# GRAVITY SURVEY

**over the**

# TEELS MARSH PROSPECT

MINERAL COUNTY, NV

for

Dajin Resources (US) Corp.

March 2015

**SUBMITTED BY**

Magee Geophysical Services LLC

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# INTRODUCTION

Gravity data were acquired over the Teels Marsh Prospect in Mineral County, Nevada for Dajin Resources (US) Corp. The gravity survey was conducted between February 24 and March 5, 2015. A total of 415 new gravity stations were acquired. Three hundred and seven (307) stations were acquired on a 250m grid and 108 station were regional stations collected on roads and tracks. Field operations were based out of Hawthorne, NV.

Relative gravity measurements were made with LaCoste & Romberg Model-G gravity meters. Topographic surveying was performed with Trimble Real-Time Kinematic (RTK) and Fast-Static GPS.

Gravity data were processed to Complete Bouguer Gravity and merged with existing USGS public domain gravity data. Maps of the Complete Bouguer Anomaly, First Vertical Derivative, Horizontal Gravity Gradient, and Residual Gravity were prepared and delivered. Additionally, consulting geophysicist Jim Wright used these gravity data to prepare a 3D basin model and produce a map of depth to bedrock.

# DATA ACQUISITION

## Survey Personnel

Data acquisition and surveying were performed by Jack Magee, Tony Kelsoe, and Kevin Foxcroft. Christopher Magee supervised all operations and completed final data processing.

## Gravity Meters

Three LaCoste & Romberg Model-G gravity meters, serial numbers G-018, G-392, and G-406, were used on the survey. Model-G gravity meters measure relative gravity changes with a resolution of 0.01 mGal. The manufacturer's calibration tables used to convert gravity meter counter units to milliGals are included with the delivered data.

## Gravity Base

The gravity survey is tied to a previously established gravity base designated HOLIDAY located at the Holiday Lodge Motel in Hawthorne, NV. The HOLIDAY base is tied to the existing US Department of Defense (DoD) gravity base at the Fallon Airport (DoD reference number 2351-1). Information on the FALLON and HOLIDAY bases is listed below and gravity base descriptions are included in Appendix A.

| Base | Absolute Gravity | Latitude | Longitude | Elevation |
|---|---|---|---|---|
| HOLIDAY | 979573.79 | 38.524349° | -118.618681° | 1313.401m |
| FALLON | 979730.77 | 38.4952° | -118.7542° | 1208m |

## GPS Equipment

All gravity stations were surveyed using the Real-Time Kinematic (RTK) GPS method or, where it was not possible to receive GPS base information via radio modem, the Fast-Static (post-processing) method was used. The following GPS equipment was used on the project:

Trimble Model 5700 Dual-Frequency GPS Receivers and Trimble Model R8 Receivers

Trimble Model TSCe & TSC2 Data Collector/controllers
Trimble TrimMark III base radios and repeaters
Trimble Zephyr GPS antennas
Trimble Business Center (Version 3.40) was used for GPS data processing.

## Geodetic Survey Control

A single GPS base station, designated *TM,* was used on this project. The coordinates and elevation of this base station location were determined by making simultaneous GPS occupations in the Fast Static mode with Continuously Operating Reference Stations (CORS). GPS data for this station were submitted to the National Geodetic Survey (NGS) OPUS service which is an automated system that uses the three closest CORS stations to determine coordinates and elevations for unknown stations. The OPUS results are included in Appendix B. The coordinates and elevation of station *TM* are listed below.

| **Station** | **WGS-84 Latitude** | **WGS-84 Longitude** | **WGS-84 Ellipsoid Ht.** |
|---|---|---|---|
| ***TM*** | N 38° 14' 17.58914" | W 118° 20' 11.26261" | 1476.968m |
| | **WGS84 UTM Northing** | **WGS84 UTM Easting** | **Elevation (NAVD29)** |
| | 4233090.833 m | 383040.298 m | 1500.759m |

## Topographic Surveying of Gravity Stations

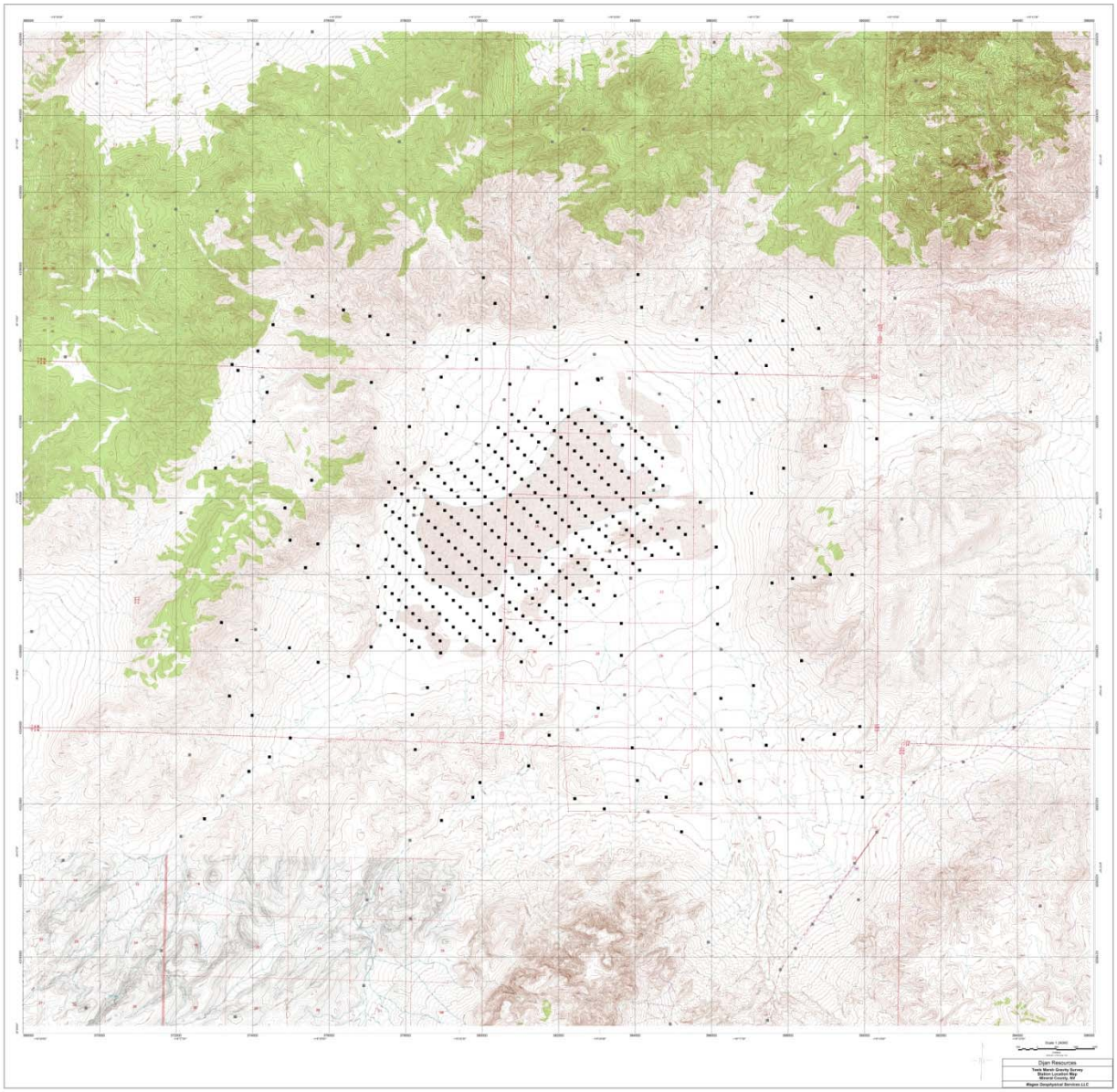
All topographic surveying was performed simultaneously with gravity data acquisition. The gravity stations were surveyed in WGS84 UTM Zone 11 North coordinates in meters. The GEOID12A geoid model was used to calculate NAVD88 elevations from ellipsoid heights. The elevations were then converted to North American Vertical Datum of 1929 (NAVD29) using the NGS program VERTCON. The coordinate system parameters used on this survey are summarized below.

| Datum | |
|---|---|
| Datum Name | WGS84 |
| Ellipsoid | GRS80 |
| Semi-Major Axis | 6378137.0 m |
| Eccentricity | 0.0818191909 |
| Transformation | None |

| Projection | |
|---|---|
| Type | Universal Transverse Mercator |
| Zone | UTM 11 North |
| Origin Latitude | 00º 00' 00.00000" N |
| Central Meridian | 117º 00' 00.00000" W |
| Scale Factor | 0.9996 |
| False Northing | 0 |
| False Easting | 500000 m |
| Geoid Model | GEOID12A (CONUS) |

## Gravity Stations

A total of 415 new gravity stations were acquired and merged with 95 USGS public domain stations. Stations were reached by ATV or on foot. A station location is shown on the following page.



***Teels Marsh Gravity Survey***
***Station Location Map***

# DATA PROCESSING

## Overview

Field data including station identifier, local time, gravity reading, measured slope, and operator remarks were recorded in field notebooks and on GPS survey controllers at each station. The recorded data were then uploaded onto a laptop computer and formatted into GeoSoft RAW gravity files. All survey coordinates were transferred digitally.

All gravity data processing was performed with the Gravity and Terrain Correction module of Geosoft Oasis Montaj (Version 8.3). Gravity data were processed to Complete Bouguer Gravity over a range of densities from 2.00 g/cc through 3.00 g/cc at steps of 0.05 g/cc using standard procedures and formulas. Color contoured images of the Complete Bouguer Anomaly, First Vertical Derivative, Horizontal Gravity Gradient, and Residual Gravity are included in Appendix D. The Residual Gravity was prepared by upward continuing the Complete Bouguer Anomaly 500 meters then subtracting the upward continued gravity from Complete Bouguer. A grid cell size of 100 meters was used in the preparation of all of the grids and maps.

## Data Processing Parameters

The following parameters were used to reduce the gravity data:

| GMT Offset | Gravity Formula | Gravity Datum |
|---|---|---|
| -8 hours | 1967 | ISGN-71 |

## Terrain Corrections

Terrain Corrections were calculated to a distance of 167 km for each gravity station. The terrain correction for the distance of 0 to 10 meters around each station was calculated using a sloped triangle method with the average slopes measured in the field. The terrain correction for the distance of 10 meters to 2000 meters around each station was calculated using a combination of a prism method and a sectional ring method with digital terrain from 10-meter Digital Elevation Models (DEM). The terrain correction for the distance of 2 to 167 kilometers around each station was calculated using the sectional ring method and digital terrain from SRTM/90-meter DEMs.

## Gravity Repeats and Loop Closures

Gravity repeat statistics for the Teels Marsh gravity surveys follow:

| | |
|---|---|
| Total number of stations: | 415 |
| Number of repeated stations: | 32 |
| % stations repeated : | 7.7% |
| Total number of readings: | 471 |
| Number of repeat readings: | 56 |
| % readings repeated: | 11.9% |
| Maximum repeat error: | 0.0441 mGal |
| Mean repeat error: | 0.0174 mGal |
| RMS error: | 0.0275 mGal |

A listing of all the gravity loops and their respective closure errors is included in Appendix C. The mean of the absolute value of all loop closure errors is 0.029 mGal.

# DATA FILES

## Raw Data Files

The raw data files are named with the gravity meter serial number, date, and operators initials. The format is *gnnn_mmm_dd_2015_iii.txt* where *gnnn* is the serial number of the gravity meter, *mmm* is the month, *dd* is the date on which the gravity loop was acquired, and *iii* are the operator's initials. The raw data file and GeoSoft database file (.gdb) for each day's data are included with the delivered data.

## Final Gravity XYZ File

The final Geosoft DataBase (GDB) file with all principle facts for the Teels Marsh Gravity Survey is named *Teels_Marsh_Gravity_Merge_06MAR2015.gdb* with a corresponding XYZ file named *Teels_Marsh_Gravity_Merge_06MAR2015.csv*. The data columns in the file include headers identifying the value of each column.

## GeoSoft Database Files

All of the additional GeoSoft database (.gdb) files associated with the data processing are also included with the delivered data, these are:

Final coordinate and elevation listing
*Coords_thru_Mar05_NAVD29.gdb*
Master gravity database
*Teels_Marsh_Gravity_Merge_06MAR2015.gdb*
Gravity Base Station database
*TeelsMarsh_GravBase.gdb*

## Grid and Terrain Files

The file names for the grid files used to create the images in this report and to calculate the terrain corrections are as follows and are included with the delivered data.

Local terrain file
*Teels_10m_DEM_WGS84UTM11.grd*
Regional terrain file
*Nevada_90m_DEM_final_WGS84UTM11.grd*
Regional terrain correction output file
*Teels_167km_tc.grd*
Complete Bouguer Anomaly Geosoft Grid File
*cbg240merge.grd*

First Vertical Derivative Geosoft Grid File
*cbg240merge_1st_Vert_Derivative.grd*

Horizontal Gravity Gradient Geosoft Grid File
*cbg240merge_Horiz_Gradient.grd*

500m Upward Continued Gravity (Regional) Geosoft Grid File
*cbg240merge_UC_500m_Regional.grd*

500m Upward Continued Gravity Removed (Residual) Geosoft Grid File
*cbg240merge_UC 500m_Residual.grd*

Each Geosoft grid file also corresponds to a PDF map file and an exported/registered GEOTIFF file that are included with delivered data.

## GPS Data Files

The raw and processed GPS data are included with the delivered data as Trimble Business Center and/or Trimble Geomatics Office projects and are organized in folders by date.

Submitted by:

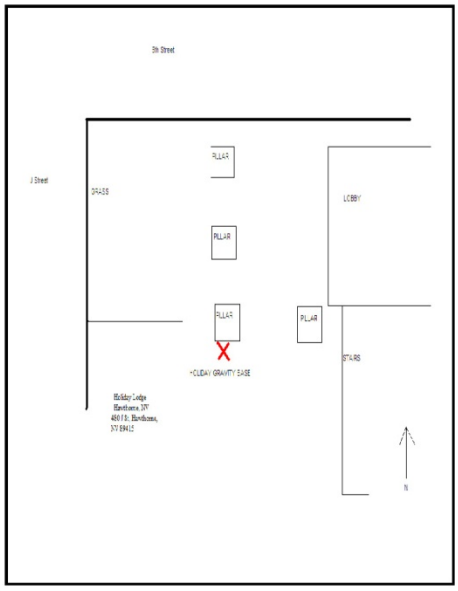
Christopher Magee
Geophysicist
Magee Geophysical Services LLC

# APPENDIX A GRAVITY BASE DESCRIPTIONS

| Gravity Base Station Description | Station Designation | Date |
|---|---|---|
| | HOLIDAY | Jan 2013 |
| Country | State | City |
| USA | Nevada | Hawthorne |
| County | Township/Range | 1:24,000 Scale Quadrangle |
| Mineral | T8N R30E Section 27 | Hawthorne East |
| Latitude WGS-84 | Longitude WGS-84 | Ellipsoid Height WGS-84 |
| N 38º 31' 27.39467" | W 118º 37' 10.77545" | 1288.485m |
| Latitude NAD27 | Longitude NAD27 | Elevation NAVD29 |
| N 38º 31' 27.65688" | W 118º 37' 07.25029" | 1313.401m |
| Type of Mark | Position Reference | Elevation Reference |
| Cement Pillar | Static GPS Survey | Static GPS Survey |
| Tied to Known Station | Estimated Accuracy of Known Station | Estimated Accuracy (Relative to Known Station) |
| Fallon Airport DoD 2351-1 | ± 0.10 mGal | ± 0.05 mGal |
| Gravity Value | Description by | |
| 979573.791 mGal | C. Magee | |

**Description**

The Holiday Gravity Base station is located at the Holiday Lodge in Hawthorne, NV on the south side of the south most support pillar. It is tied to the Fallon Airport gravity base (DoD 2351-1). NAD 27 UTM Zone 11 North coordinates in meters are 4265030.00N and 358894.19E.

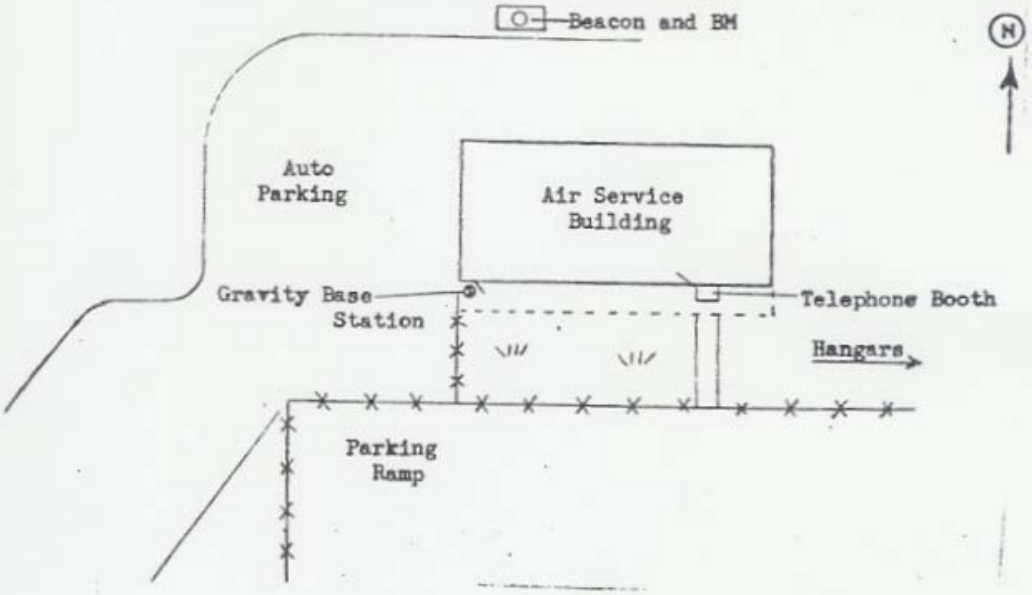



## GRAVITY BASE STATION

| | |
|---|---|
| LATITUDE 39° 29.71'N (1) | STATION DESIGNATION FALLON |
| LONGITUDE 118° 45.25'W (1) | |
| ELEVATION 1208 METERS (1) | COUNTRY/STATE USA/Nevada |
| REFERENCE CODE NUMBERS: DoD 2351-1; IGB 12098 J | ADOPTED GRAVITY VALUE: g = 979 730-77 mgals |
| ESTIMATED ACCURACY: ± 0.1 mgals | DATE: MONTH/YEAR 1 Jul 73 |

DESCRIPTION AND/OR SKETCH

Station is at the Fallon Municipal Airport (1.5 miles north of town) on porch of administration building, southwest corner of building, northwest corner of porch, on the concrete porch. Site is monumented with a "USAF Gravity Station" disc. (1)




REFERENCE SOURCE

(1) 03405

AC FORM APR 76 8342/ CD-11 PREVIOUS EDITIONS WILL BE USED

# APPENDIX B GEODETIC CONTROL

FILE: 05560570.15o OP1425162313092
**Station: TM**

NGS OPUS SOLUTION REPORT
==========

All computed coordinate accuracies are listed as peak-to-peak values.
For additional information: http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy

USER: caitlin_bernier@gravityandmag.com
RINEX FILE: 0556057q.15o

DATE: February 28, 2015
TIME: 22:25:56 UTC

SOFTWARE: page5 1209.04 master53.pl 022814
EPHEMERIS: igr18334.eph [rapid]
NAV FILE: brdc0570.15n
ANT NAME: TRM39105.00 NONE
ARP HEIGHT: 1.371

START: 2015/02/26 16:37:00
STOP: 2015/02/27 00:20:30
OBS USED: 19993 / 20404 : 98%
# FIXED AMB: 86 / 91 : 95%
OVERALL RMS: 0.012(m)

| REF FRAME: | NAD_83(2011) | (EPOCH:2010.0000) | IGS08 | (EPOCH:2015.1558) |
|---|---|---|---|---|
| X: | -2381437.806(m) | 0.017(m) | -2381438.672(m) | 0.017(m) |
| Y: | -4416075.181(m) | 0.013(m) | -4416073.880(m) | 0.013(m) |
| Z: | 3927160.813(m) | 0.011(m) | 3927160.751(m) | 0.011(m) |
| LAT: | 38 14 17.58914 | 0.009(m) | 38 14 17.60230 | 0.009(m) |
| E LON: | 241 39 48.73739 | 0.011(m) | 241 39 48.68067 | 0.011(m) |
| W LON: | 118 20 11.26261 | 0.011(m) | 118 20 11.31933 | 0.011(m) |
| EL HGT: | 1476.968(m) | 0.021(m) | 1476.353(m) | 0.021(m) |
| ORTHO HGT: | 1501.977(m) | 0.037(m) | [NAVD88 (Computed using GEOID12A)] | |

| | UTM COORDINATES<br>UTM (Zone 11) | STATE PLANE COORDINATES<br>SPC (2703 NV W) |
|---|---|---|
| Northing (Y) [meters] | 4233090.833 | 4387071.827 |
| Easting (X) [meters] | 383040.298 | 821610.856 |
| Convergence [degrees] | -0.82727333 | 0.15279738 |
| Point Scale | 0.99976847 | 0.99990575 |
| Combined Factor | 0.99953683 | 0.99967407 |

US NATIONAL GRID DESIGNATOR: 11SLC8304033090(NAD 83)

BASE STATIONS USED

| PID | DESIGNATION | LATITUDE | LONGITUDE | DISTANCE(m) |
|---|---|---|---|---|
| DM7575 P636 | LOGCABINRFCS2007 CORS ARP | N375745.962 | W1190848.090 | 77400.2 |
| AH2502 MINS | MINARET SUMMIT CORS ARP | N373913.535 | W1190339.187 | 90938.5 |
| DN7458 P651 | CHALFANTVACS2006 CORS ARP | N373347.179 | W1182313.086 | 75081.7 |

NEAREST NGS PUBLISHED CONTROL POINT

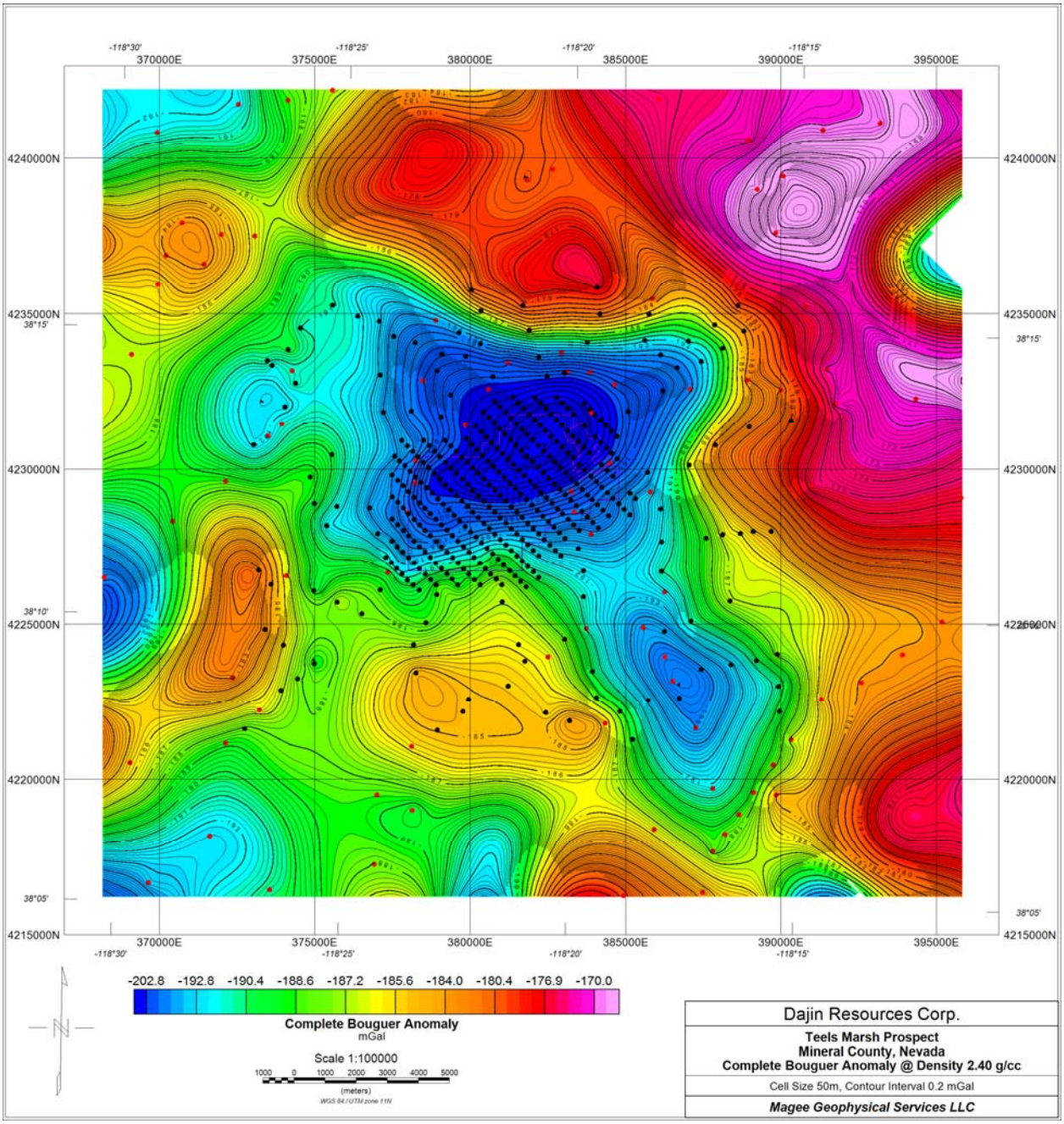
| | | | | |
|---|---|---|---|---|
| AH8154 | BM 28 RBR | N381419.049 | W1182007.890 | 93.5 |

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

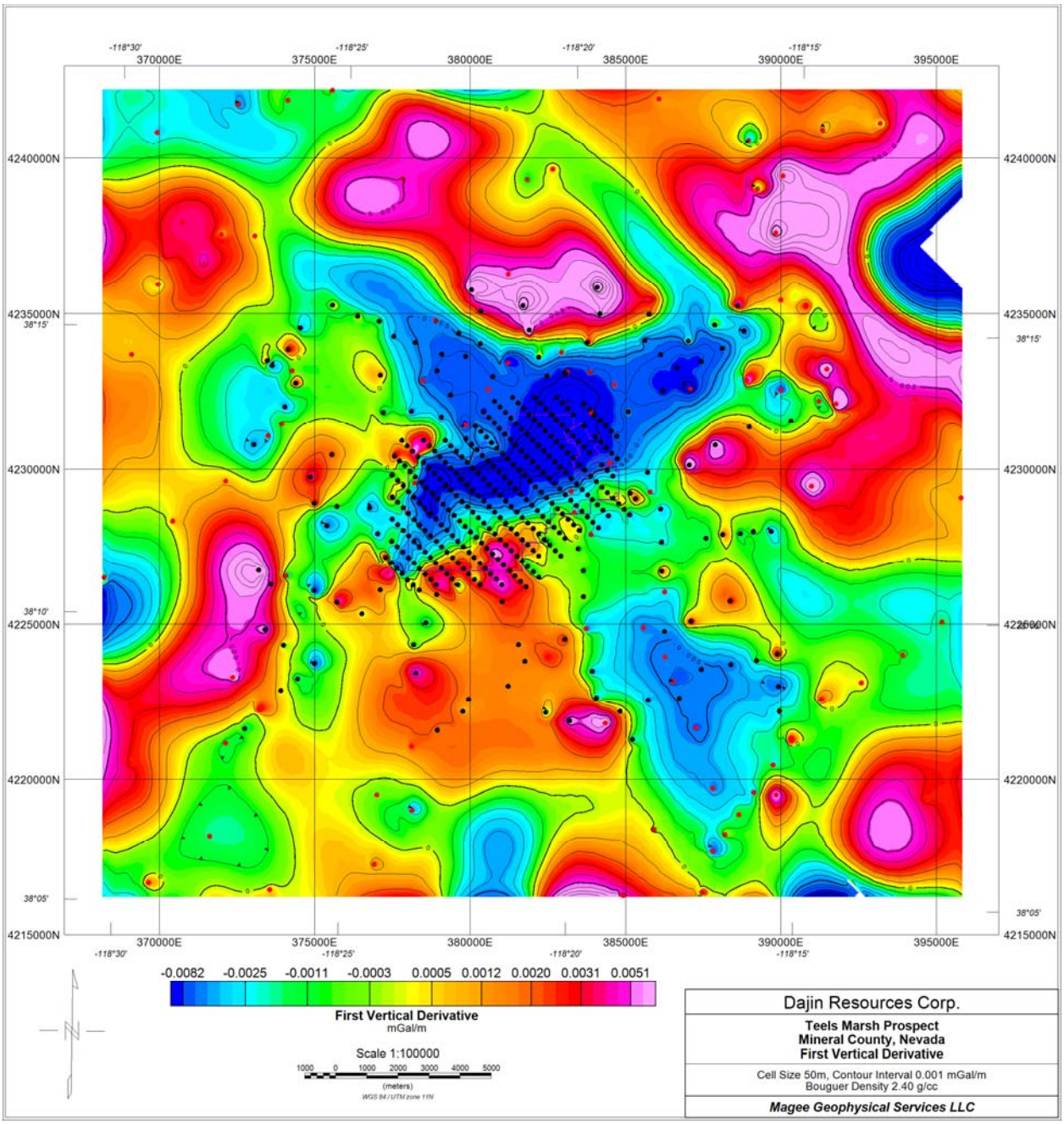
# APPENDIX C GRAVITY LOOP CLOSURES

| Loop File | Loop | Closure |
|---|---|---|
| G018_Feb_24_2015_KRF | 1 | 0.038 |
| G392_Feb_24_2015_AJK | 1 | 0.059 |
| G406_Feb_24_2015_JCM | 1 | 0.007 |
| G018_Feb_25_2015_KRF | 1 | 0.081 |
| G406_Feb_25_2015_JCM | 1 | 0.012 |
| G018_Feb_26_2015_KRF | 1 | 0.016 |
| G406_Feb_26_2015_JCM | 1 | 0.068 |
| G392_Feb_27_2015_AJK | 1 | 0.037 |
| G406_Feb_27_2015_JCM | 1 | -0.012 |
| G018_Feb_28_2015_KRF | 1 | -0.025 |
| G392_Feb_28_2015_AJK | 1 | 0.031 |
| G406_Feb_28_2015_JCM | 1 | 0.007 |
| G018_Mar_01_2015_KRF | 1 | -0.017 |
| G392_Mar_01_2015_AJK | 1 | 0.019 |
| G406_Mar_01_2015_JCM | 1 | 0.000 |
| G018_Mar_02_2015_KRF | 1 | -0.042 |
| G392_Mar_02_2015_AJK | 1 | -0.048 |
| G406_Mar_02_2015_JCM | 1 | -0.011 |
| G018_Mar_03_2015_KRF | 1 | 0.041 |
| G392_Mar_03_2015_AJK | 1 | 0.000 |
| G406_Mar_03_2015_JCM | 1 | -0.017 |
| G018_Mar_04_2015_KRF | 1 | 0.002 |
| G392_Mar_04_2015_AJK | 1 | -0.094 |
| G406_Mar_04_2015_JCM | 1 | -0.009 |
| G018_Mar_05_2015_KRF | 1 | 0.043 |
| G392_Mar_05_2015_AJK | 1 | -0.020 |
| G406_Mar_05_2015_JCM | 1 | -0.038 |
| **Average Loop Closure Absolute Value** | | **0.029** |

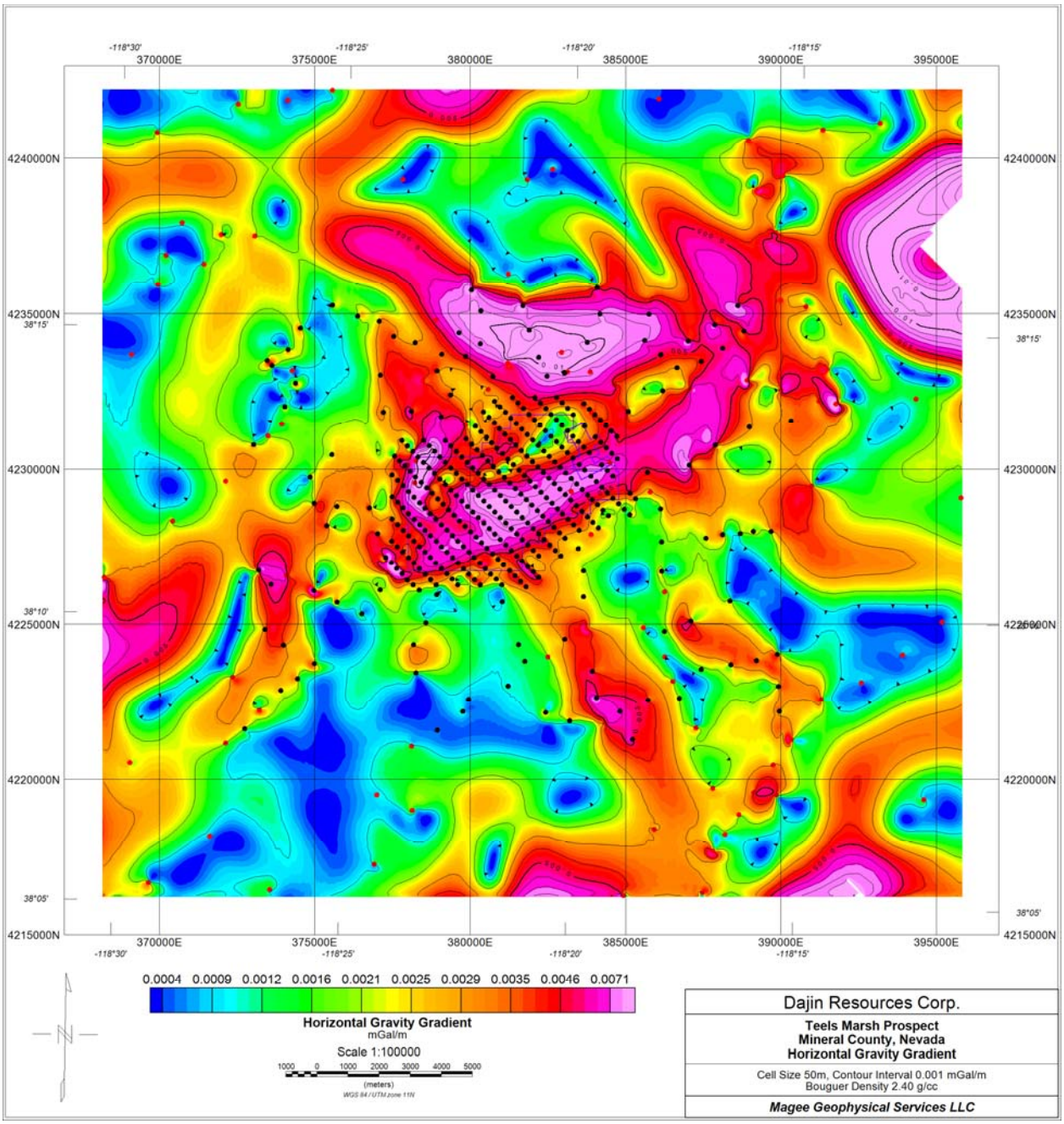
# APPENDIX D GRAVITY MAPS



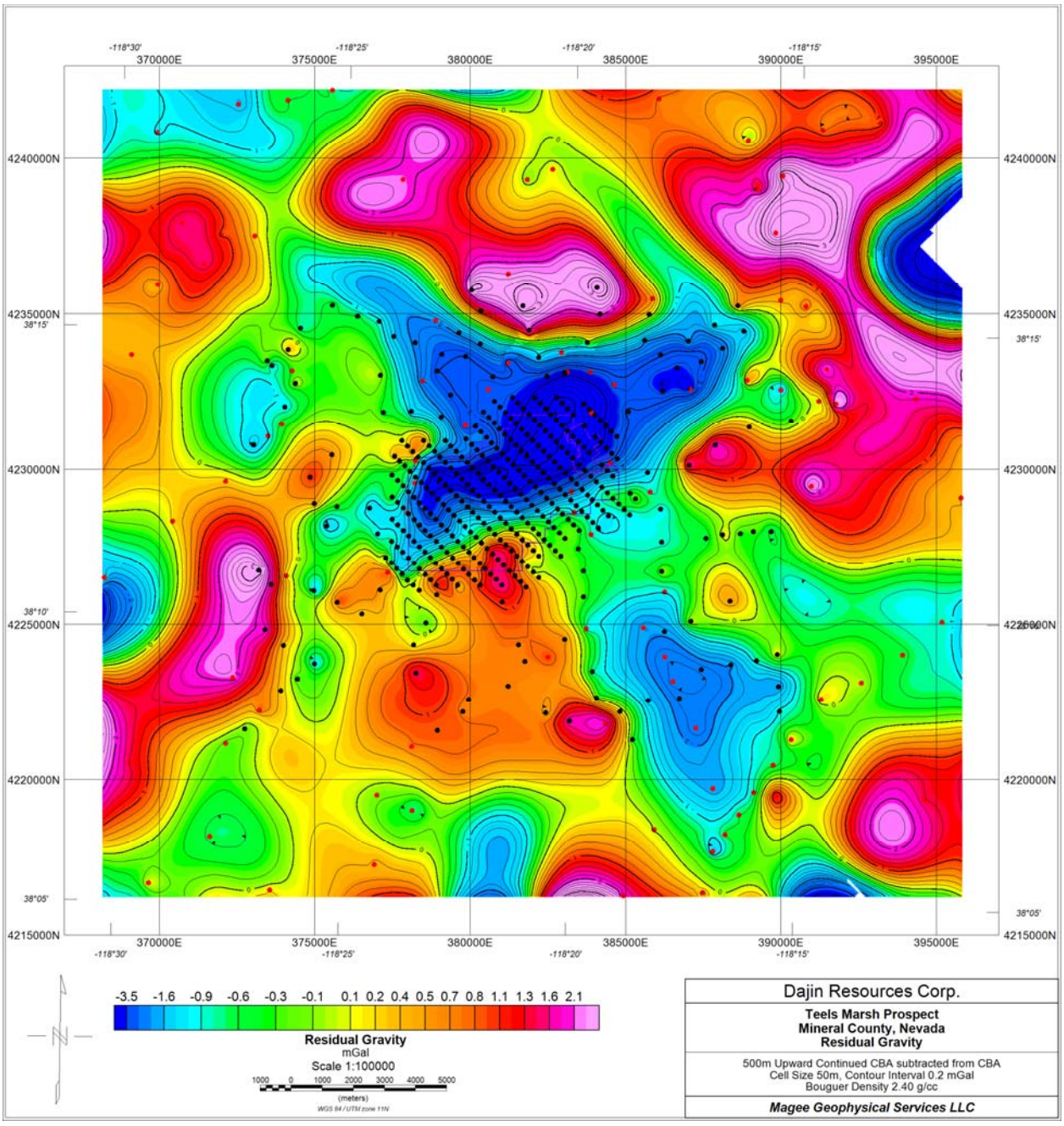

***Teels Marsh Gravity Survey***
***Complete Bouguer Gravity @ Density 2.40 g/cc***
***Contour Interval 0.2 mGal***




***Teels Marsh Gravity Survey***
***First Vertical Derivative***
***Contour Interval 0.001 mGal/m***




***Teels Marsh Gravity Survey***
***Horizontal Gravity Gradient***
***Contour Interval 0.001 mGal/m***




***Teels Marsh Gravity Survey***
***Residual Gravity***
***Contour Interval 0.2 mGal***