain elevation data.

Step 7: Repeat Step 6 for all points located within the buyoff footprint.

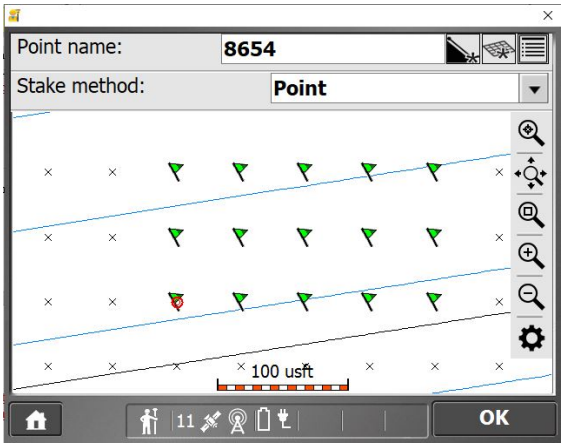


Figure 7. Select All Points

Step 8: Switch the rover into Measure mode (Figure 8) instead of Stake Mode. To do this, hit the Home key, then the Measure button.

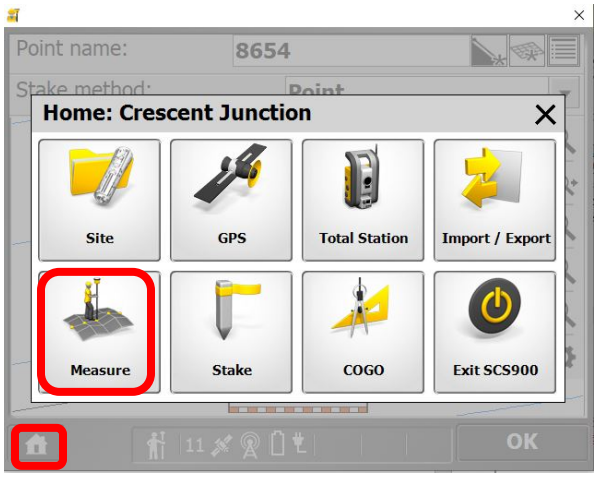


Figure 8. Measure Mode

Step 9: Once in Measure mode, "shoot in" any grade breaks within the buyoff area and the perimeter of the buyoff area (Figure 9), using point codes to describe the point. Typical codes include: Top, Toe, Brk1, 2, BDR, etc. These points are not used for grade verification but are used to create the as-build of the area within the verification survey.

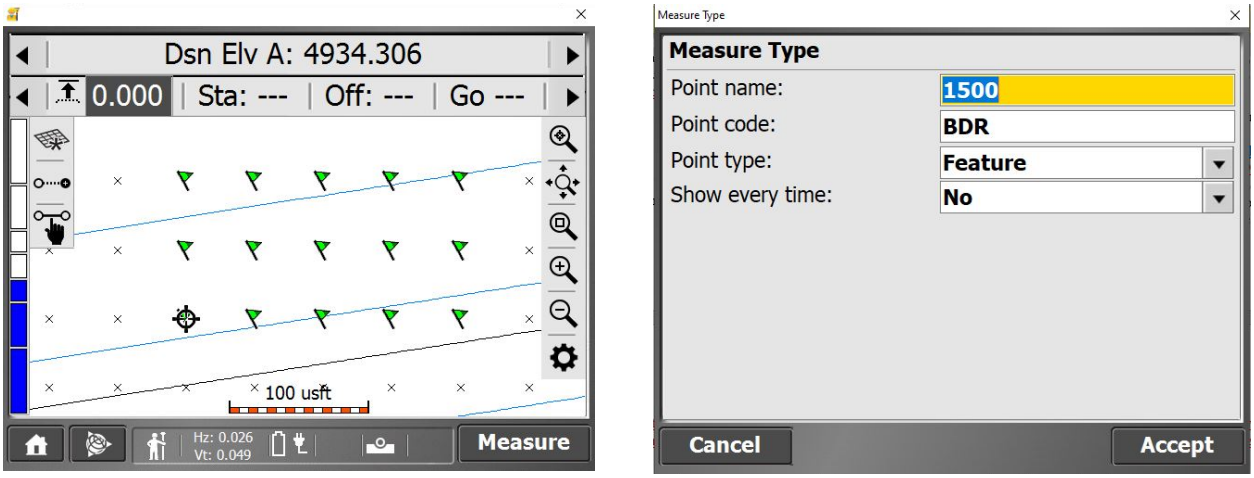


Figure 9. Shoot In and Grade Breaks

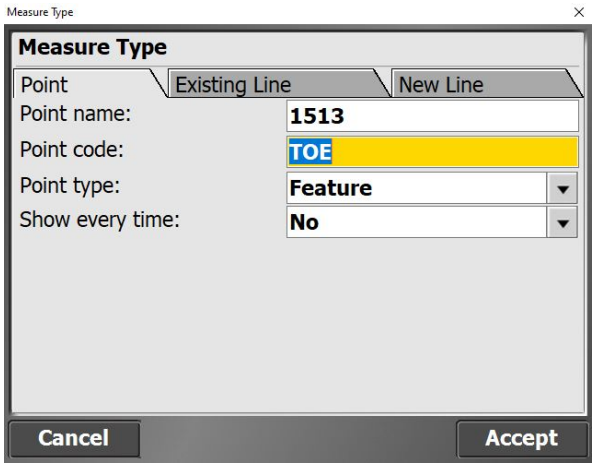


Figure 9. Shoot In and Grade Breaks (continued)

Step10: With the grade verification and topo data collected, the next step is to export the data for use in the office (Figure 10). Hit the Home Key, then Import / Export. Then Export a "Record.txt" File.

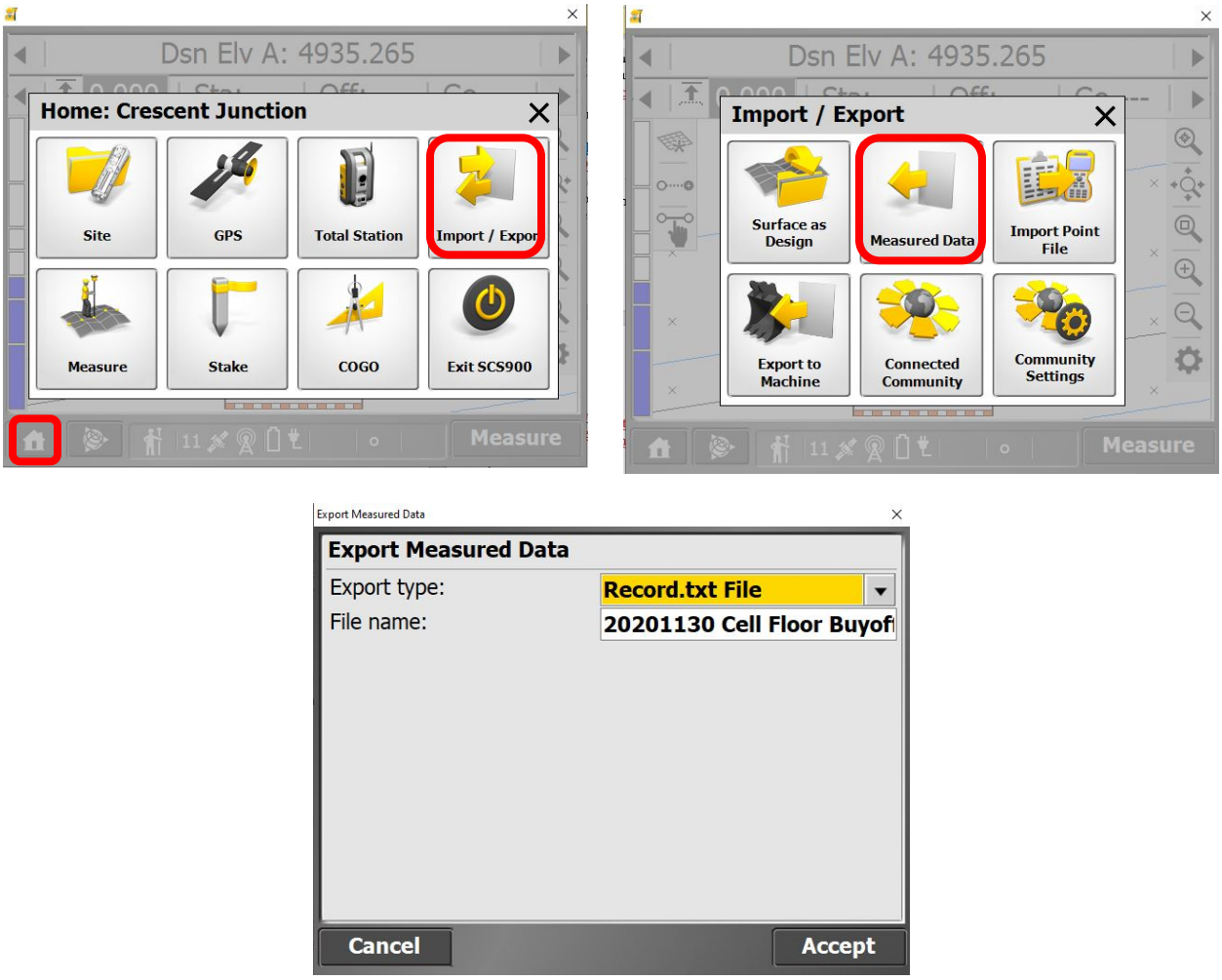


Figure 10. Export Topo Data

3.2.2 Office Procedure

Step 1: Transfer the field collected information from the data collector to the L: Drive Server. A Directory called Trimble Synchronizer Data houses the data backup for the Data Collectors. Within this directory you will find two directories, one named “PC” and the other named “GGE Collector 2” (Figure 11). The “PC” directory is the backup from the TSC7 while the “GGE Collector 2” directory is the backup from the TSC2. Plug an IT issued USB flash drive (thumb drive) into the data collector USB port and then copy the entire directory from the data collector onto the flash drive. Remove the flash drive from the data collector and then plug it into the site computer and then transfer the same directory into the appropriate directory on the server.

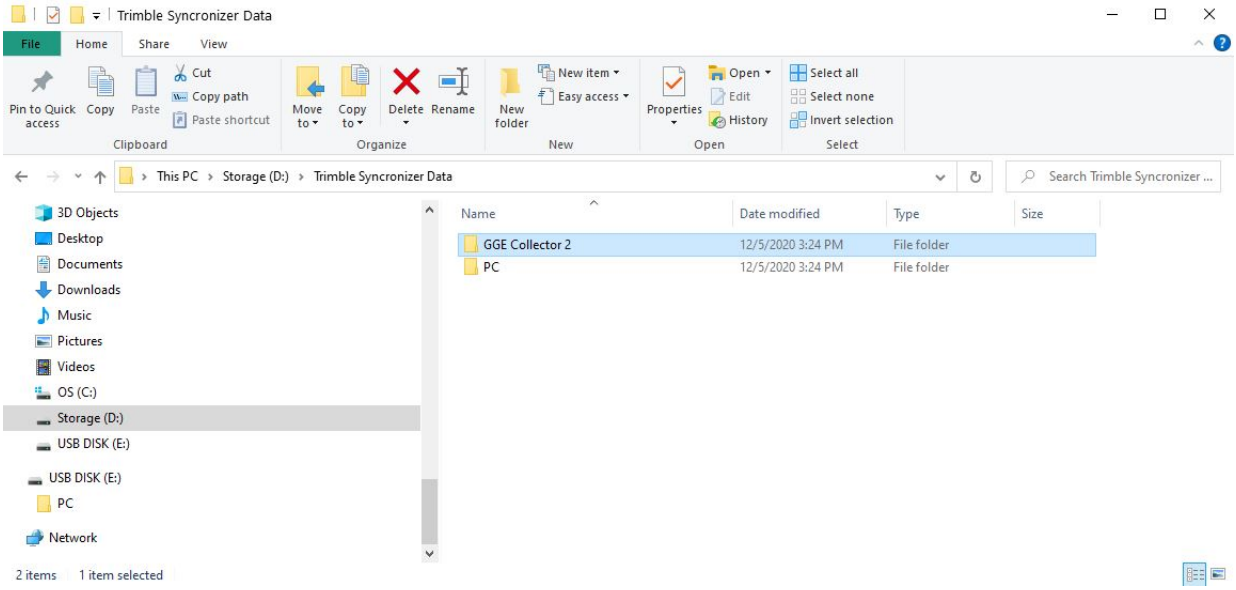


Figure 11. Data Collectors Directories

Step 2: Locate the appropriate SCS Report Utility in the “Forms” directory on the L: drive (Figure 11). Open this Excel File. Use Excel “SCS Report Utility-64” that corresponds to the data collector in which you conducted the survey. (SCS Report Utility-64 TSC7 and SCS Report Utility-64 TSC2).

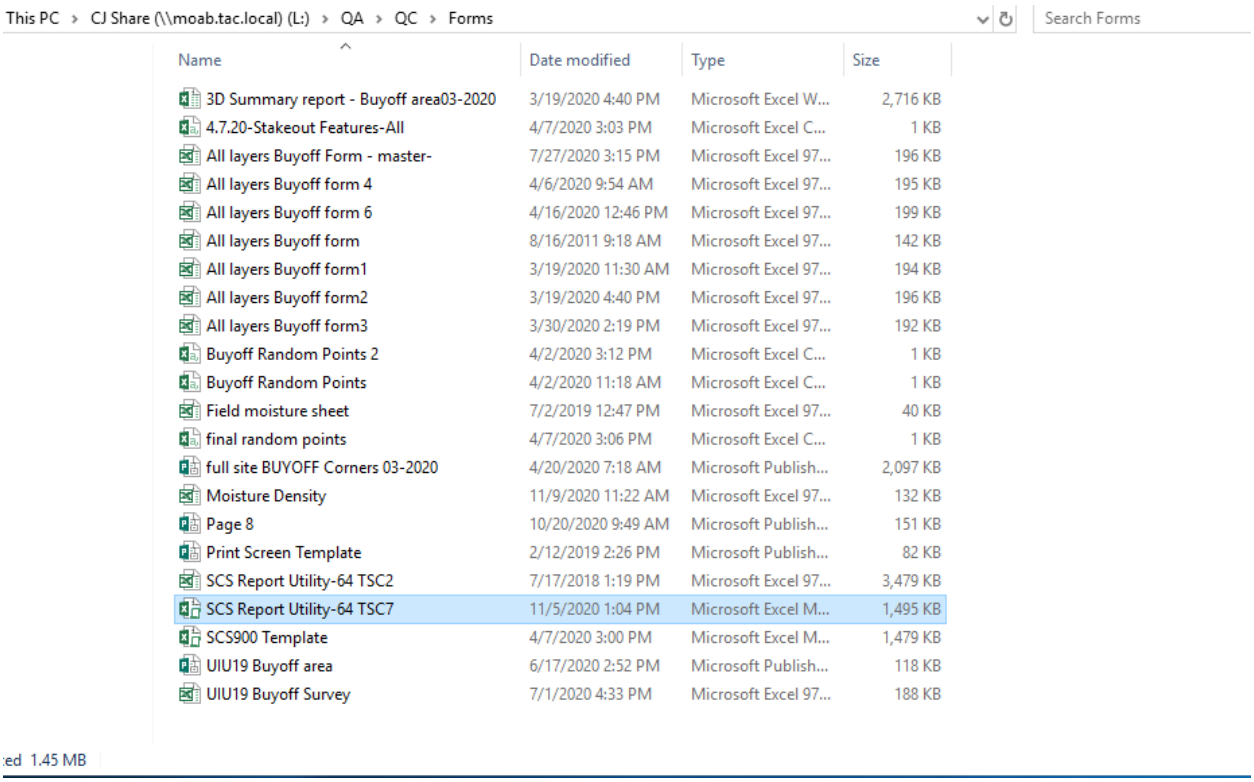


Figure 12. SCS Report Utility

Step 3: Click on “1 Import Record” (Figure 13). Navigate to the Trimble Synchronizer directory, proper controller directory, the in Trimble SCS900 Data > Crescent Junction> Work Orders > Work Order Name> Output. Then click on the record.txt file.

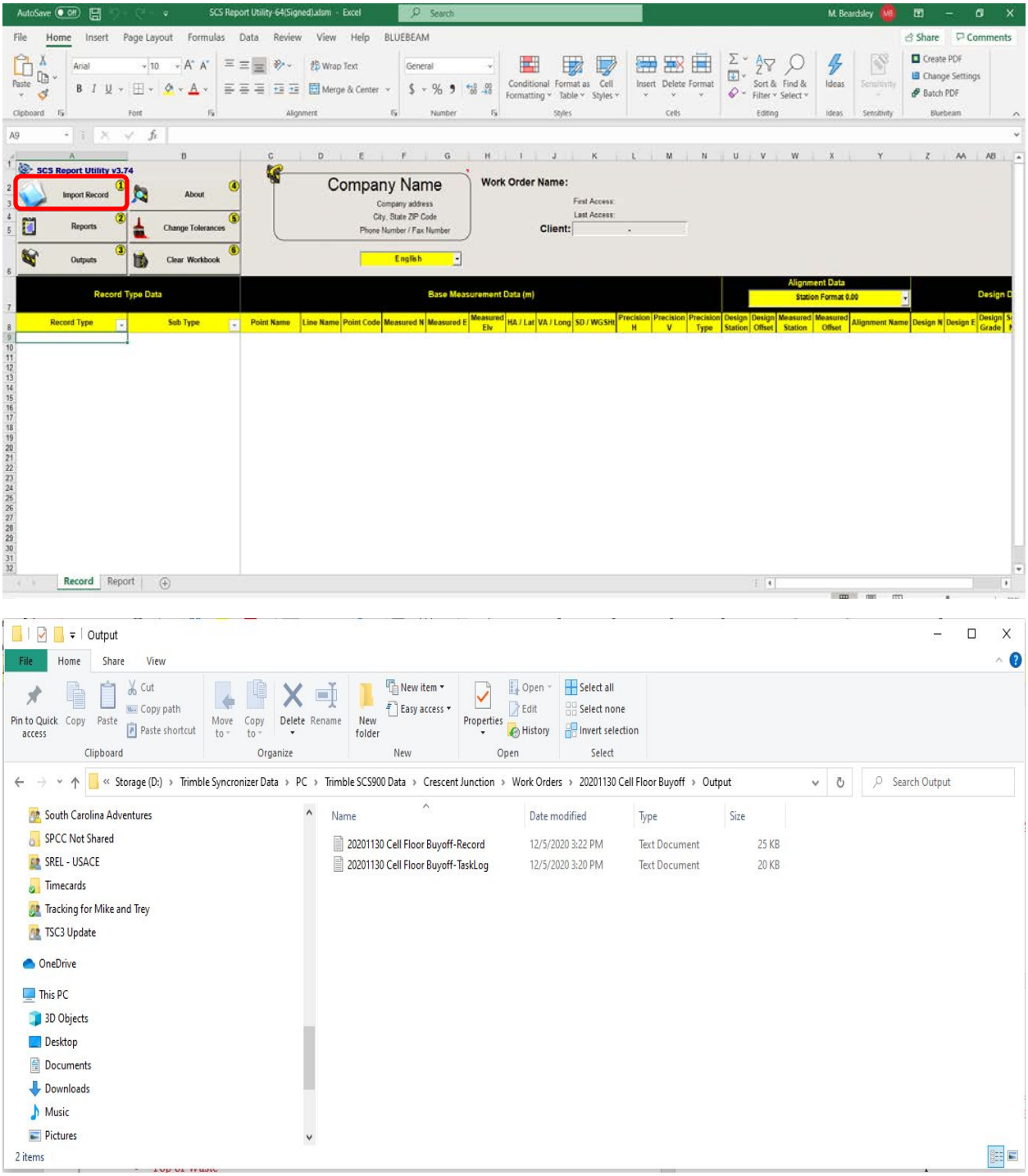


Figure 13. Import Record

Step 4: Once this data is opened you may create several new report tabs in the excel file. Create the Stakeout Features Tab, Measured Features Tab, and a custom Tab of Stakeout Features containing “Point Name, Measured Northing, Measured Easting, Measured Grade, Design Elevation, and Cut/Fill”. All 3 tabs will be created at the bottom of the excel file (Figure 14).

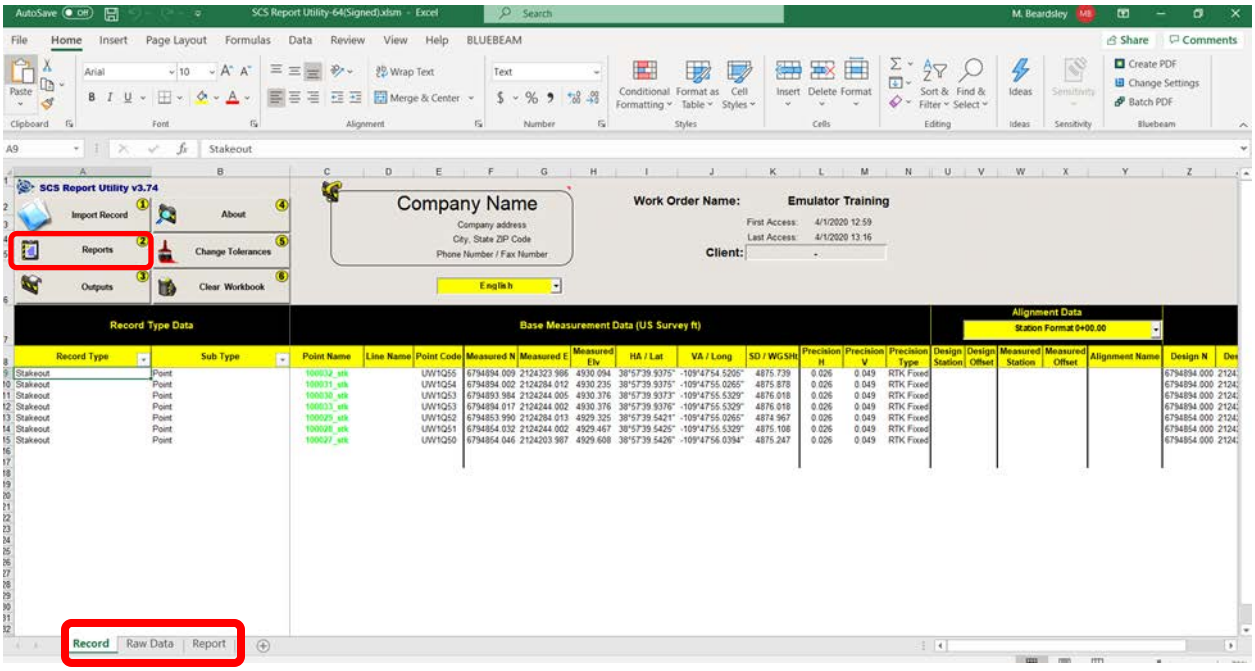
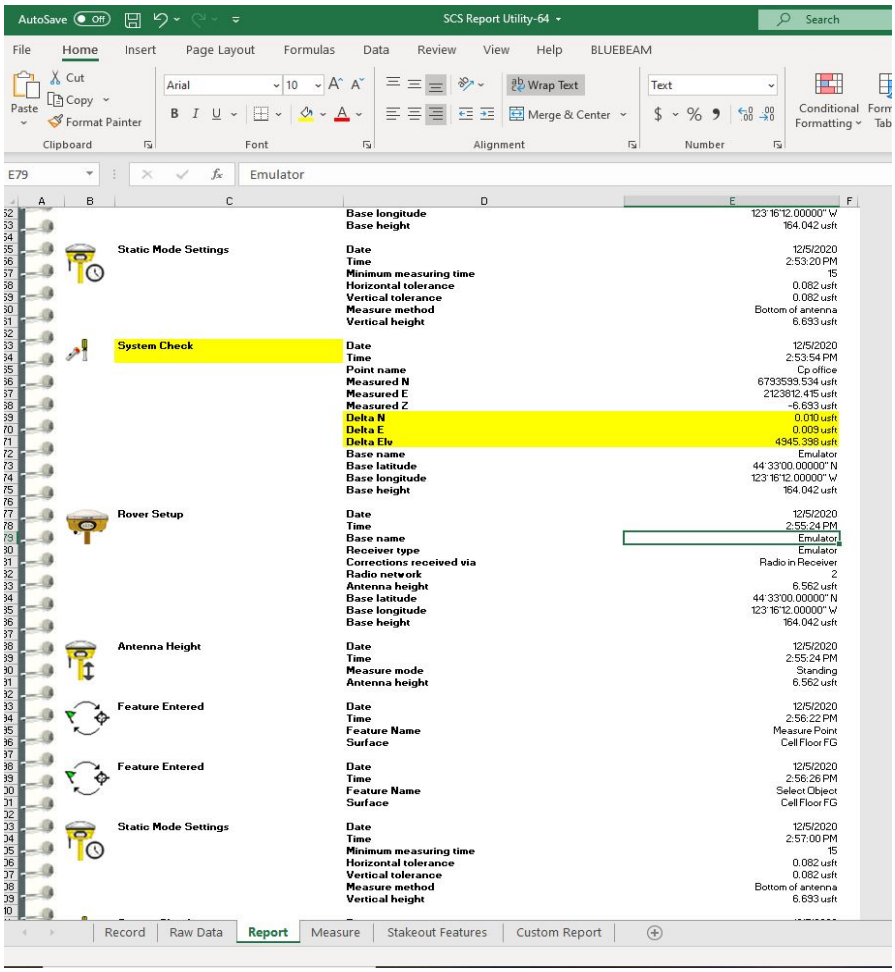


Figure 14. Create Report Tabs in Excel

Next review each tab. In the Report Tab (Figure 15), verify the Control Point Check in. In the Measured Features tab, review the measured as-built features and export a .CSV file of these features (P,N,E,Z,D format).

Store the as-built information in the location per the CJ Directory and Data Storage Procedure. Then review the Stakeout Features Tab. In this tab you will find how well the measured feature compared to the design feature. The cut/fill tells the elevation difference (Measured Elevation – Design Grade). Ensure these values meet the tolerance requirements for the survey. See Tolerance Requirements in Section 3.1. The data in the Custom Tab may then be cut and paste into the Buyoff Form.



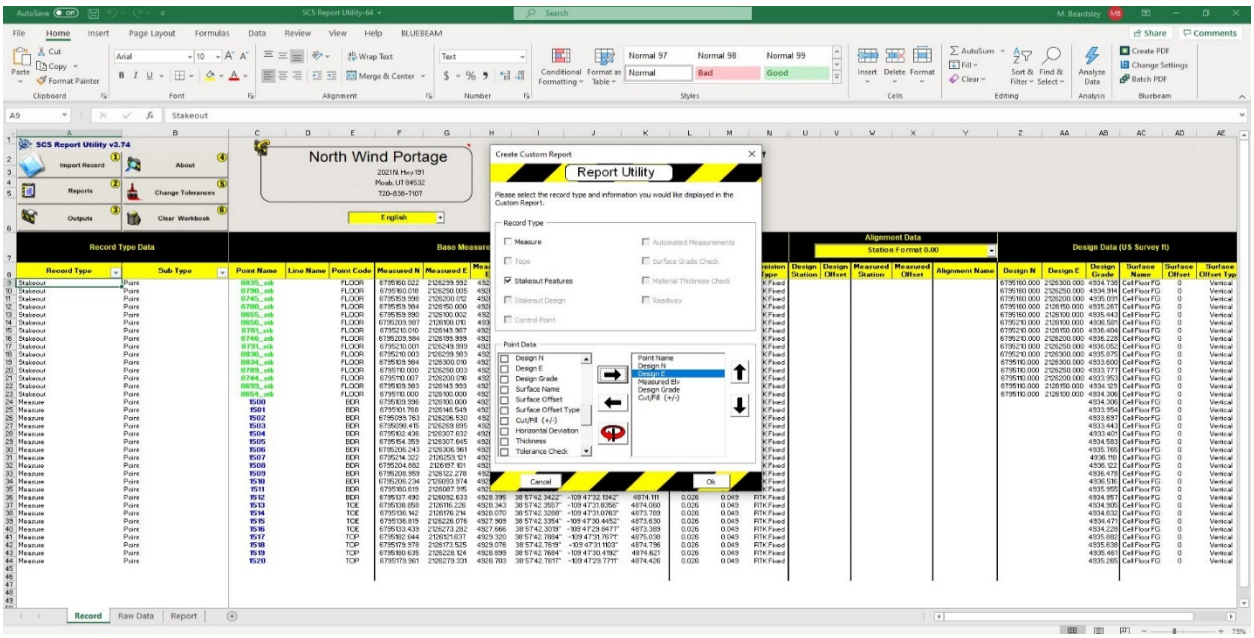


Figure 15. Report Tab

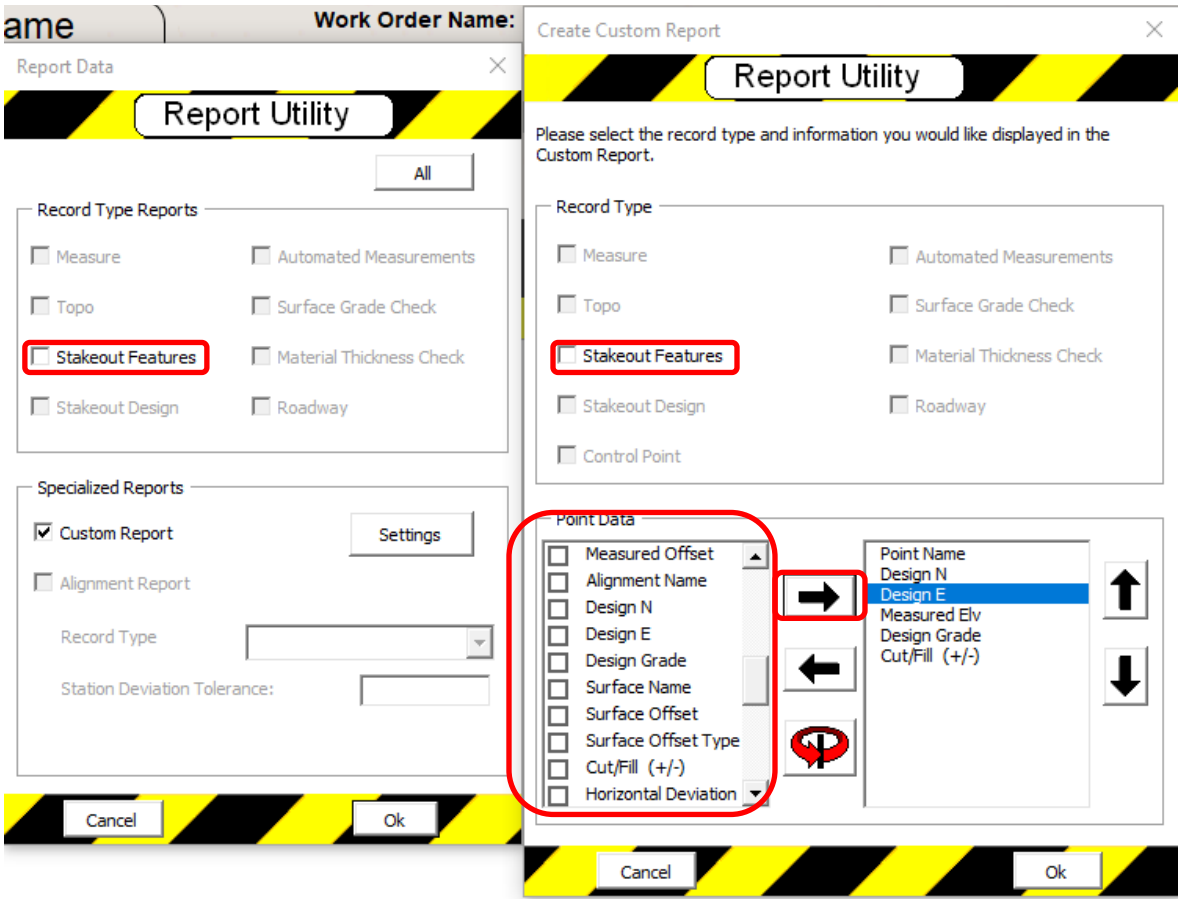


Figure 15. Report Tab (continued)

Note: The Cut/Fill value identified in the reports above can be generated manually by subtracting the Design Grade Value from the Measured Elevation. In the Buyoff form it may be useful to show this math rather than copy and pasting this value so that reviewers can more readily find where these values came from.

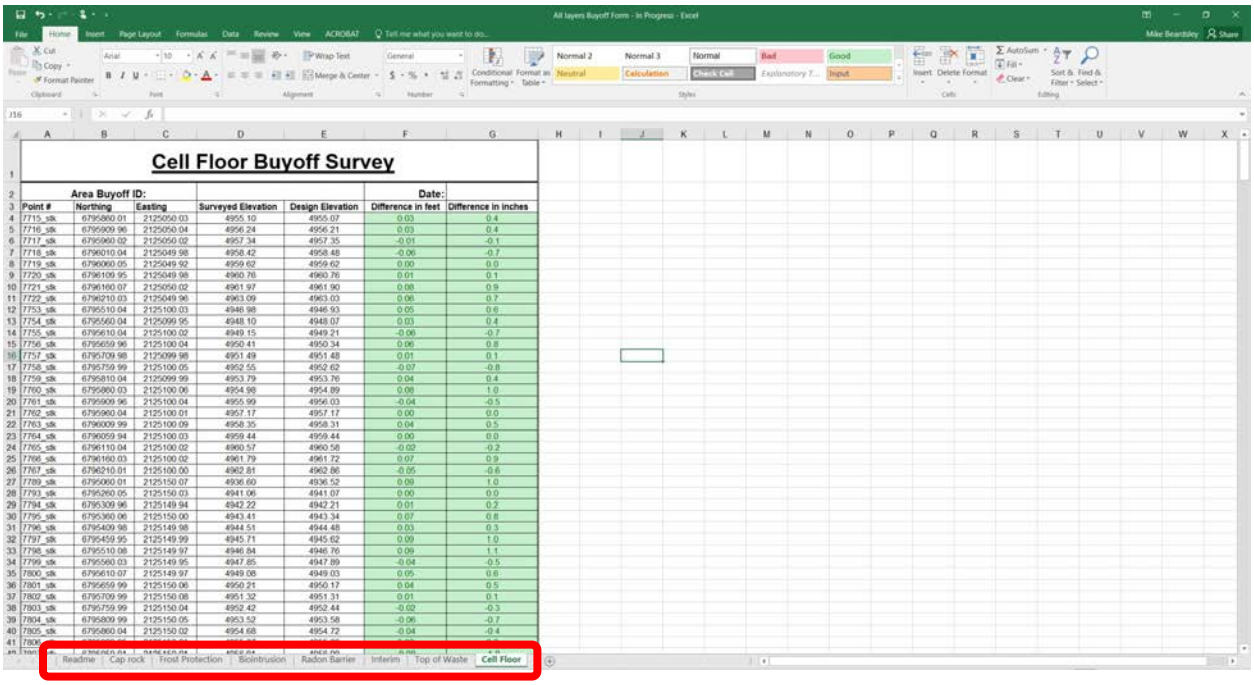
Step 5: Export Data to an excel file (Figure 16) with date and name of the buyoff you are doing.

	A	B	C	D	E	F	G
1	**Point Name**	**Measured N**	**Measured E**	**Measured Elv**	**Design Grade**	**Cut/Fill (+/-)**	
2	**21067_stk**	6794409.990	2123649.971	4972.144	4972.072	0.072	
3	**21030_stk**	6794359.949	2123600.054	4970.877	4970.780	0.098	
4	**21066_stk**	6794360.032	2123649.935	4970.836	4970.808	0.028	
5	**21102_stk**	6794360.015	2123700.072	4970.840	4970.836	0.004	
6	**21101_stk**	6794309.973	2123699.945	4969.666	4969.572	0.093	
7	**21138_stk**	6794310.038	2123749.998	4969.613	4969.571	0.042	
8	**21029_stk**	6794310.004	2123599.946	4969.553	4969.516	0.037	
9	**20993_stk**	6794309.941	2123550.011	4969.569	4969.488	0.082	
10	**20956_stk**	6794309.951	2123500.019	4969.550	4969.460	0.091	
11	**20919_stk**	6794310.015	2123450.011	4969.554	4969.431	0.123	
12	**20882_stk**	6794309.974	2123400.047	4969.497	4969.403	0.093	
13	**20845_stk**	6794310.021	2123350.002	4969.391	4969.375	0.015	
14	**20808_stk**	6794310.036	2123300.068	4969.363	4969.347	0.016	

	A	B	C	D	E	F	G
1	Point Nan	Design N	Design E	Design Gr	Measured	Cut/Fill (+/-)	
2	100133_st	6794610	2122250	4984.336	4983.991	-0.345	
3	100134_st	6794660	2122250	4985.6	4985.321	-0.278	
4	100135_st	6794710	2122250	4986.863	4986.607	-0.257	
5	100136_st	6794760	2122250	4988.127	4987.826	-0.301	
6	100093_st	6794760	2122200	4988.098	4987.827	-0.271	
7	100092_st	6794710	2122200	4986.834	4986.43	-0.404	
8	100091_st	6794660	2122200	4984.419	4984.909	0.49	
9	100090_st	6794610	2122200	4981.901	4982.395	0.494	
10							
11							

Figure 16. Export Data into Excel

Step 6: Copy and paste the values above into the “All Layers Buyoff Form”. Make sure to select the correct buyoff tab on the bottom of the sheet (Figure 17). Complete this report and provide the signed and complete report (Figure 18) to the QA Manager for review and submission to Records.



Cell Floor Buyoff Survey

Area Buyoff ID: Date:

Point #	Northing	Easting	Surveyed Elevation	Design Elevation	Difference in feet	Difference in inches
7715_stk	6795880.01	2125050.03	4955.10	4955.07	0.03	0.4
7716_stk	6795909.96	2125050.04	4956.24	4956.21	0.03	0.4
7717_stk	6795960.02	2125050.02	4957.34	4957.35	-0.01	-0.1
7718_stk	6796010.04	2125049.98	4958.42	4958.48	-0.06	-0.7
7719_stk	6796060.05	2125049.92	4959.62	4959.62	0.00	0.0
7720_stk	6796109.95	2125049.98	4960.76	4960.76	0.01	0.1
7721_stk	6796160.07	2125050.02	4961.97	4961.90	0.08	0.9
7722_stk	6796210.03	2125049.96	4963.09	4963.03	0.06	0.7
7753_stk	6795510.04	2125100.03	4946.98	4946.93	0.05	0.6
7754_stk	6795560.04	2125099.95	4948.10	4948.07	0.03	0.4
7755_stk	6795610.04	2125100.02	4949.15	4949.21	-0.06	-0.7
7756_stk	6795659.96	2125100.04	4950.41	4950.34	0.06	0.8
7757_stk	6795709.98	2125099.98	4951.49	4951.48	0.01	0.1
7758_stk	6795759.99	2125100.05	4952.55	4952.62	-0.07	-0.8
7759_stk	6795810.04	2125099.99	4953.79	4953.76	0.04	0.4
7760_stk	6795860.03	2125100.06	4954.98	4954.89	0.08	1.0
7761_stk	6795909.96	2125100.04	4955.99	4956.03	-0.04	-0.5
7762_stk	6795960.04	2125100.01	4957.17	4957.17	0.00	0.0
7763_stk	6796009.99	2125100.09	4958.35	4958.31	0.04	0.5
7764_stk	6796059.94	2125100.03	4959.44	4959.44	0.00	0.0
7765_stk	6796110.04	2125100.02	4960.57	4960.58	-0.02	-0.2
7766_stk	6796160.03	2125100.02	4961.79	4961.72	0.07	0.9
7767_stk	6796210.01	2125100.00	4962.81	4962.86	-0.05	-0.6
7789_stk	6795060.01	2125150.07	4936.60	4936.52	0.09	1.0
7793_stk	6795260.05	2125150.03	4941.06	4941.07	0.00	0.0
7794_stk	6795309.96	2125149.94	4942.22	4942.21	0.01	0.2
7795_stk	6795360.06	2125150.00	4943.41	4943.34	0.07	0.8
7796_stk	6795409.98	2125149.98	4944.51	4944.48	0.03	0.3
7797_stk	6795459.95	2125149.99	4945.71	4945.62	0.09	1.0
7798_stk	6795510.08	2125149.97	4946.84	4946.76	0.09	1.1
7799_stk	6795560.03	2125149.95	4947.85	4947.89	-0.04	-0.5
7800_stk	6795610.07	2125149.97	4949.08	4949.03	0.05	0.6
7801_stk	6795659.99	2125150.06	4950.21	4950.17	0.04	0.5
7802_stk	6795709.99	2125150.08	4951.32	4951.31	0.01	0.1
7803_stk	6795759.99	2125150.04	4952.42	4952.44	-0.02	-0.3
7804_stk	6795809.99	2125150.05	4953.52	4953.58	-0.06	-0.7
7805_stk	6795860.04	2125150.02	4954.68	4954.72	-0.04	-0.4

Readme | Cap rock | Frost Protection | Biointrusion | Radon Barrier | Interim | Top of Waste | Cell Floor

Figure 17. All Layers Buyoff Form

Step 7: Export both the stakeout report and the measured features report to comma separated value (.csv) files.

Step 8: Put the .csv file into an As-Built directory (per the CJ Directory Structure SOP)

Step 9: Create a TBC file (.vce) or open existing TBC file of applicable As-Built file. Create a layer to match work order name, and import the As-Built points. Draw grade breaks as appropriate. Save this file in the same as As-Built directory as identified in the previous step.