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Statistical Anomaly Selection at Fort Rucker, Alabama Contract No. W91ZLK-05-D-0014, Task Order 0001

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DATE:	February 14, 2012

Digital Geophysical Mapping

Digital Geophysical Mapping (DGM) operations were conducted by CH2M HILL at Fort Rucker, Alabama, at FTRU-001-R-01 (Anti-Tank/Rocket Grenade Range) and at FTRU-003-01 (Infiltration/Grenade Range) from January 24 – January 26, 2012. The DGM surveys were conducted using a man-portable EM61-MK2 time domain electromagnetic induction detector along transects, spaced at approximately 30-meter intervals. Positioning was accomplished using Real-Time Kinematic (RTK) Global Positioning System (GPS) in open areas and fiducial positioning referenced to surveyed stakes in wooded areas.

The results of the DGM surveys are depicted in Figures 1 and 2. A total of 1,059 anomalies potentially representing subsurface munitions and explosives of concern (MEC) were identified in the Anti-Tank/Rocket Grenade Range. A total of 436 anomalies potentially representing subsurface MEC were identified in the Infiltration/Grenade Range.

The geostatistical density mapping tool in Visual Sample Plan was utilized to extrapolate the anomaly density across each site based on the locations of the DGM transects and the anomalies identified along those transects. The results of the density mapping for each site are shown in Figures 3 and 4. Several areas of elevated anomaly density appear in the anomaly distribution across each site. The random sampling approach described below draws a statistically representative selection of anomalies from both higher density and lower density areas, however, upon discussion of the results with the Army Corp of Engineers geophysicist, some additional biased anomalies were selected along transect segments that appeared to be under-sampled. Although these additional targets are not part of the statistical selection, they will provide additional non-statistical confidence in the characterization results. The distribution and density of anomalies will be considered, along with the intrusive investigation results, in the analysis of the nature and extent of MEC contamination at each site. If necessary, additional excavations may be added if more information is required to confidently characterize any portion of either site.

FIGURE 1
**Anti-Tank/Rocket Grenade Range DGM Anomalies**
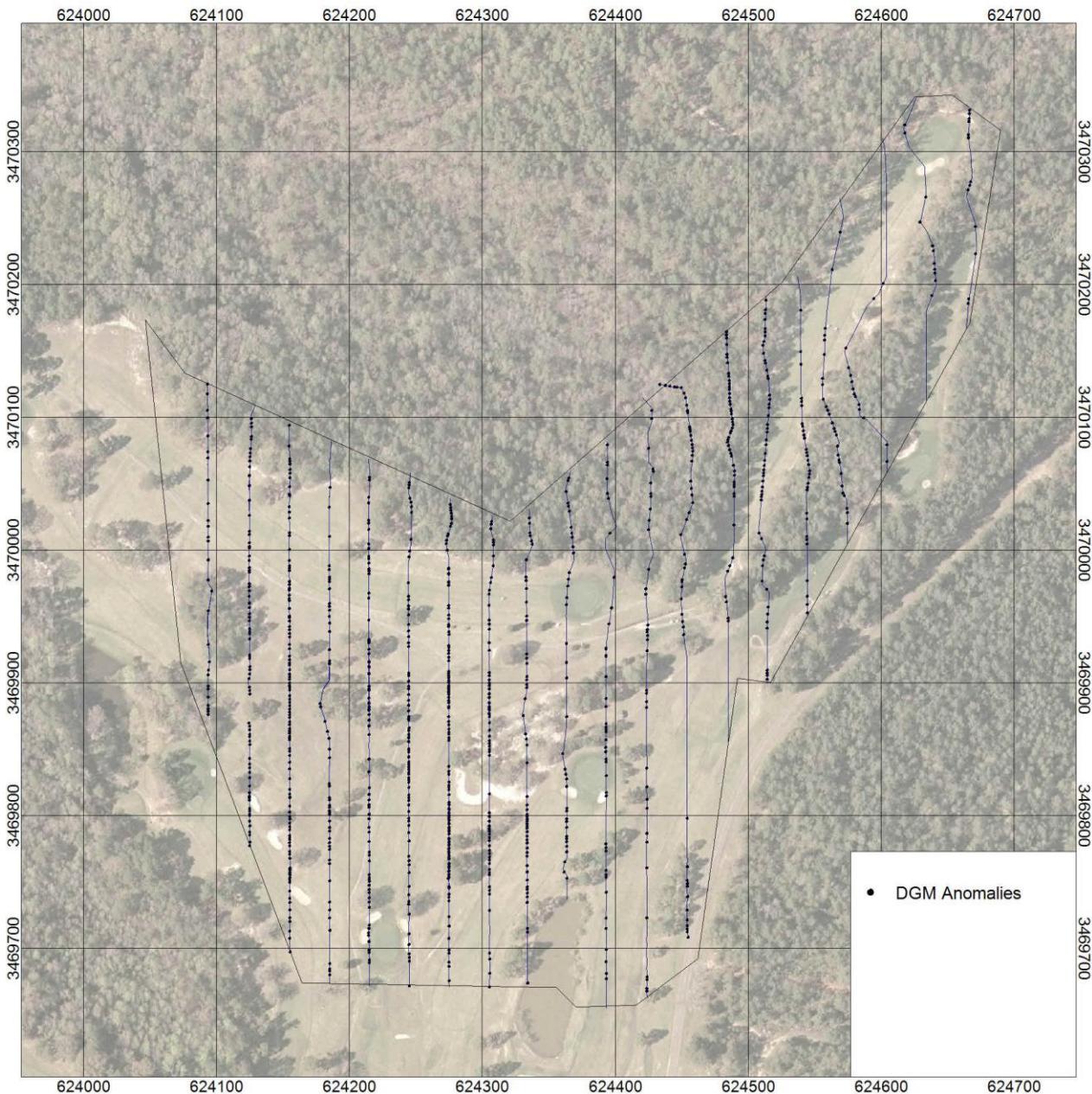
Anti-Tank/Rocket Grenade Range
Fort Rucker, Alabama
DGM Anomalies
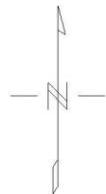
FIGURE 2
Infiltration/Grenade Range DGM Anomalies

Infiltration/Grenade Range
Fort Rucker, Alabama
DGM Anomalies
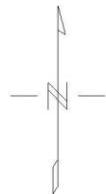
FIGURE 3
Anti-Tank/Rocket Grenade Range Anomaly Density

Anti-Tank/Rocket Grenade Range
Fort Rucker, Alabama
Anomaly Density
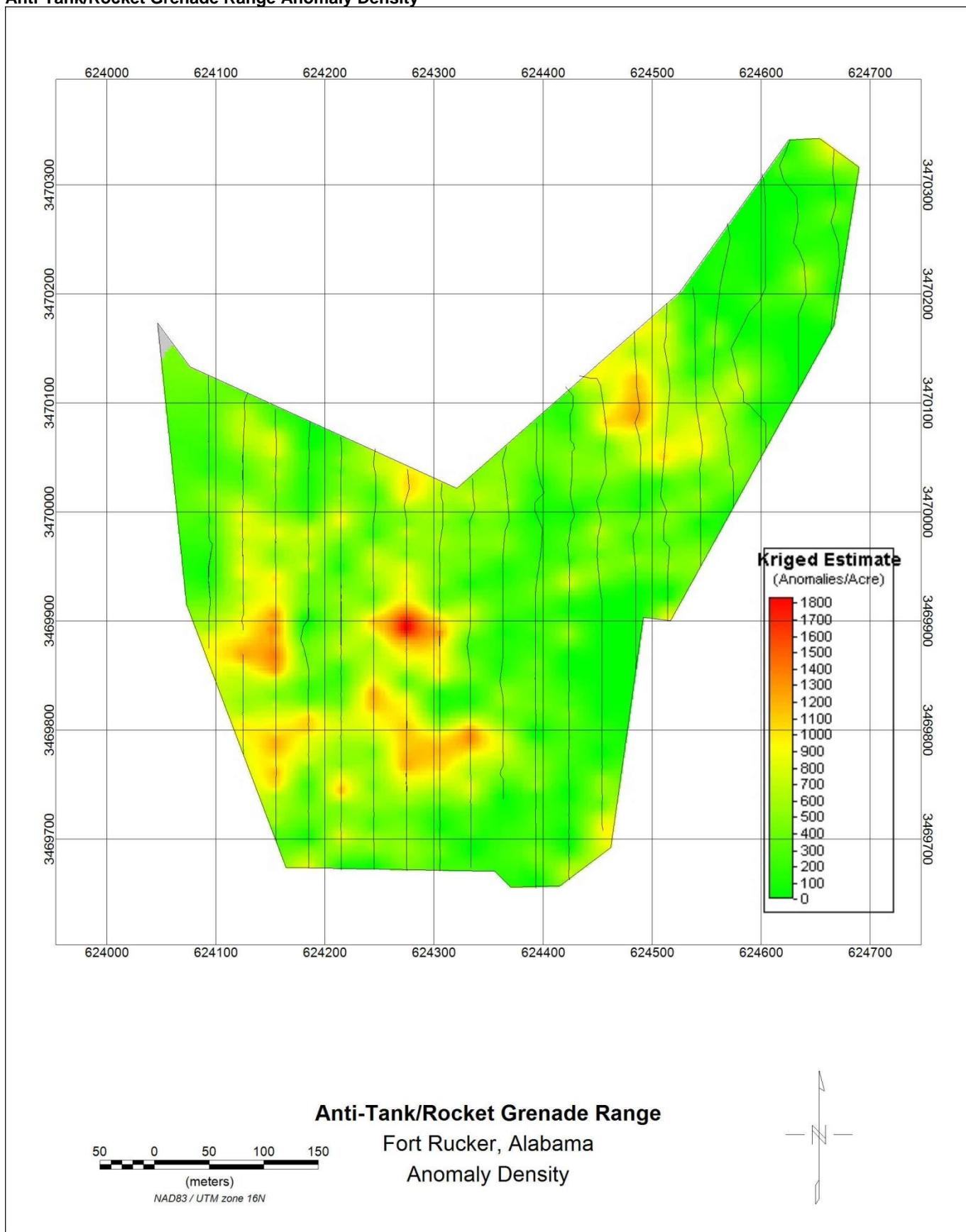
FIGURE 4
Infiltration/Grenade Range Anomaly Density
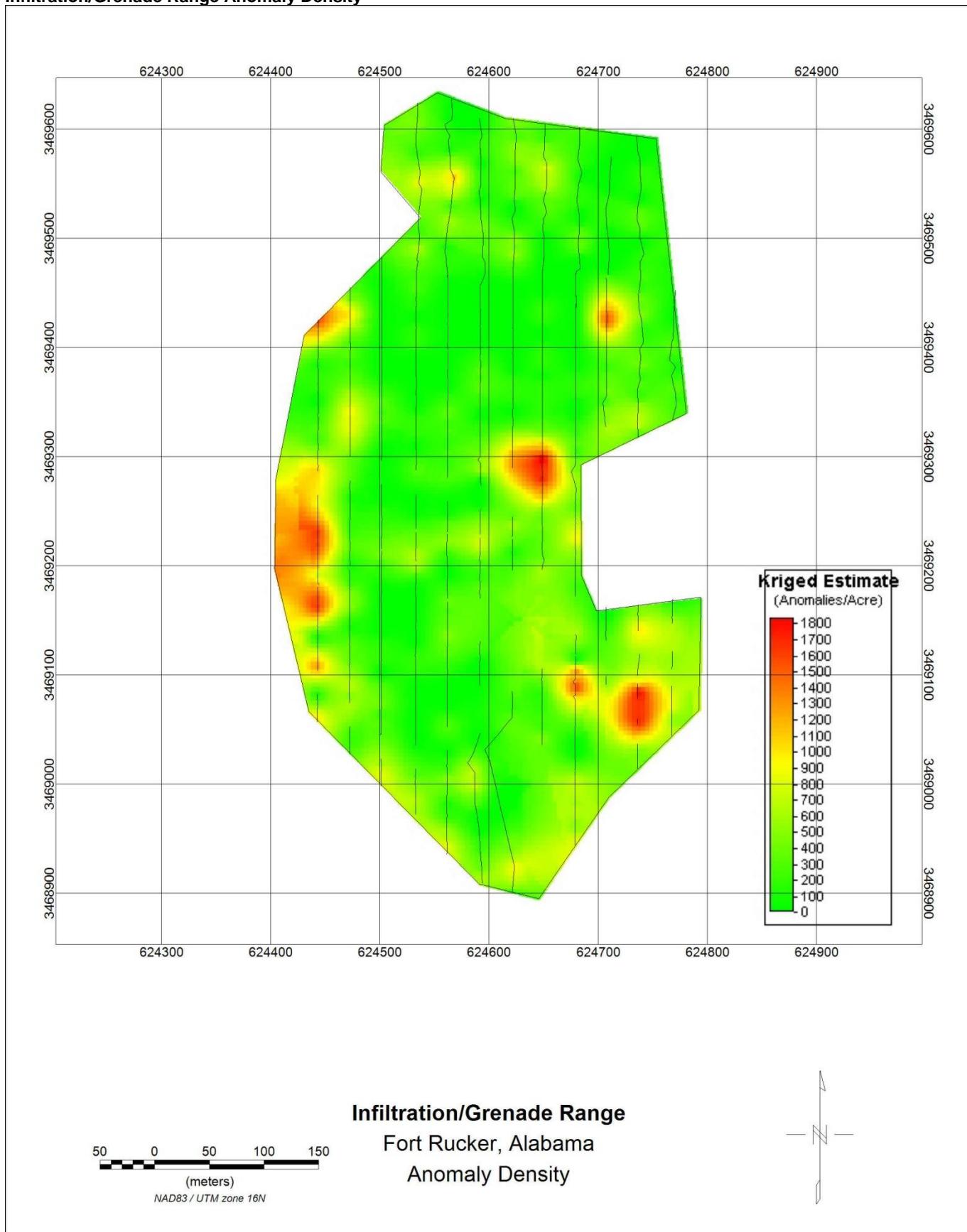
Statistical Selection of DGM Anomalies for Intrusive Investigation

Based on the results of the DGM surveys, a statistically representative subset of anomalies was selected from each site for intrusive investigation. The Estimating a Proportion method, described below, was used to calculate that 217 randomly selected DGM anomalies in the Anti-Tank/Rocket Grenade Range and 168 randomly selected DGM anomalies in the Infiltration/Grenade Range need to be classified to determine with 90% confidence and ± 5% sampling error the proportion of MEC to non-MEC DGM anomalies within the population of anomalies detected along the transects at each site.

When a population size is large or unknown, the necessary sample size of DGM anomalies to be intrusively investigated can be calculated using the following statistical sample size formulas:

$$n_0 = \frac{Z_\alpha^2 pq}{e^2}$$

Z_α = desired confidence level
p = proportion of MEC classified as DGM anomalies
q = proportion of non-MEC classified as DGM anomalies (q = 1-p)
e = acceptable margin of error for proportion being estimated
n_0 = statistical sample size for a large population

When the population size is known, the following finite population correction can be used to reduce the number of anomalies required to obtain the same confidence level:

$$n_1 = \frac{n_0}{1 + \left(\dfrac{n_0}{N}\right)}$$

n_1 = adjusted statistical sample size for a finite population
n_0 = statistical sample size for a large population
N = size of the population (number of DGM anomalies)

Figure 5 shows results of this calculation for various population sizes at a 90% confidence.

FIGURE 5
Estimating a Proportion
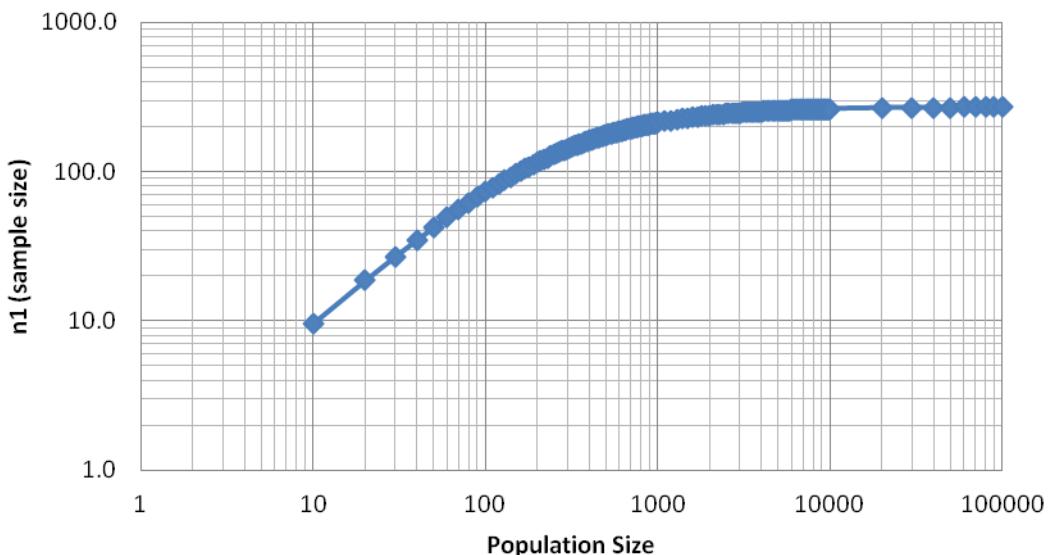
When estimating the variance of proportional variables (i.e., MEC or non-MEC), it is most conservative to estimate a population proportion of 50% (p=0.5); the result is that variance (pq) is maximized and thus, the required sample size is also maximized.

Using a z-statistic for a 90% confidence level (i.e., Z_α=1.645) and a margin of error of 5% (i.e., e=0.05), the solution for n_0 becomes:

$$n_0 = \frac{Z_\alpha^2 pq}{e^2} = \frac{1.65_\alpha^2 (0.5)(0.5)}{0.05^2} = 272$$

This formula calculates that a maximum of 272 randomly selected DGM anomalies need to be classified at each site to determine with 90% confidence and ± 5% sampling error the proportion of MEC to non-MEC DGM anomalies in a large or unknown population.

Based on the number of DGM anomalies identified at the Anti-Tank/Rocket Grenade Range (1,059), the finite population correction is solved as follows:

$$n_1 = \frac{n_0}{1 + \left(\dfrac{n_0}{N}\right)} = \frac{272}{1 + \dfrac{272}{1059}} = 216.4$$

Therefore, intrusively investigating 217 anomalies at the Anti-Tank/Rocket Grenade Range will allow us to determine with 90% confidence and ± 5% sampling error if MEC is present among the subsurface anomalies identified along the investigated transects.

Similarly, for the Infiltration/Grenade Range:

$$n_1 = \frac{n_0}{1 + \left(\dfrac{n_0}{N} \right)} = \frac{272}{1 + \dfrac{272}{436}} = 167.5$$

Intrusively investigating 168 anomalies at the Infiltration/Grenade Range will allow us to determine with 90% confidence and ± 5% sampling error if MEC is present among the subsurface anomalies identified along the investigated transects.

A random number selector was applied to the target lists from each site to select the anomalies for intrusive investigation shown in Attachment 1. Figures 6 and 7 show the selected anomalies.

Biased Selection of Additional DGM Anomalies for Intrusive Investigation

An examination of the statistically selected anomalies indicates that while the approach provides 90% confidence in the determination of the presence or absence of MEC along the investigated transects, there remain small areas of clustered anomalies that are under-sampled. To increase the confidence, non-statistically, in the determination of the nature and extent of MEC contamination, additional anomalies were selected for intrusive investigation in each of these areas. Twelve additional anomalies were selected at the Anti-Tank/Rocket Grenade Range (two anomalies in each of six clustered areas), and four additional anomalies were selected at the Infiltration/Grenade Range (two anomalies in each of two clustered areas). The additional 16 anomalies were added to the randomly-selected intrusive investigation lists and are shown in Figures 6 and 7 and in Attachment 1.

Conclusion

DGM surveys conducted at the Anti-Tank/Rocket Grenade Range and at the Infiltration/Grenade Range at Fort Rucker from January 24 – January 26, 2012, resulted in a total of 1,495 identified subsurface anomalies potentially representing MEC. 1,059 anomalies were identified along the DGM transects in the Anti-Tank/Rocket Grenade Range, and 436 were identified along the DGM transects at the Infiltration/Grenade Range. The Estimating a Proportion method was used to calculate the number of intrusive investigations needed at each site to determine with 90% confidence and ± 5% sampling error if MEC is present among the identified anomalies. This statistically-based sampling approach resulted in the random selection of 217 anomalies at the Anti-Tank/Rocket Grenade Range and 168 anomalies at the Infiltration/Grenade Range. Twelve additional anomalies in the Anti-Tank/Rocket Grenade Range and four additional anomalies in the Infiltration/Grenade Range were selected to improve the confidence in under-sampled anomaly clusters, resulting in totals of 229 targets in the Anti-Tank/Rocket Grenade Range and 172 targets in the Infiltration/Grenade Range. These 401 anomalies will be intrusively investigated as part of the characterization of the nature and extent of MEC contamination and to guide decisions regarding future actions at the sites.

FIGURE 6
Anti-Tank/Rocket Grenade Range Anomalies for Intrusive Investigation
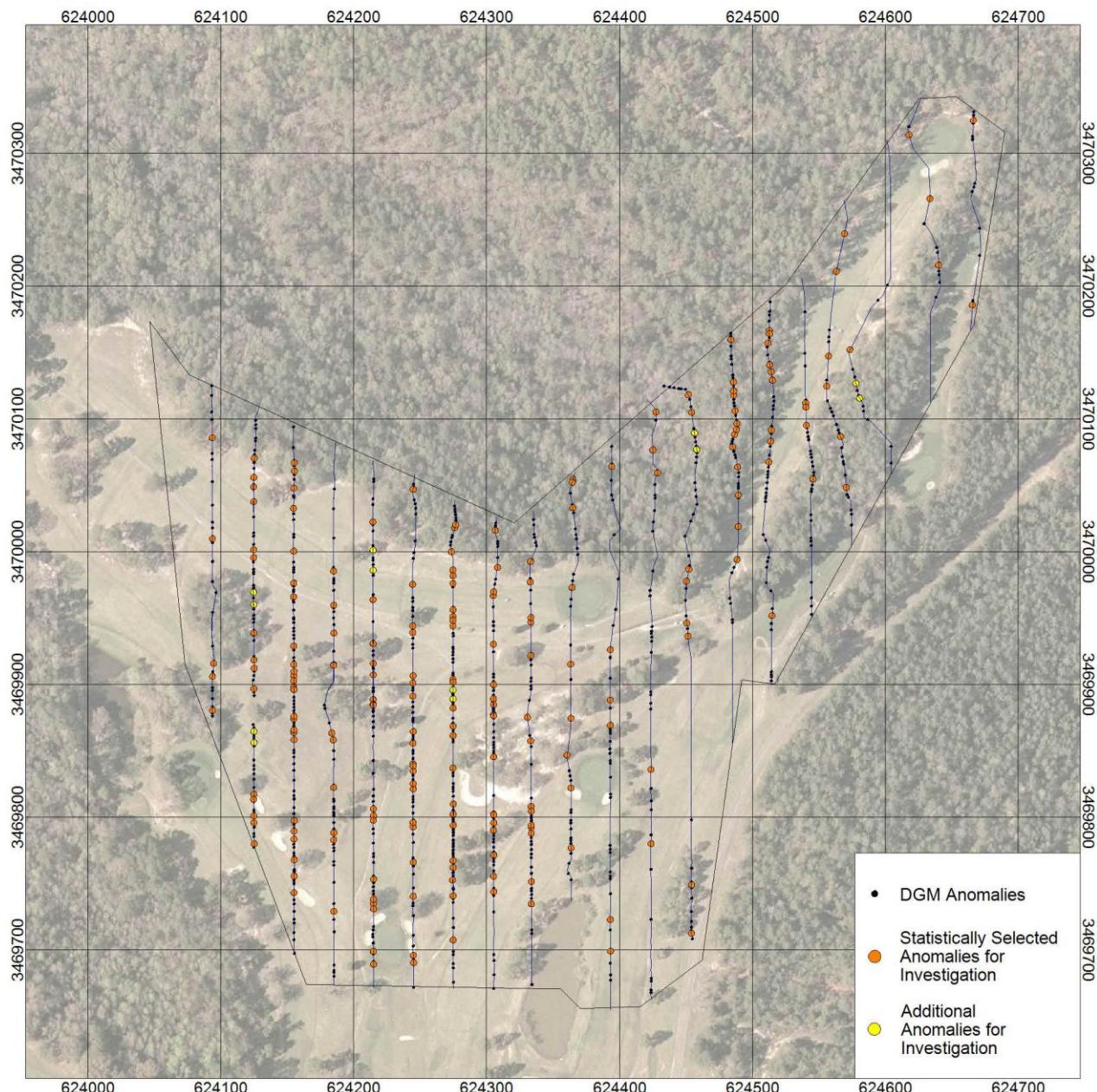
Anti-Tank/Rocket Grenade Range
Fort Rucker, Alabama
Selected Anomalies
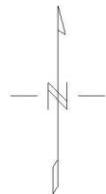
FIGURE 7
Infiltration/Grenade Range Anomalies for Intrusive Investigation
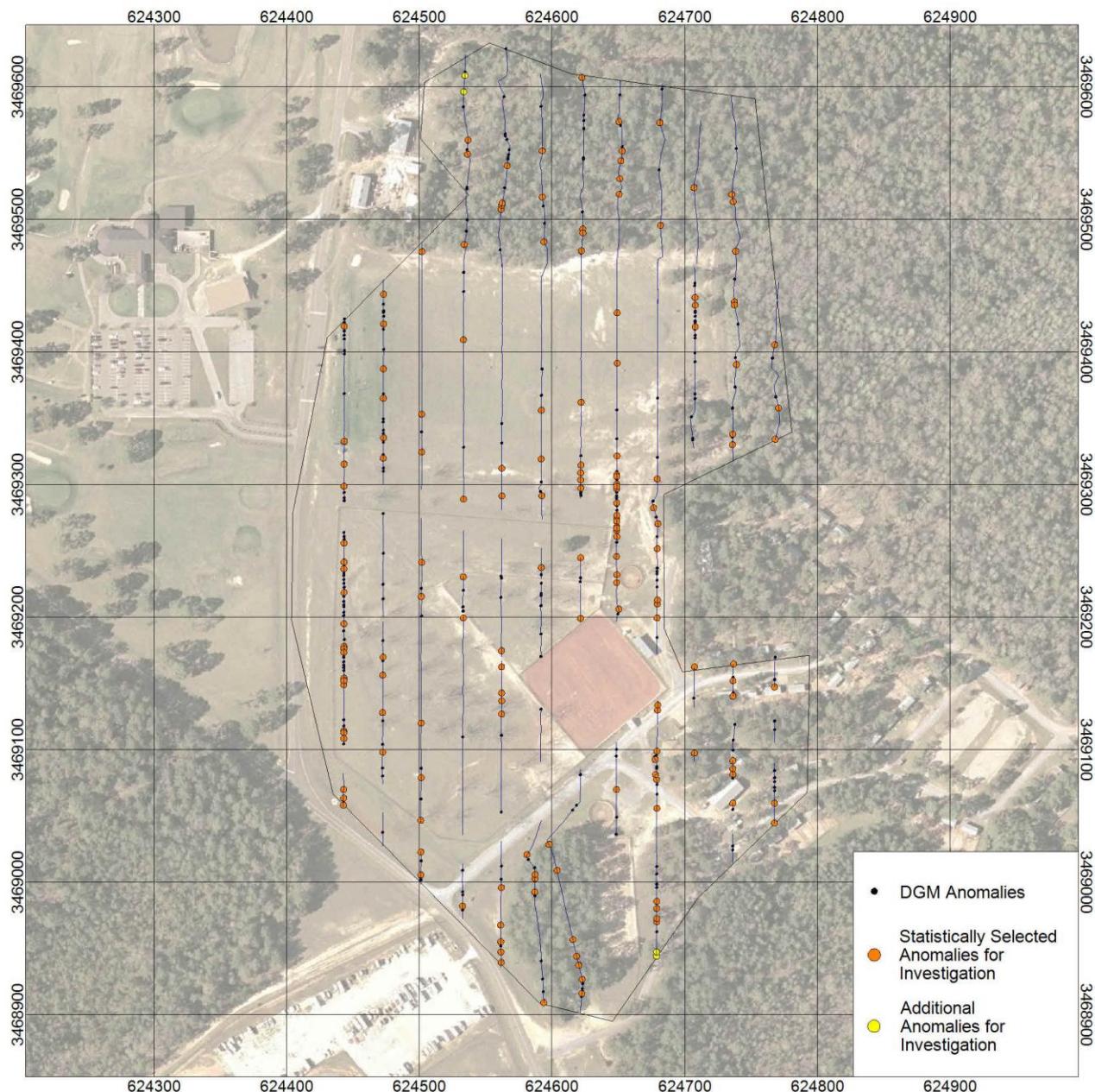
Infiltration/Grenade Range
Fort Rucker, Alabama
DGM Anomalies
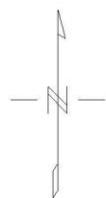
Attachment 1
Intrusive Investigation Dig Lists

Anti-Tank/Rocket Grenade Range Dig List

Anomaly_ID	Transect_ID	X*	Y*	Amplitude (mV)	Selection Method
AT-RGR-01-00003	AT-RGR-01	624093.6	3469880.6	8.0	Statistical
AT-RGR-01-00008	AT-RGR-01	624093.6	3469906.1	7.7	Statistical
AT-RGR-01-00010	AT-RGR-01	624094.5	3469916.0	42.4	Statistical
AT-RGR-01-00017	AT-RGR-01	624093.4	3470086.0	3.3	Statistical
AT-RGR-01A-00004	AT-RGR-01A	624093.6	3470009.9	17.9	Statistical
AT-RGR-02-00001	AT-RGR-02	624124.8	3469918.5	116.3	Statistical
AT-RGR-02-00006	AT-RGR-02	624124.8	3469938.8	106.5	Statistical
AT-RGR-02A-00003	AT-RGR-02A	624124.7	3470056.0	27.8	Statistical
AT-RGR-02A-00006	AT-RGR-02A	624125.1	3470070.4	13.5	Statistical
AT-RGR-02B-00002	AT-RGR-02B	624125.1	3469780.2	132.5	Statistical
AT-RGR-02B-00006	AT-RGR-02B	624124.8	3469796.0	276.8	Statistical
AT-RGR-02B-00008	AT-RGR-02B	624124.8	3469801.2	52.0	Statistical
AT-RGR-02B-00012	AT-RGR-02B	624124.6	3469813.6	33.3	Statistical
AT-RGR-02B-00014	AT-RGR-02B	624124.7	3469817.4	3.3	Statistical
AT-RGR-02B-00030	AT-RGR-02B	624124.7	3469896.9	10.5	Statistical
AT-RGR-02B-00034	AT-RGR-02B	624125.0	3469912.3	48.8	Statistical
AT-RGR-02B-00044	AT-RGR-02B	624124.6	3469995.6	5.9	Statistical
AT-RGR-02B-00045	AT-RGR-02B	624124.6	3470001.6	18.5	Statistical
AT-RGR-02B-00051	AT-RGR-02B	624124.6	3470037.8	5.9	Statistical
AT-RGR-02B-00052	AT-RGR-02B	624124.6	3470048.9	14.0	Statistical
AT-RGR-03-00002	AT-RGR-03	624154.9	3470047.9	49.6	Statistical
AT-RGR-03-00005	AT-RGR-03	624155.3	3470060.8	85.4	Statistical
AT-RGR-03-00007	AT-RGR-03	624155.1	3470067.0	22.2	Statistical
AT-RGR-03A-00009	AT-RGR-03A	624155.0	3469743.3	31.8	Statistical
AT-RGR-03A-00013	AT-RGR-03A	624155.1	3469755.7	12.8	Statistical
AT-RGR-03A-00017	AT-RGR-03A	624155.1	3469768.0	43.6	Statistical
AT-RGR-03A-00023	AT-RGR-03A	624155.0	3469783.6	36.5	Statistical
AT-RGR-03A-00025	AT-RGR-03A	624155.0	3469789.6	504.4	Statistical
AT-RGR-03A-00028	AT-RGR-03A	624155.1	3469797.6	141.2	Statistical
AT-RGR-03A-00033	AT-RGR-03A	624155.0	3469858.5	4.8	Statistical
AT-RGR-03A-00036	AT-RGR-03A	624154.9	3469864.0	35.2	Statistical
AT-RGR-03A-00037	AT-RGR-03A	624154.9	3469865.8	212.4	Statistical
AT-RGR-03A-00040	AT-RGR-03A	624154.9	3469874.1	881.4	Statistical
AT-RGR-03A-00041	AT-RGR-03A	624154.9	3469876.1	357.3	Statistical
AT-RGR-03A-00049	AT-RGR-03A	624155.0	3469896.2	115.4	Statistical
AT-RGR-03A-00050	AT-RGR-03A	624154.8	3469897.9	247.9	Statistical
AT-RGR-03A-00052	AT-RGR-03A	624154.8	3469902.9	88.2	Statistical
AT-RGR-03A-00054	AT-RGR-03A	624154.9	3469906.7	235.9	Statistical
AT-RGR-03A-00055	AT-RGR-03A	624155.0	3469909.9	48.2	Statistical
AT-RGR-03A-00057	AT-RGR-03A	624154.8	3469915.2	95.6	Statistical

AT-RGR-03A-00061	AT-RGR-03A	624154.8	3469929.0	5.0	Statistical
AT-RGR-03A-00072	AT-RGR-03A	624154.7	3469966.1	93.8	Statistical
AT-RGR-03A-00076	AT-RGR-03A	624154.8	3469976.4	8.1	Statistical
AT-RGR-03A-00081	AT-RGR-03A	624154.8	3470000.5	12.9	Statistical
AT-RGR-03A-00086	AT-RGR-03A	624154.6	3470032.7	8.4	Statistical
AT-RGR-04-00007	AT-RGR-04	624185.0	3469729.2	9.6	Statistical
AT-RGR-04-00015	AT-RGR-04	624184.9	3469783.1	41.5	Statistical
AT-RGR-04-00016	AT-RGR-04	624185.0	3469788.5	8.2	Statistical
AT-RGR-04-00026	AT-RGR-04	624184.9	3469822.5	3.3	Statistical
AT-RGR-04-00030	AT-RGR-04	624184.9	3469914.9	39.5	Statistical
AT-RGR-04-00032	AT-RGR-04	624185.0	3469938.8	36.9	Statistical
AT-RGR-04-00037	AT-RGR-04	624184.9	3469959.8	3.1	Statistical
AT-RGR-04-00042	AT-RGR-04	624184.8	3469985.4	286.7	Statistical
AT-RGR-04A-00001	AT-RGR-04A	624184.6	3469858.3	33.4	Statistical
AT-RGR-04A-00002	AT-RGR-04A	624183.4	3469863.5	3.7	Statistical
AT-RGR-04A-00006	AT-RGR-04A	624184.9	3469914.5	34.6	Statistical
AT-RGR-05-00001	AT-RGR-05	624214.9	3469689.4	78.4	Statistical
AT-RGR-05-00004	AT-RGR-05	624214.7	3469699.1	63.4	Statistical
AT-RGR-05-00010	AT-RGR-05	624214.9	3469731.1	4.6	Statistical
AT-RGR-05-00011	AT-RGR-05	624214.8	3469735.1	19.8	Statistical
AT-RGR-05-00012	AT-RGR-05	624214.8	3469738.3	127.9	Statistical
AT-RGR-05-00018	AT-RGR-05	624214.9	3469753.5	17.5	Statistical
AT-RGR-05-00026	AT-RGR-05	624214.7	3469797.8	26.7	Statistical
AT-RGR-05-00027	AT-RGR-05	624214.8	3469801.3	38.9	Statistical
AT-RGR-05-00028	AT-RGR-05	624214.7	3469806.5	10.1	Statistical
AT-RGR-05-00041	AT-RGR-05	624214.7	3469884.6	12.1	Statistical
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AT-RGR-05A-00005	AT-RGR-05A	624214.6	3469907.3	5.3	Statistical
AT-RGR-05A-00007	AT-RGR-05A	624214.6	3469915.9	9.1	Statistical
AT-RGR-05A-00010	AT-RGR-05A	624214.6	3469930.8	25.6	Statistical
AT-RGR-05A-00017	AT-RGR-05A	624214.4	3470022.5	10.6	Statistical
AT-RGR-06-00002	AT-RGR-06	624245.0	3469690.6	5.4	Statistical
AT-RGR-06-00004	AT-RGR-06	624244.8	3469696.1	42.5	Statistical
AT-RGR-06-00010	AT-RGR-06	624244.7	3469740.6	27.7	Statistical
AT-RGR-06-00014	AT-RGR-06	624244.8	3469766.2	43.0	Statistical
AT-RGR-06-00018	AT-RGR-06	624244.7	3469792.8	4.1	Statistical
AT-RGR-06-00019	AT-RGR-06	624244.6	3469796.2	41.4	Statistical
AT-RGR-06-00026	AT-RGR-06	624244.7	3469821.4	18.7	Statistical
AT-RGR-06-00027	AT-RGR-06	624244.7	3469825.3	21.6	Statistical
AT-RGR-06-00033	AT-RGR-06	624244.6	3469840.4	46.8	Statistical
AT-RGR-06-00036	AT-RGR-06	624244.5	3469855.9	7.6	Statistical
AT-RGR-06-00045	AT-RGR-06	624244.5	3469891.3	38.1	Statistical
AT-RGR-06-00048	AT-RGR-06	624244.5	3469901.3	5.8	Statistical
AT-RGR-06-00052	AT-RGR-06	624244.4	3469939.2	24.5	Statistical

AT-RGR-06-00053	AT-RGR-06	624244.4	3469944.1	3.7	Statistical
AT-RGR-06-00059	AT-RGR-06	624244.2	3469975.5	3.1	Statistical
AT-RGR-06A-00002	AT-RGR-06A	624244.7	3469835.0	241.6	Statistical
AT-RGR-06A-00004	AT-RGR-06A	624244.7	3469838.9	14.9	Statistical
AT-RGR-06A-00011	AT-RGR-06A	624244.7	3469864.7	17.5	Statistical
AT-RGR-06A-00021	AT-RGR-06A	624244.7	3470047.0	33.5	Statistical
AT-RGR-06B-00003	AT-RGR-06B	624244.6	3469906.7	37.4	Statistical
AT-RGR-07-00006	AT-RGR-07	624274.8	3469707.7	3.9	Statistical
AT-RGR-07-00011	AT-RGR-07	624274.8	3469740.9	6.7	Statistical
AT-RGR-07-00013	AT-RGR-07	624274.3	3469752.8	87.9	Statistical
AT-RGR-07-00016	AT-RGR-07	624274.9	3469762.2	20.4	Statistical
AT-RGR-07-00018	AT-RGR-07	624274.8	3469767.5	115.0	Statistical
AT-RGR-07-00028	AT-RGR-07	624274.9	3469794.0	57.9	Statistical
AT-RGR-07-00035	AT-RGR-07	624274.9	3469810.1	7.7	Statistical
AT-RGR-07-00043	AT-RGR-07	624274.7	3469837.2	6.6	Statistical
AT-RGR-07-00046	AT-RGR-07	624274.8	3469861.6	12.7	Statistical
AT-RGR-07-00049	AT-RGR-07	624274.8	3469868.6	5.9	Statistical
AT-RGR-07-00058	AT-RGR-07	624274.6	3469944.1	38.0	Statistical
AT-RGR-07-00059	AT-RGR-07	624274.7	3469948.4	3.1	Statistical
AT-RGR-07-00060	AT-RGR-07	624274.7	3469951.2	39.0	Statistical
AT-RGR-07-00061	AT-RGR-07	624274.7	3469956.4	15.1	Statistical
AT-RGR-07-00065	AT-RGR-07	624274.7	3469982.0	7.3	Statistical
AT-RGR-07A-00021	AT-RGR-07A	624274.8	3469802.5	71.6	Statistical
AT-RGR-07A-00024	AT-RGR-07A	624274.6	3469976.1	4.2	Statistical
AT-RGR-07A-00026	AT-RGR-07A	624274.6	3469986.3	6.6	Statistical
AT-RGR-07A-00027	AT-RGR-07A	624273.5	3470000.0	744.3	Statistical
AT-RGR-07A-00032	AT-RGR-07A	624276.0	3470018.1	3.6	Statistical
AT-RGR-07A-00033	AT-RGR-07A	624276.7	3470020.2	12.4	Statistical
AT-RGR-07B-00002	AT-RGR-07B	624274.7	3469882.3	95.0	Statistical
AT-RGR-07B-00014	AT-RGR-07B	624274.7	3469901.9	87.0	Statistical
AT-RGR-07B-00015	AT-RGR-07B	624274.7	3469904.0	19.0	Statistical
AT-RGR-08-00007	AT-RGR-08	624305.4	3469744.0	11.1	Statistical
AT-RGR-08-00009	AT-RGR-08	624305.2	3469755.6	6.2	Statistical
AT-RGR-08-00015	AT-RGR-08	624305.4	3469771.6	125.3	Statistical
AT-RGR-08-00022	AT-RGR-08	624305.1	3469790.3	95.1	Statistical
AT-RGR-08-00026	AT-RGR-08	624305.2	3469802.5	53.6	Statistical
AT-RGR-08-00027	AT-RGR-08	624305.1	3469877.2	10.1	Statistical
AT-RGR-08-00031	AT-RGR-08	624305.1	3469889.3	37.9	Statistical
AT-RGR-08-00040	AT-RGR-08	624305.1	3469930.3	27.4	Statistical
AT-RGR-08-00045	AT-RGR-08	624305.0	3469967.0	3.9	Statistical
AT-RGR-08A-00004	AT-RGR-08A	624305.4	3469795.9	49.9	Statistical
AT-RGR-08A-00006	AT-RGR-08A	624305.4	3469802.0	64.7	Statistical
AT-RGR-08A-00008	AT-RGR-08A	624305.3	3469845.5	10.2	Statistical
AT-RGR-08A-00018	AT-RGR-08A	624305.3	3469876.5	12.7	Statistical
AT-RGR-08A-00021	AT-RGR-08A	624305.3	3469884.9	65.1	Statistical
AT-RGR-08A-00022	AT-RGR-08A	624305.2	3469889.1	39.4	Statistical

AT-RGR-08A-00026	AT-RGR-08A	624305.2	3469900.0	5.7	Statistical
AT-RGR-08A-00027	AT-RGR-08A	624305.3	3469969.9	8.6	Statistical
AT-RGR-08A-00030	AT-RGR-08A	624308.2	3469988.3	3.8	Statistical
AT-RGR-08A-00035	AT-RGR-08A	624306.4	3470016.1	243.6	Statistical
AT-RGR-09-00004	AT-RGR-09	624333.7	3469734.8	174.0	Statistical
AT-RGR-09-00009	AT-RGR-09	624333.7	3469751.6	6.0	Statistical
AT-RGR-09-00018	AT-RGR-09	624333.7	3469788.0	195.9	Statistical
AT-RGR-09-00020	AT-RGR-09	624333.6	3469792.4	31.2	Statistical
AT-RGR-09-00021	AT-RGR-09	624333.6	3469794.1	25.7	Statistical
AT-RGR-09-00026	AT-RGR-09	624333.6	3469804.7	14.1	Statistical
AT-RGR-09-00027	AT-RGR-09	624333.6	3469808.2	51.6	Statistical
AT-RGR-09-00035	AT-RGR-09	624333.3	3469921.9	3.6	Statistical
AT-RGR-09-00036	AT-RGR-09	624333.3	3469947.1	11.3	Statistical
AT-RGR-09-00037	AT-RGR-09	624333.3	3469950.5	21.5	Statistical
AT-RGR-09A-00004	AT-RGR-09A	624333.1	3469857.7	3.7	Statistical
AT-RGR-09A-00006	AT-RGR-09A	624330.7	3469875.4	30.0	Statistical
AT-RGR-09A-00008	AT-RGR-09A	624332.9	3469977.2	27.5	Statistical
AT-RGR-09A-00010	AT-RGR-09A	624333.0	3469992.7	74.5	Statistical
AT-RGR-10-00005	AT-RGR-10	624363.5	3469777.1	6.0	Statistical
AT-RGR-10-00014	AT-RGR-10	624363.4	3469822.1	4.2	Statistical
AT-RGR-10-00018	AT-RGR-10	624363.3	3469915.4	151.1	Statistical
AT-RGR-10-00022	AT-RGR-10	624364.3	3469973.1	86.0	Statistical
AT-RGR-10A-00001	AT-RGR-10A	624360.5	3469846.8	58.1	Statistical
AT-RGR-10A-00002	AT-RGR-10A	624363.4	3469874.6	3.7	Statistical
AT-RGR-10A-00010	AT-RGR-10A	624364.8	3470033.2	7.8	Statistical
AT-RGR-10A-00013	AT-RGR-10A	624364.5	3470052.4	6.6	Statistical
AT-RGR-10A-00014	AT-RGR-10A	624365.0	3470054.4	54.1	Statistical
AT-RGR-11-00004	AT-RGR-11	624393.3	3469699.3	312.3	Statistical
AT-RGR-11-00006	AT-RGR-11	624393.1	3469723.0	9.6	Statistical
AT-RGR-11A-00006	AT-RGR-11A	624393.1	3469869.4	13.2	Statistical
AT-RGR-11A-00008	AT-RGR-11A	624393.0	3469888.4	60.7	Statistical
AT-RGR-11A-00011	AT-RGR-11A	624393.1	3469926.3	1247.0	Statistical
AT-RGR-11A-00017	AT-RGR-11A	624394.1	3470064.2	26.8	Statistical
AT-RGR-12-00007	AT-RGR-12	624423.8	3469780.2	9.3	Statistical
AT-RGR-12-00012	AT-RGR-12	624423.7	3469836.0	248.7	Statistical
AT-RGR-12A-00012	AT-RGR-12A	624428.6	3470059.4	10.6	Statistical
AT-RGR-12A-00014	AT-RGR-12A	624425.1	3470076.7	3.4	Statistical
AT-RGR-12A-00016	AT-RGR-12A	624427.4	3470105.3	20.4	Statistical
AT-RGR-13-00002	AT-RGR-13	624454.2	3469712.7	3.0	Statistical
AT-RGR-13-00009	AT-RGR-13	624454.3	3469749.1	11.3	Statistical
AT-RGR-13-00013	AT-RGR-13	624451.5	3469936.4	36.8	Statistical
AT-RGR-13-00015	AT-RGR-13	624450.7	3469946.3	371.2	Statistical
AT-RGR-13A-00004	AT-RGR-13A	624450.3	3469977.9	7.4	Statistical
AT-RGR-13A-00005	AT-RGR-13A	624452.2	3469986.8	5.2	Statistical
AT-RGR-13A-00026	AT-RGR-13A	624454.3	3470105.0	4.9	Statistical
AT-RGR-13A-00029	AT-RGR-13A	624451.8	3470118.2	5.1	Statistical

AT-RGR-14A-00006	AT-RGR-14A	624488.4	3469994.2	4.6	Statistical
AT-RGR-14A-00007	AT-RGR-14A	624489.3	3470019.0	5.0	Statistical
AT-RGR-14A-00009	AT-RGR-14A	624489.4	3470042.6	8.4	Statistical
AT-RGR-14A-00015	AT-RGR-14A	624488.9	3470063.9	10.7	Statistical
AT-RGR-14A-00019	AT-RGR-14A	624485.2	3470078.8	78.3	Statistical
AT-RGR-14A-00023	AT-RGR-14A	624486.6	3470088.4	34.2	Statistical
AT-RGR-14A-00025	AT-RGR-14A	624488.0	3470092.0	188.0	Statistical
AT-RGR-14A-00027	AT-RGR-14A	624488.3	3470096.6	75.9	Statistical
AT-RGR-14A-00031	AT-RGR-14A	624487.0	3470106.1	58.7	Statistical
AT-RGR-14A-00035	AT-RGR-14A	624486.0	3470117.9	192.0	Statistical
AT-RGR-14A-00036	AT-RGR-14A	624485.9	3470121.1	48.7	Statistical
AT-RGR-14A-00039	AT-RGR-14A	624485.8	3470127.7	44.0	Statistical
AT-RGR-14A-00046	AT-RGR-14A	624483.8	3470159.8	3.4	Statistical
AT-RGR-15-00007	AT-RGR-15	624514.7	3469951.9	11.6	Statistical
AT-RGR-15-00026	AT-RGR-15	624512.4	3470067.6	8.1	Statistical
AT-RGR-15-00029	AT-RGR-15	624513.7	3470083.1	4.4	Statistical
AT-RGR-15-00031	AT-RGR-15	624514.4	3470091.6	5.4	Statistical
AT-RGR-15-00038	AT-RGR-15	624515.1	3470129.2	4.0	Statistical
AT-RGR-15-00040	AT-RGR-15	624514.1	3470135.5	30.1	Statistical
AT-RGR-15-00041	AT-RGR-15	624513.0	3470140.9	4.2	Statistical
AT-RGR-15-00045	AT-RGR-15	624511.8	3470157.2	11.5	Statistical
AT-RGR-15-00047	AT-RGR-15	624512.9	3470164.3	46.7	Statistical
AT-RGR-15-00048	AT-RGR-15	624512.8	3470166.7	13.5	Statistical
AT-RGR-16-00013	AT-RGR-16	624545.7	3470054.7	8.9	Statistical
AT-RGR-16-00025	AT-RGR-16	624540.7	3470095.3	84.4	Statistical
AT-RGR-16-00026	AT-RGR-16	624540.3	3470108.9	143.6	Statistical
AT-RGR-16-00027	AT-RGR-16	624540.2	3470112.0	17.0	Statistical
AT-RGR-17-00006	AT-RGR-17	624570.6	3470048.3	13.6	Statistical
AT-RGR-17-00012	AT-RGR-17	624566.4	3470086.7	8.5	Statistical
AT-RGR-17-00020	AT-RGR-17	624556.0	3470124.7	49.2	Statistical
AT-RGR-17-00022	AT-RGR-17	624557.3	3470147.4	10.6	Statistical
AT-RGR-17-00026	AT-RGR-17	624563.3	3470211.2	7.5	Statistical
AT-RGR-17-00027	AT-RGR-17	624569.3	3470239.5	3.7	Statistical
AT-RGR-18-00012	AT-RGR-18	624573.5	3470152.2	6.0	Statistical
AT-RGR-19-00005	AT-RGR-19	624640.1	3470215.9	5.3	Statistical
AT-RGR-19-00009	AT-RGR-19	624633.6	3470265.9	11.5	Statistical
AT-RGR-19-00010	AT-RGR-19	624617.9	3470314.0	291.4	Statistical
AT-RGR-20-00001	AT-RGR-20	624665.6	3470185.8	13.7	Statistical
AT-RGR-20-00011	AT-RGR-20	624666.3	3470324.8	6.2	Statistical
AT-RGR-02-00012	AT-RGR-02	624124.7	3469960.3	21.8	Additional
AT-RGR-02B-00022	AT-RGR-02B	624124.9	3469856.3	39.1	Additional
AT-RGR-02B-00025	AT-RGR-02B	624124.8	3469864.8	221.4	Additional
AT-RGR-02B-00037	AT-RGR-02B	624124.6	3469969.5	53.9	Additional
AT-RGR-05-00054	AT-RGR-05	624214.6	3469986.1	7.3	Additional
AT-RGR-05A-00013	AT-RGR-05A	624214.5	3470001.3	3.7	Additional
AT-RGR-07B-00005	AT-RGR-07B	624274.7	3469889.2	217.9	Additional

AT-RGR-07B-00010	AT-RGR-07B	624274.7	3469896.0	102.8	Additional
AT-RGR-13A-00018	AT-RGR-13A	624458.1	3470077.0	25.3	Additional
AT-RGR-13A-00022	AT-RGR-13A	624456.5	3470089.4	34.7	Additional
AT-RGR-18-00006	AT-RGR-18	624580.7	3470115.6	19.3	Additional
AT-RGR-18-00009	AT-RGR-18	624578.0	3470126.9	14.5	Additional

* All coordinates reported in NAD83, UTM Zone 16N, meters.

Infiltration/Grenade Range Dig List

Anomaly_ID	Transect_ID	X*	Y*	Amplitude (mV)	Selection Method
I-GR-01-00004	I-GR-01	624443.1	3469298.8	3.7	Statistical
I-GR-01-00005	I-GR-01	624443.2	3469315.5	6.2	Statistical
I-GR-01-00006	I-GR-01	624443.3	3469332.7	4.4	Statistical
I-GR-01-00013	I-GR-01	624443.3	3469419.4	8.5	Statistical
I-GR-01A-00002	I-GR-01A	624443.0	3469108.5	4.2	Statistical
I-GR-01A-00003	I-GR-01A	624442.9	3469113.0	5.6	Statistical
I-GR-01A-00004	I-GR-01A	624443.0	3469114.2	4.0	Statistical
I-GR-01A-00007	I-GR-01A	624442.9	3469149.1	5.6	Statistical
I-GR-01A-00008	I-GR-01A	624443.1	3469152.2	7.2	Statistical
I-GR-01A-00009	I-GR-01A	624443.1	3469154.0	4.8	Statistical
I-GR-01A-00017	I-GR-01A	624443.0	3469173.4	6.4	Statistical
I-GR-01A-00018	I-GR-01A	624443.1	3469176.2	6.8	Statistical
I-GR-01A-00019	I-GR-01A	624443.1	3469177.9	4.8	Statistical
I-GR-01A-00022	I-GR-01A	624443.1	3469195.0	5.9	Statistical
I-GR-01A-00030	I-GR-01A	624443.2	3469218.6	8.4	Statistical
I-GR-01A-00037	I-GR-01A	624443.0	3469236.5	4.8	Statistical
I-GR-01A-00039	I-GR-01A	624443.1	3469241.5	5.2	Statistical
I-GR-01A-00041	I-GR-01A	624443.1	3469255.8	7.3	Statistical
I-GR-01B-00001	I-GR-01B	624442.7	3469058.2	12.5	Statistical
I-GR-01B-00004	I-GR-01B	624442.8	3469063.5	15.0	Statistical
I-GR-01B-00005	I-GR-01B	624442.8	3469070.1	3.5	Statistical
I-GR-02-00003	I-GR-02	624472.7	3469319.9	3.3	Statistical
I-GR-02-00006	I-GR-02	624472.9	3469335.3	3.4	Statistical
I-GR-02-00011	I-GR-02	624472.8	3469365.1	9.8	Statistical
I-GR-02-00013	I-GR-02	624472.8	3469387.3	4.3	Statistical
I-GR-02-00016	I-GR-02	624473.0	3469421.2	3.7	Statistical
I-GR-02-00021	I-GR-02	624472.9	3469443.6	4.3	Statistical
I-GR-02A-00004	I-GR-02A	624472.3	3469098.2	4.9	Statistical
I-GR-02A-00007	I-GR-02A	624472.2	3469128.0	6.7	Statistical
I-GR-02A-00008	I-GR-02A	624472.3	3469156.3	4.2	Statistical
I-GR-02A-00010	I-GR-02A	624472.5	3469169.9	3.3	Statistical
I-GR-03-00001	I-GR-03	624501.7	3469324.6	4.5	Statistical
I-GR-03-00003	I-GR-03	624501.7	3469353.1	3.6	Statistical
I-GR-03A-00001	I-GR-03A	624500.9	3469046.7	3.9	Statistical
I-GR-03A-00003	I-GR-03A	624501.3	3469079.0	4.6	Statistical
I-GR-03A-00005	I-GR-03A	624501.3	3469120.1	5.4	Statistical
I-GR-03A-00007	I-GR-03A	624501.3	3469215.6	4.7	Statistical
I-GR-03A-00009	I-GR-03A	624501.7	3469241.4	12.8	Statistical
I-GR-03B-00003	I-GR-03B	624501.1	3469005.6	4.2	Statistical

I-GR-03B-00005	I-GR-03B	624501.1	3469022.8	5.1	Statistical
I-GR-03C-00001	I-GR-03C	624501.9	3469475.7	5.1	Statistical
I-GR-04-00001	I-GR-04	624533.2	3469289.1	5.8	Statistical
I-GR-04-00003	I-GR-04	624533.1	3469409.3	5.3	Statistical
I-GR-04A-00002	I-GR-04A	624533.1	3469199.5	4.0	Statistical
I-GR-04A-00006	I-GR-04A	624533.0	3469230.4	4.4	Statistical
I-GR-04B-00002	I-GR-04B	624532.5	3468982.1	4.1	Statistical
I-GR-04C-00002	I-GR-04C	624533.8	3469481.0	9.9	Statistical
I-GR-04C-00008	I-GR-04C	624536.2	3469549.2	10.2	Statistical
I-GR-04C-00011	I-GR-04C	624536.7	3469559.9	4.0	Statistical
I-GR-05-00001	I-GR-05	624562.1	3469291.5	24.2	Statistical
I-GR-05-00002	I-GR-05	624562.1	3469312.3	9.3	Statistical
I-GR-05A-00003	I-GR-05A	624561.9	3469126.9	4.5	Statistical
I-GR-05A-00004	I-GR-05A	624562.0	3469136.9	95.8	Statistical
I-GR-05A-00005	I-GR-05A	624562.0	3469142.8	3.4	Statistical
I-GR-05A-00006	I-GR-05A	624561.9	3469162.5	3.5	Statistical
I-GR-05A-00007	I-GR-05A	624561.9	3469174.7	4.4	Statistical
I-GR-05B-00001	I-GR-05B	624561.6	3468939.6	38.4	Statistical
I-GR-05B-00002	I-GR-05B	624561.4	3468947.5	4.4	Statistical
I-GR-05B-00004	I-GR-05B	624561.3	3468955.2	3.6	Statistical
I-GR-05B-00005	I-GR-05B	624561.2	3468967.8	4.8	Statistical
I-GR-05B-00006	I-GR-05B	624561.8	3468996.0	3.9	Statistical
I-GR-05C-00002	I-GR-05C	624561.5	3469507.5	5.0	Statistical
I-GR-05C-00003	I-GR-05C	624562.0	3469510.7	335.2	Statistical
I-GR-05C-00004	I-GR-05C	624562.3	3469512.2	833.8	Statistical
I-GR-05C-00006	I-GR-05C	624566.1	3469540.5	33.6	Statistical
I-GR-06-00009	I-GR-06	624591.9	3469237.4	5.6	Statistical
I-GR-06A-00001	I-GR-06A	624592.3	3469291.6	3.9	Statistical
I-GR-06A-00004	I-GR-06A	624591.8	3469319.3	4.1	Statistical
I-GR-06A-00005	I-GR-06A	624591.9	3469356.1	7.9	Statistical
I-GR-06B-00001	I-GR-06B	624581.0	3469020.9	3.9	Statistical
I-GR-06C-00001	I-GR-06C	624593.7	3468909.3	17.2	Statistical
I-GR-06C-00006	I-GR-06C	624587.0	3468992.8	8.9	Statistical
I-GR-06C-00007	I-GR-06C	624587.2	3469002.8	4.0	Statistical
I-GR-06C-00008	I-GR-06C	624587.2	3469005.9	4.0	Statistical
I-GR-06C-00011	I-GR-06C	624593.8	3469483.1	71.6	Statistical
I-GR-06C-00014	I-GR-06C	624592.6	3469516.9	5.7	Statistical
I-GR-06C-00015	I-GR-06C	624592.6	3469551.8	6.4	Statistical
I-GR-07-00004	I-GR-07	624621.7	3469297.3	4.2	Statistical
I-GR-07-00005	I-GR-07	624621.6	3469303.5	6.7	Statistical
I-GR-07-00006	I-GR-07	624621.6	3469308.9	3.4	Statistical
I-GR-07-00008	I-GR-07	624621.8	3469314.8	16.0	Statistical
I-GR-07-00010	I-GR-07	624621.9	3469362.1	4.6	Statistical
I-GR-07A-00001	I-GR-07A	624621.5	3469199.1	3.5	Statistical
I-GR-07A-00004	I-GR-07A	624621.6	3469244.8	13.5	Statistical
I-GR-07C-00002	I-GR-07C	624622.4	3468916.1	13.0	Statistical

I-GR-07C-00005	I-GR-07C	624622.7	3468926.9	3.5	Statistical
I-GR-07C-00006	I-GR-07C	624620.1	3468937.5	7.9	Statistical
I-GR-07C-00007	I-GR-07C	624618.5	3468944.3	8.6	Statistical
I-GR-07C-00008	I-GR-07C	624615.7	3468956.8	11.7	Statistical
I-GR-07C-00009	I-GR-07C	624603.8	3469009.1	868.7	Statistical
I-GR-07C-00010	I-GR-07C	624597.7	3469028.6	13.5	Statistical
I-GR-07C-00012	I-GR-07C	624622.2	3469476.3	272.4	Statistical
I-GR-07C-00013	I-GR-07C	624623.2	3469489.9	9.4	Statistical
I-GR-07C-00014	I-GR-07C	624623.2	3469492.8	75.2	Statistical
I-GR-07C-00022	I-GR-07C	624622.5	3469607.0	8.5	Statistical
I-GR-08-00002	I-GR-08	624650.3	3469206.1	3.1	Statistical
I-GR-08-00003	I-GR-08	624648.7	3469226.1	4.5	Statistical
I-GR-08-00004	I-GR-08	624648.9	3469232.1	13.8	Statistical
I-GR-08-00005	I-GR-08	624648.6	3469245.8	4.8	Statistical
I-GR-08-00007	I-GR-08	624648.9	3469260.8	6.6	Statistical
I-GR-08-00008	I-GR-08	624648.8	3469265.6	5.1	Statistical
I-GR-08-00009	I-GR-08	624648.8	3469267.2	18.5	Statistical
I-GR-08-00010	I-GR-08	624648.8	3469268.2	8.8	Statistical
I-GR-08-00011	I-GR-08	624648.8	3469272.4	18.7	Statistical
I-GR-08-00012	I-GR-08	624648.8	3469274.0	4.0	Statistical
I-GR-08-00013	I-GR-08	624648.9	3469276.9	13.2	Statistical
I-GR-08-00016	I-GR-08	624648.8	3469286.2	21.4	Statistical
I-GR-08-00021	I-GR-08	624648.8	3469296.9	18.1	Statistical
I-GR-08-00022	I-GR-08	624648.8	3469298.7	59.1	Statistical
I-GR-08-00023	I-GR-08	624648.8	3469300.4	32.7	Statistical
I-GR-08-00025	I-GR-08	624648.8	3469306.2	3.7	Statistical
I-GR-08-00026	I-GR-08	624648.8	3469307.6	4.0	Statistical
I-GR-08-00028	I-GR-08	624648.9	3469321.6	4.7	Statistical
I-GR-08-00031	I-GR-08	624649.1	3469391.5	20.1	Statistical
I-GR-08-00032	I-GR-08	624649.0	3469429.5	4.9	Statistical
I-GR-08A-00001	I-GR-08A	624650.5	3469519.1	3.4	Statistical
I-GR-08A-00002	I-GR-08A	624651.0	3469530.7	7.2	Statistical
I-GR-08A-00003	I-GR-08A	624652.0	3469544.2	6.2	Statistical
I-GR-08A-00004	I-GR-08A	624652.9	3469551.7	14.6	Statistical
I-GR-08A-00009	I-GR-08A	624650.4	3469573.8	4.2	Statistical
I-GR-08B-00003	I-GR-08B	624648.5	3469070.1	3.5	Statistical
I-GR-09-00002	I-GR-09	624679.1	3469199.4	4.9	Statistical
I-GR-09-00003	I-GR-09	624679.4	3469209.9	4.1	Statistical
I-GR-09-00004	I-GR-09	624679.4	3469213.0	6.0	Statistical
I-GR-09-00010	I-GR-09	624679.3	3469251.7	3.6	Statistical
I-GR-09-00012	I-GR-09	624679.8	3469270.5	7.1	Statistical
I-GR-09-00014	I-GR-09	624676.5	3469282.5	20.1	Statistical
I-GR-09-00016	I-GR-09	624679.3	3469304.2	3.6	Statistical
I-GR-09A-00005	I-GR-09A	624678.9	3468970.3	4.1	Statistical
I-GR-09A-00006	I-GR-09A	624678.9	3468972.7	12.8	Statistical
I-GR-09A-00007	I-GR-09A	624678.9	3468980.3	25.7	Statistical

I-GR-09A-00008	I-GR-09A	624678.9	3468985.7	93.0	Statistical
I-GR-09A-00013	I-GR-09A	624681.7	3469495.5	10.3	Statistical
I-GR-09A-00016	I-GR-09A	624681.3	3469572.9	16.9	Statistical
I-GR-09B-00001	I-GR-09B	624679.0	3469055.9	6.6	Statistical
I-GR-09B-00004	I-GR-09B	624678.8	3469077.6	3.9	Statistical
I-GR-09B-00006	I-GR-09B	624678.0	3469081.2	8.4	Statistical
I-GR-09B-00009	I-GR-09B	624677.8	3469092.7	73.2	Statistical
I-GR-09B-00013	I-GR-09B	624679.0	3469098.9	126.1	Statistical
I-GR-09B-00015	I-GR-09B	624679.5	3469129.9	4.0	Statistical
I-GR-09B-00016	I-GR-09B	624679.7	3469133.7	954.8	Statistical
I-GR-10A-00001	I-GR-10A	624707.4	3469097.5	14.8	Statistical
I-GR-10A-00002	I-GR-10A	624707.1	3469523.9	24.8	Statistical
I-GR-10N-00011	I-GR-10N	624707.9	3469419.0	7.3	Statistical
I-GR-10N-00017	I-GR-10N	624707.9	3469435.3	8.4	Statistical
I-GR-10N-00018	I-GR-10N	624707.8	3469441.1	3.7	Statistical
I-GR-10S-00002	I-GR-10S	624707.4	3469162.5	23.5	Statistical
I-GR-11N-00004	I-GR-11N	624736.3	3469059.7	20.0	Statistical
I-GR-11N-00007	I-GR-11N	624736.3	3469081.5	11.2	Statistical
I-GR-11N-00008	I-GR-11N	624736.3	3469085.7	4.5	Statistical
I-GR-11N-00010	I-GR-11N	624736.3	3469091.7	103.5	Statistical
I-GR-11N-00014	I-GR-11N	624736.0	3469330.1	41.4	Statistical
I-GR-11N-00016	I-GR-11N	624736.2	3469338.0	40.1	Statistical
I-GR-11N-00020	I-GR-11N	624739.0	3469390.5	4.5	Statistical
I-GR-11N-00023	I-GR-11N	624737.6	3469435.5	25.6	Statistical
I-GR-11N-00024	I-GR-11N	624737.5	3469438.0	7.8	Statistical
I-GR-11N-00026	I-GR-11N	624738.3	3469476.1	15.2	Statistical
I-GR-11N-00027	I-GR-11N	624736.6	3469513.4	95.9	Statistical
I-GR-11N-00028	I-GR-11N	624735.5	3469518.8	53.0	Statistical
I-GR-11S-00001	I-GR-11S	624736.4	3469140.5	157.5	Statistical
I-GR-11S-00003	I-GR-11S	624736.5	3469152.1	26.7	Statistical
I-GR-11S-00005	I-GR-11S	624736.8	3469164.7	13.8	Statistical
I-GR-12N-00001	I-GR-12N	624767.7	3469044.8	52.2	Statistical
I-GR-12N-00003	I-GR-12N	624767.7	3469059.7	4.9	Statistical
I-GR-12N-00011	I-GR-12N	624768.3	3469334.2	14.2	Statistical
I-GR-12N-00012	I-GR-12N	624770.7	3469357.8	5.4	Statistical
I-GR-12N-00015	I-GR-12N	624767.8	3469405.5	4.9	Statistical
I-GR-12S-00001	I-GR-12S	624767.7	3469147.3	12.3	Statistical
I-GR-04C-00013	I-GR-04C	624533.4	3469596.3	4.6	Additional
I-GR-04C-00014	I-GR-04C	624534.3	3469608.5	42.0	Additional
I-GR-09A-00001	I-GR-09A	624678.8	3468944.3	10.3	Additional
I-GR-09A-00003	I-GR-09A	624678.8	3468947.6	6.6	Additional

* All coordinates reported in NAD83, UTM Zone 16N, meters.