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Depth to bedrock in the Upper San Pedro Valley, Cochise County, southeastern Arizona

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U.S. DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

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Abstract

The thickness, distribution, and character of alluvial sediments that were deposited in the structural subbasins of the upper San Pedro basin in southeastern Arizona during the late Cenozoic provide important constraints on ground-water availability of the area. Two sedimentary units are recognized; the Oligocene and Miocene Pantano(?) Formation and an unnamed upper Miocene through lower Pleistocene unit termed basin fill.

The complete Bouguer gravity anomaly map shows that there are three major structural subbasins in the upper San Pedro basin north of the international border with Mexico. The Tombstone subbasin is north of Tombstone, and two more are located north and south of Sierra Vista, respectively. This report concentrates on the two subbasins north and south of Sierra Vista. The northern subbasin (termed the Huachuca City subbasin) extends from east of Huachuca City to northeast of Whetstone, and the southern subbasin (termed the Palominas subbasin) extends southward from a line between Nicksville and Hereford to the border. The locations and shapes of these subbasins, thickness of basin fill, and depth to bedrock were estimated using a procedure involving interpolation of (1) the density functions derived in this study, (2) stratigraphic data from water wells, and (3) a residual gravity anomaly grid obtained by subtracting the gravity effects of the bedrock ranges bordering the basin from the complete Bouguer gravity anomaly.

This procedure indicates that the subbasins are shallow and contain significant thicknesses of the Pantano (?) Formation in addition to the overlying younger basin fill. The maximum depth to bedrock is about 1,700 m in the Palominas subbasin and 800m in the Huachuca City subbasin; the basin-fill unit occupies the upper 250-350 m in general with local thickenings exceeding 1,000 m in the Palominas subbasin. An east-west trending buried bedrock high beneath Fort Huachuca, Sierra Vista, and Charleston separates the subbasins. The depth to bedrock over this high is 200-500 m and the basin-fill unit ranges from 100 to 200 m thick there. A number of previously unrecognized faults were identified and the lengths of some of the known faults were extended based on reconnaissance geologic mapping, study of driller's logs, interpretation of aerial photographs and thematic mapper satellite images, and inspection of contoured gravity and aeromagnetic anomaly data. Many faults that segment the main San Pedro basin and shape the boundaries of the subbasins are apparently pre-existing faults that have been reactivated by Basin and Range extension.

Introduction

The San Pedro River, which has its headwaters in Mexico near Cananea, flows generally northward through the study area to its confluence with the Gila River at Winkelman, Arizona. This report addresses the three-dimensional shape of the subbasins that comprise the 75-km-long reach of the upper San Pedro River Valley from the international border with Mexico to Benson, Arizona (throughout this report, a larger version of the figure can be obtained by clicking on the link to the figure, for example, fig. 1).

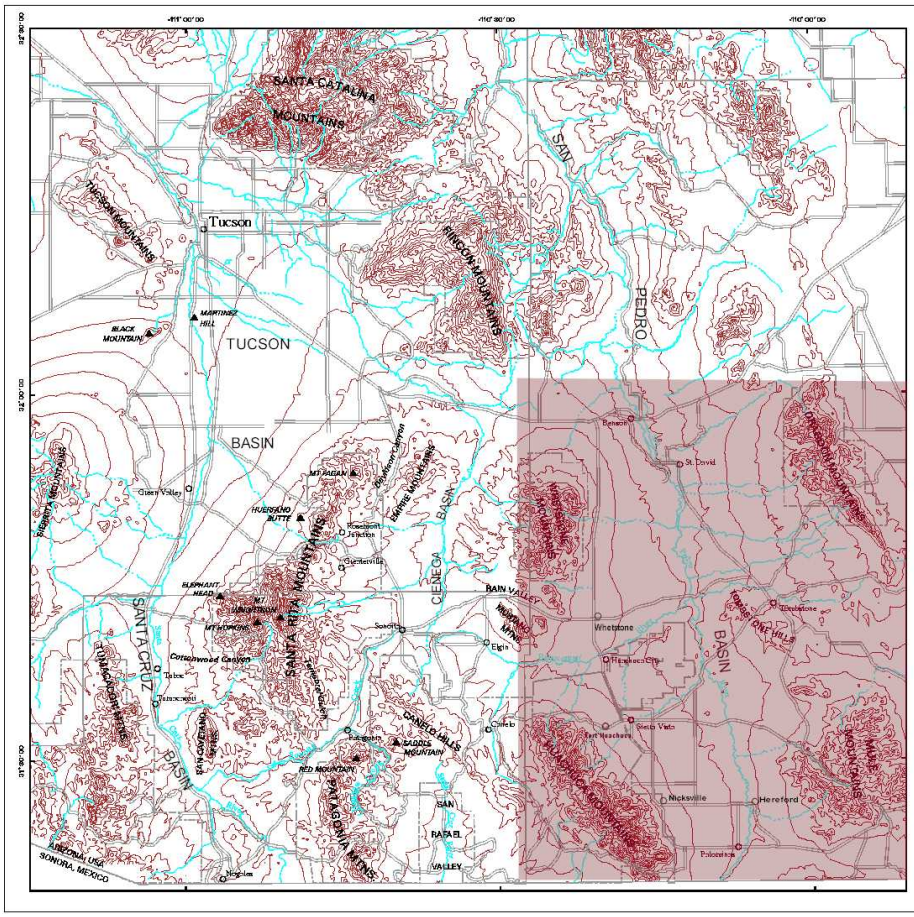


Figure 1.

Location map of the study area.

Increased ground-water usage due to population growth in the upper San Pedro Valley has the potential to exceed the available ground water of the area in the future, to the extent that perennial flow in the San Pedro River will be affected. Federal, state and local land-use planners need to know the location, thickness, depth, and estimated yield and quality of the ground-water aquifers in the valley. Unfortunately, there is little direct information about the thickness and depth of the aquifers in the valley because few deep wells to bedrock have been drilled. The objective of this study is to use a combination of geologic and geophysical methods to model the shapes and locations of the subbasins that make up the upper San Pedro basin and to estimate the thickness of better consolidated Pantano(?) Formation sediments (poor aquifers) relative to less consolidated overlying basin-fill sediments (better aquifers) in the subbasins.

Geologic setting

The upper San Pedro River Valley is in the southern Basin and Range Province of southeastern Arizona and northern Sonora. This terrain of alternating fault-bounded linear mountain ranges and sediment-filled basins began to form about 17 Ma in southeastern Arizona as the result of dominantly east-northeast/ west-southwest directed crustal extension. The topography of the basins and ranges in this part of the province has a zigzag northeast and northwest pattern that may be a result of movement along west-northwest-trending Mesozoic faults that were reactivated by the Miocene extension.

The geologic map of the upper San Pedro Valley (plate 1) is part of a digital geologic database created by digitizing the maps of Drewes (1980, 1996) at a scale of 1:125,000. Additional data were then added from Dempsey and Pearthree (1994), Gettings and Houser (1995, 1997), Moore (1993), and from fieldwork conducted in this study.

Topographically, the north-northwest-trending upper San Pedro basin has the appearance of a broad alluvial valley interrupted only by the bedrock of the low-lying Tombstone Hills (fig.1, pl.1). As shown below, the San Pedro basin is actually made up of three main subbasins between the International border and Benson. One is south of Sierra Vista between the Huachuca Mountains and the San Pedro River (Palominas subbasin), and

the other two are north of Sierra Vista. The Huachuca City subbasin is the westernmost, and to the east lies the Tombstone subbasin north of Tombstone. The Huachuca City and Tombstone subbasins are separated from each other by the Tombstone Hills and a subsurface extension of the Hills to the north. The Huachuca City and Palominas subbasins and the intervening bedrock high are the focus of this report.

The Huachuca Mountains, Mustang Mountains and Whetstone Mountains on the western side of the valley are composed of igneous, metamorphic, volcanic, and sedimentary rocks ranging in age from Precambrian to Miocene (Drewes, 1980; pl. 1). The Huachuca Mountains (fig.1) rise to a maximum altitude of 2885 m. The Dragoon and Mule Mountains bound the eastern side of the upper San Pedro Valley (fig.1). These mountains are made up of a diverse variety of rocks similar to those in the mountains on the west side of the valley (Drewes, 1980; pl. 1). The mountains east of the valley are considerably lower than those to the west; the highest altitude is 2292 m in the Dragoon Mountains (fig.1).

Basin stratigraphy

Basin-fill sediments of the southern Basin and Range Province are usually defined as the detritus that accumulated in structural basins that had more or less the modern configuration. At least two ages of basin fill can be distinguished in most basins in southeastern Arizona (Houser and others, 1985; Dickinson, 1991). The older basin-fill beds may be mildly to moderately deformed with dips of 10° to 45° ; locally, adjacent to range front faults for example, bedding can be nearly vertical. Younger basin-fill beds commonly display only initial dips, usually less than 5° . The older basin fill is usually better consolidated and is more dense than the younger basin fill. The consolidation and greater density of the older fill result from diagenetic processes that alter the mineralogy of the matrix of the sediment and fill pore spaces. It is chiefly the reduction in pore space and resultant decrease in permeability that makes the older basin-fill sediments poor aquifers compared to the younger basin-fill sediments. Another difference between the two ages of basin fill that is useful in mapping the units is that older fill commonly contains clasts of lithologies that are no longer present in the immediately adjacent ranges. In most cases this is simply a consequence of erosional stripping where the uppermost rocks of the ranges are removed first and are, thus, deposited as the oldest basin sediments. In some cases, however, significant offset along faults may be involved in bringing diverse bedrock lithologies in juxtaposition with basin sediments.

The sedimentary rocks in the upper San Pedro Valley are Miocene to Holocene, chiefly alluvial sand and gravel deposits of fans, valley centers, terraces, and channels. On the basis of age and consolidation, these rocks were separated by Brown and others (1966) into three basin-fill units, overlain by surficial deposits, as follows: (1) the upper Oligocene to lower Miocene well-consolidated Pantano(?) Formation (Balcer, 1984); (2) the upper Miocene to Pliocene lower basin-fill unit, which is unconsolidated to moderately consolidated; and (3) the upper Pliocene to Pleistocene upper basin-fill unit, which also is unconsolidated to moderately consolidated. Thin surficial deposits include Pleistocene and Holocene alluvium of stream channels, flood plains, and terraces, which is unconsolidated overall but is locally well indurated with calcite.

Preliminary field work of the present study indicates that some of the unit designated as Pantano(?) by Brown may not correlate, either in age or lithology, with the Pantano Formation exposed south of the Rincon Mountains where it was described by Balcer (1984). Also, strictly speaking, the Pantano south of the Rincons is not a basin-fill unit because it was deposited prior to the Basin and Range extensional event. These considerations, in addition to the fact that the Pantano(?) probably includes several units of different age in different parts of the basin suggest that the Pantano(?) may show considerable variation in aquifer characteristics. The Pantano(?) is shown as Tc on plate 1 (Drewes, 1980) and is called conglomerate (cgl) on the table of well logs (appendix 1).

For this study, we have treated the lower basin fill, upper basin fill, and surficial deposits as a single unit because these units cannot be differentiated reliably by gravity anomaly modeling. Thus, we distinguish only the Pantano(?) Formation (conglomerate) and the overlying, less consolidated basin fill as a simplified stratigraphy.

Well log information

Drillers' logs of water wells were studied for information on depth to bedrock and thickness of basin fill and of Pantano(?) Formation. Appendix 1 gives interpreted subsurface data and locations for 349 wells (plate 2.). Ninety-eight wells from appendix 1 were interpreted as having penetrated at least into the Pantano

(?) Formation and were used as primary points for estimating depths to the base of the Pantano(?) Formation as described below. Within this group of 98 wells, 42 wells are interpreted to have penetrated through the Pantano? Formation and into bedrock and were used as primary points for estimating depth to bedrock as described below. On plate 2, a small circle symbol marks the well location with its well number in appendix 1 nearby to the upper right. Some clusters of wells are so dense that the individual numbers overlap. Appendix 1 shows the grid coordinates of the wells as "gridx" (easting) and "gridy" (northing) so that a particular well can be located using the grid scales on the plates if the number is unreadable. The grid values are distances east and north of the point 31° N latitude and 111° W longitude with Universal Transverse Mercator projection coordinates for zone 12N of 3,429.418 km northing and 500.000 km easting. To obtain the UTM coordinates of any well in Appendix 1, add the gridx value for the well to 500.000 for the easting and the gridy value to 3,429.418 for the northing. The well location code (Appendix 1, column 2) is described in Appendix 6.

Well 30 (table 1 and appendix 1) is a petroleum exploration well 2,595 m deep that penetrated Cenozoic basin fill, Cretaceous and Jurassic Bisbee Group sedimentary rocks, and Paleozoic sedimentary rocks. Geological and geophysical logs of the well together with selected cuttings were examined to provide insight into the nature and variability of the subbasin bedrock. It appears that the Mesozoic and Paleozoic sedimentary rocks at the drillhole site are highly deformed, as they are in exposures in the Whetstone Mountains to the west.

Table 1.Log of Phillips Petroleum #A-1, Huachuca State

D(20-20)16aac

Longitude =110º 18' 09", Latitude = 31º 41â 57"

Upper San Pedro well # 30

TD = 8,513', Surface elev. = 4,265' [All depths are given in feet]

0 - 750 Basin fill

Cuttings -- Chips and grains of limestone, quartzite, arkose, muddy calcareous sandstone, granite, quartz, feldspar, and epidote. No volcanic rocks. Grains are angular to well rounded.

Geophysical logs show a change at about 500'; this may be the boundary between upper basin fill and lower basin fill as used by Brown and others (1966) in the Fort Huachuca area. Based on the cuttings, the Pantano (?) Formation apparently is not present.

750 - 3,350 Bisbee Group

750 - 930 Cuttings -- In this interval limestone and quartzite chips are rare to absent and volcanic rock chips are absent. Chips of pale red (10R 6/2) calcareous sandstone and sandy mudstone are common. Chips and grains of granite, and white sandstone are present from 870 to 930. Many grains are very well rounded; some quartz grains are nearly spherical.

930 - 1,560 Mud log* -- Siltstone and sandstone.

1,560 - 2,830 Mud log -- Siltstone, sandstone, and limestone.

2,830 - 3,350 Mud log -- Siltstone and sandstone.

3,350 - 8,513 Paleozoic sedimentary rocks

3,350 - 3,900 Mud log -- Siltstone, sandstone, and dolomite.

3,900 - 4,650 Mud log -- Dolomite, siltstone, and sandstone.

4,650 - 5,450 Mud log -- Shale, siltstone, and limestone.

5,450 -- 6,050 Mud log -- Limestone, shale, and siltstone.

6,050 - 6,200 Mud log -- Siltstone, limestone, and shale.

6,200 - 6,930 Mud log -- Siltstone and shale.

6,930 - 8,513 Mud log -- Limestone, shale, and siltstone.

8,513 = TD

* Lithologies are listed in order of relative abundance

Stratigraphic Breaks in Compensated Neutron Formation Density Log

0 - 1,062 Not logged

1,062 - 2,050 Moderate density (2.55 - 2.60) with many lower density interbeds

2,050 - 3,800 Denser than above interval (2.65 - 2.70); less variable overall with fewer low density interbeds.

3,800 - 5,200 Same density as above interval (2.65 -2.70), but with many lower density interbeds.

5,200 - 5,650 Very dense rock (2.75 - 2.80) with many low density interbeds.

5,650 - 6,400 Uniformly dense rock (2.75).

6,400 - 6,830 Density decreases from 2.75 to 2.65 over the interval with a few low density interbeds.

6,830 Thin, very low density interval labeled as a fault on the log.

6,830 - 7,415 Variably dense rock (2.70 - 2.85).

7,415 Thin, very low density interval labeled as a fault on the log.

7,415 - 7,800 Interval with considerable variation in density (2.65 - 2.80) and a few low density interbeds.

7,800 - 8,252 Overall density is 2.75 - 2.80 with many beds as thick as 40 ft having densities of 3.00.

8,252 Bottom of logged interval

Discussion of the log

Absence of volcanic rocks in the cuttings from the interval interpreted to be upper Cenozoic basin fill (0 - 750) indicates that Cretaceous volcanic rocks of the Tombstone Hills were not exposed within the source area

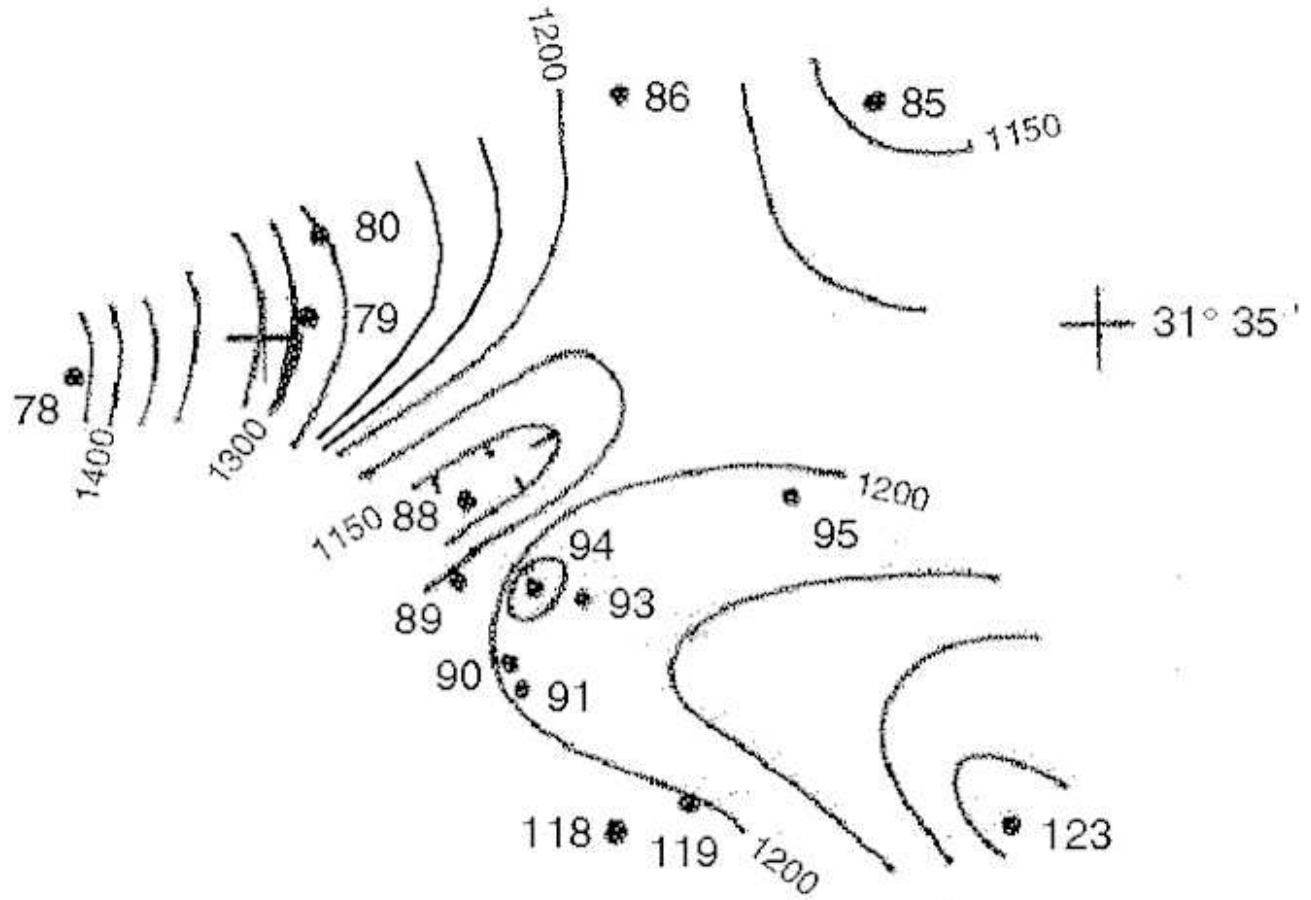
of the basin-fill sediments represented by these cuttings.

A hand written note at the bottom of the mud log states:

> *Appears to have stayed in faulted Cretaceous to TD or is it Paleozoic? May have entered Paleo or granite at 8225' despite shale cuttings (cavings?).*

In the present interpretation of the logs and cuttings, the base of the Bisbee Group (3,350') is placed at the top of the first appearance of dolomite in the cuttings. There is no indication in the cuttings that granite was entered at 8,225, and the core taken at 8,500 - 8,513 is described as siltstone. Thus, the interval from 3,350 to 8,513 is interpreted to be Paleozoic sedimentary rocks.

The Pantano(?) Formation is well exposed in the western half of the Fort Huachuca Military Reservation. Examination of topographic maps of these areas underlain by the Pantano(?) Formation shows that the present day topographic relief is about 20 m. The altitude and relief of the surface of the Pantano (?) Formation where encountered in wells can be calculated from the data given in appendix 1. Figure 2 is a contour map of these altitudes for wells in the Sierra Vista-Fort Huachuca area. At several localities on figure 2, the relief on the surface of the Pantano(?) Formation is much larger than that observed on present day exposures. For example, between wells 88 and 94 (fig. 2) the relief is 91 m in less than 1 km of horizontal distance, and between wells 78 and 79 the relief is more than 150 m in a distance of about 2 km. In other areas, for example wells 95, 86 and 85, the relief is more like that observed on todayâs erosional surfaces. These areas of high relief strongly suggest fault offsets, although high erosional relief is not precluded if the paleoenvironment was a high energy one in post Pantano(?) Formation time. The areas of high relief on figure 2 correlate with gradients of gravity anomalies as shown below; the gradients are interpreted to be due to faults offsetting the Pantano(?) Formation and older units, and in some cases, the overlying basin fill.



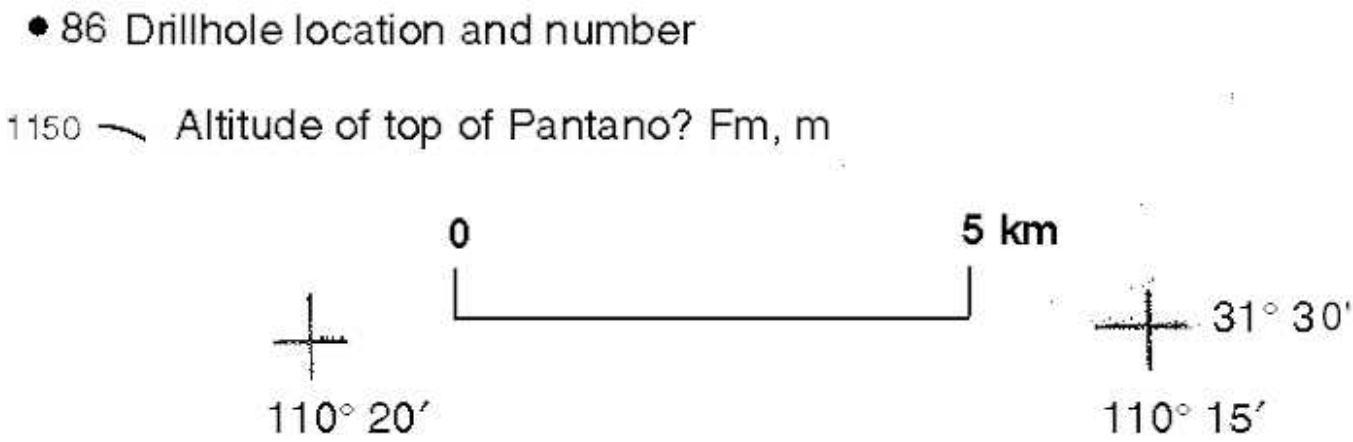
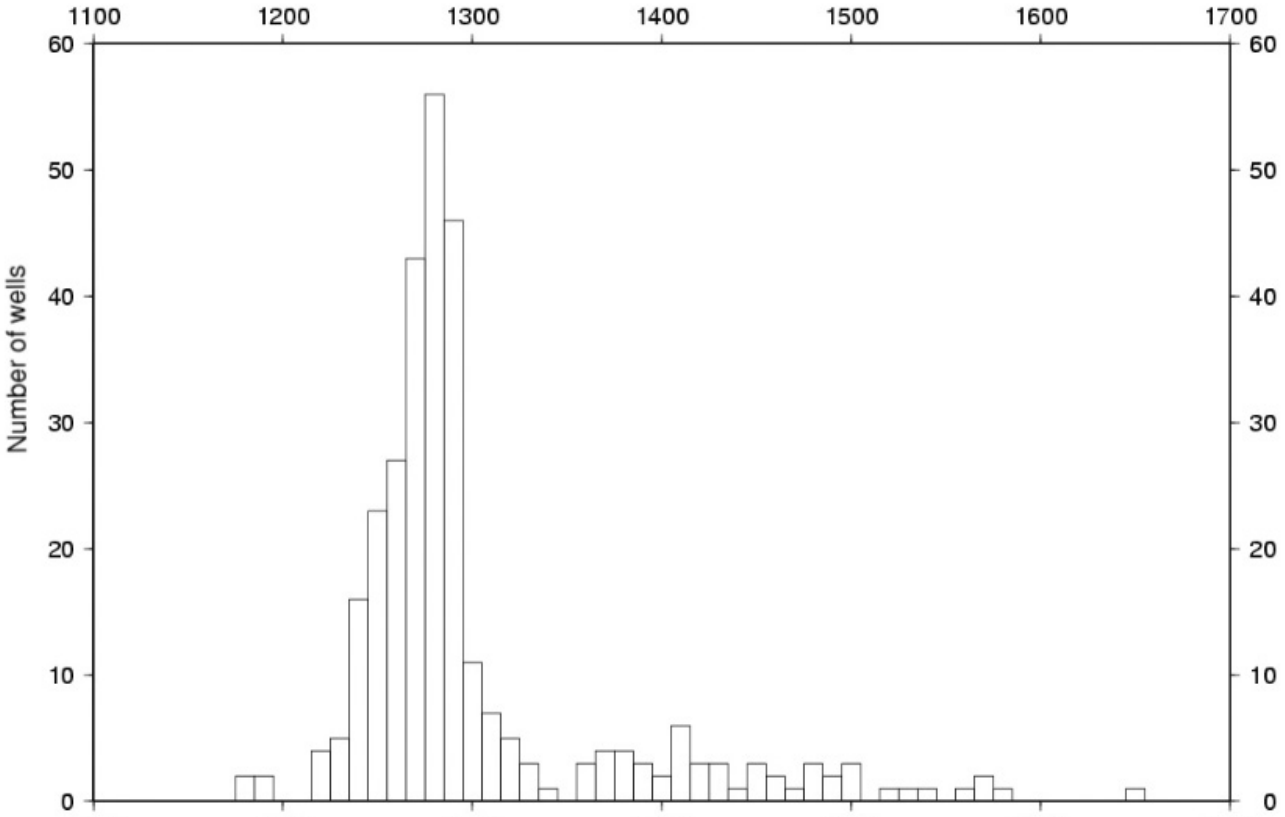


Figure 2. Contour map of altitude of the top of the Pantano(?) Formation in the Sierra Vista-Fort Huachuca area. Numbered dots correspond to drillholes (Appendix1) which penetrated into the Pantano(?) Formation. Contour interval is 25 m.

Table 2 summarizes some statistical properties of the altitudes of: the water table at the time of drilling; the top of the Pantano? Formation; and the top of bedrock as interpreted from the well logs. These altitudes are plotted as histograms in Figures 3a-3c. In Fig. 3a, the altitude of water table is a centrally peaked distribution with a tail towards higher elevations (1350-1600m). The wells in this tail are located on bedrock or shallowly covered bedrock in the Huachuca Mountains. Within the basin proper, the altitude of the water table is fairly well contained in the 50 m interval between 1240 and 1290m altitude even though the relief of the basin surface is over 300m. The basin behaves to a first approximation as an unconfined and permeable aquifer with the water level at about the same altitude throughout, like a bathtub of water.



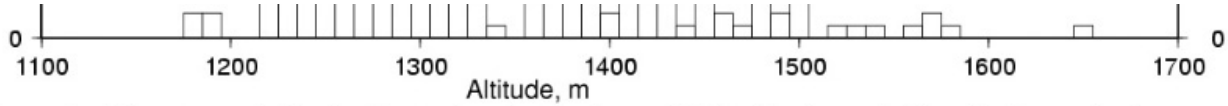


Figure 3a. Histogram of altitude of water level at the time of drilling for the wells listed in Appendix 1.

Table 2. Statistical results for altitudes of water, top of Pantano? Formation, and top of bedrock in the wells studied.

Altitude in well of	Number of wells	Mini-mum, m	Maximum, m	Mean, m	Stand. Dev., m	Median, m	Mode, m	Note
Water	301	1179	1653	1301	73.5	1280	1285	1
Top of Pantano? Fm	72	984	1570	1293	121.7	1303	1325	2
Top of bedrock	46	943	1577	1361	174.5	1404	1575	3

Notes:

1. Dry holes excluded.

2. Includes holes in exposed Pantano? Fm and excludes holes with zero thickness of Pantano? Fm between basin fill and bedrock.

3. Excludes holes starting in bedrock.

Figure 3b shows the distribution of altitudes of the top contact of the Pantano? Formation in the wells studied. Note that this includes wells which began or "collared" in exposed Pantano? Formation and accounts for the peak in the distribution centered at 1400m. For the altitudes below the surface, the distribution is approximately normal with a mean of about 1275m and standard deviation of about 120 m and somewhat skewed toward higher elevations. The two peaked nature of the distribution may be due to the faulted nature of the western edge of the basin where most of the wells which encountered the contact are located.

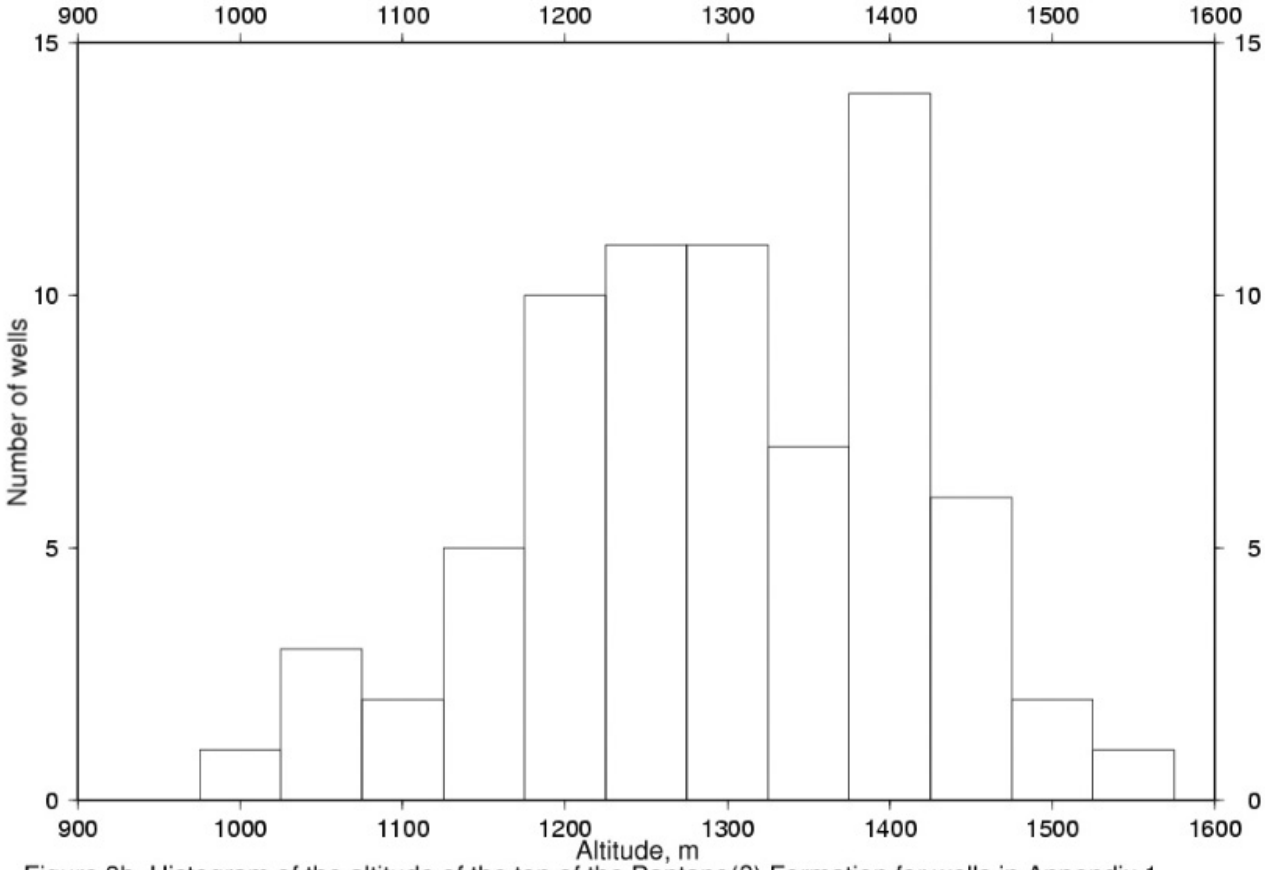


Figure 3b. Histogram of the altitude of the top of the Pantano(?) Formation for wells in Appendix 1 that penetrated into the Pantano(?) Formation.

Figure 3c shows a histogram of the distribution of the top contact of bedrock for the wells which penetrated into bedrock. Holes which were "collared" in bedrock are not included so that the distribution represents only holes in the basin reaching to bedrock. The distribution is multimodal and clearly skewed to higher altitudes because of the lack of deep holes. The multimodal distribution reflects the fact that the buried bedrock is a faulted topographic surface.

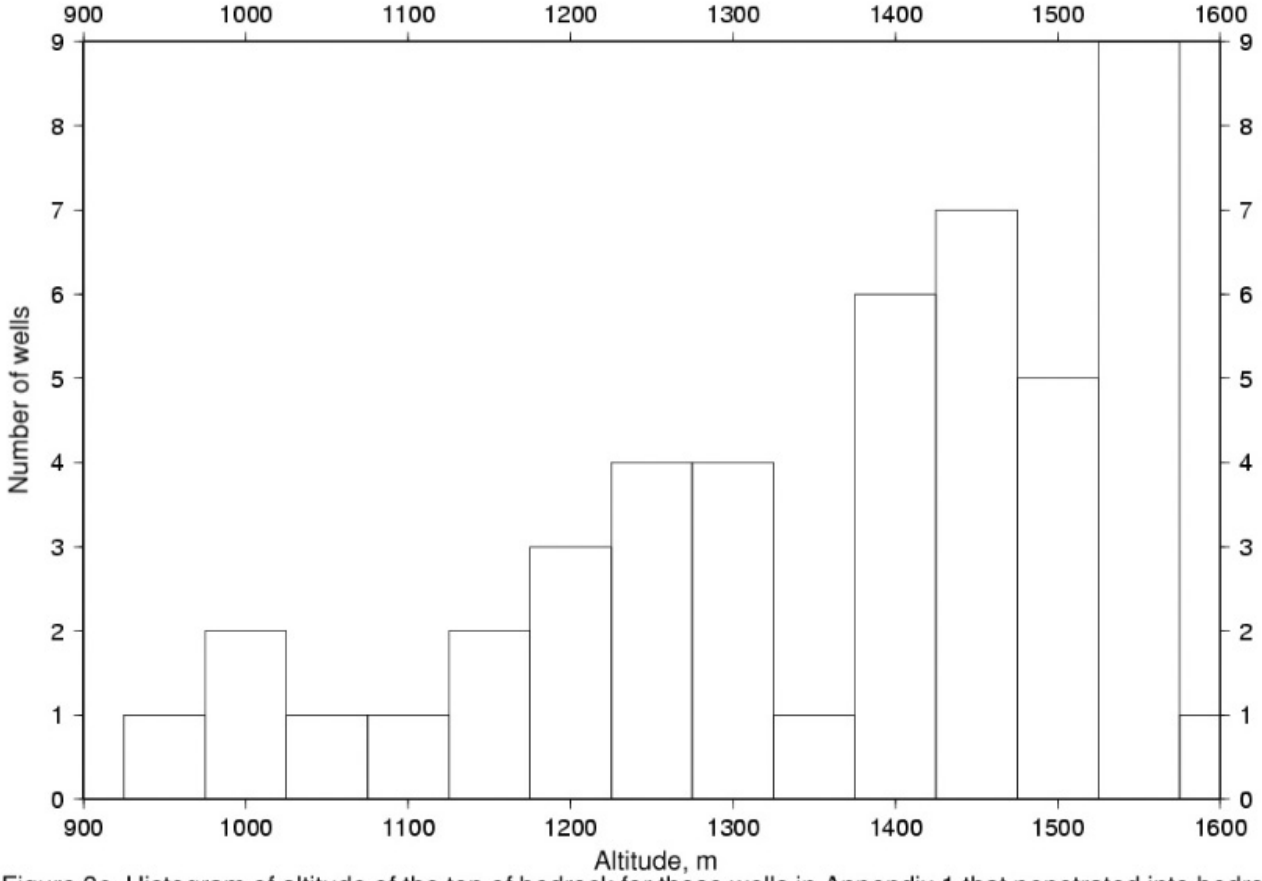


Figure 3c. Histogram of altitude of the top of bedrock for those wells in Appendix 1 that penetrated into bedrock.

Gravity data compilation

Gravity data were compiled from the gravity library of the Defense Mapping Agency and from data acquired for the mineral-resource assessment of the Coronado National Forest (Gettings, 1996). In addition, U.S. Geological Survey (USGS) personnel established 182 new stations for the current investigation. The resulting 1,521 data points were terrain corrected and the Complete Bouguer gravity anomaly value at each station was computed using standard USGS formulae as described in Gettings (1996). The resulting gravity anomaly map is shown in plate 3 and the gravity principal facts for the stations used are listed in Appendix 4. The Bouguer reduction density used in computation of the gravity anomalies was 2.67 g/cc (gram/cubic centimeter), and all observed gravity values are based on the observed gravity value of the gravity base station in the basement of the Gould-Simpson Building at the University of Arizona, Tucson. The data were compiled for digital use into grids of values at 0.5-km and 1.0-km intervals across the study area using minimum curvature as the interpolation technique (Briggs, 1974; Webring, 1991).

The gravity anomaly map (pl. 3) shows gravity anomaly relative maxima over the mountain ranges, the Tombstone Hills, and in an area of sparse bedrock exposures about 20 km northwest of Tombstone (pl. 1). Gravity station coverage is poorest in the Mule Mountains and consequently little is known of the detailed shape of the anomaly field in the Bisbee area. The Tombstone Hills and Whetstone Mountains areas are the only mountain areas with adequate gravity station coverage for regional geologic structural studies of the ranges themselves. The basin areas are generally marked by relative gravity anomaly minima or lows (pl.3). The areas of large gravity anomaly minima are much more restricted than the areas of alluvial basin fill on the geologic map (pl. 1), showing that the deep portions of the basin fill are restricted to subbasins within the valleys. The fact that the steep gravity anomaly gradients are well within the basin fill indicates that much of the basin areas are alluviated pediment surfaces eroded toward the mountains from the range-bounding faults. Gravity station coverage within the basin is good to excellent for the scale of the study (pl.3) except for

the basin northeast of the Mule Mountains. This area appears to have a significant gravity anomaly minima associated with it and therefore a substantial depth of fill but is not considered further here due to lack of gravity station data.

The Tombstone subbasin is well defined by a northwest-trending gravity minima. The regional continuity and amplitude of the anomaly gradient along the southwest side strongly suggests a major fault as the boundary between the subbasin and the Tombstone Hills. Gettings and Gettings (1996) have modelled a gravity and ground magnetic profile across the Tombstone subbasin and continuing across the Tombstone Hills to Sierra Vista. Their results show that the subbasin may be as deep as 2 km beneath the profile track, but as much as 50% of the basin fill is probably Tertiary volcanic rocks, some of which are exposed in the area (pl. 1).

West of the Tombstone Hills, the gravity anomaly minima associated with the upper San Pedro basin (pl.3) has three local minima defining three subbasin areas separated by bedrock saddle points or highs. The largest anomaly minima, and therefore probably the area of largest depth of fill, is the Palominas subbasin, defined by a north-trending minima in the gravity anomaly field just west of Palominas (fig. 1). The Fort Huachuca-Sierra Vista area is an area of a bedrock high beneath the valley connecting the Tombstone Hills and the Huachuca Mountains in the subsurface. To the northwest, another anomaly minima defines the Huachuca City subbasin, which is also a north-trending gravity anomaly low with the largest minimum at the southern end, similar in form to the Palominas subbasin to the southeast. Finally, at Benson in the northern part of the map area (pl.3) there is a northwest trending anomaly minimum defining the subbasin there. It is notable that the San Pedro River location (pl.3) is completely uncorrelated with the deepest parts of the basin as defined by the gravity anomaly field.

Preliminary depth estimates for anomalies on the Bouguer gravity anomaly map (pl.3) were computed using an automated program which estimates the depth to source for gravity anomaly gradients which are sufficiently continuous to allow an estimate not overly affected by the noise level of the data. The method is based on estimation of the analytic signal of the potential field data from the horizontal gradient (Roest and Pilkington, 1993) and yields a depth to source, an estimate of the error of the depth estimate, and the trend of the gradient on which the estimate was made. By using the trends from all depth estimates regardless of error, one obtains a map of quantifiable trends in addition to the depth estimates. Usually, only the depth estimates with reasonably low error values are used for depth estimates. For this study, only depths with error estimates of 10% or less were used, although trends from all estimates were used to plot the trends. The method can be carried out on both gravity and magnetic field data. For gravity data, the method assumes the signal is coming from a thin horizontal layer and thus gives maximum depth estimates. For magnetic field data, the method corresponds to a thick source and the depth estimates are minimums. For this work, the gravity data were transformed to equivalent magnetic data using the pseudomagnetic transformation in program FFTFIL (Hildenbrand, 1983). Depths and trends were computed for both the gravity and pseudomagnetic datasets using a set of programs written by J. Phillips (written communication, 1998).

Figure 4a shows the results of these calculations for the gravity anomaly field, and figure 4b shows the results for the pseudomagnetic field. In both cases, the trend lines and depth estimate symbols are superimposed on the geologic map of pl. 1. The diameter of the depth estimate circle at map scale is the depth estimate at the center of the circle. Phillips (written communication, 1999) and other investigators have shown that the trend lines from the horizontal gradient method used here are sometimes displaced horizontally relative to the actual contact, due to the geometry of the real source not agreeing with the assumptions of the model. The displacement in the case of a fault is usually down dip. Study of figs. 4a and 4b in those places where the contact is known, shows displacements varying between 0 and 500 m, with approximately 200m being the most common. For the purposes of this study, these displacements are not important, but they should be borne in mind when using this work in any detailed study.

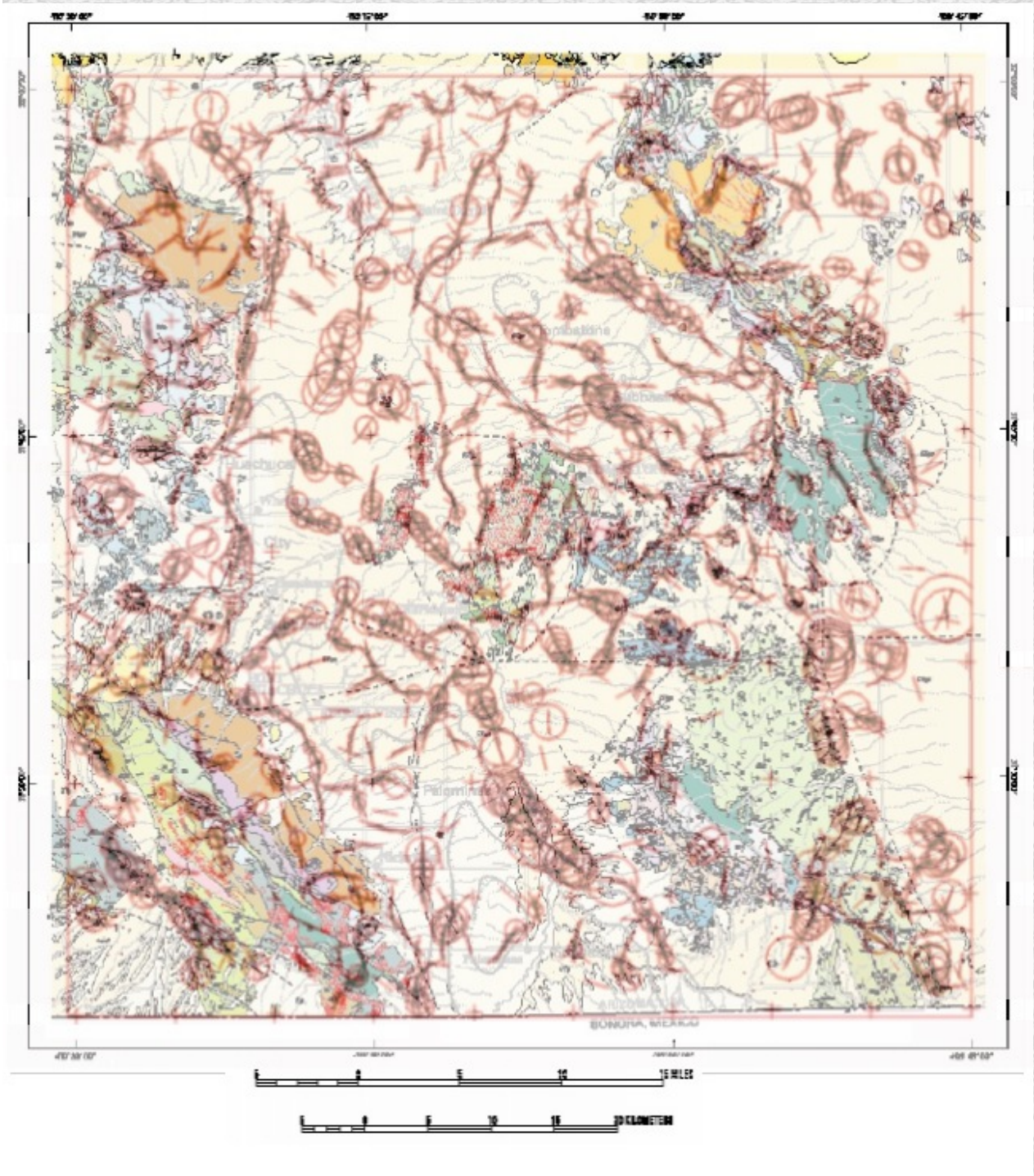


Figure 4a. Trends (line segments) and depth estimates (diameter of circles at map scale) for sources of gravity anomalies computed from the Bouguer gravity anomaly grid. Trends and depths are shown in red superimposed on the geologic map of plate 1.

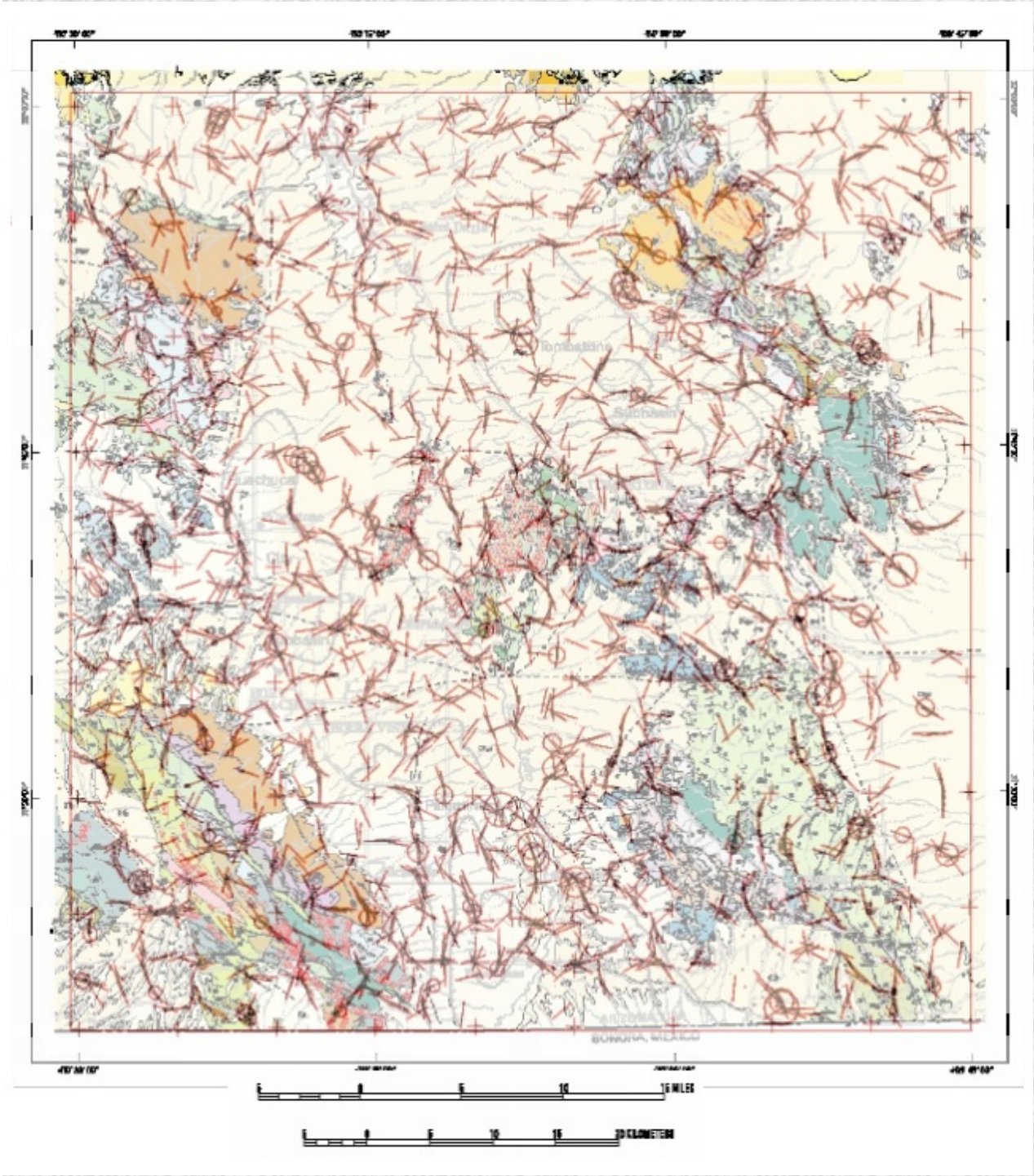


Figure 4b. Trends (line segments) and depth estimates (diameter of circles at map scale) for sources of gravity anomalies computed from the pseudomagnetic transformation of the Bouguer gravity anomaly grid. Trends and depths are shown in red superimposed on the geologic map of plate 1.

Fig. 4a shows a fairly continuous set of trends that mark the basin-bounding faults on the west side of the San Pedro basin and correspond well with known boundaries in the geologic data. Similarly, the bounding structures in the Tombstone subbasin are clearly identified, together with a number of quasi-linear features within the subbasin which appear to correlate with exposures of volcanic rocks (pl.1). Surprisingly, the Benson fault, which separates the Precambrian rocks from the Bisbee group rocks to the northeast at the northern end of the Whetstone mountains, has virtually no gravity anomaly expression. The trend analysis instead outlines a roughly circular structure beneath the Precambrian, Bisbee group, and fill to the north, and strongly suggests a buried intrusive "rafting" the northern Whetstone block structurally upward

as suggested by Gettings (1996). The bounding trend for the subbasin in the Benson area appears to be a northwest extension of the trend defining the southwest edge of the Tombstone subbasin, rather than the Benson Fault farther south.

Trends in fig. 4b are much less continuous and more random in their directions. This is due mainly to the relative scarcity of (gravity) stations relative to the variability of the magnetic field. The pseudomagnetic transformation is essentially a differentiation operation and thus introduces noise into the computed grid, resulting in more dispersion in the trend directions. The lack of sufficient station density is a low pass filter on the gridded data; this results in many fewer areas from which reliable depth estimates can be computed. Nevertheless, the trends in fig. 4b do yield additional insight into the location of structural boundaries, and where depths are available, yield a depth estimate based on different assumptions. Ideally, the depths from fig4a and 4b should bracket the true depth to source where the sources are reasonably close to the model geometries. Many of the major structural boundaries are delineated on both figures 4a and 4b. In particular, the west-southwest trending boundaries in the Sierra Vista-Fort Huachuca are well defined. At least some of these boundaries appear to be faults of shallow horsts and grabens of the bedrock high between the Huachuca City and Palominas subbasins. Bedrock of one or more of these horsts has been sampled by drillholes listed in Appendix 1.

Histograms of the computed depth estimates with error estimates of less than 20% are plotted in figures 5a and 5b. Fig. 5a shows the distribution of depths for estimates computed from the Bouguer gravity anomaly field, and fig 5b shows those calculated from the pseudomagnetic transformation of the gravity anomaly. Table 3 lists the summary statistics for these estimates and from figs 5a and 5b and Table 3 it is obvious that the pseudomagnetic transformation estimates are less than those from the gravity anomaly itself, but the distribution shape is essentially unchanged. It should be noted that the deeper depths (especially deeper than 2 km) may be due to density changes within the bedrock rather than the basin fill-bedrock interface. The most frequent depths in the distributions are in the 1.0-1.25 km range suggesting that the largest areas of the subbasins are about this depth. The shallowest depths are about 0.4 km and correspond mainly to depths to the tops of the range-bounding faults beneath basin fill, that is, the edge of the buried pediment surface. In general, areas of exposed bedrock have too small a station density to yield shallower depth estimates even though the gradient corresponds to a contact on the surface. The close coincidence of the depth estimate location and contact implies that the contacts are steeply dipping. The deeper depth estimate in these cases is due to the low pass filtering effect of the grid generation process plus the lack of closely spaced station data.

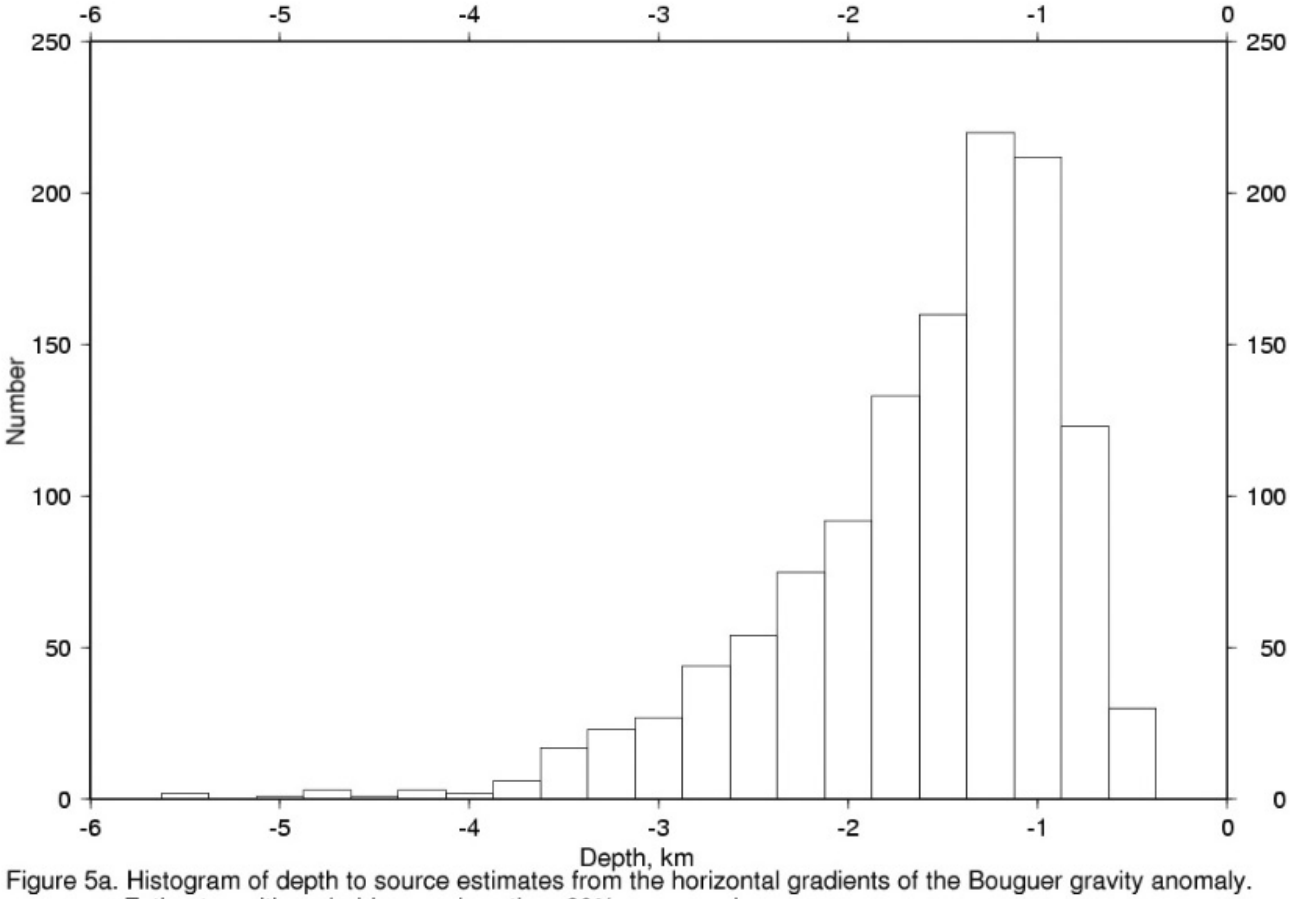


Figure 5a. Histogram of depth to source estimates from the horizontal gradients of the Bouguer gravity anomaly. Estimates with probable error less than 20% were used.

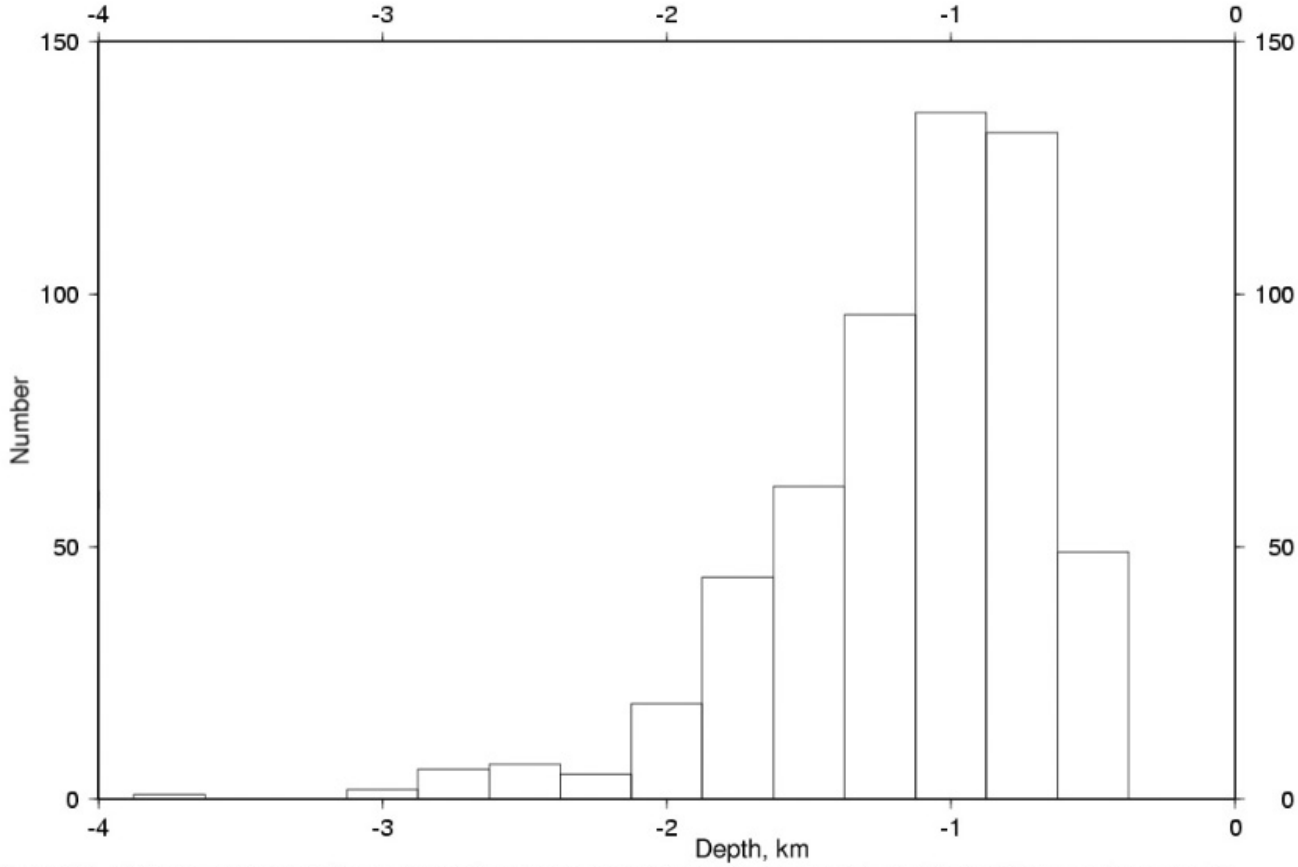


Figure 5b. Histogram of depth to source estimate computed from the horizontal gradient of the pseudomagnetic transformation of the Bouguer gravity anomaly. Estimates with probable error less than 20% were used.

Table 3. Summary statistics for computed depths to source from the Bouguer gravity anomaly dataset.

Depths estimated on:	Number of points	Minimum, km	Maximum, km	Mean, km	Stand. Dev., km	Median, km	Mode, km
Bouguer gravity anomaly	1227	0.389	5.438	1.603	0.751	1.410	1.125
Pseudo-magnetic transform	558	0.387	3.736	1.151	0.484	1.050	0.875

Estimation of basin geometry from the geologic and geophysical data

The procedure used to model the shape of the basin and the thickness of the basin fill units from the geologic and geophysical data is a refinement of that used by Gettings and Houser (1997) and is comprised of a number

of steps described in detail below. The main steps are as follows.

1) Define the density contrast versus depth functions to be used for the basin fill and the Pantano? Formation from density measurements and well logs.

2) Estimate the gravity anomaly field due to the bedrock using gravity stations located on bedrock, modified gravity anomalies at wells which penetrated into bedrock, and from appropriately upward continued estimates of bedrock gravity anomalies over the basin.

3) Calculate the gravity anomaly field due to the basin by subtraction of the bedrock gravity anomaly from the observed complete Bouguer gravity anomaly.

4) For wells which penetrated into the Pantano? Formation, calculate the depth to bedrock from the residual gravity anomaly and the known thickness of basin fill.

5) Calculate a grid of depth to bedrock (base of the Pantano? Formation) values from the residual gravity anomaly, controlled by the location of bedrock in outcrop and in wells (those that penetrated to bedrock and those that penetrated into Pantano? Formation described in step 4) and using a preliminary grid of thickness of basin fill from outcrop and well control.

6) Calculate a grid of thickness of basin fill using the depth to bedrock grid of step 5, the residual gravity anomaly grid, and all control points from outcrop and wells.

7) If the model does not fit the gravity anomaly field sufficiently well, repeat steps 5 and 6; if there is still poor agreement, steps 2 to 6 must be repeated with additional data or model assumptions to provide further constraints.

In this study, step 7 was not needed because the final model anomaly fit the basin anomaly to within the limits of definition due to the uncertainty in the bedrock gravity anomaly. However, steps 1-6 were performed numerous times because of newly discovered well data and due to the correction of errors discovered in the various datasets.

Basin-fill density functions

An element critical to successful estimation of depths from gravity anomaly data is knowledge of the density of the material filling the basin and the density of the bedrock below. Density data from well logs within the upper San Pedro basin are available for seven test wells on the Fort Huachuca Military Reservation (United States Army, 1972, 1974) and for two deep petroleum exploration wells (Schlumberger geophysical logs done in 1981 and 1982, available at the Arizona Geological Survey, Tucson). Figure 6 shows the measured densities as a function of depth for Test Well 8 (well 85, appendix 1) and interval averages for the deep petroleum exploration well drilled in 1982 by Phillips Petroleum Company (#A-1) located about 4 km east of Whetstone, (table 1; well 30, appendix 1). Note that the upper 324 m (1,062 ft) of the Phillips well were not logged for density.

All densities were determined by a downhole compensated gamma-gamma formation density logging tool. Although the data show large variability, they generally show increasing density with depth and changes of density with lithology. The section of the log of Test Well 8 (fig. 6) from 11 to 193 m corresponds to density in the basin fill sediments both above and below water table, which stood at 75 m (245 ft) at the time of logging. The interval from 193 to 395 m corresponds to the density of the consolidated sediments that are interpreted to be the Pantano? Formation. The density variations over short vertical distances in the log of Test Well 8 are interpreted to be due to changes in the proportion of silt, sand, and gravel, as well as degree of cementation. The approximately linear increase in density with depth of the basin-fill unit is interpreted to be due mainly to compaction of the unconsolidated basin fill. It is notable that there is not an obvious increase in density at the water table (75 m); this can only mean that the porosity is low and may indicate that there is not a large proportion of connected pore space in this interval of the material penetrated by Test Well 8.

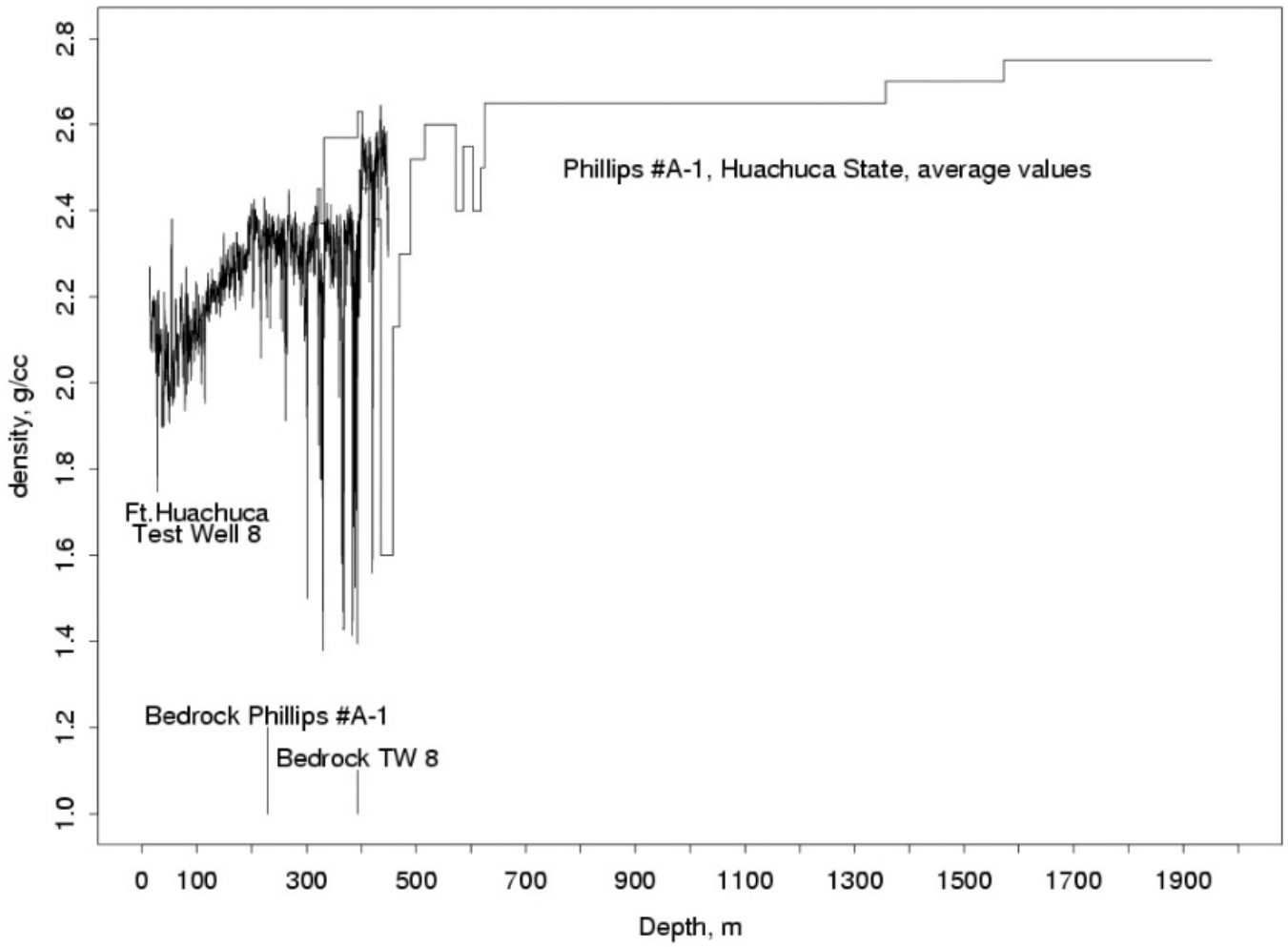


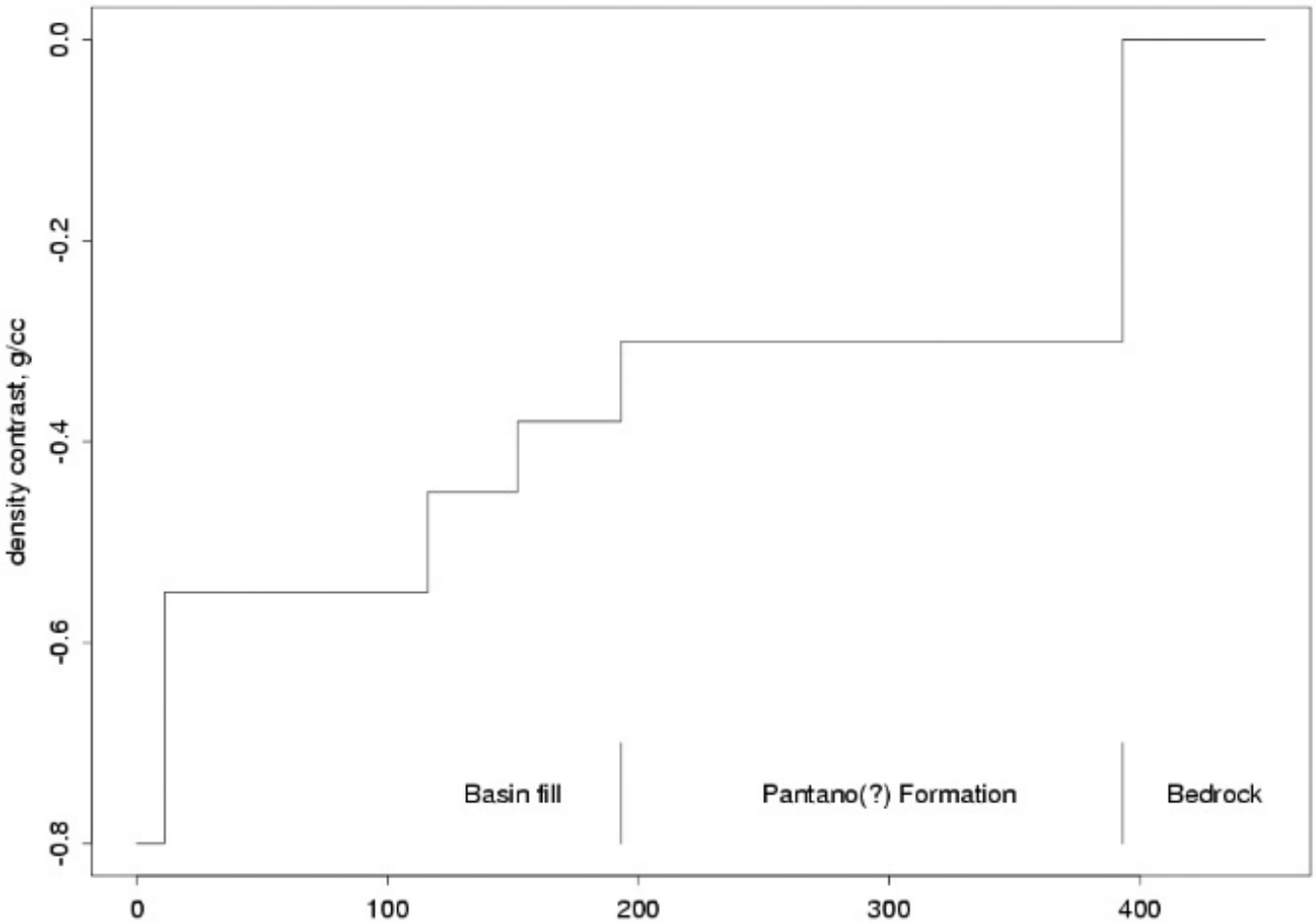
Figure 6. Compensated gamma-gamma formation density logs of two drillholes which penetrated to bedrock. Values shown for the Phillips #A-1 hole are interval averages.

Also shown in figure 6 are interval average densities for the density log of Phillips Petroleum A-1, Huachuca State well, determined by averaging more or less constant density segments of the log by eye, as the log has not yet been digitized. All of the log is in bedrock of the Cretaceous and Jurassic Bisbee Group and older formations (Table 1) and serves as a good example of how variable the bedrock density function may be. The thickness-weighted average bedrock density of the log for the interval shown on figure 6 is 2.65 g/cc, which is taken as the average bedrock density for the area in this study. This value corresponds closely with the Bouguer density of 2.67 g/cc used in the reduction of the gravity data.

Density functions which are a function of depth present analytical difficulties in gravity anomaly model calculations, so the segment of figure 6 that shows increasing density with depth of basin fill is approximated with three constant mean values for intervals as tabulated in table 4. The density contrast, that is, the difference between the sediment and the bedrock density, is shown in figure 7. Note that more intervals are used in the shallow part of the function where the density changes with depth are large. The shallow layers also have a larger effect because the gravitational force varies as the inverse square of distance, so it is important to model them adequately. An 11 m thick uppermost layer corresponding to dry, unconsolidated surficial alluvium has been included in the density contrast function.

Table 4. Density versus depth functions for the basin fill, Pantano? Formation, and bedrock.
Density contrast is sediment density minus bedrock density.

Unit	Depth (ft)	Depth (m)	Density (g/cc)	Density contrast (g/cc)
basin fill				
dry	0-36	0-11	1.85	-0.80
dry/saturated	36-381	11-116	2.10	-0.55
saturated	381-499	116-152	2.20	-0.45
saturated	499-633	152-193	2. 27	-0.38
saturated	633-	193-	2.27	-0.38
Pantano? Formation				
saturated	0-1312	0-400	2.35	-0.30
saturated	1312-	400-	2.35	-0.30
Bedrock (average)			2.65	0.00



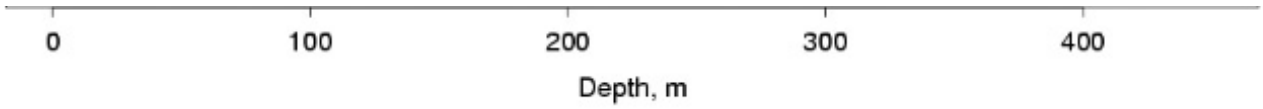


Figure 7. Density contrast function relative to bedrock adopted for this study.

Separation of the basin gravity anomaly

The interpretation of gravity anomaly data depends on the separation of the anomaly due to the geologic bodies of interest from the observed anomaly, which is the total gravity anomaly from all sources. Numerous methods are available for this procedure, but most are numerical methods that may or may not be geologically reasonable. The method used here follows that of Saltus and Jachens (1995), and is regarded as the best for this study because it defines the regional field using the gravity anomaly field from the bedrock of the surrounding ranges and from wells within the basin which intersected bedrock. Before discussing the details of the regional anomaly field estimation, a digression to describe the model used to calculate the gravity effect of a basin from its fill thickness, or to calculate the depth of fill from the basin gravity anomaly is necessary. The model was used repeatedly in this work to calculate gravity effects or thicknesses.

Using the density contrast functions discussed above, depths to bedrock can be estimated from the gravity anomaly. Depths are traditionally computed using an infinite horizontal slab model for the various density layers because of computational simplicity (for example, see Litinsky, 1989). However, the infinite slab formula is independent of depth to the slab and has infinite mass, leading to depth estimates that are too shallow. With the ready availability of computers, finite models are easily used to produce more realistic estimates. For this work, the finite right circular cylinder with vertical axis was used. For points on the axis, the exact solution is available (Duska, 1958). The model then consists of a stack of cylinders with coincident axes, each with a density contrast and thickness corresponding to the density contrast function of figure 7 and a radius appropriate for the basin being modeled (figure 8). When a site is located near a gravity anomaly gradient interpreted to be a fault, partial cylinders may be used as shown in the lower cylinder of fig. 8. This feature allows the interpreter to get accurate depths in the footwall right up to the fault, and the overlying cylinders model the fill on the pediment surface quite accurately. The partial cylinder gravity effect is obtained by calculating the effect of the missing part of the cylinder approximately using a series of partial cylindrical annuli and subtracting this effect from that for a whole cylinder.

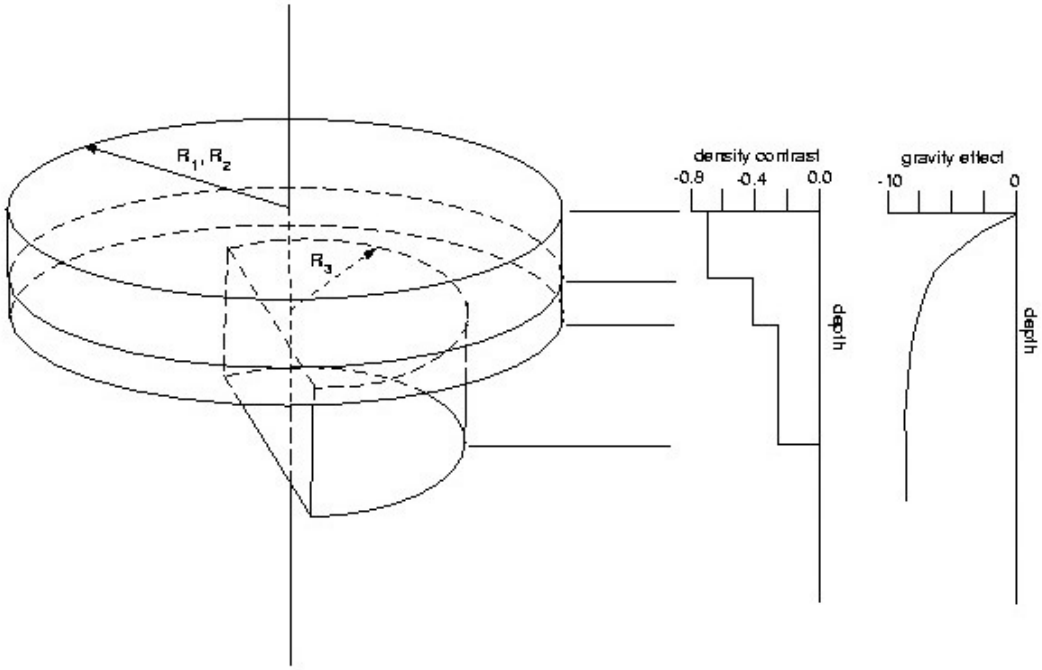


Figure 8. Illustration of the stack of coaxial vertical axes cylinders model used in gravity anomaly modelling. Note that each cylinder may have a different density contrast and radius, and may range between a full cylinder and a partial one, such as the half cylinder with radius R3. A diagrammatic density contrast function and cumulative gravity effect plot are shown.

Computer programs were written for several versions of this model, all of which use the density contrast functions for the basin fill and the Pantano? Formation described above. For the estimation of gravity effects, a version was written which uses the depth to Pantano? Formation and bedrock as input. Another version uses the depth to Pantano? Formation and residual gravity anomaly to calculate depth to bedrock using the method of bisection. Both of these programs additionally require radii and fraction of the cylinders as input parameters. Finally, there are two programs written to work on grids of residual gravity anomaly data, using grids of depth constraints. One of these programs uses a grid of depth to the Pantano? Formation and a grid of drillhole and outcrop depths to bedrock to calculate the depth to bedrock for all grid points in the basin. The other program uses a grid of depth to bedrock and a grid of drillhole and outcrop depths to the Pantano? Formation to calculate the depth to the Pantano? Formation for all grid points in the basin. These two programs use the stack of cylinders model for the grid point being calculated and a stack of finite (vertical) lines of mass for grid points off axis but still in the basin. No fractional cylinders are used and needed radii and distances are defined by the grid. Listings of the code for these four computer programs are given in Appendix 5.

For this work the upper basin fill or the Pantano? Formation functions were used as required by the log of the well. Because the density logs do not show much sensitivity to the presence of water, the values were not adjusted for the depth to water table.

Based on the assumption that the rocks exposed in the adjacent ranges are likely to be the same as those that underlie the upper San Pedro basin, the regional field was defined by generating a coarse interval grid (5-km in this case) of Complete Bouguer gravity anomaly values from stations that are not located on upper basin fill or on Pantano? Formation. At each of the wells that penetrated into bedrock, the gravity effect of the basin fill and Pantano? Formation was calculated using the density contrast functions and software described above. This computed value was then added to the Complete Bouguer gravity anomaly value at each well location to

yield the value that would be observed if the basin sediments were not present (Appendix 2). For this study, 206 stations were located on bedrock. These stations, together with the calculated values at 42 well locations that penetrated to bedrock (App. 2) and 10 locations on bedrock interpolated from the Complete Bouguer gravity anomaly map (pl. 3) where there were no station data, were used to calculate the coarse interval grid. Grid values for grids in this report were calculated by the method of minimum curvature (Briggs, 1974). This method of calculation will generate steep gradients at the edges of areas with no data points, so a coarse grid interval is used in a first pass to obtain a smooth interpolation. The grid is then recomputed using both the data for the coarse grid and the coarse grid points themselves to obtain a smooth grid at the same interval as the complete Bouguer gravity anomaly grid.

One additional complication arises in this process in parts of the basin where there are no drillholes to bedrock and thus no regional gravity control points. In these areas, the value of regional gravity estimated by the minimum curvature grid generation process is the value expected if the bedrock were in outcrop at the surface, since it is being interpolated from areas of bedrock outcrop. In fact, the bedrock in the basin is buried by the basin fill and thus the gridded values should be upward continued by a distance equal to the depth of burial. Since the depth of the basin is an unknown, one cannot calculate the continuation directly. Instead, "phony" stations are introduced where needed using a simplified continuation procedure discussed below. The "phony" stations are calculated by continuing the values from the coarse grid at points where control is needed due to lack of drillhole control. For this study thirteen "phony" stations were used. Two of these were in the Palominas subbasin; the others were in areas of poor gravity station coverage over basins such as south and west of Benson, east of Tombstone and Bisbee, and northeast of the Dragoon Mountains. These stations are included on plate 4 and can be identified as those which do not correspond to a drillhole to bedrock (pl. 2) and do not occur on bedrock outcrop (pl. 1). For purposes of the continuation procedure, a rough depth estimate from the estimated basin anomaly from the complete Bouguer gravity anomaly (pl. 3) using the stack of cylinders model was used.

In order to calculate a simple upward continuation factor, the continuation integral for a simple "plateau" anomaly was calculated. This corresponds to a mean anomaly due to bedrock of a range of the order of 20 km characteristic size. The upward continuation integral is (Grant and West, 1965)

$$\Delta g(\vec{r}) = \frac{|z|}{2\pi} \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \frac{\Delta g(\xi,\eta)}{R^3} d\xi d\eta$$

where

$$R = \left[(x-\xi)^2 + (y-\eta)^2 + (z-\zeta)^2\right]^{\frac{1}{2}}, z \le 0, and \zeta = 0$$

is the data surface**.**

Take the observation point $\vec{r}$ to be (0,0,z) where $z \le 0$, then $R = (\xi^2 + \eta^2 + z^2)^{\frac{1}{2}}$. Now suppose that the gravity anomaly $\Delta g(\vec{r})$ is a constant (boxcar function) within the rectangular area and zero elsewhere

$$\Delta g(\xi,\eta) = \Delta g_0, -X \le \xi \le X; -Y \le \eta \le Y$$

$= 0$ otherwise.

Although this function is not strictly a potential field function because of the discontinuities at $\pm X$ and $\pm Y$, we are not concerned about the details of anomaly shape at the boundaries since upward continuation at the center of the rectangle is the goal. One can assume the actual anomaly shape change occurs

continuously between grid points. Integration yields

$$\Delta g(0,0,z) = \frac{2\Delta g_0}{\pi} \tan^{-1} \frac{XY}{z(X^2+Y^2+z^2)^{\frac{1}{2}}}$$

as the desired relation.

To evaluate the accuracy of this formula for real cases, two tests were carried out. In the first, the gravity effect of a unit density sphere of radius 5 km with center at 10 km depth was evaluated. The upward continued field over the sphere was evaluated at 1 km and 5 km upward continuation distances. The upward continued field was also evaluated by Fourier transform techniques (program FFTFIL, Hildenbrand, 1983) and the above formula. For 1 km continuation distance, FFTFIL gave a value 0.75% too large while the formula above gave a value 0.50% too small compared to the exact solution. For 5 km distance, compared to the exact results, FFTFIL was 6.8% too large and the formula 25% too small, a result to be expected since at this distance the source is much more a point source than a "plateau" anomaly. In the second test, a grid was computed with gravity anomaly values equal to zero except in a rectangle 20 km by 30 km in the middle, where they were set to 10 mGal. Both FFTFIL and the formula were evaluated for upward continuation distances of 1, 2, and 3 km. For 1 and 2 km distances, the formula was about 3% smaller than FFTFIL, and for 3 km continuation, it was about 6% smaller than FFTFIL. From the sphere comparison, we conclude that FFTFIL overestimates the value whereas the formula underestimates them and thus the errors in the second test must partially cancel. For the application here, an error of 3% or less is acceptable as the determination of the bedrock regional anomalies are probably less certain than 3% in any case. Here we are only interested in how to reduce the value for bedrock due to burial beneath the basin. Dimensions of 20 km by 20 km and continuation depths of 0-2 km (about 10% or less of the horizontal extent of the source) are the appropriate values so that the simple approximation of the formula above is entirely adequate.

The coarse grid (5 km interval) was recomputed using the upward continued "phony" stations in addition to the original points, and then recomputed at 1-km intervals as described above to yield the regional gravity anomaly field shown in plate 4. This grid was then subtracted from the complete Bouguer gravity anomaly grid generated using all stations to yield a residual gravity anomaly grid shown as a contour map in plate 5. Because the density-depth functions are fixed in the formulation of Saltus and Jachens (1995), whereas here the object is to find the variations in the depth to the intra-sedimentary contact, the modeling scheme is carried out somewhat differently from that described by those authors. In this study, the residual gravity anomaly, shown in plate 5, forms the basic data for analysis.

Estimation of depth to bedrock

Using the residual gravity anomaly defined above, depths to bedrock were computed at all wells that penetrated into the Pantano? Formation but not to bedrock. For each of these wells, parameters defining the average radii and fractions of cylinders to be used were defined by overlaying the well locations (pl.2), residual gravity anomaly (pl.3) and geologic map (pl.1). The stack of cylinders model was then used to compute depth to bedrock. Appendix 3 summarizes the parameters and the final estimated depth to bedrock for the 56 wells that penetrated into the Pantano? Formation.

Next, a grid of bedrock depth estimates at a 1-km interval was computed using the following three grids as controls. (1) A grid was constructed that contained the outline of bedrock outcrop and that flagged all grid cells on bedrock as zero depth. Into this grid were inserted the locations and control depth points from the 42 wells of Appendix 2 and the 56 wells of Appendix 3. (2) A second grid was constructed by minimum curvature interpolation using the bedrock outcrop and the depths to the top of the Pantano? Formation from the wells of appendices 2 and 3 as data points. This grid is the first estimate of the thickness of basin fill. (3) The residual gravity anomaly grid of plate 5 was used to compute depth estimates using the stack-of-cylinders model and using the second grid for the depth to the Pantano? Formation and the first grid for control points. The depth-to-bedrock grid is shown in plate 6 at a contour interval of 0.1 km.

Estimation of thickness of basin fill

Depth to the contact between the basin fill and the Pantano? Formation was computed from the the residual gravity anomaly (pl. 5), the estimated depth to bedrock (pl. 6), and the density contrast-depth functions of figure 7 using the following algorithm. First, the density contrast-depth function (table 4) was split into one function for the upper basin fill, and a second function for the Pantano? Formation. For a given total depth (depth to bedrock), one can compute the gravity anomaly as a function of the depth to the contact between the upper basin fill and the Pantano? Formation. Then for the residual basin anomaly at that point, one can interpolate the depth to the contact from the gravity anomaly-depth function just computed. This proceeds for all points in the grid. Points on bedrock are not computed, and points where depths to bedrock or Pantano? Formation are known (for example, wells in appendix 2) are not allowed to change. The model gravity effect from the new model is then computed and compared to the residual gravity anomaly grid. Differences between the model and the gravity anomaly data are then used to assess the quality of the gravity model.

Thus, this procedure finds the depth to Pantano? Formation that best fits both the gravity anomaly and the estimated depth-to-bedrock datasets, constrained by the known depths to the Pantano? Formation. It must be noted that because of the inherent ambiguity of solutions to the gravity anomaly field, iteration has to be used with caution, and the process is more one of interpolation of the known depths using the gravity anomaly as a guide, rather than an iterative procedure. If necessary, the depth to bedrock can then be adjusted and the procedure repeated. For this study, the rms misfit between the model and the residual gravity anomaly (pl.5) was 0.65 mgal, and further adjustment is not justified as the uncertainty in the residual gravity anomaly value is at least as large. In the course of carrying out these computations, it was found to be necessary to assume the depth of fill in the area of wells 99, 104, and 106 because the algorithm yielded small thicknesses of basin fill relative to the thickness of Pantano? Formation in this area. We could find no geologic justification for this being the case. We therefore assumed that the depth to the top of Pantano? Formation was about the same as to the south at well 108 and to the northwest at 105, for example, and used a depth of 200 m for the top of Pantano? Formation at wells 99, 104, and 106. The deepest well in this cluster, 104 (app. 1), penetrated only basin fill in the total depth of 183 m.

Plate 7 shows the depth to Pantano? Formation computed using the residual gravity anomaly grid (pl. 5), the depth to bedrock grid (pl. 6) and the control grid described above. Plate 7 shows that areas where the basin fill is thicker than 200 m form a belt in the basin about midway between bedrock outcrop on the west and the San Pedro River on the east. Basin fill is thicker over the two subbasins; the larger subbasin extends from the area of Huachuca City north to Whetstone (pl.1), and the other is southwest of Hereford (pl.1). The depth of basin fill in the bedrock high area between the two subbasins is generally 200 m or less (pl. 7).

In general the agreement of calculated depths for the grid with control values is good. Some areas have several control points within a one-km grid cell and the editing process assigns a value to the grid point equal to the last one in the list falling in that cell. This is not a serious difficulty because from field observations we know that the variations in the degree of consolidation of the Pantano? Formation and the possibility of relief on the contact of at least 20 m mean that we can only estimate an average depth in any case. Real variations in the physical properties of the basin units probably preclude any more accurate knowledge of the interface over small areas.

Conclusions

Based on reasonable approximations, we have constructed a basin-fill model that satisfies constraints from geologic, well log, and gravity anomaly data. This model indicates that within the study area, the upper San Pedro basin is composed of a series of structurally controlled subbasins with intervening bedrock highs. Some of the highs outcrop, such as the Tombstone Hills, while others are buried beneath the alluvial fill of the basin. The subbasins are approximately 1.0 to 1.7 km in depth, and generally filled with a consolidated alluvial unit overlain by an unconsolidated basin fill unit. The only areas of significantly thick basin fill are within those areas which have already been established by well logs. North of Huachuca City, the consolidated basin unit, the Pantano? Formation, is not present at least locally in wells and does not outcrop.

We have included an animation of a rendering of the depth to bedrock and depth to the top of the Pantano (?) Formation. In the animation, the grid of computed bedrock depths (pl. 6) is the smooth colored surface and the colored wire frame is the depth to the top of the Pantano(?) Formation (pl. 7). The depth estimates from

the gravity anomaly and pseudomagnetic transformation of the gravity anomaly (figs. 4a and 4b) are also shown. The animation shows the surfaces from above and below and multiple viewpoints in order to help visualize the subbasins and the bedrock highs. Although a few of the depth estimates are above the model surface, most ar well below it and represent maximum depth estimates.

Plate 8 shows a color shaded relief image of the residual gravity anomaly pl. 5) with the contours of the calculated depth to bedrock (pl.6) superimposed. Areas of pl. 8 where contours are lacking correspond to areas of shallow cover or outcrop (note that the first contour is the 0.1 km depth contour to keep the figure uncluttered). Examination of areas of bedrock outcrop in pl.8 (see pl. 1 for geologic map) shows that there are significant gravity anomalies within the bedrock areas. We expect that the same kind of relief of the gravity anomaly field is present in the bedrock beneath the basin fill although the amplitudes of the anomalies will be less because of the upward continuation effect from burial beneath the basin fill. In this study, we have attributed all negative gravity anomalies in the basin area to the thickness of less dense alluvial units. However, some of the negative anomalies over the basin may in fact be due, at least in part, to low density units in the bedrock. If this is the case, then the modelled basin depths will be too deep. Therefore the model depths of this study should be viewed as maximum depths of fill. The opposite case, namely where a positive bedrock anomaly masks part of the basin fill anomaly does occur between Sierra Vista and Charleston, but we believe it has been adequately accounted for by the control from wells and analysis of the aeromagnetic data (Gettings, 1999). In any case this effect of positive anomalies is not as serious a limitation because there are not many rocks in the bedrock more dense than the average density of 2.67 g cm^{-3} used in the model. Large areas of mafic intrusive rocks which might be significantly more dense are not present in outcrops within the study area (pl.1).

We have identified a number of previously unrecognized faults and several outcrops of bedrock (pl. 1). The shape of the subbasins is predominantly controlled by the pattern of faulting. Some of the faults may affect the course of the river. The possibility that these and other faults may also control the movement of ground water should be investigated. In all of the subbasins defined in this study, the subbasin shape appears to be controlled by a combination of northwest-southeast trending older structures and younger approximately north-south trending structures. The older trend expresses the northeast-southwest directed extensional tectonic event, and the younger the more recent east-west directed Basin and Range extensional event.

Acknowledgments

We gratefully acknowledge the many people who assisted in collecting geologic and geophysical data for this project. Karen Baird established 66 new gravity stations in the study area. Don Pool contributed data for 46 gravity stations in critical parts of the eastern Fort Huachuca area. Frederick Houser assisted in the geologic mapping. The Arizona Geological Survey gave permission to study well cuttings. Funding for this project was provided in part by the United States Army, Fort Huachuca Garrison.

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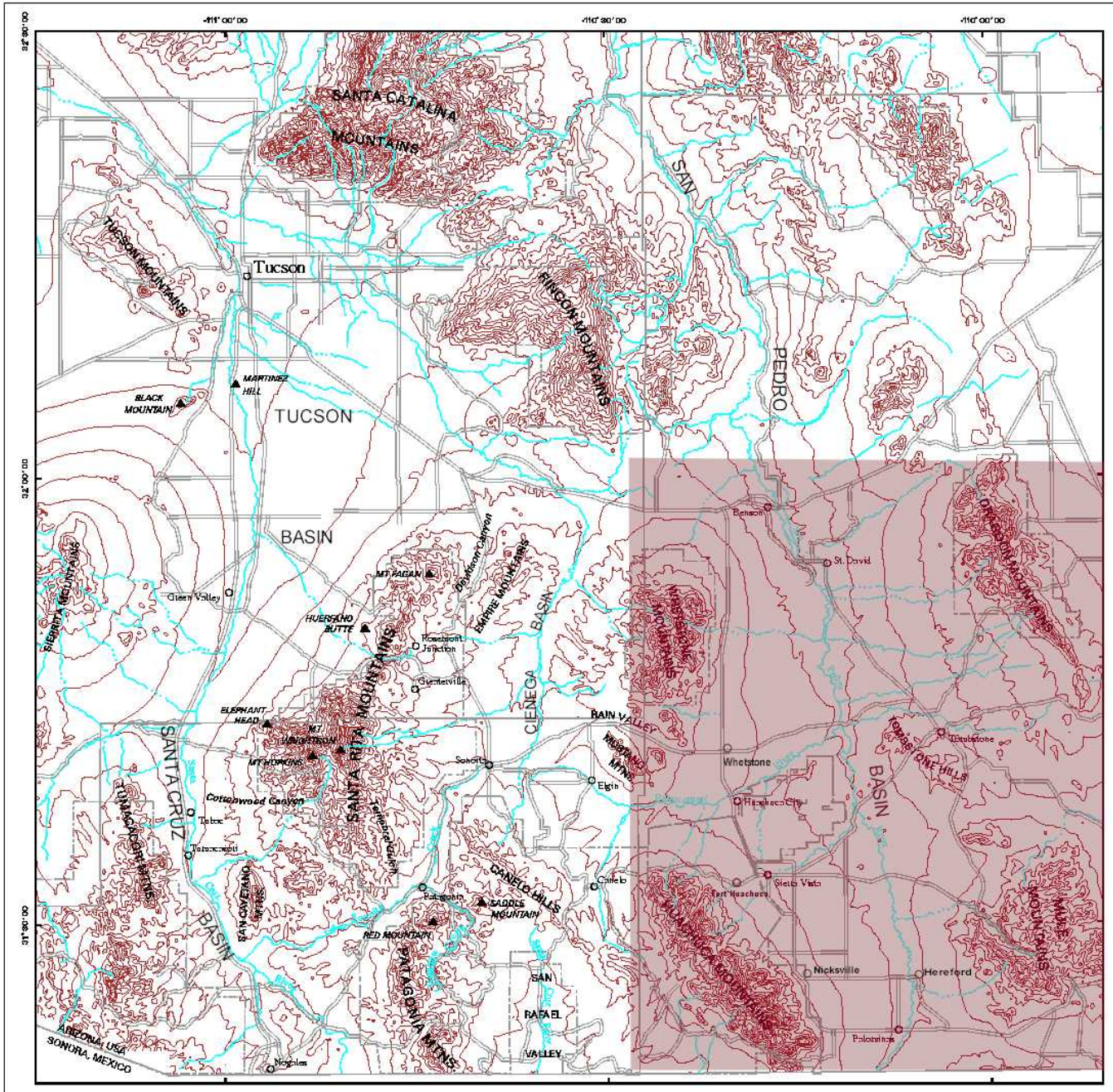
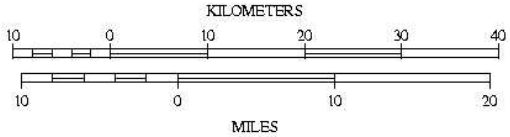


Figure 1.

Location map of the study area.

Contour interval is 100 meters



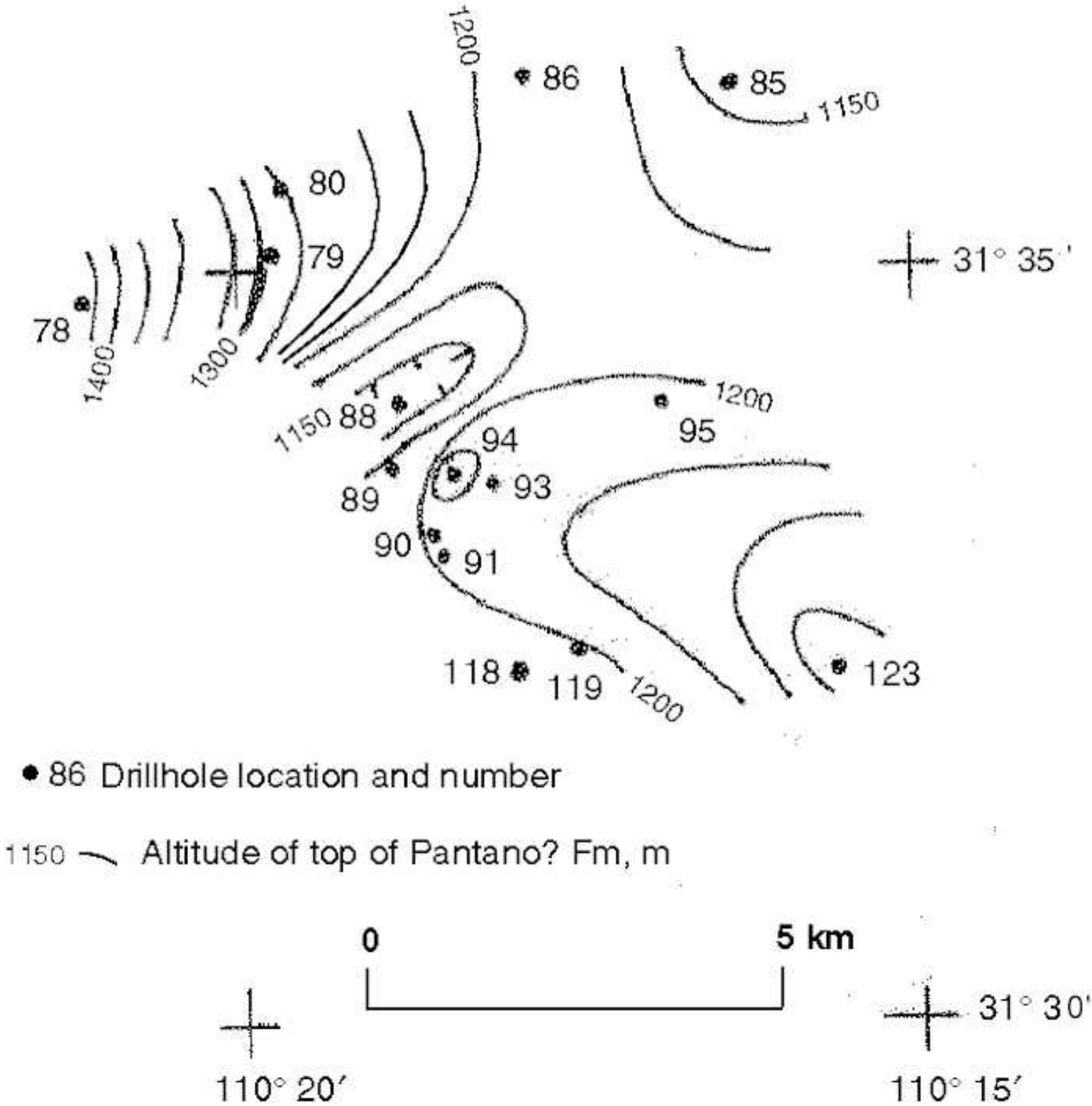


Figure 2. Contour map of altitude of the top of the Pantano(?) Formation in the Sierra Vista-Fort Huachuca area. Numbered dots correspond to drillholes (Appendix1) which penetrated into the Pantano(?) Formation. Contour interval is 25 m.

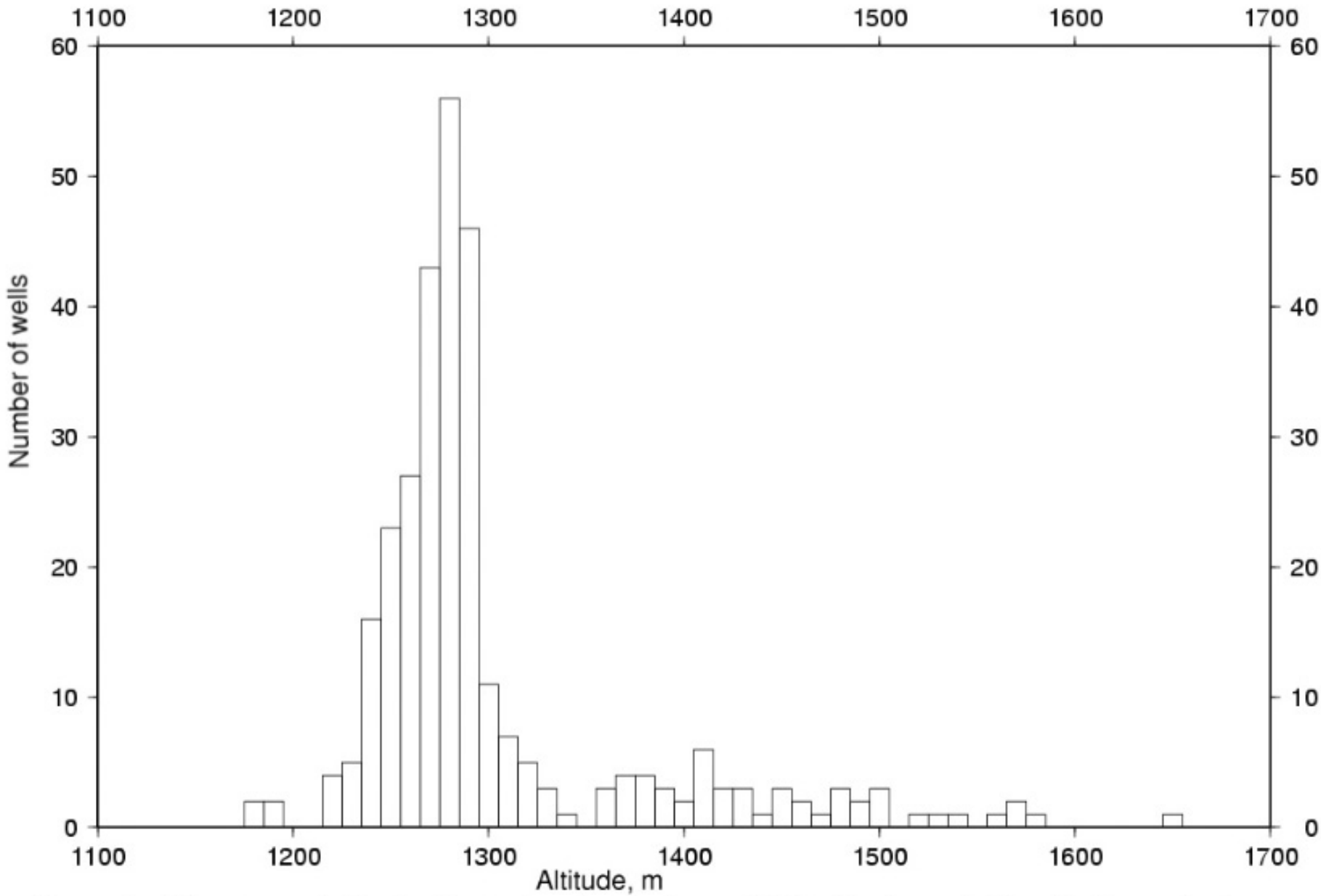


Figure 3a. Histogram of altitude of water level at the time of drilling for the wells listed in Appendix 1.

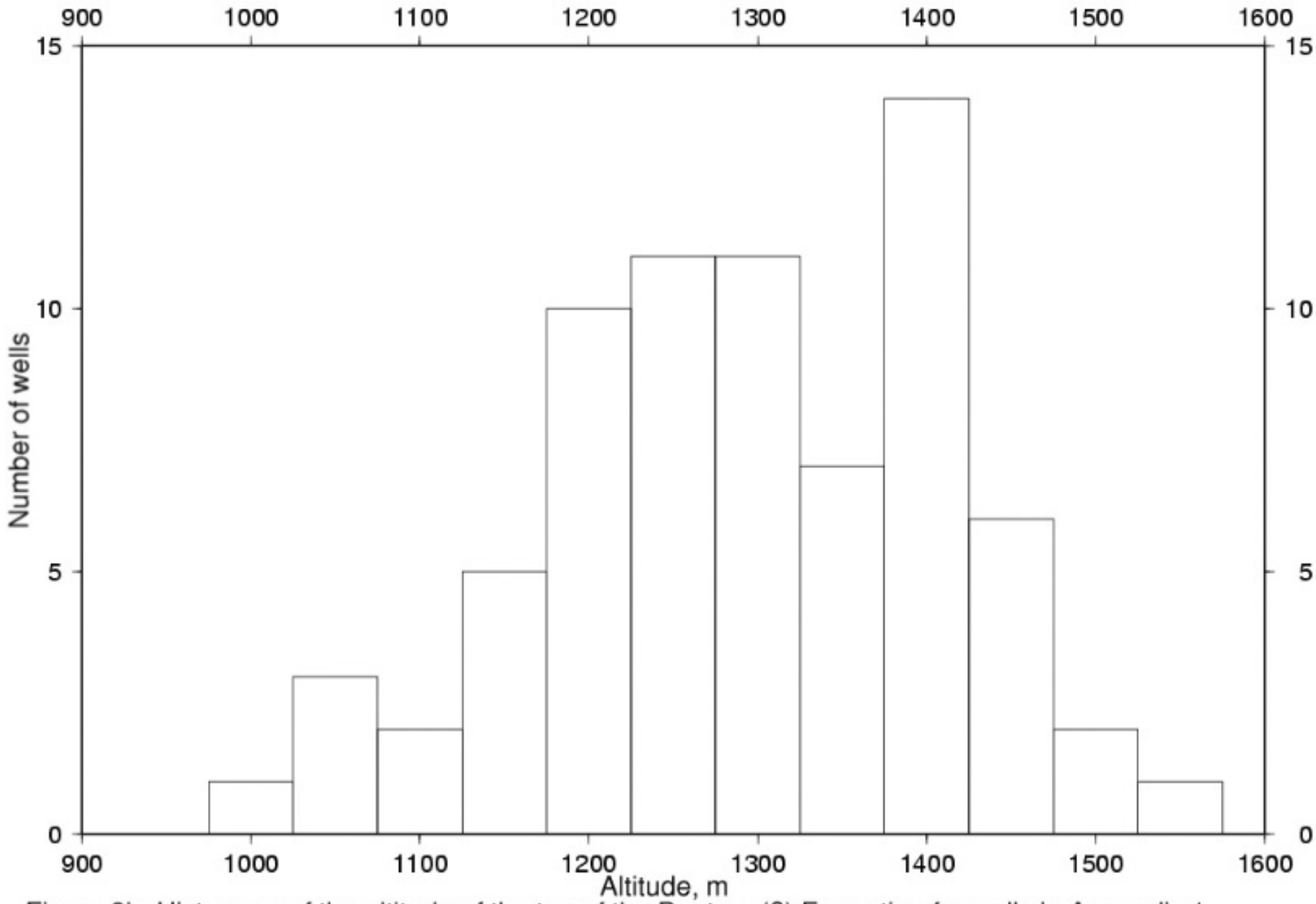


Figure 3b. Histogram of the altitude of the top of the Pantano(?) Formation for wells in Appendix 1 that penetrated into the Pantano(?) Formation.

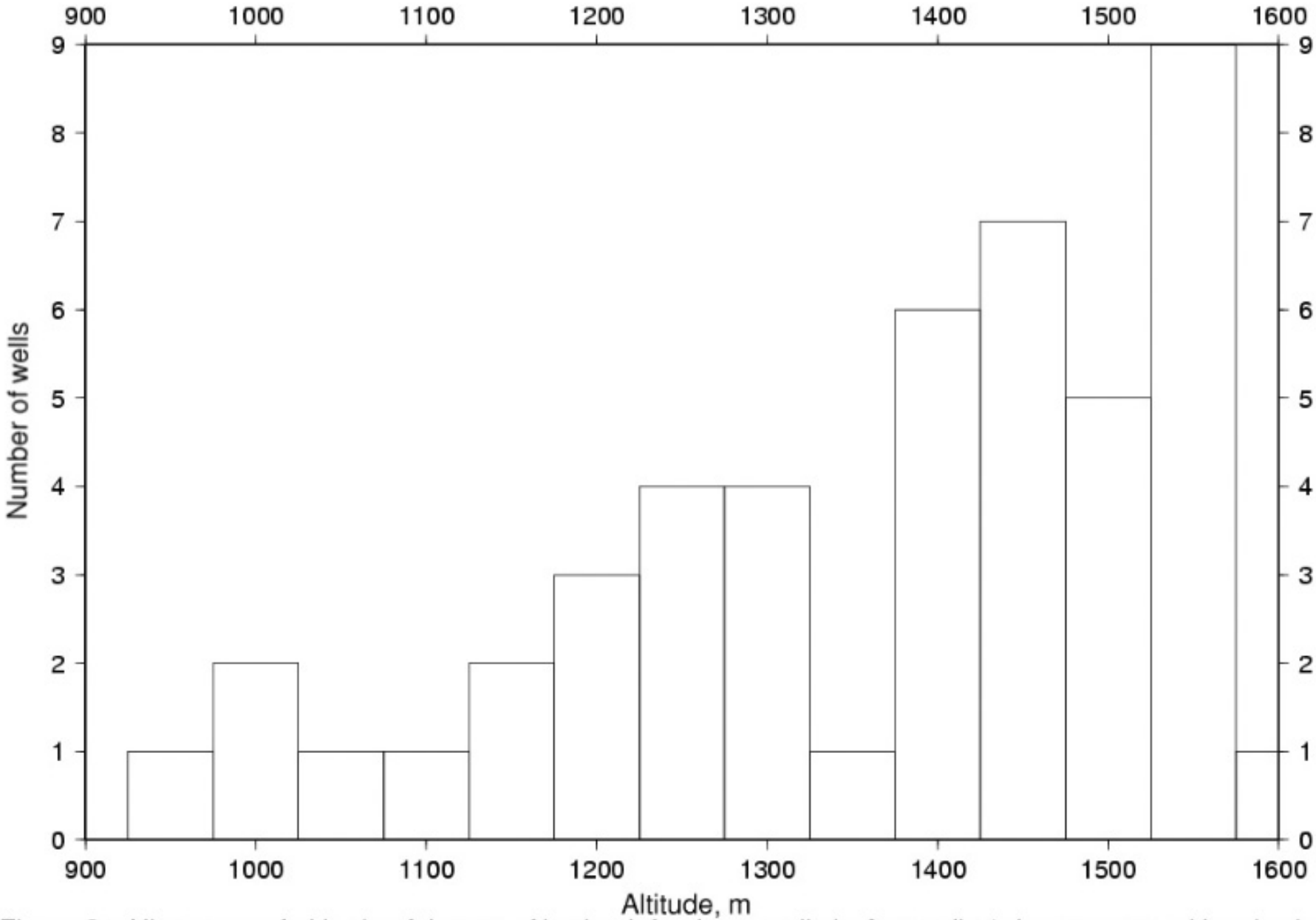
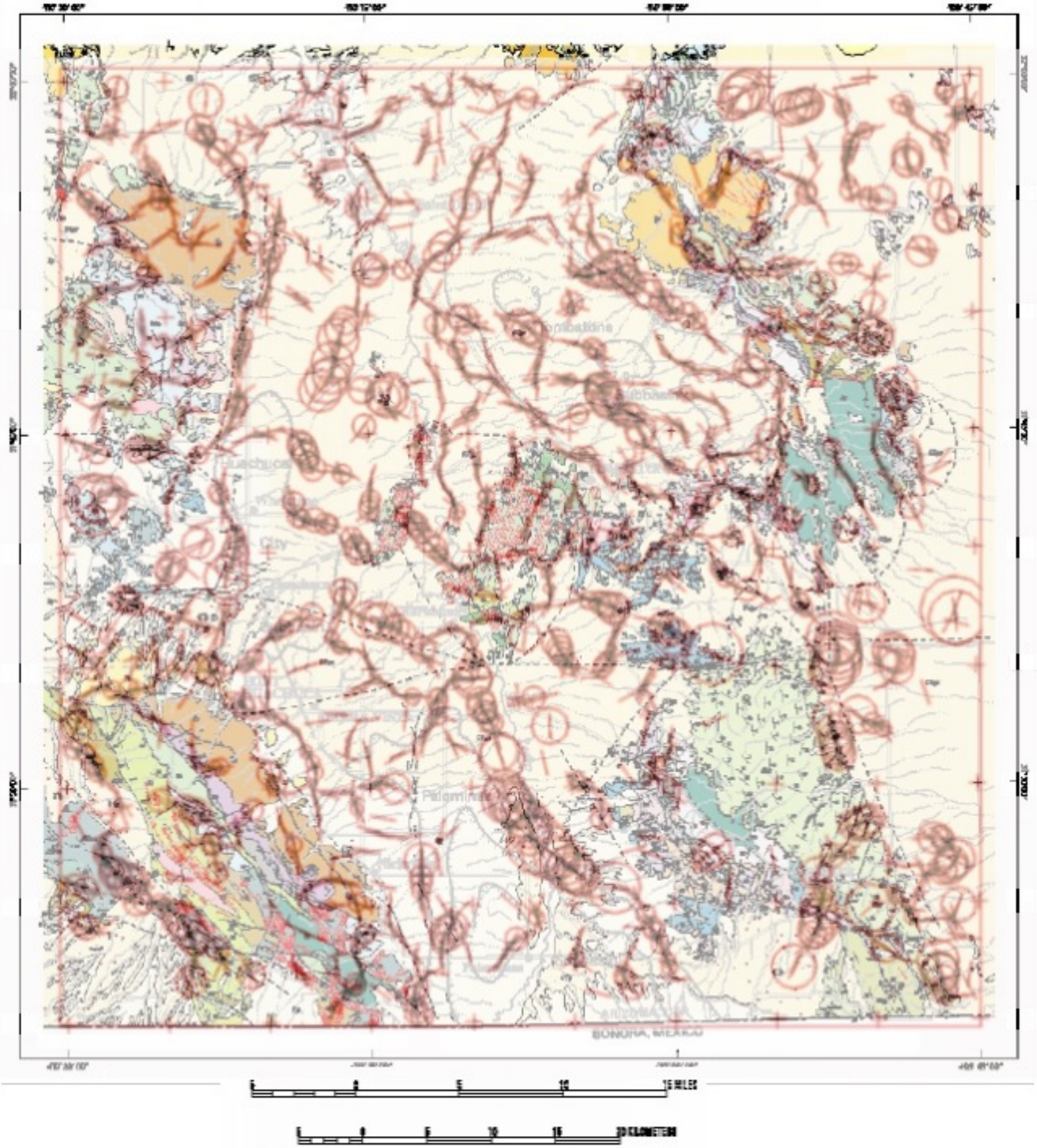
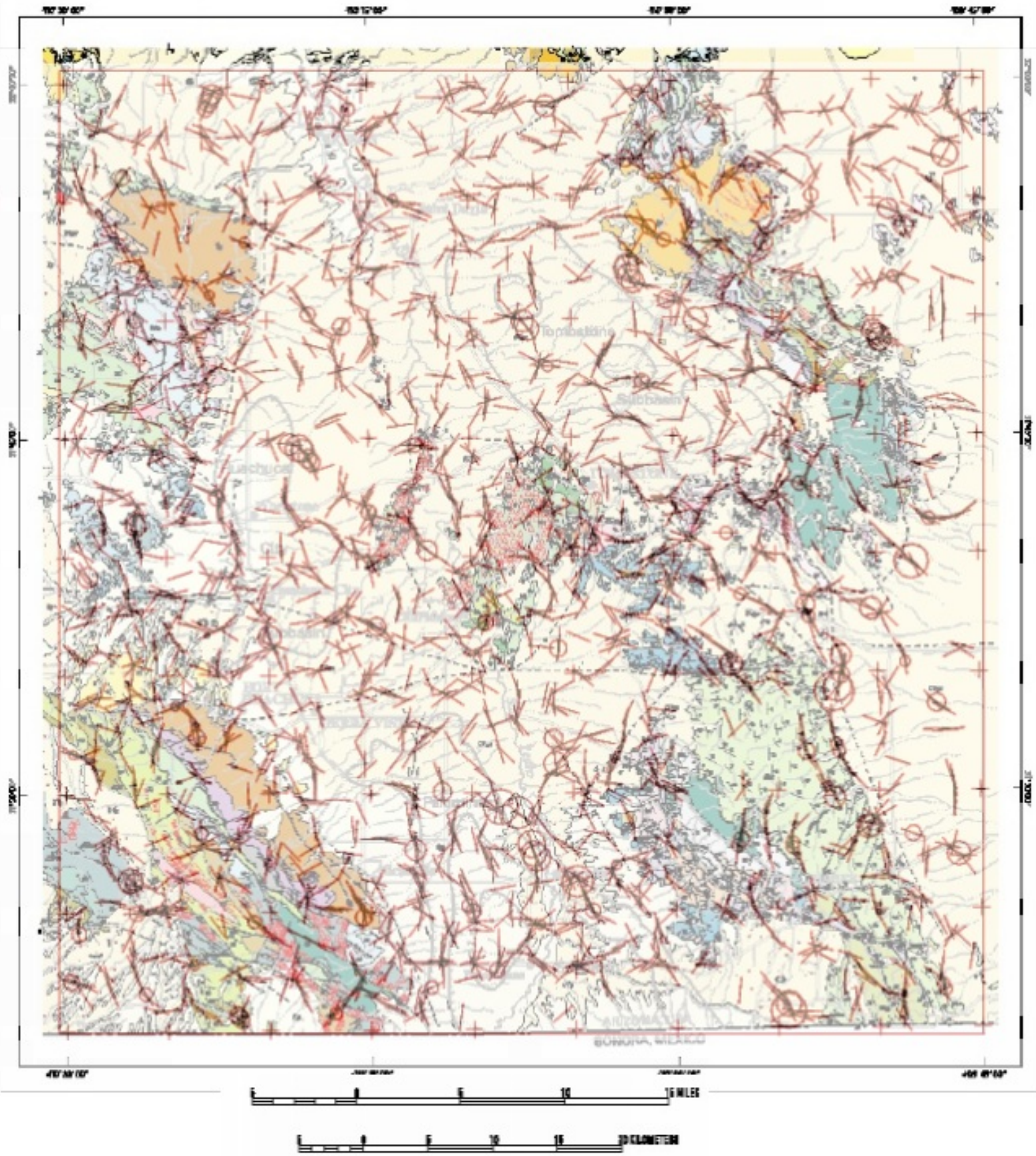


Figure 3c. Histogram of altitude of the top of bedrock for those wells in Appendix 1 that penetrated into bedrock.




Tombstone
Sierra Vista
Bisbee
Douglas
Sunsites
Pearce
Cochise
Dragoon
Benson
Tombstone
Huachuca City
Sierra Vista
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Douglas
Sunsites
Pearce
Cochise
Dragoon
Benson
ARIZONA
SONORA, MEXICO
MILES
KILOMETERS

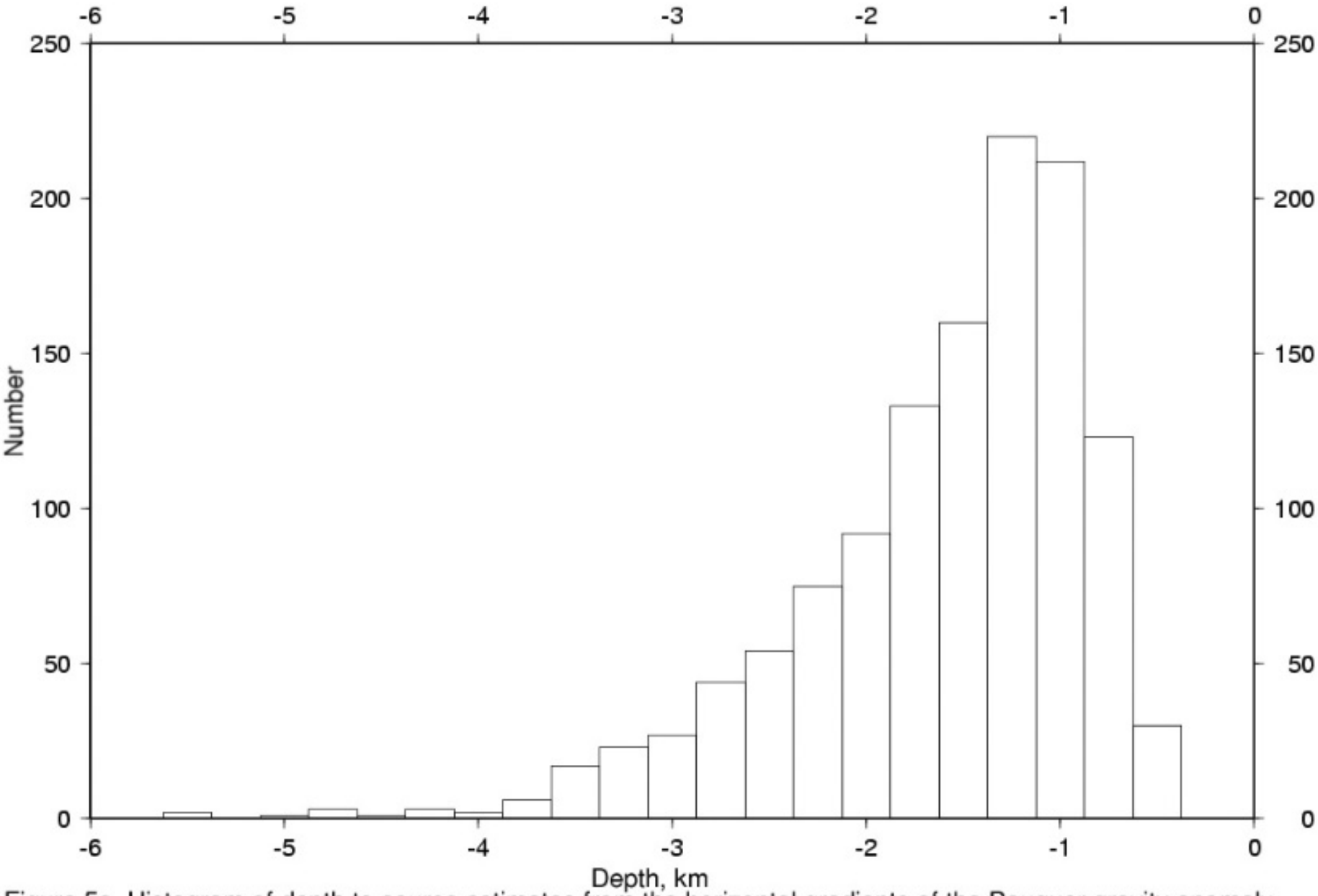


Figure 5a. Histogram of depth to source estimates from the horizontal gradients of the Bouguer gravity anomaly. Estimates with probable error less than 20% were used.

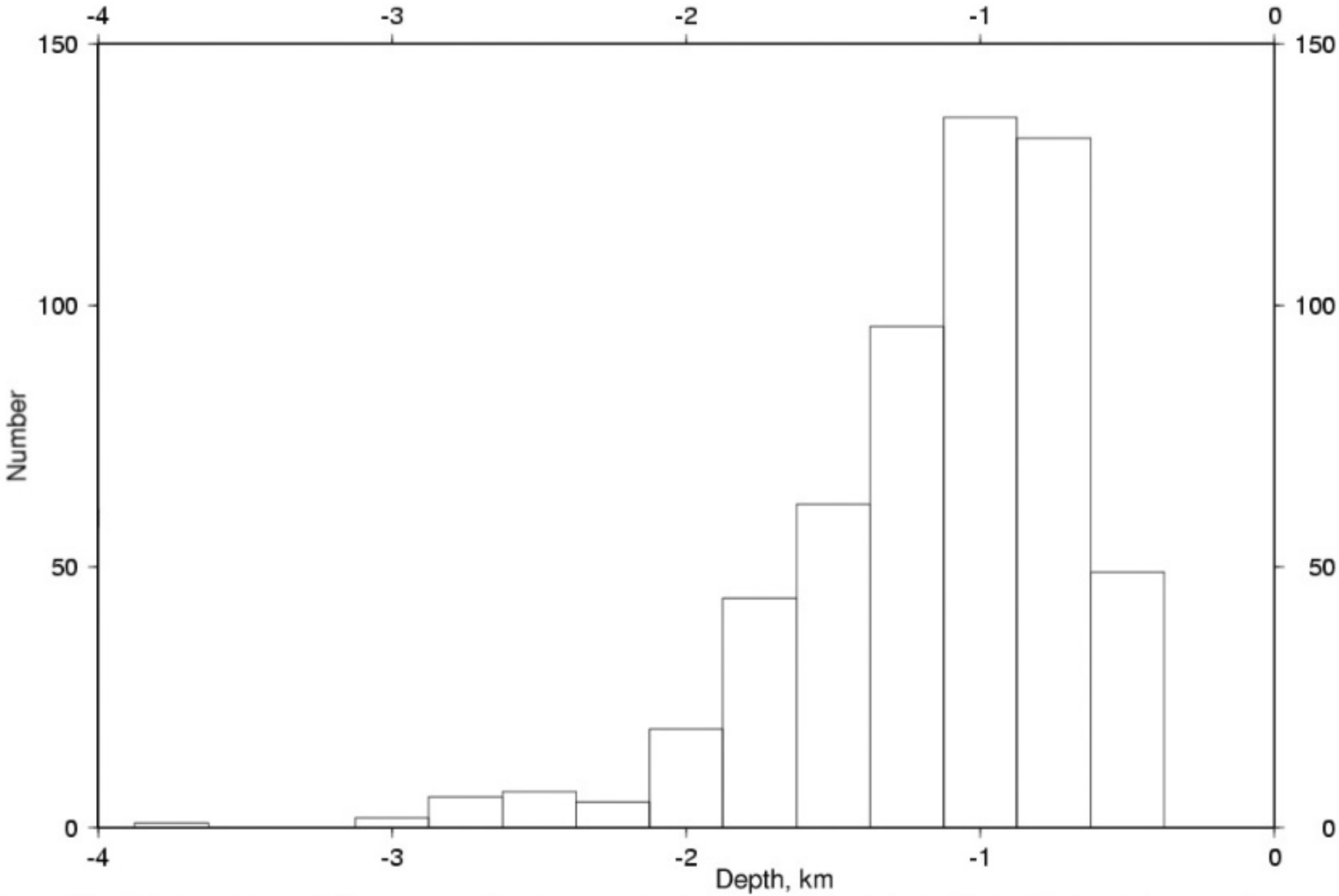
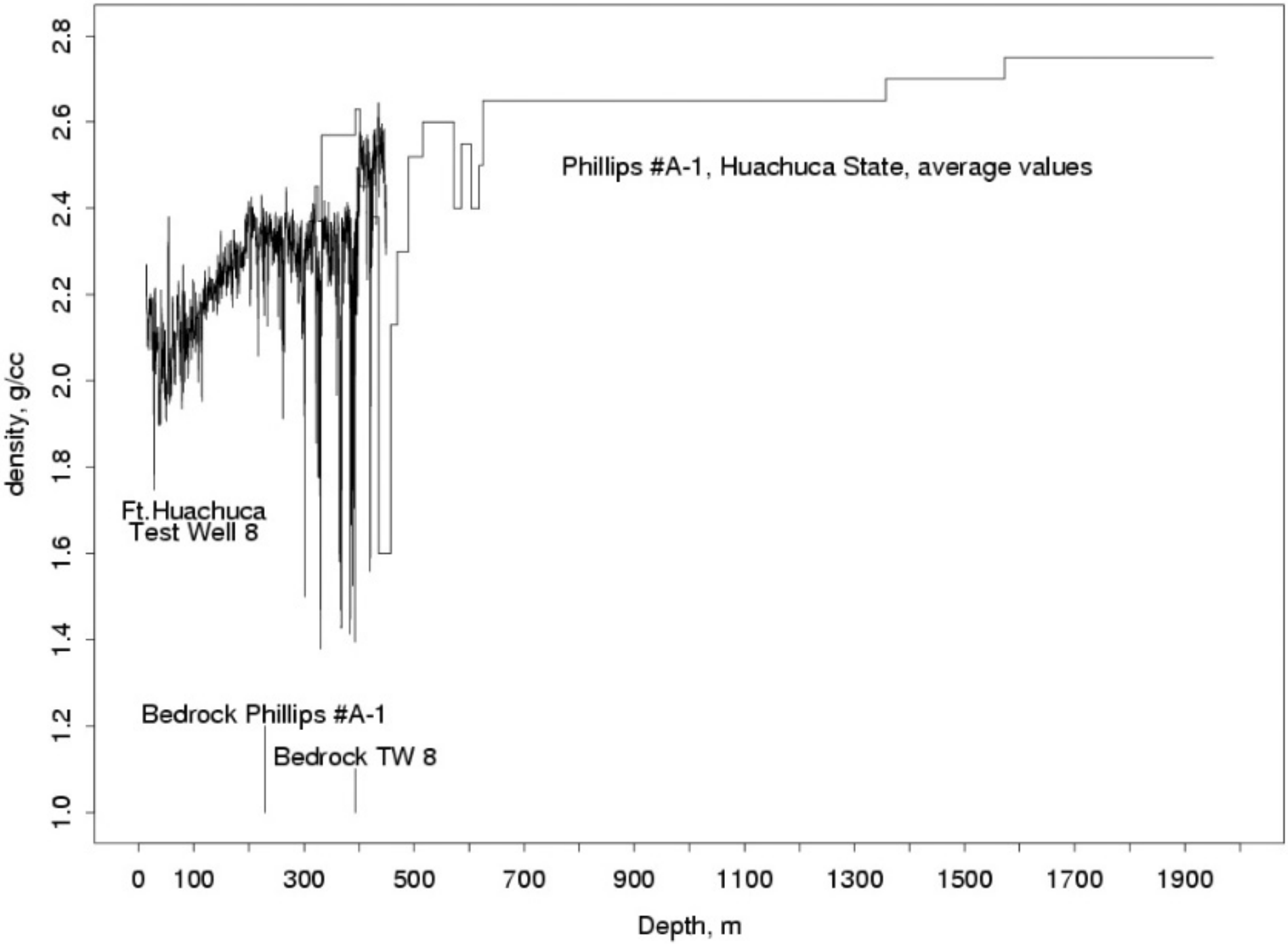
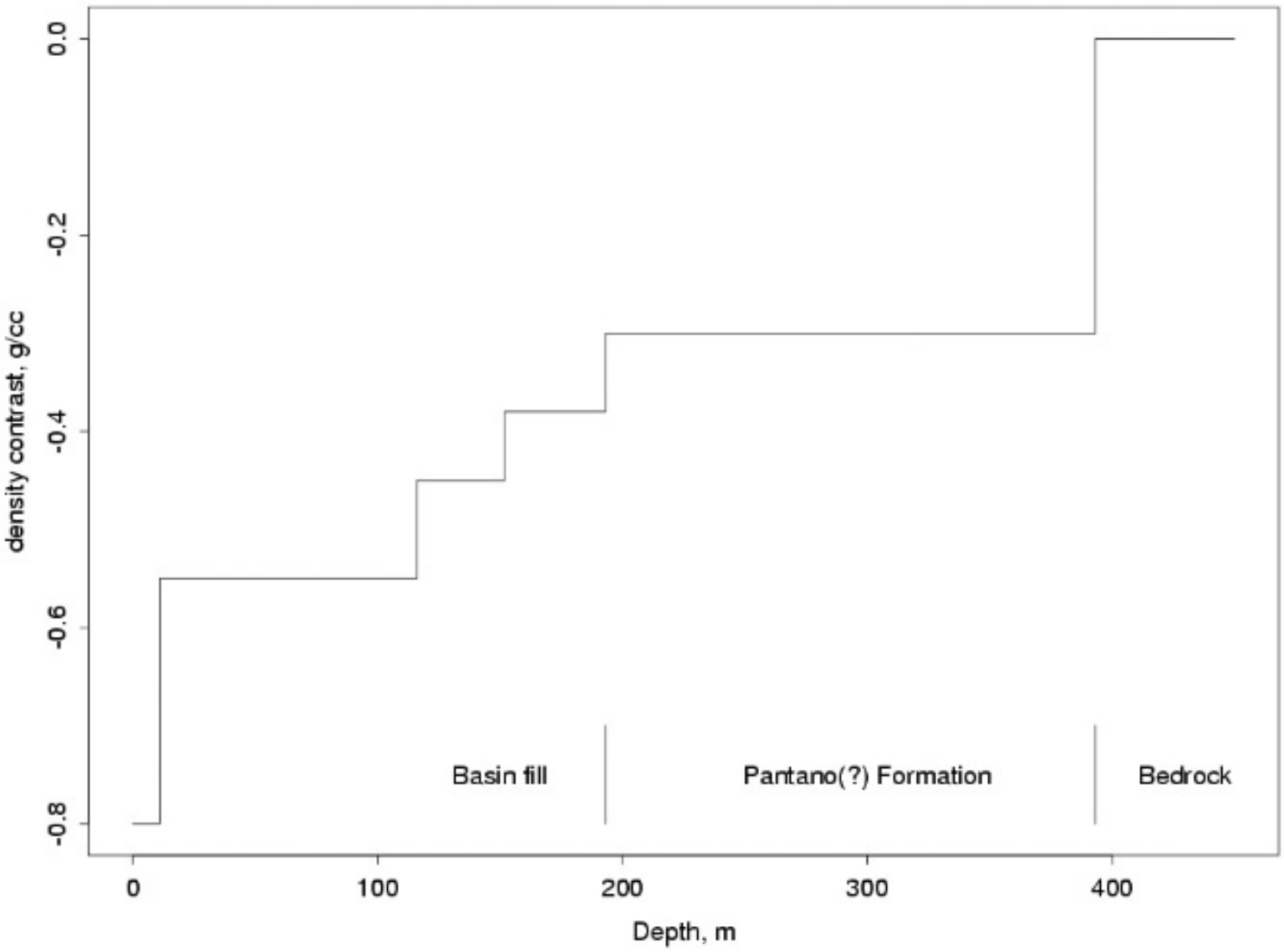


Figure 5b. Histogram of depth to source estimate computed from the horizontal gradient of the pseudomagnetic transformation of the Bouguer gravity anomaly. Estimates with probable error less than 20% were used.


Phillips #A-1, Huachuca State, average values
Ft.Huachuca
Test Well 8
Bedrock Phillips #A-1
Bedrock TW 8
density, g/cc
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
2.8
0
100
300
500
700
900
1100
1300
1500
1700
1900
Depth, m


0.0
-0.2
-0.4
-0.6
-0.8
density contrast, g/cc
Basin fill
Pantano(?) Formation
Bedrock
0
100
200
300
400
Depth, m

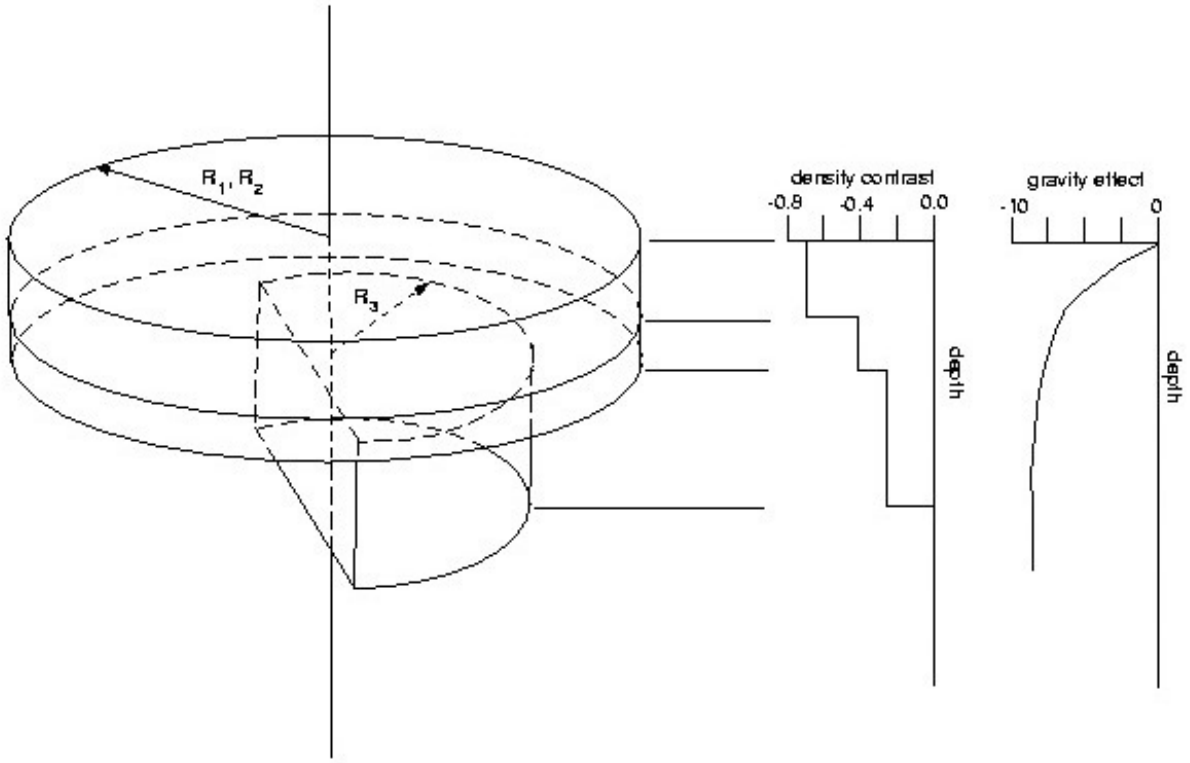


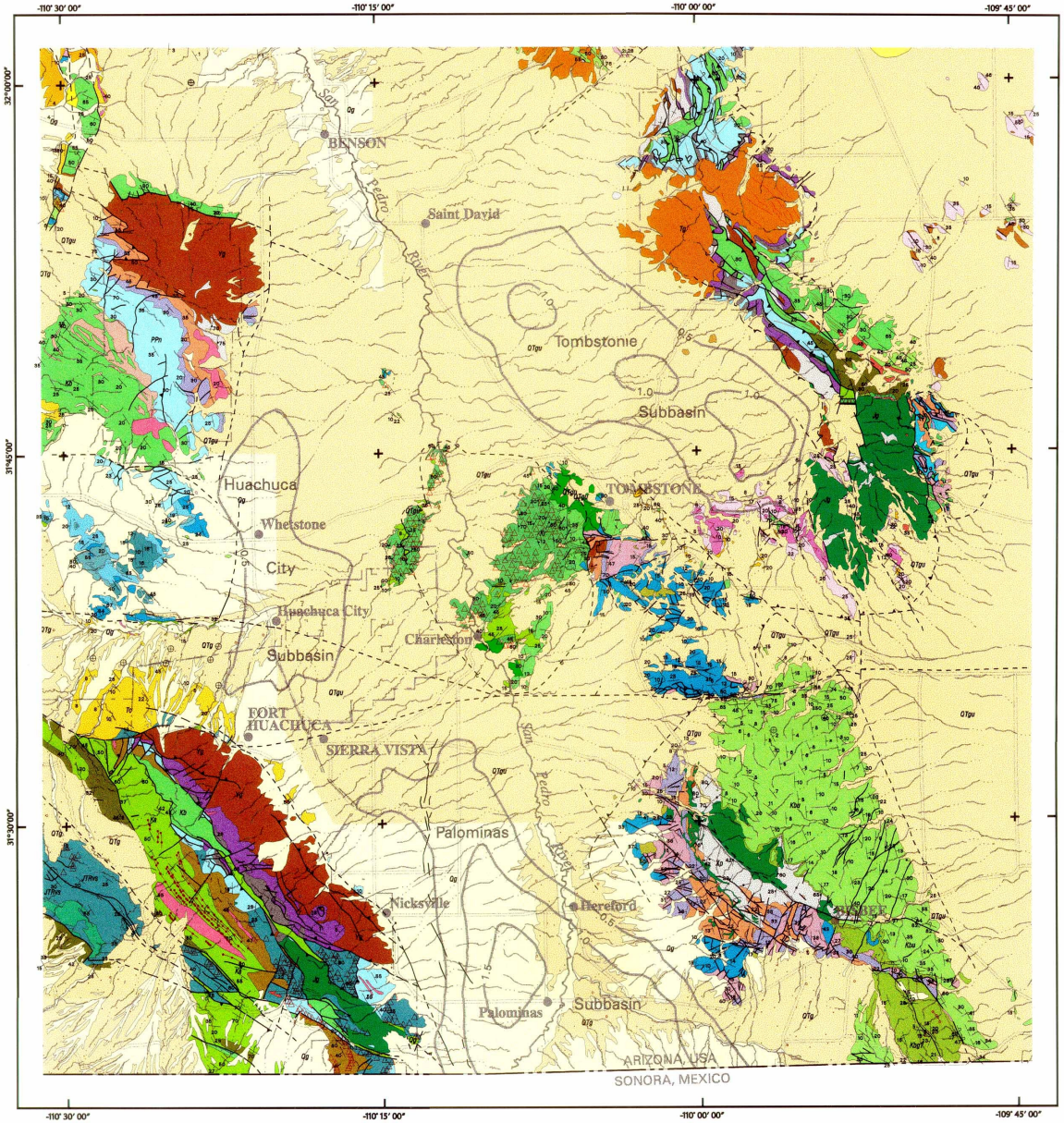
Figure 8. Illustration of the stack of coaxial vertical axes cylinders model used in gravity anomaly modelling. Note that each cylinder may have a different density contrast and radius, and may range between a full cylinder and a partial one, such as the half cylinder with radius R3. A diagrammatic density contrast function and cumulative gravity effect plot are shown.

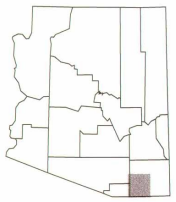
http://pubs.usgs.gov/of/2000/of00-138/plate1.jpg

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

GEOLOGIC MAP OF THE UPPER SAN PEDRO VALLEY, ARIZONA

OPEN FILE REPORT 00–138





Map Location

Scale 1:250,000

5 0 5 10 15 MILES

5 0 5 10 15 20 KILOMETERS

UTM zone 12 projection, NAD 27 datum

Contour interval = 0.5 kilometer

Geology Features:
The geologic themes shown on this map are from the Southeast Arizona Geology series of digital GIS datasets. This map is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards or with the North American Stratigraphic Code.

Sources

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Hydrologic features, Roadways, Towns, Political/Administrative Boundaries:
The hydrologic and background themes shown on this map are from the Arizona

EXPLANATION

Qg YOUNGER SURFICIAL DEPOSITS (HOLOCENE AND PLEISTOCENE)-Gravel, sand and silt (Holocene and Pleistocene)-Alluvium pediments; includes some colluvium and soils. Deposits mostly light-gray, unindurated and of poorly rounded and locally-derived clasts, except along larger valley-center rivers. Mostly several meters thick but as much as a hundred meters thick

Qp Gravel, sand, silt and clay (Pleistocene)-Pluvial lake deposits, including beach gravel in low ridges. Deposits well sorted and mostly unconsolidated; gravel well rounded. Thickness unknown.

QTg GRAVEL, SAND AND CONGLOMERATE (HOLOCENE TO MIOCENE)-Alluvium filling intermontane basins, on pediments, in alluvial aprons and stream terraces and along watercourses

QTgu Gravel, sand and silt (Holocene to Miocene)-Alluvium of floodplains, terraces, pediments and basins, undifferentiated. Commonly a few tens of meters thick to hundreds of meters thick

QTb BASALT (PLEISTOCENE TO MIOCENE)-Lava flows and cinder deposits

Tuc Upper conglomerate, gravel and sand (Pliocene and Miocene)-Alluvium; mainly deposits rich in volcanic fragments derived from underlying or nearby rhyolite rocks. Thickness several tens of meters to hundreds of meters.

Tc Conglomerate (Miocene to Eocene?)-Mostly reddish-gray poorly indurated to moderatately indurated rock with subrounded clasts; locally includes some landslide deposits and some bodies of tuff and coarsely porphyritic andesite too small to be mapped separately. Commonly several tens to hundreds of meters thick

Tsv SEDIMENTARY AND VOLCANIC ROCKS, UNDIVIDED (MIOCENE TO EOCENE)-Rhyolitic to andesitic lava and tuff, and some interbedded conglomerate, sandstone and shale

Trt RHYOLITIC TUFFS (MIOCENE AND OLIGOCENE)-Airfall tuff, ashflow tuff, tuff breccia, welded tuff and some sedimentary rocks

?INTRUSIVE ROCKS (MIOCENE TO OLIGOCENE)

Tri RHYOLITE (MIOCENE AND OLIGOCENE)-Dikes and plugs

Tg GRANITE (OLIGOCENE)- Stocks

Tva Extrusive andesite and dacite (Miocene and Upper Oligocene)-Lava flows, pyroclastic rocks, some intercalated epiclastic rocks and dikes. Mostly gray, fine-grained, porphyritic rocks; includes some very coarse feldspar porphyry andesite (Turkey track porphyry, an informal term of Cooper, 1961). Thickness mostly several meters to several tens of meters. Dated at 24, 25, 27, 33 and 39 m.y.

Tv Extrusive rhyolite and rhyodacite (Miocene and Upper Oligocene)-Lava flows, welded tuff, pyroclastic rocks and some intercalated epiclastic rocks. Light-gray to grayish-pink, vitric to fine-grained, porphyritic. Commonly a few tens of meters to a few thousands of meters thick. Dated at 23, 24, 25, 26, 26, 26, 26 and 27 m.y., if substantiated, may indicate the presence of Eocene rocks in the lower member of the S O Volcanics of Cochise Co.

Ta ANDESITIC ROCKS (OLIGOCENE)-Lava flows, breccia deposits and interbedded sedimentary rocks

Tlc Lower conglomerate, gravel and sand (Oligocene and Eocene?)-Alluvium; commonly grayish-red deposits of small, well rounded, nonvolcanic clasts. Mostly several meters to a few tens of meters thick

Tlv UPPER CORDILLERAN (LARAMIDE) IGNEOUS ROCKS (LOWER PALEOCENE)-Lower volcanic rocks-Rhyolite to andesite lava flows, pyroclastic rocks and some intercalated epiclastic rocks. Dated at 57 m.y. Possibly younger age to east

TKg INTRUSIVE ROCKS (EOCENE TO LATE CRETACEOUS)-Mainly Eocene to Late Cretaceous granite, monzonite, granodiorite and diorite; some Oligocene to Late Cretaceous peraluminous (two-mica and garnet-bearing) granite. Includes Copper Creek Granodiorite

TKr RHYOLITE (EOCENE TO LATE CRETACEOUS)-Plugs and dikes

TKp MAIN CORDILLERAN (LARAMIDE) IGNEOUS ROCKS-Porphyritic and aplitic intrusive rocks (Paleocene and Upper Cretaceous)-Mostly latite porphyry to dacite porphyry in small stocks and plugs and aplitic bodies not associated with other granitoid stocks. Dated ar 61, 63, 63, 64 and 65 m.y.

Ksv SEDIMENTARY AND VOLCANIC ROCKS, UNDIVIDED (UPPER CRETACEOUS)-Volcaniclastic conglomerate, sandstone, lacustrine shale and some andesitic and rhyolitic tuff

Kus LOWER CORDILLERAN (LARAMIDE) IGNEOUS AND SEDIMENTARY ROCKS (UPPER CRETACEOUS)-Upper sedimentary rocks-Mainly conglomerate and sandstone; includes some tuffaceous rocks. Thickness as much as several hundreds of meters

Kr RHYOLITE (UPPER CRETACEOUS)-Lava flows, tuffs and interbedded conglomerate and sandstone

Ka ANDESITE (UPPER CRETACEOUS)-Lava flows, breccia sheets and interbedded conglomerate and sandstone

Klq Lower quartz monzonite and granodiorite-Includes some quartz diorite; appears in small stocks. Locally associated with mineralization. Dated at 70, 71, 72, 73, 74, 74, 74 and 76 m.y.

Ks LOWEST CORDILLERAN (LARAMIDE)SEDIMENTARY ROCKS-Sedimentary rocks (Upper Cretaceous)-Includes Fort Crittenden Formation and formation near Javelina Canyon of Epis (1956). Mainly conglomerate, sandstone and siltstone; includes some red beds, fossiliferous black shale and tuffaceous rocks. Thickness several tens to several hundreds of meters

Kl Rhyodacite porphyry (Upper and Lower Cretaceous)-Mainly stocks, sills and some dikes but possibly includes some tuffs. Some of the rocks may be as young as rhyodacite tuff and welded tuff

Kb BISBEE GROUP (LOWER CRETACEOUS)-Mainly gray shale and siltstone and some sandstone, conglomerate and limestone

Kbu BISBEE FORMATION OR GROUP, UNDIFFERENTIATED (LOWER CRETACEOUS)-Upper part of Bisbee Formation or Group, undifferentiated and related rocks-Includes upper part of Bisbee Formation, Mural Limestone, Morita, Cintura, Willow Canyon, Apache Canyon, Shellenberger Canyon and Turney Ranch Formations (not listed in stratigraphic sequence) of the Bisbee Group, Armole Arkose of Bryant and Kinnison (1954) and Angelic Arkose. Consists of brownish- to reddish-gray arkose, siltstone, sandstone, conglomerate and some fossiliferous gray limestone. Commonly several hundred meters thick.

Kbg Glance Conglomerate of Bisbee Group, or Glance Conglomerate Member of Bisbee Formation-Typically limestone-pebble-and cobble conglomerate; locally granite or schist conglomerate. Mostly less than 10 meters thick; locally several hundreds of meters thick

Kbt BATHTUB AND TEMPORAL FORMATIONS, UNDIVIDED (LOWER CRETACEOUS)-Andesitic to rhyolitic rocks, conglomerate and sandstone

?INTRUSIVE ROCKS (JURASSIC)

Jg GRANITE STOCKS

Jr RHYOLITE PLUGS

JTRvs VOLCANIC AND SEDIMENTARY ROCKS (JURASSIC TO UPPER TRIASSIC)-Rhyolitic welded tuff and lava flows, andesitic lava flows, eolian sandstone and redbeds. Includes Walnut Gap Formation, Canelo Hills Volcanics and Gardner Canyon and Mount Wrightson Formations

TRm MONZONITE ROCKS (TRIASSIC)-Stocks of dark-gray very coarse-grained monzonite and quartz monzonite. Dated at 184, 190 and 210 m.y.

TRs SEDIMENTARY ROCKS (TRIASSIC)-Red mudstone, sandstone and conglomerate and intercalated rhyodacite volcanic rocks. As much as several hundreds of meters thick. Dated at 192 m.y.

Pzs SEDIMENTARY ROCKS (PALEOZOIC)-Rainvalley Formation (Lower Permian) to Bolsa Quartzite (Middle Cambrian), undifferentiated

PPn NACO GROUP (LOWER PERMIAN AND PENNSYLVANIAN)-Mainly limestone and dolomite; some siltstone, sandstone and marlstone

Ps Sedimentary rocks (Lower Permian)-Consists of Rainvalley Formation, Concha Limestone and Scherrer Formation, undifferentiated. Rainvalley Formation is a sparsely fossiliferous limestone, dolomite and some sandstone, 90-120 meters thick. Concha Limestone is dark-gray, cherty, fossiliferous limestone, 120-180 meters thick. Scherrer Formation is a light-pinkish-gray fine-grained quartzite with some basal reddish-gray siltstone and a medial gray dolomite unit, 240-310 meters thick

PPs Sedimentary rocks (Lower Permian and Upper Pennsylvanian)-Consists of Epitaph Dolomite (Lower Permian), Colina Limestone (Lower Permian) and Earp Formation (Lower Permian and Upper Pennsylvanian), undifferentiated. Epitaph Dolomite is a dark- to light-gray slightly cherty dolomite, limestone, marl, siltstone and gypsum, 120-280 meters thick. Colina Limestone is a medium-gray, thick-bedded, sparsely cherty and sparsely fossiliferous limestone, 120-280 meters thick. Earp Formation is a pale-red siltstone, mudstone, shale and limestone, 120-240 meters thick

Ph Horquilla Limestone (Upper and Middle Pennsylvanian)-Light-pinkish-grey, thick- to thin-bedded, cherty, fossiliferous limestone and intercalated pale-brown to pale-reddish-gray siltstone that increases in abundance upward. Typically 300-490 meters thick

Ms SEDIMENTARY ROCKS (MISSISSIPPIAN)-Generally only Escabrosa Limestone; to the east unit also includes Paradise Formation, mostly shale

MDs SEDIMENTARY ROCKS (MISSISSIPPIAN AND DEVONIAN)-Consists mainly of Escabrosa Limestone (Mississippian)-locally (Armstrong and Silberman, 1974) called Escabrosa Group-and Martin Formation (Upper Devonian), undifferentiated. In part of Chiricahua Mountains also includes Paradise Formation (Upper Mississippian) and Portal Formation of Sabins, 1957a (Upper Devonian). In the Little Dragoon Mountains and some adjacent hills also includes Black Prince Limestone, whose fauna and correlation show strongest affinities with Mississippian rocks but which may include some Pennsylvanian rocks. Escabrosa Limestone is a medium-gray, massive to thick-bedded, commonly crinoidal, cherty, fossiliferous limestone 90-130 meters thick. Martin Formation is thick- to thin-bedded, gray to brown dolomite, gray sparsely fossiliferous limestone and some siltstone and sandstone, 90-120 meters thick. Paradise Formation is a brown, fossiliferous, shaly limestone. Portal Formation is a black shale and limestone, 60-105 meters thick. Black Prince Limestone is a pinkish-gray limestone with a basal shale and chert conglomerate, as much as 52 meters thick

Pzl LOWER PALEOZOIC FORMATIONS, UNDIVIDED (UPPER DEVONIAN TO MIDDLE CAMBRIAN)-Mainly limestone and dolomite; some sandstone, shale and conglomerate. Includes Percha Shale, Portal, Swisshelm, Martin, El Paso and Abrigo Formations, Coronado Sandstone and Bolsa Quartzite

Cs Sedimentary rocks (Upper and Middle Cambrian)-Abrigo Formation (Upper and Middle Cambrian) and Bolsa Quartzite (Middle Cambrian), undifferentiated

Yg INTRUSIVE ROCKS (MIDDLE PROTEROZOIC)-Granite, granodiorite and some alaskite, aplite and lamprophyre

Xp PINAL SCHIST (EARLY PROTEROZOIC)-Schist, phyllite, metaquartzite, metagraywacke and meta-igneous rocks

CONTACT-Dotted where concealed, queried where uncertain

FAULT-Showing dip; dotted where concealed or intruded, queried where uncertain. Where solid line becomes dotted line within a map unit, that unit is a composite of several formations, of which a younger one conceals faulting in an older one

NORMAL FAULT-Ball and bar on downthrown side; dotted where concealed, queried where uncertain

THRUST FAULT-Sawteeth on upper plate

GLIDE FAULT-Open sawteeth on glide plate

DIKES- Tri

DIKES-Ti

DIKES- TKr

DIKES-TKp

DIKES- Yd

STRIKE DIP OF BEDS

Inclined bed

Vertical bed

Overturned bed

Inclined foliation

Vertical foliation

Horizontal

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The Geology of Geographic Information Systems (GIS) on this map are from the Alabama State Land Department-ALRIS. It is not known if these datasets meet any cartographic standards. They are shown for reference purposes only.

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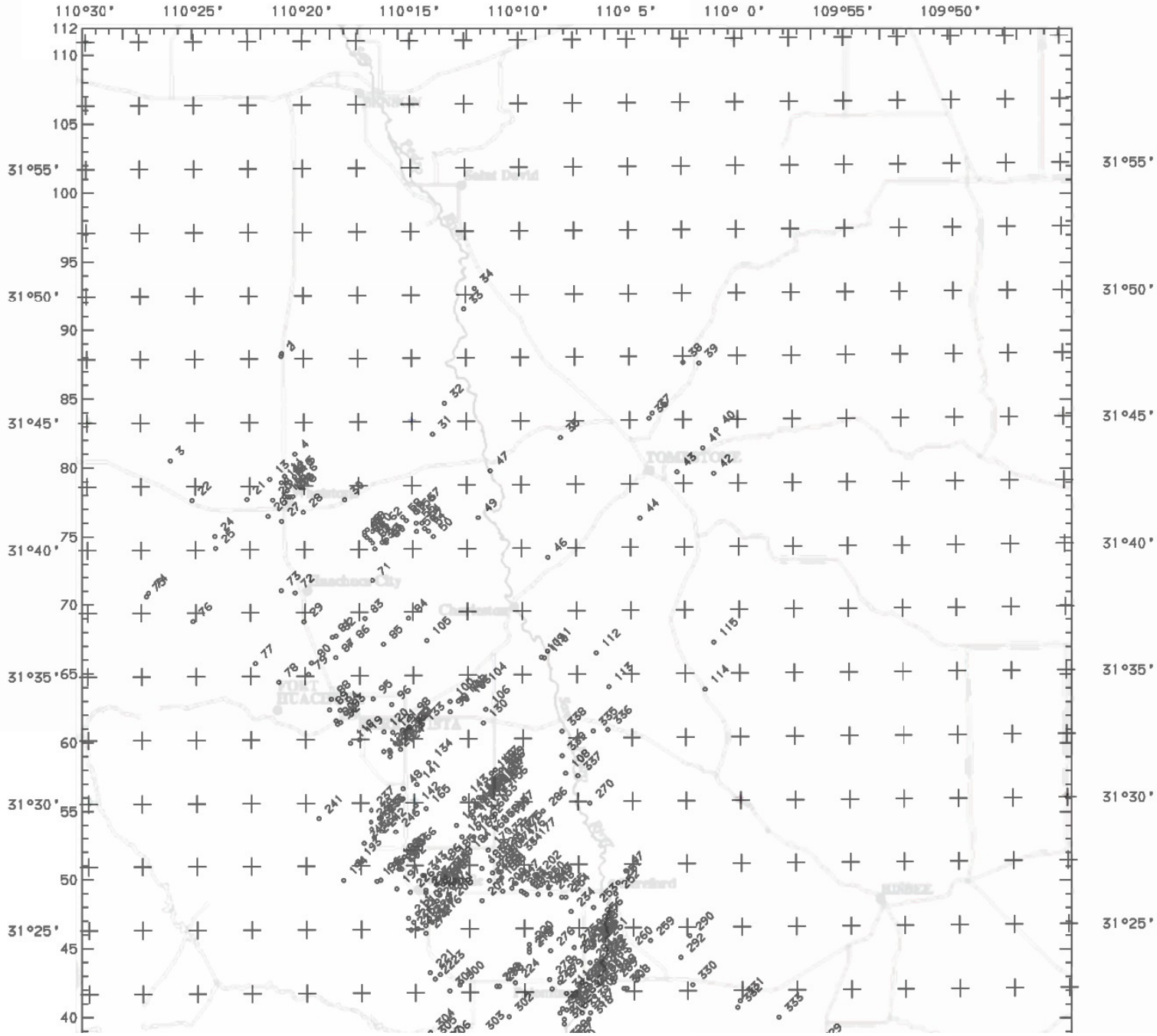

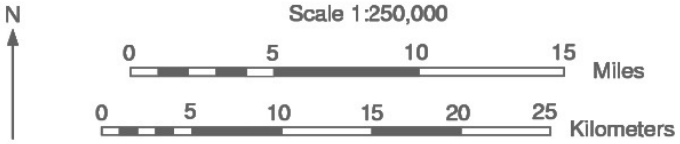

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Plate 2. Locations of drillholes used in this study. Number to the upper right of the circular location symbol is the entry number in the table of drillhole data in the text. Numbered ticks along the horizontal and vertical axes are UTM coordinates relative to 31° n latitude and 111° west longitude.

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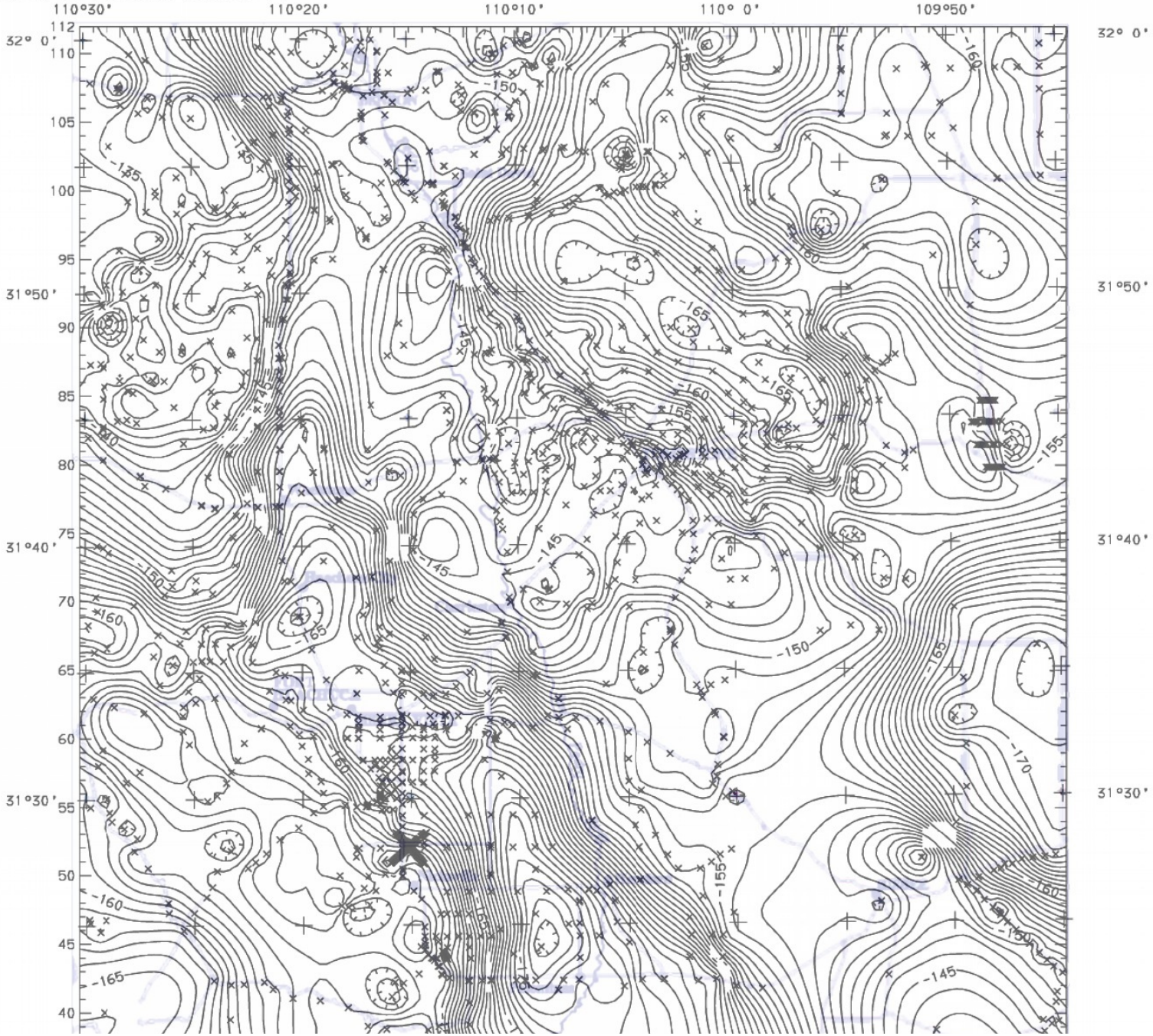

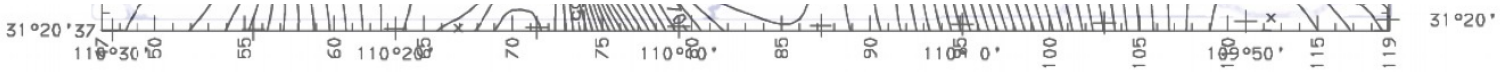

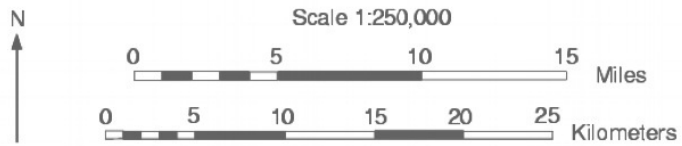

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Plate 3. Complete Bouguer gravity anomaly map, upper San Pedro basin, southeastern Arizona. Contour interval 1 mGal. Symbols "x" mark location of gravity stations used in compiling the map. Numbered ticks along the horizotal and vertical axes are UTM coordinates relative to 31° north latitude and 111° west longitude. Relative lows are indicated by hatchures for closed contours.

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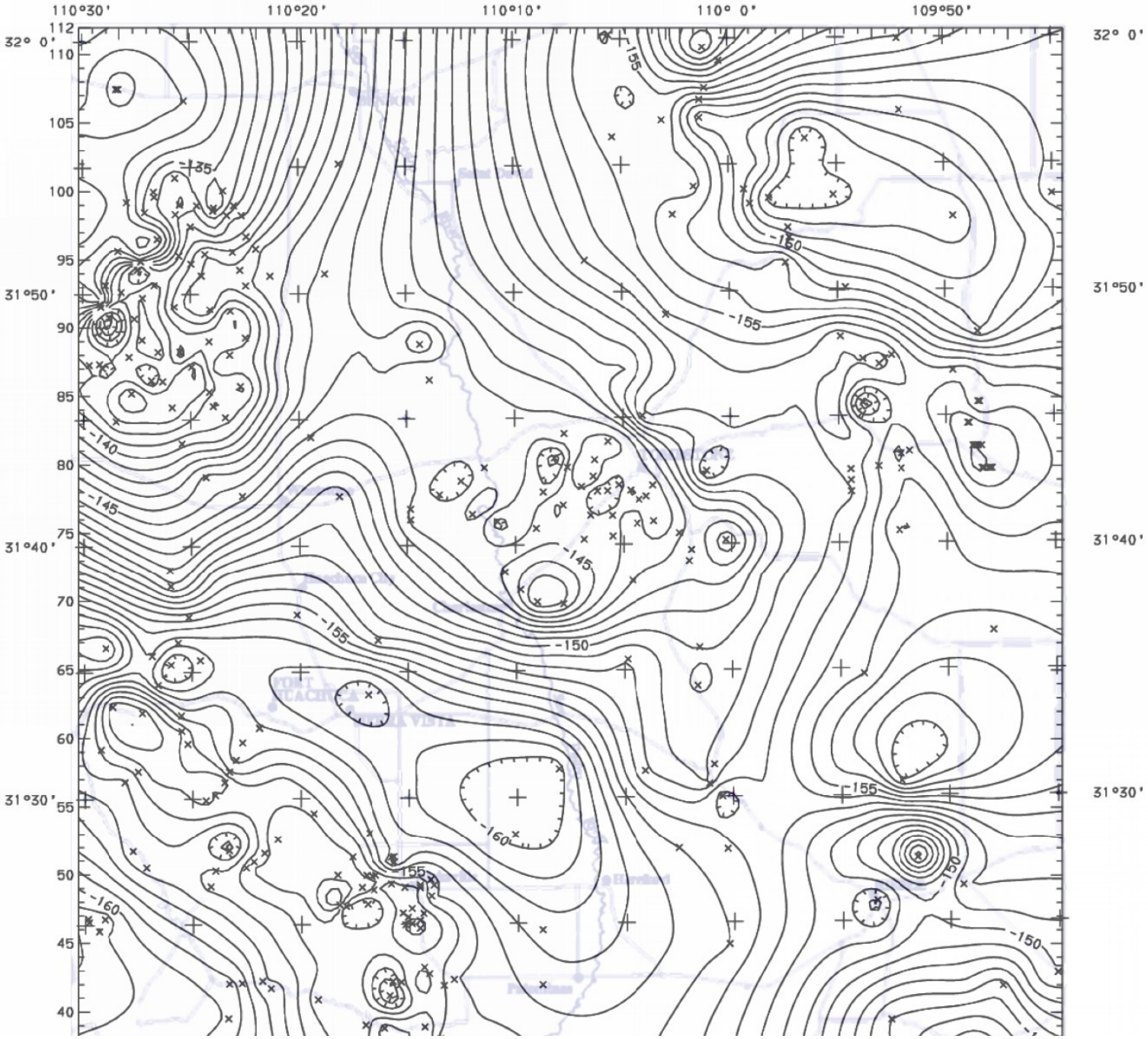

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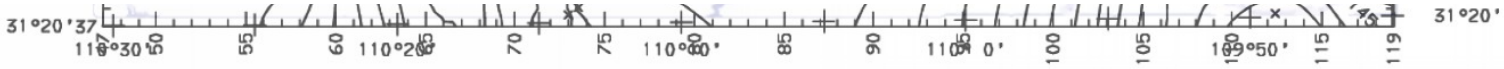

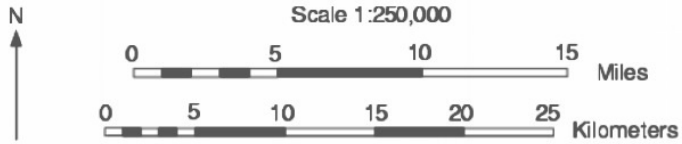

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Plate 4. Regional gravity anomaly map from bedrock stations, upper San Pedro basin, southeastern Arizona. Contour interval 1 mGal. Symbols "x" mark locations of stations used in compilation. See text for further explanation. Numbered ticks along horizontal and vertical axes are UTM coordinates relative to 31° north latitude and 111° west longitude.

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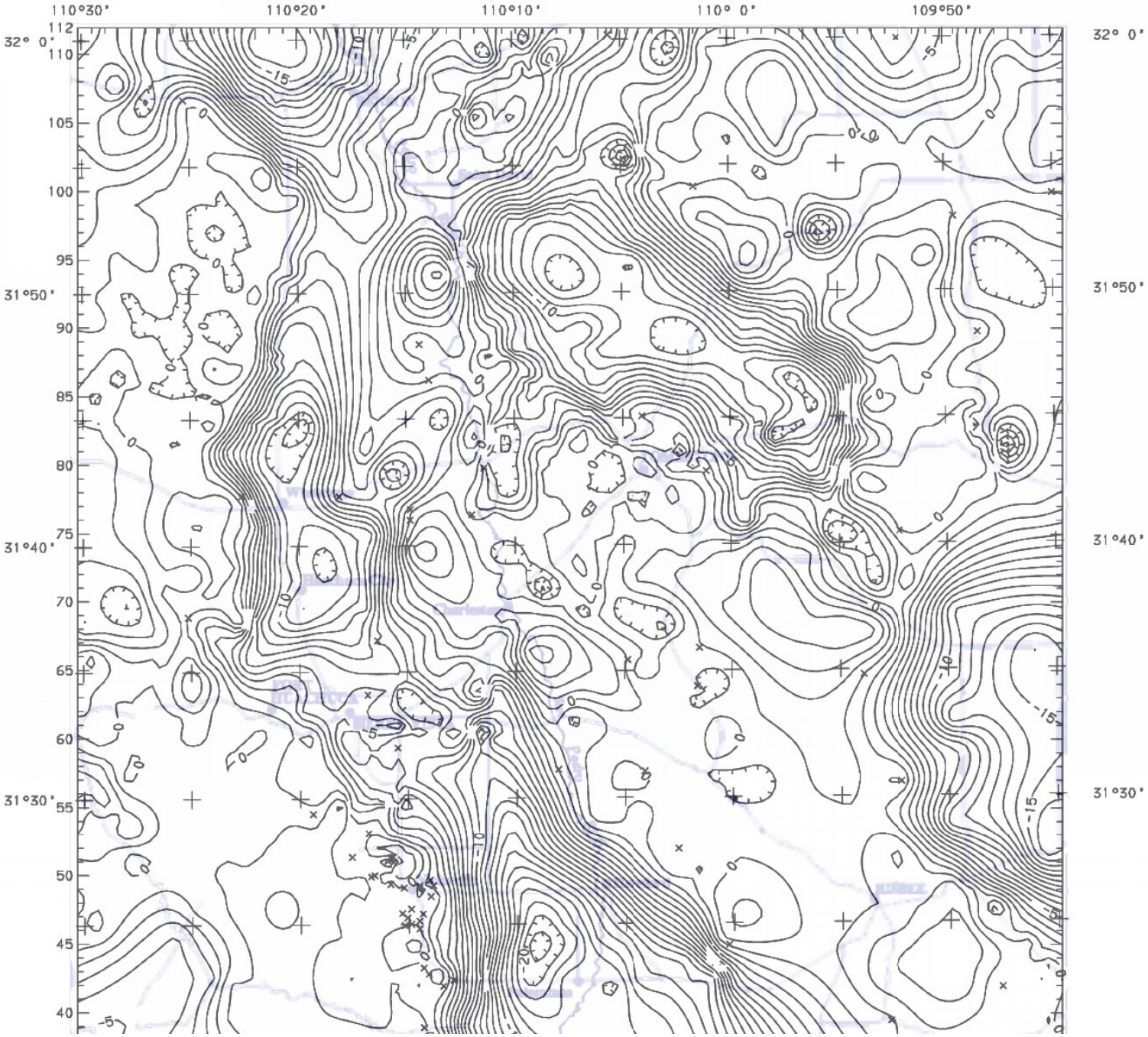

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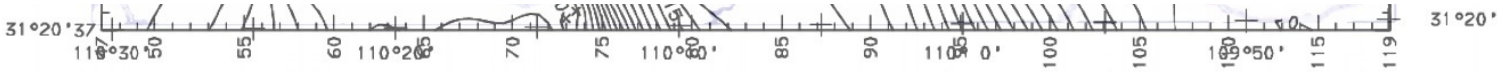

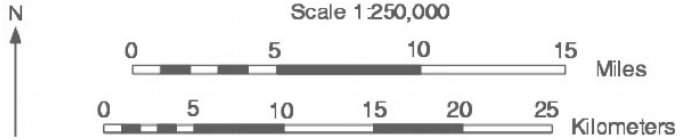

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Plate 5. Residual gravity anomaly map, upper San Pedro basin, southeastern Arizona. Contour interval 1 mGal. Symbols "x" mark location of drillhole penetrating to bedrock. Closed contours of relative low are hatchured. Numbered ticks along horizontal and vertical axes are UTM coordinates relative to 31° north latitude and 111° west longitude.

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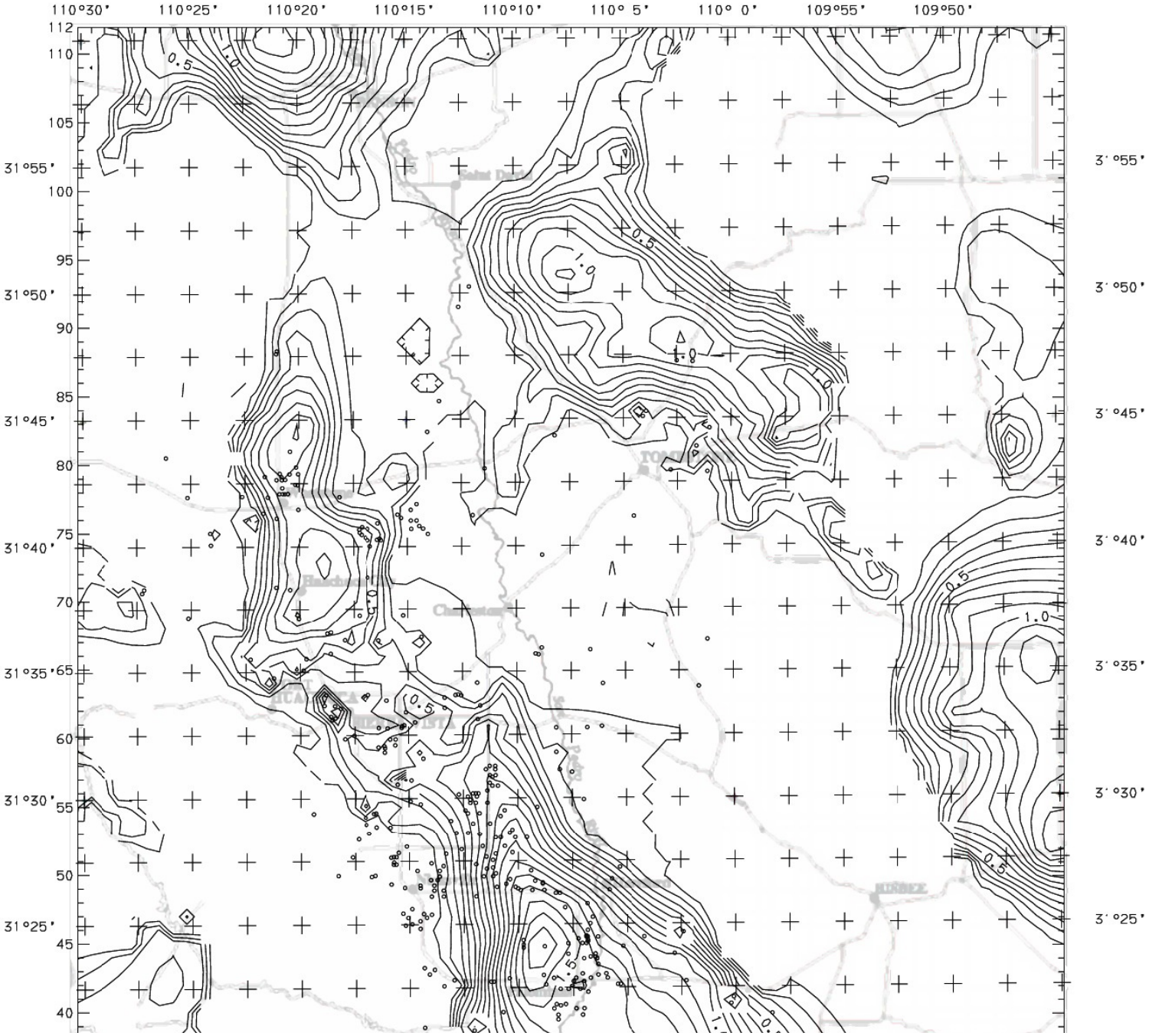

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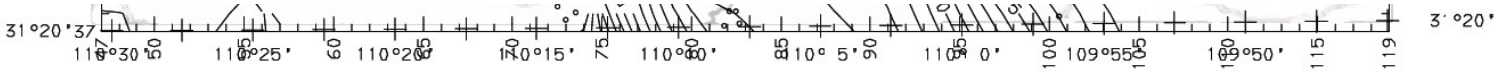

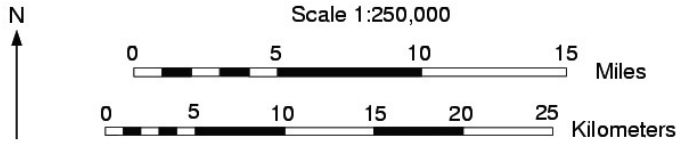

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Plate 6. Map of estimated depth to the base of the Pantano? Formation (top of bedrock), upper San Pedro basin, southeastern Arizona. Contour interval is 0.1 km; small circular symbols are the locations of drillholes used in this study. Numbered ticks along the horizontal and vertical axis are UTM coordinates relative to 31° north latitude and 111° west longitude.

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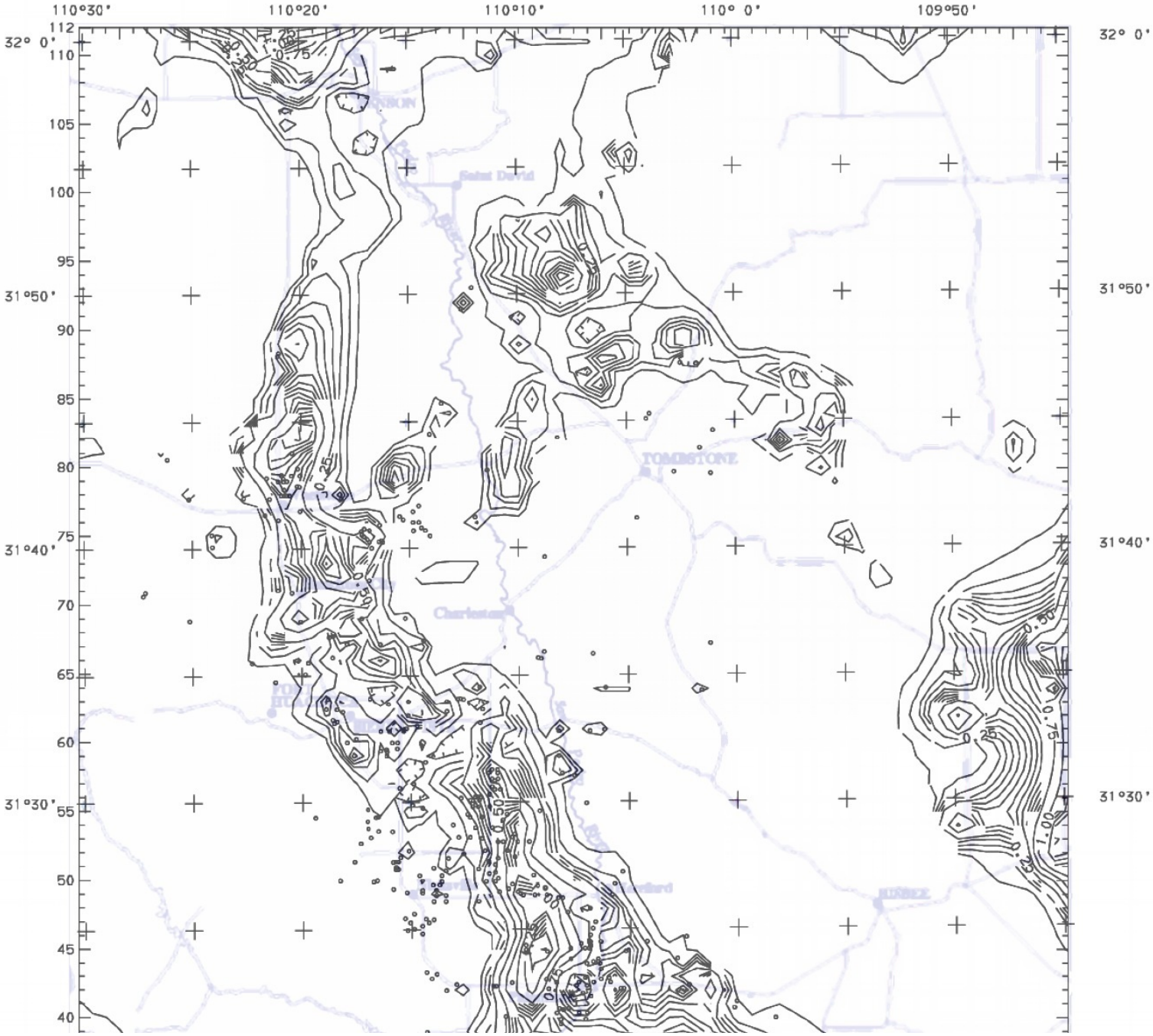

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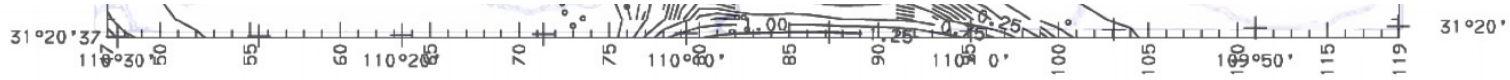

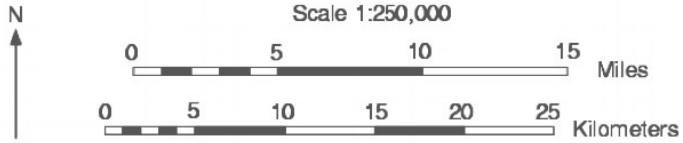

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Plate 7. Map of estimated depth to the base of the basin fill (top of the Pantano? Formation), upper San Pedro basin, southeastern Arizona. Contour interval is 0.05 km. Small circular symbols are the locations of drillholes used in this study. Numbered ticks along the horizontal and vertical axes are UTM coordinates relative to 31° north latitude and 111° west longitude.

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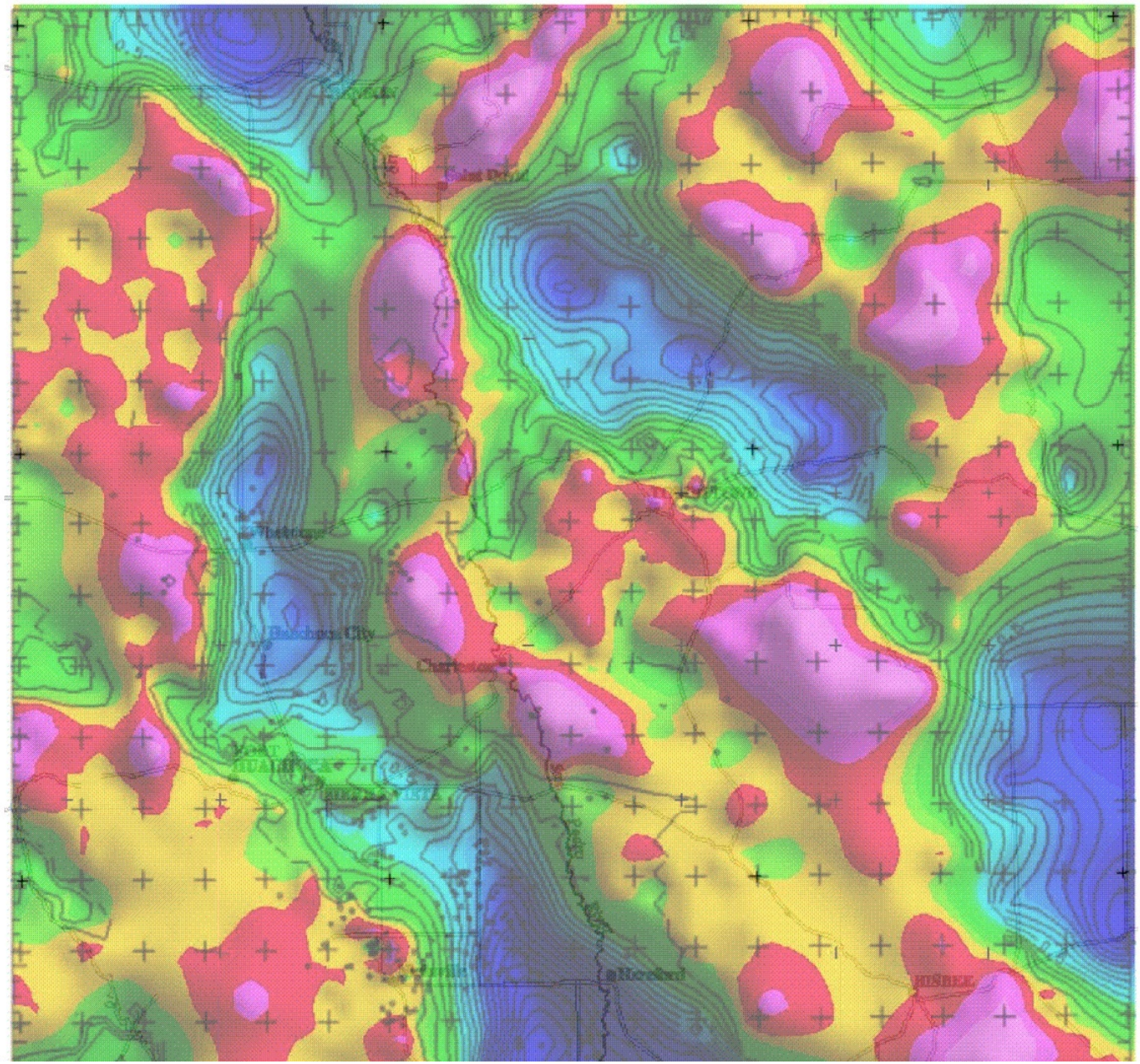
32° 00′



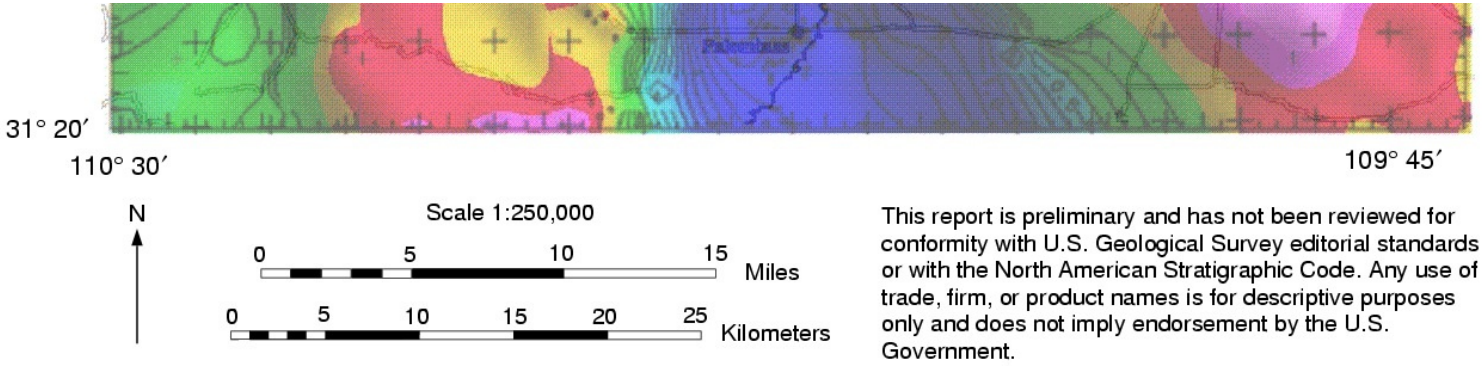


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Plate 8. Color shaded relief map of the residual gravity anomaly (Pl.5) overlain with model depth to the base of Pantano? Formation (Pl.6)

Appendix 1. Drillerâs logs of water wells, upper San Pedro Valley with interpretation of geologic units that were penetrated. All depths, intervals and altitudes are in feet. Blank spaces indicate no data available. See Appendix 2 for explanation of well location system used in Arizona. Explanation of abbreviations: bf= upper Miocene to lower Pleistocene basin fill and Pleistocene and Holocene surficial deposits; cgl = Pantano? as used in the upper San Pedro Valley and other cemented conglomerates of unknown age; TW = Fort Huachuca Test Well; PW = Fort Huachuca Post Well.

Well No.	Location	Longitude	Grid x	Latitude	Grid y	Quadrangle map	Surface altitude	Total depth	Depth to water	Interval	Lithology
1	D(19-19)12daa	110o 21' 00"	61.534	31o 47' 42"	88.292	McGrew Spring	4,560	305	180	0-305	bf
2	D(19-19)12daa	110o 21' 02"	61.478	31o 47' 36"	88.104	McGrew Spring	4,560	312	240	0-312	bf
3	D(20-19)6ada	110o 26' 08"	53.470	31o 43' 31"	80.522	Mustang Mtns	4,940	200	160	0-200	bf
4	D(20-20)6aab	110o 20' 25"	62.496	31o 43' 45"	81.005	Huachuca City	4,320	327	180	0-327	bf
5	D(20-20)6ddb	110o 20' 09"	62.930	31o 43' 08"	79.866	Huachuca City	4,315	337	270	0-337	bf
6	D(20-20)7aaa	110o 20' 03"	63.085	31o 42' 52"	79.368	Huachuca City	4,310	330	196	0-330	bf
7	D(20-20)7dab	110o 20' 11"	62.880	31o 42' 27"	78.602	Huachuca City	4,320	305	205	0-305	bf
8	D(20-20)7dab	110o 20' 05"	63.042	31o 42' 26"	78.569	Huachuca City	4,320	315	205	0-315	bf
9	D(20-20)7bdb	110o 20' 39"	62.139	31o 42' 39"	78.963	Huachuca City	4,340	300	220	0-300	bf
10	D(20-20)7abb	110o 20' 27"	62.459	31o 42' 52"	79.364	Huachuca City	4,330	300	220	0-300	bf
11	D(20-20)7bbb	110o 20' 54"	61.749	31o 42' 53"	79.393	Huachuca City	4,365	325	270	0-325	bf
12	D(20-20)7bbd	110o 20' 49"	61.882	31o 42' 45"	79.150	Huachuca City	4,350	310	260	0-310	bf
13	D(20-19)12bac	110o 21' 35"	60.669	31o 42' 46"	79.176	Huachuca City	4,425	385	271	0-385	bf
14	D(20-19)12ada	110o 21' 03"	61.514	31o 42' 38"	78.937	Huachuca City	4,370	320	305	0-320	bf
15	D(20-20)7bca	110o 20' 48"	61.902	31o 42' 38"	78.939	Huachuca City	4,347	300	190?	0-300	bf
16	D(20-20)7cbd	110o 20' 47"	61.935	31o 42' 19"	78.352	Huachuca City	4,350	325	260	0-325	bf
17	D(20-20)7cdd	110o 20' 32"	62.335	31o 42' 05"	77.922	Huachuca City	4,350	325	265	0-325	bf
18	D(20-20)7ccc	110o 20' 46"	61.966	31o 42' 05"	77.920	Huachuca City	4,360	300	240	0-300	bf
19	D(20-20)7ccc	110o 20' 55"	61.728	31o 42' 05"	77.919	Huachuca City	4,365	350	280	0-350	bf
20	D(20-19)13abb	110o 21' 27"	60.887	31o 41' 57"	77.670	Huachuca City	4,400	345	265	0-345	bf
21	D(20-19)14bab	110o 22' 38"	59.020	31o 41' 59"	77.714	Mustang Mtns	4,480	410	250?	0-390	bf
										390-410	limestone
22	D(20-19)17aaa	110o 25' 09"	55.040	31o 41' 57"	77.637	Mustang Mtns	4,750	300	260	0-300	bf
23	D(20-20)26abb	110o 16' 24"	68.887	31o 40' 16"	74.605	Huachuca City	4,120	100	42	0-100	bf
24	D(20-19)21add	110o 24' 07"	56.693	31o 40' 32"	75.030	Mustang Mtns	4,575	350	275	0-350	bf
25	D(20-19)21dad	110o 24' 05"	56.746	31o 40' 04"	74.166	Mustang Mtns	4,570	300	260	0-300	bf
26	D(20-19)13cdb	110o 21' 40"	60.553	31o 41' 19"	76.493	Huachuca City	4,425	400	355	0-400	bf
27	D(20-19)24aaa	110o 21' 03"	61.531	31o 41' 07"	76.133	Huachuca City	4,390	340	275	0-340	bf
28	D(20-20)18dad	110o 20' 03"	63.100	31o 41' 28"	76.785	Huachuca City	4,335	300	275	0-300	bf
29	D(21-20)8caa	110o 20' 03"	63.149	31o 37' 08"	68.783	Fort Huachuca	4,435	502	287	0-502	bf
30	D(20-20)16aac	110o 18' 09"	66.099	31o 41' 57"	77.702	Huachuca City	4,265	8,513		0-750	bf
										750-3,350	Bisbee Group
										3,350-8,513	Paleozoic sed. rocks
31	D(19-21)31aac	110o 14' 03"	72.539	31o 44' 30"	82.456	Fairbank	4,050	300	135	0-300	bf
32	D(19-21)20cdb	110o 13' 30"	73.394	31o 45' 43"	84.701	Land	3,930	190		0-190	bf
33	D(18-21)33cb	110o 12' 35"	74.793	31o 49' 25"	91.551	Land	3,700	625		0-625	bf
34	D(18-21)28db	110o 12' 05"	75.567	31o 50' 15"	93.097	Land	3,724	105		0-105	bf
35	D(19-22)31acc	110o 08' 11"	81.805	31o 44' 20"	82.215	Fairbank	4,112	300	243	0-300	bf
36	D(19-22)26dbb	110o 04' 04"	88.292	31o 45' 04"	83.621	Haberstock Hill	4,400	560	390	0-555	cgl
										555-560	granite
37	D(19-22)26aca	110o 03' 55"	88.526	31o 45' 16"	83.989	Haberstock Hill	4,405	490	365	0-120	bf
										120-490	cgl & rock
38	D(19-23)18bbb	110o 02' 29"	90.757	31o 47' 15"	87.677	Haberstock Hill	4,588	700	570	0-700	cgl

39	D(19-23)18aab	110o 01' 45"	91.913	31o 47' 13"	87.621	Haberstock Hill	4,650	600	dry hole	0-600	cgl
40	D(19-23)32abb	110o 00' 60"	93.140	31o 44' 36"	82.799	Tombstone	4,630	650	520	0-150	Granite
										150-650	cgl
41	D(19-23)31ddd	110o 01' 37"	92.185	31o 43' 53"	81.471	Tombstone	4,530	471	413	0-471	cgl
42	D(20-23)8baa	110o 01' 07"	92.988	31o 42' 53"	79.627	Tombstone	4,530	520		0-330	cgl
										330-520	bedrock
43	D(20-22)1ddc	110o 02' 48"	90.325	31o 42' 57"	79.725	Tombstone	4,450	890	333	0-890	cgl
44	D(20-22)23bbb	110o 04' 31"	87.643	31o 41' 09"	76.377	Tombstone	4,885	1,000	420	0-1,000	bedrock
46	D(20-21)25dda	110o 08' 48"	80.897	31o 39' 38"	73.529	Fairbank	4,190	360	120	0-360	bf
47	D(20-21)3cd	110o 11' 25"	76.717	31o 43' 03"	79.804	Fairbank	3,860	623		0-474	bf
										474-617	cgl
										617-623	granite
48	D(22-20)24aaa	110o 15' 31"	70.402	31o 30' 33"	56.670	Fort Huachuca	4,604	795	381	0-330	bf
										330-795	cgl
49	D(20-21)16ddc	110o 11' 59"	75.851	31o 41' 13"	76.406	Fairbank	3,890	385	13?	0-350	bf
										350-385	granite
50	D(20-21)19ddb	110o 14' 03"	72.591	31o 40' 29"	75.030	Fairbank	4,255	150	77	0-45	bf
										45-150	granite
51	D(20-21)19dbb	110o 14' 16"	72.247	31o 40' 42"	75.427	Fairbank	4,170	140	45	0-25	bf
										25-140	bedrock
52	D(20-21)19bdd	110o 14' 27"	71.961	31o 40' 48"	75.613	Fairbank	4,150	92	55	0-34	bf
										34-92	bedrock
53	D(20-21)19cbb	110o 14' 49"	71.384	31o 40' 41"	75.398	Fairbank	4,135	100	57	0-100	bf
54	D(20-21)19bac	110o 14' 34"	71.769	31o 41' 01"	76.010	Fairbank	4,110	95	48	0-95	bf
55	D(20-21)19bbc	110o 14' 50"	71.352	31o 41' 01"	76.008	Fairbank	4,100	200	60	0-10	bf
										10-200	granite
56	D(20-21)18cbc	110o 14' 50"	71.346	31o 41' 26"	76.783	Fairbank	4,030	200	26	0-100	bf
										100-200	bedrock
57	D(20-21)18bdc	110o 14' 34"	71.760	31o 41' 40"	77.208	Fairbank	4,040	100	10?	0-100	bf
58	D(20-20)13cdd	110o 15' 27"	70.372	31o 41' 15"	76.433	Huachuca City	4,076	150	20	0-150	bf
59	D(20-20)24abb	110o 15' 17"	70.639	31o 41' 07"	76.191	Huachuca City	4,070	100	14	0-100	bf
60	D(20-20)26aba	110o 16' 13"	69.171	31o 40' 15"	74.574	Huachuca City	4,140	120	38	0-120	bf
61	D(20-20)23dbc	110o 16' 17"	69.066	31o 40' 19"	74.695	Huachuca City	4,115	100	0	0-100	bf
62	D(20-20)23acb	110o 16' 22"	68.927	31o 40' 55"	75.803	Huachuca City	4,150	120	50	0-120	bf
63	D(20-20)26bca	110o 16' 44"	68.359	31o 40' 01"	74.136	Huachuca City	4,120	100	20	0-100	bf
64	D(20-20)26bbb	110o 16' 51"	68.176	31o 40' 15"	74.567	Huachuca City	4,130	150	20	0-150	bf
65	D(20-20)22ddd	110o 16' 57"	68.014	31o 40' 21"	74.755	Huachuca City	4,140	100	50	0-100	bf
66	D(20-20)22ddb	110o 17' 08"	67.719	31o 40' 28"	74.963	Huachuca City	4,200	137	87	0-137	bf
67	D(20-20)22dbd	110o 17' 14"	67.566	31o 40' 33"	75.118	Huachuca City	4,200	160	70	0-160	bf
68	D(20-20)22dbd	110o 17' 15"	67.536	31o 40' 40"	75.339	Huachuca City	4,200	201	88	0-201	bf
69	D(20-20)22adc	110o 17' 07"	67.743	31o 40' 46"	75.518	Huachuca City	4,226	150	118	0-150	bf
70	D(20-20)23cbb	110o 16' 51"	68.171	31o 40' 42"	75.399	Huachuca City	4,200	130	58	0-130	bf
71	D(20-20)35ccb	110o 16' 52"	68.166	31o 38' 45"	71.796	Huachuca City	4,287	1,004	149	0-550	bf
(TW6)										550-1,004	cgl
72	D(21-20)5bcb	110o 20' 27"	62.511	31o 38' 16"	70.874	Huachuca City	4,295	210	96	0-210	bf
73	D(21-20)6bad	110o 21' 05"	61.504	31o 38' 22"	71.045	Huachuca City	4,290	218	98	0-218	bf
74	D(21-19)6bda	110o 27' 10"	51.890	31o 38' 17"	70.848	Mustang Mtns	4,620	120	60	0-120	bf
75	D(21-19)6bdc	110o 27' 16"	51.739	31o 38' 09"	70.593	Mustang Mtns	4,675	80	50	0-80	bf

76	D(21-19)9cad	110o 25' 08"	55.115	31o 37' 10"	68.792	Pyeatt Ranch	4,575	230	40	0-50	basalt
										50-200	cgl
										200-230	volcanic rock
77	D(21-19)24cba	110o 22' 17"	59.638	31o 35' 30"	65.748	Fort Huachuca	4,670	305	200?	0-200	bf
										200-305	cgl
78	D(21-20)30bdb	110o 21' 13"	61.335	31o 34' 46"	64.394	Fort Huachuca	4,739	797	575	0-26	bf
(TW2)										26-797	cgl
79	D(21-20)20dcd	110o 19' 51"	63.495	31o 35' 04"	64.961	Fort Huachuca	4,584	801	439	0-340	bf
(TW1)										340-801	cgl
80	D(21-20)20adc	110o 19' 43"	63.699	31o 35' 31"	65.794	Fort Huachuca	4,555	805	427	0-375	bf
										375-805	cgl
81	D(21-20)16add	110o 18' 45"	65.214	31o 36' 31"	67.654	Fort Huachuca	4,426	807	282	0-422	bf
(TW5)										422-807	cgl
82	D(21-20)16aad	110o 18' 35"	65.480	31o 36' 34"	67.744	Fort Huachuca	4,420	807	277	0-434	bf
(TW3)										434-807	cgl
83	D(21-20)11bcd	110o 17' 15"	67.577	31o 37' 15"	69.021	Fort Huachuca	4,347	1,002	213	0-635	bf
(TW7)										635-1,002	cgl
84	D(21-21)7bcd	110o 15' 13"	70.792	31o 37' 15"	69.043	Fort Huachuca	4,275	300		0-300	bf
85	D(21-20)13cbb	110o 16' 22"	68.984	31o 36' 14"	67.158	Fort Huachuca	4,390	1,501	244	0-632	bf
(TW8)										632-1,295	cgl
										1,295-1,501	volcanics
86	D(21-20)15dbb	110o 17' 56"	66.508	31o 36' 15"	67.175	Fort Huachuca	4,425	807	275	0-521	bf
(TW4)										521-807	cgl
87	D(21-20)21aad	110o 18' 36"	65.461	31o 35' 43"	66.181	Fort Huachuca	4,480	600		0-600	bf
88	D(21-20)33aba	110o 18' 49"	65.138	31o 34' 05"	63.165	Fort Huachuca	4,590	912		0-847	bf
(PW4)										847-912	cgl
89	D(21-20)33dbb	110o 18' 54"	65.010	31o 33' 40"	62.388	Fort Huachuca	4,635	1,230		0-771	bf
(PW6)										771-1,230	cgl
90	D(22-20)3bbb	110o 18' 36"	65.490	31o 33' 14"	61.593	Fort Huachuca	4,641	710	477?	0-690	bf
(PW2)										690-710	cgl
91	D(22-20)3bbb	110o 18' 32"	65.596	31o 33' 06"	61.350	Fort Huachuca	4,641	701	470?	0-692	bf
(PW1)										692-701	cgl
92	D(22-20)3bbb	110o 18' 24"	65.804	31o 33' 10"	61.473	Fort Huachuca	4,640	622		0-622	bf
93	D(21-20)34caa	110o 18' 09"	66.198	31o 33' 33"	62.185	Fort Huachuca	4,600	645	440	0-622	bf
										622-645	cgl
94	D(21-20)34cbb	110o 18' 25"	65.779	31o 33' 39"	62.360	Fort Huachuca	4,585	1,000	465	0-543	bf
										543-1,000	cgl

95	D(21-20)35abb	110o 16' 52"	68.223	31o 34' 05"	63.185	Fort Huachuca	4,525	975	373	0-575	bf
										575-780	cgl
										780-975	granite
96	D(21-20)36bda	110o 16' 01"	69.573	31o 33' 52"	62.783	Fort Huachuca	4,485	600	341	0-600	bf
97	D(23-22)3ddd	110o 05' 20"	86.568	31o 27' 14"	50.663	Hereford	4,275	105		0-105	bf
98	D(21-21)31cdb	110o 15' 07"	71.002	31o 33' 24"	61.939	Fort Huachuca	4,440	501	272	0-501	bf
99	D(21-21)33bcc	110o 13' 20"	73.819	31o 33' 34"	62.259	Lewis Springs	4,320	322	155	0-322	bf
100	D(21-21)33bbc	110o 13' 20"	73.814	31o 33' 58"	63.001	Lewis Springs	4,320	500	174	0-500	bf
101	D(21-21)33aba	110o 12' 50"	74.600	31o 34' 04"	63.195	Lewis Springs	4,300	231	130	0-231	bf
102	D(21-21)33aba	110o 12' 43"	74.790	31o 34' 05"	63.230	Lewis Springs	4,295	193	123	0-193	bf
103	D(21-21)33aab	110o 12' 34"	75.028	31o 34' 03"	63.165	Lewis Springs	4,290	174	118	0-174	bf
104	D(21-21)27dbb	110o 11' 50"	76.179	31o 34' 33"	64.093	Lewis Springs	4,235	600		0-600	bf
105	D(21-21)17bcc	110o 14' 23"	72.122	31o 36' 22"	67.423	Lewis Springs	4,299	1,005	157	0-600	bf
(TW9)										600-1,005	cgl
106	D(21-21)34dbb	110o 11' 42"	76.400	31o 33' 39"	62.432	Lewis Springs	4,275	233	122	0-233	bf
107	D(22-21)14cac	110o 11' 01"	77.519	31o 30' 54"	57.364	Lewis Springs	4,310	243		0-243	bf
108	D(22-22)17bcd	110o 08' 04"	82.188	31o 31' 07"	57.799	Lewis Springs	4,095	908	20	0-660	bf
										660-875	cgl
										875-908	lava
109	D(21-22)19bbd	110o 09' 08"	80.433	31o 35' 41"	66.220	Lewis Springs	4,025	350	130	0-350	granite
110	D(21-22)19bac	110o 09' 00"	80.642	31o 35' 39"	66.167	Lewis Springs	4,025	133	40	0-45	bf
										45-133	volcanics
111	D(21-22)18cdd	110o 08' 51"	80.875	31o 35' 55"	66.656	Lewis Springs	4,023	120	16	0-49	bf
										49-120	granite
112	D(21-22)21aba	110o 06' 37"	84.406	31o 35' 50"	66.529	Tombstone SE	4,180	131	70	0-131	bf
113	D(21-22)27cba	110o 06' 03"	85.327	31o 34' 30"	64.076	Tombstone SE	4,190	180	90	0-180	bf
114	D(21-23)29dbc	110o 01' 36"	92.361	31o 34' 22"	63.892	Tombstone SE	4,487	973		0-250	bf
										250-973	limestone
115	D(21-23)16cbb	110o 01' 11"	92.995	31o 36' 13"	67.312	Tombstone SE	4,625	592		0-592	limestone
116	D(20-20)7cdc	110o 20' 40"	62.127	31o 42' 05"	77.921	Huachuca City	4,355	300	204	0-300	bf
117	D(23-20)1acd	110o 15' 43"	70.124	31o 27' 40"	51.337	Miller Peak	4,815	165	68	0-103	bf
										103-165	limestone
118	D(22-20)10abb	110o 17' 57"	66.525	31o 32' 21"	59.970	Fort Huachuca	4,675	805	515	0-770	bf
										770-805	cgl
119	D(22-20)3ddd	110o 17' 32"	67.188	31o 32' 29"	60.219	Fort Huachuca	4,645	867	515	0-675	bf
										675-867	cgl
120	D(22-20)1cbb	110o 16' 22"	69.027	31o 32' 47"	60.784	Fort Huachuca	4,450	605	375	0-385	bf
										385-605	cgl
121	D(22-20)1caa	110o 15' 58"	69.663	31o 32' 46	60.756	Fort Huachuca	4,530	600	365	0-245	bf
										245-600	cgl
122	D(22-20)12abb	110o 15' 51"	69.848	31o 32' 20"	59.959	Fort Huachuca	4,520	604	342	0-345	bf
										345-604	cgl
123	D(22-20)12aab	110o 15' 36"	70.247	31o 32' 20"	59.961	Fort Huachuca	4,525	1,050	334	0-335	bf
										335-1,050	cgl

124	D(22-20)12adb	110o 15' 37"	70.221	31o 32' 06"	59.529	Fort Huachuca	4,515	465	375?	0-400	bf
										400-465	cgl
126	D(22-20)12cac	110o 16' 06"	69.465	31o 31' 49"	59.003	Fort Huachuca	4,550	602	372	0-375	bf
										375-602	cgl
127	D(22-20)12bdc	110o 16' 05"	69.483	31o 31' 59"	59.313	Fort Huachuca	4,575	544	396	0-405	bf
										405-544	cgl
128	D(22-20)12bdb	110o 16' 07"	69.434	31o 32' 04"	59.457	Fort Huachuca	4,570	540	395	0-465	bf
										465-540	cgl
129	D(22-20)12bcc	110o 16' 23"	69.007	31o 32' 01"	59.366	Fort Huachuca	4,590	542	400	0-250	bf
										250-542	cgl
130	D(22-21)3abc	110o 11' 49"	76.226	31o 33' 07"	61.444	Lewis Springs	4,295	180	82	0-180	bf
131	D(22-21)6bcd	110o 15' 12"	70.876	31o 32' 53"	60.985	Fort Huachuca	4,483	700	297	0-700	bf
132	D(22-21)6bcc	110o 15' 18"	70.715	31o 32' 51"	60.918	Fort Huachuca	4,475	600	311	0-600	bf
133	D(22-21)6aca	110o 14' 42"	71.662	31o 33' 00"	61.201	Lewis Springs	4,450	500	280	0-280	bf
										280-500	cgl
134	D(22-21)8ccc	110o 14' 20"	72.260	31o 31' 34"	58.556	Lewis Springs	4,495	220	180	0-189	bf
										189-220	cgl
135	D(22-21)14cca	110o 11' 10"	77.283	31o 30' 50"	57.240	Lewis Springs	4,320	180	128	0-180	bf
136	D(22-21)14bdc	110o 11' 02"	77.488	31o 31' 08"	57.796	Lewis Springs	4,275	194	91	0-194	bf
137	D(22-21)14bcb	110o 11' 17"	77.087	31o 31' 16"	58.037	Lewis Springs	4,315	200	120	0-200	bf
138	D(22-21)14cbc	110o 11' 17"	77.092	31o 30' 54"	57.361	Lewis Springs	4,300	250	120	0-250	bf
139	D(22-21)14bdb	110o 11' 02"	77.486	31o 31' 16"	58.040	Lewis Springs	4,290	220	120	0-220	bf
140	D(22-21)15add	110o 11' 28"	76.804	31o 31' 08"	57.791	Lewis Springs	4,325	180	129	0-180	bf
141	D(22-21)18dcc	110o 14' 53"	71.397	31o 30' 43"	56.977	Lewis Springs	4,550	650	342	0-148	bf
										148-650	cgl
142	D(22-21)19cdd	110o 14' 56"	71.331	31o 29' 53"	55.447	Nicksville	4,610	450	370	0-450	bf
143	D(22-21)21dba	110o 12' 43"	74.842	31o 30' 09"	55.959	Lewis Springs	4,430	300	215	0-300	bf
144	D(22-21)22add	110o 11' 24"	76.920	31o 30' 18"	56.251	Lewis Springs	4,350	240	160	0-240	bf
145	D(22-21)22cab	110o 12' 04"	75.867	31o 30' 11"	56.033	Lewis Springs	4,375	247	160	0-247	bf
146	D(22-21)22cad	110o 11' 53"	76.154	31o 30' 04	55.813	Lewis Springs	4,375	260	170	0-260	bf
147	D(22-21)22cbc	110o 12' 18"	75.498	31o 30' 04"	55.808	Lewis Springs	4,390	280	203	0-280	bf
148	D(22-21)22cca	110o 12' 11"	75.680	31o 29' 56"	55.566	Nicksville	4,390	265	193	0-265	bf
149	D(22-21)22ccd	110o 12' 11"	75.682	31o 29' 49"	55.344	Nicksville	4,390	270	183	0-270	bf
150	D(22-21)22cdd	110o 11' 56"	76.081	31o 29' 49"	55.347	Nicksville	4,375	260	170	0-260	bf
151	D(22-21)30bbb	110o 15' 22"	70.650	31o 29' 42"	55.098	Miller Peak	4,650	802	400	0-802	bf & cgl
152	D(22-21)22dbb	110o 11' 49"	76.266	31o 30' 11"	56.036	Lewis Springs	4,360	260	154	0-260	bf
153	D(22-21)22ddd	110o 11' 24"	76.926	31o 29' 49"	55.354	Nicksville	4,350	230	170	0-230	bf
154	D(22-21)23bbb	110o 11' 17"	77.096	31o 30' 36"	56.807	Lewis Springs	4,305	215	125	0-215	bf
155	D(22-21)23bbd	110o 11' 10"	77.288	31o 30' 29"	56.597	Lewis Springs	4,312	175	128	0-175	bf
156	D(22-21)23bad	110o 10' 55"	77.686	31o 30' 29"	56.600	Lewis Springs	4,300	220	110	0-220	bf
157	D(22-21)26aca	110o 10' 37"	78.174	31o 29' 31"	54.808	Nicksville	4,310	190	115	0-190	bf
158	D(22-21)26ccc	110o 11' 17"	77.118	31o 28' 59"	53.825	Nicksville	4,375	250	155	0-250	bf
159	D(22-21)26dbb	110o 10' 48"	77.883	31o 29' 17"	54.385	Nicksville	4,325	200	180	0-200	bf
160	D(22-21)27acc	110o 11' 46"	76.353	31o 29' 24"	54.584	Nicksville	4,387	300	175	0-300	bf
161	D(22-21)27bcc	110o 12' 18"	75.507	31o 29' 24"	54.578	Nicksville	4,425	315	205	0-315	bf
162	D(22-21)27cdc	110o 12' 04"	75.883	31o 28' 59"	53.816	Nicksville	4,410	300	232	0-300	bf
163	D(22-21)28ada	110o 12' 25"	75.325	31o 29' 31"	54.787	Nicksville	4,430	313	224	0-313	bf
164	D(22-21)28cdb	110o 13' 05"	74.267	31o 29' 06"	54.015	Nicksville	4,500	300	240	0-300	bf
165	D(22-21)30aaa	110o 14' 28"	72.074	31o 29' 46"	55.230	Nicksville	4,580	440		0-440	bf
166	D(22-21)31cdc	110o 15' 07"	71.069	31o 28' 05"	52.119	Miller Peak	4,710	620	80	0-300	bf
										300-620	cgl
167	D(22-21)33acb	110o 12' 50"	74.673	31o 28' 37"	53.120	Nicksville	4,480	300	229	0-300	bf

168	D(22-21)34acc	110o 11' 46"	76.364	31o 28' 34"	53.044	Nicksville	4,410	400	197	0-400	bf
169	D(22-21)34bcb	110o 12' 18"	75.518	31o 28' 37'	53.126	Nicksville	4,480	325	270	0-325	bf
170	D(22-21)34dcd	110o 11' 38"	76.579	31o 28' 05"	52.158	Nicksville	4,425	300	210	0-300	bf
171	D(22-21)35ada	110o 10' 23"	78.548	31o 28' 37"	53.149	Nicksville	4,330	240	140	0-240	bf
172	D(22-21)35cab	110o 11' 02"	77.525	31o 28' 26"	52.808	Nicksville	4,375	250	180	0-250	bf
173	D(22-21)35dbb	110o 10' 48"	77.895	31o 28' 26"	52.811	Nicksville	4,363	240	180	0-240	bf
174	D(22-21)35dcd	110o 10' 37	78.194	31o 28' 05"	52.170	Nicksville	4,375	215	160	0-215	bf
175	D(22-21)36bbc	110o 10' 16"	78.737	31o 28' 44"	53.372	Nicksville	4,322	235		0-235	bf
176	D(22-21)36cba	110o 10' 08"	78.950	31o 28' 26"	52.819	Nicksville	4,335	280	180	0-280	bf
177	D(22-21)36dba	110o 09' 36"	79.795	31o 28' 26"	52.825	Nicksville	4,330	180	140	0-180	bf
178	D(22-21)22caa	110o 11' 56"	76.076	31o 30' 11"	56.034	Lewis Springs	4,365	262	166	0-262	bf
179	D(23-21)2bdb	110o 11' 02"	77.534	31o 27' 47"	51.612	Nicksville	4,415	213	170	0-213	bf
180	D(23-21)2cba	110o 11' 10"	77.328	31o 27' 32"	51.145	Nicksville	4,425	300	210	0-300	bf
181	D(23-21)2ccd	110o 11' 10"	77.333	31o 27' 14"	50.590	Nicksville	4,440	300	201	0-300	bf
182	D(23-21)3add	110o 11' 28"	76.851	31o 27' 40"	51.385	Nicksville	4,436	395	213	0-395	bf
183	D(23-21)3cda	110o 11' 56"	76.114	31o 27' 22"	50.825	Nicksville	4,480	300	250	0-300	bf
184	D(23-21)4aab	110o 12' 36"	75.052	31o 27' 58"	51.926	Nicksville	4,480	335	255	0-335	bf
185	D(23-21)4bcb	110o 13' 19"	73.923	31o 27' 47"	51.585	Nicksville	4,540	437	360	0-437	bf
186	D(23-21)5cad	110o 13' 59"	72.864	31o 27' 25"	50.890	Nicksville	4,620	120		0-120	bf
187	D(23-20)1aad	110o 15' 29"	70.483	31o 27' 50"	51.650	Miller Peak	4,763	103	60	0-103	bf
188	D(22-21)6cbb	110o 15' 19"	70.687	31o 32' 47"	60.796	Fort Huachuca	4,490	400	150	0-400	bf
189	D(23-20)1acc	110o 15' 50"	69.935	31o 27' 39"	51.303	Miller Peak	4,825	130	78	0-127	bf
										127-130	granite
190	D(23-20)1adc	110o 15' 36"	70.305	31o 27' 40"	51.338	Miller Peak	4,810	104	52	0-104	bf
191	D(23-20)1dca	110o 15' 43"	70.128	31o 27' 22"	50.783	Miller Peak	4,890	405	192	0-79	bf
										79-405	cgl
192	D(23-20)1ddb	110o 15' 36"	70.309	31o 27' 22"	50.784	Miller Peak	4,870	97		0-97	bf
193	D(23-20)3adc	110o 17' 38"	67.084	31o 27' 40"	51.317	Miller Peak	5,150	90		0-65	bf
										65-90	granite
194	D(23-20)10bca	110o 18' 18"	66.038	31o 26' 56"	49.958	Miller Peak	5,525	200	100	0-200	granite
195	D(23-20)11aac	110o 16' 34"	68.784	31o 26' 56"	49.976	Miller Peak	5,150	120	14	0-47	bf
										47-120	granite
196	D(23-20)11aca	110o 16' 44"	68.519	31o 26' 53"	49.886	Miller Peak	5,175	150	10	0-48	bf
										49-150	limestone
197	D(23-20)12dbc	110o 15' 50"	69.948	31o 26' 35"	49.341	Miller Peak	5,137	100	19	0-68	bf
										68-100	granite
198	D(23-21)11bac	110o 11' 02"	77.545	31o 27' 00"	50.159	Nicksville	4,445	300	215	0-300	bf
199	D(23-21)11bca	110o 11' 10"	77.337	31o 26' 53"	49.947	Nicksville	4,455	310	241	0-310	bf
200	D(23-21)11cdb	110o 10' 59"	77.628	31o 26' 28"	49.173	Nicksville	4,470	300	210	0-300	bf
201	D(23-21)11dac	110o 10' 34"	78.291	31o 26' 35"	49.400	Nicksville	4,435	265	192	0-265	bf
202	D(23-21)12aaa	110o 09' 25"	80.109	31o 27' 07"	50.389	Nicksville	4,355	240	130	0-240	bf
203	D(23-21)12cca	110o 10' 08"	78.977	31o 26' 28"	49.184	Nicksville	4,403	283	162	0-283	bf
204	D(23-21)12cdc	110o 10' 01"	79.168	31o 26' 24"	49.063	Nicksville	4,398	260	167	0-260	bf
205	D(23-21)12cdd	110o 09' 54"	79.350	31o 26' 20"	48.943	Nicksville	4,390	240	160	0-240	bf
206	D(23-21)12ddd	110o 09' 22"	80.196	31o 26' 20"	48.949	Nicksville	4,365	200	130	0-200	bf
207	D(23-21)15bda	110o 11' 56"	76.131	31o 26' 06"	48.487	Nicksville	4,560	440	325	0-440	bf
208	D(23-21)17aad	110o 13' 26"	73.755	31o 26' 06"	48.469	Nicksville	4,670	202	105	0-130	bf
										130-202	cgl
209	D(23-21)17bad	110o 13' 59"	72.881	31o 26' 06"	48.463	Nicksville	4,745	305	160	0-58	bf
										58-266	granite
										266-305	cgl

210	D(23-21)18dcb	110o 14' 53"	71.462	31o 25' 37"	47.556	Nicksville	4,675	205		0-38	bf
										38-205	granite
211	D(23-21)18ccc	110o 15' 18"	70.808	31o 25' 26"	47.219	Miller Peak	5,135	105		0-30	bf
										30-105	granite
212	D(23-21)19acc	110o 14' 53"	71.469	31o 25' 01"	46.448	Nicksville	4,950	250	31	0-5	bf
										5-250	granite
213	D(23-21)19ada	110o 14' 31"	72.057	31o 25' 08	46.673	Nicksville	4,885	150	92	0-50	bf
										50-150	quartzite
214	D(23-21)19bac	110o 15' 04"	71.181	31o 25' 16"	46.911	Miller Peak	5,050	525	335	0-18	bf
										18-525	granite
215	D(23-21)19cba	110o 15' 11"	70.995	31o 24' 58"	46.355	Miller Peak	5,075	280	180	0-21	bf
										21-280	granite
216	D(23-21)20baa	110o 13' 59"	72.890	31o 25' 23"	47.144	Nicksville	4,785	200		0-200	bf
217	D(23-21)20bbd	110o 14' 13"	72.531	31o 25' 16"	46.920	Nicksville	4,820	113		0-113	bf
218	D(23-21)25dbb	110o 09' 47"	79.562	31o 24' 04"	44.755	Nicksville	4,415	310	155	0-310	bf
219	D(23-21)25acc	110o 09' 47"	79.560	31o 24' 11"	44.976	Nicksville	4,415	260	200	0-260	bf
220	D(23-21)25abc	110o 09' 47"	79.558	31o 24' 22"	45.309	Nicksville	4,415	500		0-500	bf
221	D(23-21)32bcc	110o 14' 20"	72.366	31o 23' 17"	43.261	Nicksville	5,190	73	24	0-17	bf
										17-73	granite
222	D(23-21)32cdb	110o 14' 06"	72.740	31o 23' 02"	42.798	Nicksville	5,190	200	131	0-50	bf
										50-200	granite
223	D(32-21)32dbb	110o 13' 52"	73.108	31o 23' 13"	43.134	Nicksville	5,070	200	55	0-200	bf
224	D(23-21)35ddd	110o 10' 26"	78.552	31o 22' 52"	42.530	Nicksville	4,460	247	153	0-247	bf
225	D(23-20)1dbd	110o 15' 42"	70.146	31o 27' 27"	50.938	Miller Peak	4,865	150	40	0-110	bf
										110-150	granite
226	D(23-21)7cca	110o 15' 13"	70.928	31o 26' 27"	49.093	Miller Peak	4,800	757	190	0-25	bf
										25-757	granite
227	D(23-21)7dad	110o 14' 30"	72.058	31o 26' 32"	49.255	Nicksville	4,740	220	122	0-97	bf
										97-200	cgl
										200-220	granite
228	D(23-21)7dda	110o 14' 30"	72.059	31o 26' 26"	49.078	Nicksville	4,760	215	140	0-120	bf
										120-210	cgl
										210-215	granite
229	D(23-21)17ccc	110o 14' 21"	72.310	31o 25' 25"	47.196	Nicksville	4,855	240	dry	0-100	bf
										100-240	granite
230	D(23-21)8bdd	110o 14' 01"	72.825	31o 26' 45"	49.660	Nicksville	4,479	200	120?	0-195	bf
										195-200	granite
231	D(23-21)8dbc	110o 13' 52"	73.065	31o 26' 32"	49.262	Nicksville	4,680	290	144	0-145	bf
										145-281	cgl
										281-290	granite
232	D(23-21)3ddd	110o 11' 27"	76.886	31o 27' 11"	50.498	Nicksville	4,455	360	245	0-360	bf

234	D(23-22)17cad	110o 07' 52"	82.581	31o 25' 39"	47.704	Nicksville	4,280	1,200	32	0-1,050	bf
										1,050-1,200	cgl
235	D(22-20)26adc	110o 16' 37"	68.678	31o 29' 24"	54.531	Miller Peak	4,765	360	167	0-360	bf
236	D(22-20)26add	110o 16' 31"	68.830	31o 29' 25"	54.565	Miller Peak	4,760	525	450	0-220	bf
										360-525	cgl
237	D(22-20)26baa	110o 17' 00"	68.066	31o 29' 43"	55.115	Miller Peak	4,750	400	51	0-110	bf
										110-400	cgl
238	D(22-20)26caa	110o 17' 01"	68.044	31o 29' 15"	54.250	Miller Peak	4,805	475	256	0-45	bf
										45-475	cgl
239	D(22-20)26cdd	110o 16' 59"	68.095	31o 28' 58"	53.729	Miller Peak	4,825	705	465	0-40	bf
										40-705	cgl
240	D(22-20)26ddd	110o 16' 31"	68.835	31o 29' 00"	53.789	Miller Peak	4,805	625	580	0-625	bf & cgl
241	D(22-20)28bcc	110o 19' 25"	64.243	31o 29' 24"	54.502	Miller Peak	5,025	105		0-75	bf
										75-105	granite
242	D(22-20)35aaa	110o 16' 30"	68.865	31o 28' 52"	53.546	Miller Peak	4,815	412	330	0-50	bf
										50-412	cgl
243	D(24-22)6abc	110o 08' 46"	81.199	31o 22' 37"	42.085	Nicksville	4,330	260	115	0-260	bf
244	D(22-20)35acb	110o 16' 51"	68.317	31o 28' 37"	53.076	Miller Peak	4,880	100	30	0-40	bf
										40-45	limestone
										45-100	granite
245	D(22-20)35cbb	110o 17' 21"	67.522	31o 28' 23"	52.650	Miller Peak	4,985	130	70	0-130	bf
246	D(22-20)36abb	110o 15' 52"	69.873	31o 28' 51"	53.519	Miller Peak	4,755	601	226?	0-80	bf
										80-601	cgl
247	D(23-22)7caa	110o 08' 53"	80.951	31o 26' 38"	49.509	Nicksville	4,335	252		0-252	bf
248	D(23-22)7dcc	110o 08' 49"	81.070	31o 26' 20"	48.956	Nicksville	4,325	250	100	0-250	bf
249	D(23-22)7cad	110o 08' 53"	80.952	31o 26' 35"	49.420	Nicksville	4,330	306		0-306	bf
250	D(23-22)7cbb	110o 09' 14"	80.399	31o 26' 42"	49.627	Nicksville	4,360	210	150	0-210	bf
251	D(23-22)10acc	110o 05' 42"	85.995	31o 26' 46"	49.793	Hereford	4,200	384	23	0-384	bf w/ gypsum
252	D(23-22)10cdd	110o 05' 49"	85.821	31o 26' 20"	48.994	Hereford	4,190	300	11	0-300	bf
253	D(23-22)16caa	110o 06' 50"	84.214	31o 25' 48"	47.994	Hereford	4,230	795		0-620	bf
										620-795	cgl
254	D(23-22)17baa	110o 08' 06"	82.202	31o 26' 13"	48.743	Nicksville	4,290	223	95	0-223	bf
255	D(23-22)17bbb	110o 08' 17"	81.908	31o 26' 13"	48.741	Nicksville	4,295	504	80	0-504	bf (warm
											water)
256	D(23-22)21abd	110o 06" 36"	84.592	31o 25' 16"	47.011	Hereford	4,195	209	40	0-209	bf
257	D(23-22)21acc	110o 06' 43"	84.416	31o 25' 01"	46.544	Hereford	4,210	264	30	0-264	bf
258	D(23-22)21cda	110o 06' 50"	84.230	31o 24' 45"	46.055	Hereford	4,215	100	35	0-100	bf
259	D(23-22)25bbb	110o 04' 12"	88.407	31o 24' 29"	45.602	Hereford	4,385	312	182	0-312	bf
260	D(23-22)26bcc	110o 05' 13"	86.806	31o 24' 07"	44.901	Hereford	4,320	250	190	0-250	bf
261	D(23-22)28aaa	110o 06' 22"	84.975	31o 24' 29"	45.573	Hereford	4,205	563	70	0-563	bf
262	D(23-22)28baa	110o 06' 54"	84.128	31o 24' 32"	45.655	Hereford	4,220	116	41	0-116	bf
263	D(23-22)28baa	110o 06' 50"	84.233	31o 24' 29"	45.567	Hereford	4,220	150	40	0-150	bf
264	D(23-22)28baa	110o 06' 54"	84.129	31o 24' 29"	45.566	Hereford	4,220	85	41	0-85	bf
265	D(23-22)28bad	110o 06' 50"	84.235	31o 24' 22"	45.345	Hereford	4,220	104	43	0-104	bf
266	D(23-22)28bbc	110o 07' 16"	83.550	31o 24' 25"	45.429	Hereford	4,240	250	57	0-250	bf
267	D(23-22)28bca	110o 07' 05"	83.838	31o 24' 14"	45.098	Hereford	4,230	280	53	0-280	bf
268	D(23-22)28bda	110o 06' 50"	84.236	31o 24' 18"	45.223	Hereford	4,220	87		0-87	bf
269	D(23-22)28bda	110o 06' 54"	84.133	31o 24' 14"	45.101	Hereford	4,228	125	31	0-125	bf

270	D(23-22)28cac	110o 06' 58"	83.944	31o 29' 56"	55.629	Hereford	4,228	96		0-96	bf
271	D(23-22)28dcc	110o 06' 43"	84.435	31o 23' 42"	44.117	Hereford	4,220	150	15	0-150	bf
272	D(23-22)28ddb	110o 06' 29"	84.795	31o 23' 49"	44.330	Hereford	4,210	101	41	0-101	bf
273	D(23-22)28ddc	110o 06' 29"	84.796	31o 23' 42"	44.120	Hereford	4,210	200	16	0-200	bf
274	D(23-21)19dad	110o 14' 31"	72.061	31o 24' 50"	46.119	Nicksville	4,900	500	45	0-5	bf
										5-500	granite
275	D(23-22)29acb	110o 07' 44"	82.811	31o 24' 14"	45.090	Nicksville	4,275	460		0-460	bf
276	D(23-22)30bdd	110o 08' 49"	81.102	31o 24' 07"	44.855	Nicksville	4,349	220	110	0-220	bf
277	D(23-22)29dcb	110o 07' 44"	82.817	31o 23' 49"	44.314	Nicksville	4.280	350		0-350	bf
278	D(23-22)31cda	110o 08' 52"	81.033	31o 22' 59"	42.771	Nicksville	4,330	201	70	0-201	bf
279	D(23-22)31ddd	110o 08' 24"	81.776	31o 22' 52"	42.555	Nicksville	4,295	200	80	0-200	bf
280	D(23-22)32ddd	110o 07' 23"	83.383	31o 22' 52"	42.567	Hereford	4,245	201	40	0-201	bf
281	D(23-22)33dda	110o 06' 22"	84.997	31o 22' 59"	42.802	Hereford	4,230	100	44	0-100	bf
282	D(23-22)33aaa	110o 06' 25"	84.911	31o 23' 38"	43.999	Hereford	4,205	80	18	0-80	bf
283	D(23-22)33ada	110o 06' 22"	84.991	31o 23' 24"	43.567	Hereford	4,215	90	17	0-90	bf
284	D(23-22)33bab	110o 07' 01"	83.961	31o 23' 38"	43.991	Hereford	4,237	130	35	0-130	bf
285	D(23-22)33cbd	110o 07' 05"	83.855	31o 23' 02"	42.882	Hereford	4,237	234	26	0-234	bf
286	D(22-22)30bbd	110o 09' 07"	80.547	31o 29' 38"	55.048	Nicksville	4,255	201	66	0-201	bf
287	D(23-22)33dcc	110o 06' 43"	84.448	31o 22' 52"	42.576	Hereford	4,220	200	19	0-200	bf
288	D(23-22)34cac	110o 06' 00"	85.577	31o 23' 02"	42.896	Hereford	4,248	152	25	0-152	bf
289	D(23-22)34cdc	110o 05' 56"	85.684	31o 22' 52"	42.586	Hereford	4,260	180	120	0-180	bf
290	D(23-23)19ddb	110o 02' 24"	91.256	31o 24' 40"	45.959	Hereford	4,550	450	380	0-170	bf
										170-450	cgl
291	D(23-23)29bbb	110o 02' 10"	91.629	31o 24' 29"	45.629	Hereford	4,570	400	380	0-400	bf & cgl
292	D(23-23)30cda	110o 02' 49"	90.614	31o 23' 49"	44.379	Hereford	4,475	330	260	0-170	bf
										170-330	cgl
293	D(23-23)30dac	110o 02' 24"	91.268	31o 23' 56"	44.606	Hereford	4,510	395	375	0-395	bf & cgl
294	D(23-23)31acb	110o 02' 38"	90.905	31o 23' 24"	43.617	Hereford	4,455	343	241	0-343	bf & cgl
295	D(23-23)31baa	110o 02' 49"	90.617	31o 23' 35"	43.958	Hereford	4,460	363	260	0-363	bf & cgl
296	D(23-23)32bcb	110o 02' 13"	91.572	31o 23' 20"	43.501	Hereford	4,462	270	250	0-270	bf & cgl
297	D(23-23)34cdb	109o 59' 52"	95.297	31o 22' 55"	42.758	Bisbee	4,590	740	661	0-590	no record
										590-740	cgl
298	D(24-21)2bba	110o 11' 10"	77.394	31o 22' 44"	42.278	Nicksville	4,555	400	280	0-400	bf
299	D(24-21)2bbb	110o 11' 17"	77.203	31o 22' 44"	42.276	Nicksville	4,570	402	304	0-402	bf
300	D(24-21)4baa	110o 12' 58"	74.540	31o 22' 48"	42.379	Nicksville	4,840	324		0-275	bf
										275-318	cgl
										318-324	granite
301	D(24-21)5ada	110o 13' 26"	73.801	31o 22' 34"	41.941	Nicksville	4,975	245	84	0-82	bf
										82-245	Paleozoics
302	D(24-21)11acc	110o 10' 44"	78.095	31o 21' 32"	40.066	Bob Thompson Peak	4,470	1,015		0-1,015	bf
303	D(24-21)15bac	110o 12' 04"	75.993	31o 20' 49"	38.721	Bob Thompson Peak	4,640	403	322	0-367	bf
										367-375	cgl
304	D(24-21)17bbc	110o 14' 20"	72.396	31o 20' 56"	38.917	Bob Thompson Peak	5,150	340	246	0-18	cgl
										18-340	granite
305	D(24-21)17bcd	110o 14' 15"	72.532	31o 20' 39"	38.397	Bob Thompson Peak	5,065	295	70	0-295	granite
306	D(24-21)17dac	110o 13' 37"	73.544	31o 20' 28"	38.060	Bob Thompson Peak	4,880	350	207	0-305	cgl
										305-350	granite
307	D(24-21)17cdd	110o 13' 58"	72.985	31o 20' 15"	37.657	Bob Thompson Peak	4,930	758	632	0-280	cgl
										280-758	bedrock

308	D(24-22)3aad	110o 05' 20"	86.639	31o 22' 37"	42.128	Hereford	4,330	500	140	0-500	bf
309	D(24-22)4caa	110o 06' 50"	84.266	31o 22' 19"	41.555	Stark	4,230	530	20	0-530	bf
310	D(24-22)5acc	110o 07' 44"	82.838	31o 22' 26"	41.765	Bob Thompson Peak	4,265	200	60	0-200	bf
311	D(24-22)5bcd	110o 08' 06"	82.257	31o 22' 26"	41.760	Bob Thompson Peak	4,285	168	85	0-168	bf
312	D(24-22)7ada	110o 08' 24"	81.793	31o 21' 40"	40.338	Bob Thompson Peak	4,290	186	49	0-180	bf
313	D(24-22)8ada	110o 07' 23"	83.400	31o 21' 40"	40.351	Stark	4,250	200	26	0-200	bf
314	D(24-22)8bbd	110o 08' 06"	82.267	31o 21' 47"	40.563	Bob Thompson Peak	4,277	205	55	0-205	bf
315	D(24-22)8cbb	110o 08' 13"	82.091	31o 21' 25"	39.875	Bob Thompson Peak	4,277	315	40	0-315	bf
316	D(24-22)8ccb	110o 08' 13"	82.094	31o 21' 14"	39.542	Bob Thompson Peak	4,277	300	40	0-300	bf
317	D(42-22)9bdb	110o 07' 01"	83.990	31o 21' 40"	40.355	Stark	4,245	455	20	0-455	bf
318	D(24-22)9cba	110o 07' 05"	83.879	31o 21' 25"	39.889	Stark	4,265	456		0-456	bf
319	D(24-22)19aad	110o 08' 24"	81.817	31o 20' 02"	37.323	Bob Thompson Peak	4,305	350	40	0-350	bf
320	D(24-22)20baa	110o 07' 52"	82.662	31o 20' 06"	37.452	Bob Thompson Peak	4,325	350	40	0-350	bf
321	D(24-22)3aac	110o 05' 28"	86.429	31o 22' 37"	42.127	Hereford	4,330	301	125	0-301	bf
322	D(24-22)4bcc	110o 07' 12"	83.684	31o 22' 26"	41.772	Stark	4,240	178	23	0-178	bf
323	D(24-22)4bab	110o 07' 01"	83.974	31o 22' 44"	42.328	Hereford	4,230	150	22	0-150	bf
324	D(24-22)5aab	110o 07' 30"	83.204	31o 22' 44"	42.322	Nicksville	4,255	210	43	0-210	bf
325	D(24-22)8bbb	110o 08' 17"	81.971	31o 21' 50"	40.650	Bob Thompson Peak	4,290	206	55	0-206	bf
326	D(24-22)8baa	110o 07' 52"	82.637	31o 21' 50"	40.655	Bob Thompson Peak	4,270	606	34	0-606	bf
327	D(24-22)17cac	110o 07' 59"	82.466	31o 20' 28"	38.127	Bob Thompson Peak	4,270	248	40	0-248	bf
328	D(24-22)17cbc	110o 08' 13"	82.105	31o 20' 28"	38.124	Bob Thompson Peak 4,275	4,275	300	25	0-300	bf
329	D(24-24)18dcc	109o 56' 35"	100.546	31o 20' 14"	37.852	Naco	4,590	160	118	0-160	bf
330	D(24-23)6aaa	110o 02' 17"	91.468	31o 22' 44"	42.391	Hereford	4,415	400	210	0-296	bf
										296-400	cgl
331	D(24-23)3ccb	110o 00' 07"	94.921	31o 22' 05"	41.225	Stark	4,475	460	240	0-350	bf
										350-460	cgl
332	D(24-23)9aaa	110o 00' 14"	94.735	31o 21' 50"	40.758	Stark	4,425	280	210	0-220	bf
										220-280	cgl
333	D(24-23)11cab	109o 58' 21"	97.728	31o 21' 26"	40.042	Naco	4,525	285	177	0-285	bf
334	D(23-21)1bbc	110o 10' 16"	78.749	31o 27' 50"	51.709	Nicksville	4,370	240	120	0-240	bf
335	D(22-22)4dbb	110o 06' 47"	84.186	31o 32' 46"	60.863	Tombstone SE	4,187	230	108	0-230	bf
336	D(22-22)3cba	110o 06' 07"	85.248	31o 32' 49"	60.960	Tombstone SE	4,255	300	197	0-300	bf
337	D(22-22)17dab	110o 07' 30"	83.082	31o 31' 01"	57.617	Tombstone SE	4,090	460	9	0-460	bf
338	D(22-22)5cbb	110o 08' 13"	81.926	31o 32' 46"	60.845	Lewis Springs	4,073	715	14	0-445	bf
										445-715	cgl
339	D(22-22)8cbc	110o 08' 13"	81.940	31o 31' 48"	59.061	Lewis Springs	4,070	855	15	0-580	bf
										580-855	cgl
340	D(23-21)8dcc	110o 13' 52"	73.068	31o 26' 20"	48.897	Nicksville	4,705	205		0-182	bf
										182-205	cgl
341	D(23-21)8ddd	110o 13' 26"	73.752	31o 26' 20"	48.902	Nicksville	4,650	300	150	0-150	bf
										150-300	cgl
343	D(23-21)7aab	110o 14' 38"	71.842	31o 27' 07"	50.329	Nicksville	4,710	175	54	0-175	bf
344	D(23-21)8adb	110o 13' 37"	73.460	31o 26' 53"	49.919	Nicksville	4,620	247	143	0-247	bf
345	D(23-21)8aab	110o 13" 37"	73.457	31o 27' 07"	50.340	Nicksville	4,605	400	300	0-400	bf
346	D(23-21)10adb	110o 11' 35"	76.672	31o 26' 53"	49.942	Nicksville	4,480	300	260	0-300	bf
347	D(23-21)11add	110o 10' 23"	78.574	31o 26' 46"	49.735	Nicksville	4,415	245	205	0-245	bf
348	D(23-21)8acd	110o 13' 43"	73.300	31o 26' 45"	49.664	Nicksville	4,640	200	125	0-120	bf
										120-200	cgl
349	D(23-21)5dda	110o 13' 26"	73.740	31o 27' 18"	50.686	Nicksville	4,577	400	341	0-400	bf

Appendix 2. Complete Bouguer gravity anomalies (CBGA), gravity effect of basin fill including conglomerate (Pantano? Formation), and gravity anomaly with basin fill removed for the drillholes which penetrated into bedrock. Grid x and Grid y are in km, altitudes and depths are in meters, and gravity anomalies are in mGals.

Well no.	Grid x	Grid y	Surface altitude	Total depth	Depth to water	Depth to congl.	Depth to bedrk.	CBGA	Fill gravity effect	"Nofill" gravity anomaly
21	59.0197	77.7144	1365.5	125.0	76.2	118.9	118.9	-147.1	-1.382	-145.7
30	66.0991	77.7019	1300.0	2594.8	-1.0	228.6	228.6	-155.0	-4.418	-150.6
36	88.2917	83.6206	1341.1	170.7	118.9	0.0	169.2	-153.6	-1.680	-151.9
42	92.9883	79.6272	1380.7	158.5	-1.0	0.0	100.6	-153.9	-1.003	-152.9
47	76.7168	79.8037	1176.5	189.9	-1.0	144.5	188.1	-147.9	-2.534	-145.4
49	75.8511	76.4055	1185.7	117.3	4.0	106.7	106.7	-146.1	-1.403	-144.7
55	71.3515	76.0078	1249.7	61.0	18.3	3.0	3.0	-145.8	-0.050	-145.8
56	71.3462	76.7834	1228.3	61.0	7.9	30.5	30.5	-146.5	-0.632	-145.9
85	68.9842	67.1577	1338.1	457.5	74.4	192.6	394.7	-159.3	-6.060	-153.2
95	68.2228	63.1846	1379.2	297.2	113.7	175.3	237.7	-164.4	-4.482	-159.9
108	82.1881	57.7991	1248.2	276.8	6.1	201.2	266.7	-163.1	-2.655	-160.4
114	92.3608	63.8918	1367.6	296.6	-1.0	76.2	76.2	-150.8	-1.005	-149.8
117	70.1244	51.3372	1467.6	50.3	20.7	31.4	31.4	-157.5	-0.455	-157.0
189	69.9347	51.3027	1470.7	39.6	23.8	38.7	38.7	-158.0	-0.820	-157.2
193	67.0843	51.3171	1569.7	27.4	-1.0	19.8	19.8	-153.4	-0.387	-153.0
195	68.7843	49.9763	1569.7	36.6	4.3	14.3	14.3	-153.7	-0.260	-153.4
196	68.5188	49.8857	1577.3	45.7	3.0	14.6	14.6	-153.5	-0.267	-153.2
197	69.9478	49.3411	1565.8	30.5	5.8	20.7	20.7	-153.0	-0.407	-152.6
209	72.8809	48.4631	1446.3	93.0	48.8	17.7	17.7	-155.1	-0.338	-154.8

210	71.4616	47.5557	1424.9	62.5	-1.0	11.6	11.6	-152.9	-0.198	-152.7
211	70.8083	47.2188	1565.1	32.0	-1.0	9.1	9.1	-152.9	-0.152	-152.7
212	71.4692	46.4475	1508.8	76.2	9.4	1.5	1.5	-151.7	-0.025	-151.7
213	72.0572	46.6729	1488.9	45.7	28.0	15.2	15.2	-152.1	-0.281	-151.8
214	71.1810	46.9109	1539.2	160.0	102.1	5.5	5.5	-152.4	-0.092	-152.3
215	70.9948	46.3555	1546.9	85.3	54.9	6.4	6.4	-152.0	-0.107	-151.9
221	72.3659	43.2615	1581.9	22.3	7.3	5.2	5.2	-153.5	-0.087	-153.4
222	72.7398	42.7983	1581.9	61.0	39.9	15.2	15.2	-153.2	-0.281	-152.9
225	70.1459	50.9385	1482.9	45.7	12.2	33.5	33.5	-159.3	-0.701	-158.6
226	70.9283	49.0928	1463.0	230.7	57.9	7.6	7.6	-152.9	-0.127	-152.8
227	72.0583	49.2554	1444.8	67.1	37.2	29.6	61.0	-154.2	-1.003	-153.2
228	72.0595	49.0781	1450.8	65.5	42.7	36.6	64.0	-154.2	-1.113	-153.1
229	72.3103	47.1958	1479.8	73.2	0.0	30.5	30.5	-153.1	-0.632	-152.5
230	72.8254	49.6599	1365.2	61.0	36.6	59.4	59.4	-155.7	-1.292	-154.4
231	73.0653	49.2625	1426.5	88.4	43.9	44.2	85.6	-155.9	-1.460	-154.4
241	64.2427	54.5024	1531.6	32.0	-1.0	22.9	22.9	-153.7	-0.458	-153.2
244	68.3174	53.0764	1487.4	30.5	9.1	12.2	12.2	-156.2	-0.212	-156.0
274	72.0611	46.1189	1493.5	152.4	13.7	1.5	1.5	-151.8	-0.025	-151.8
300	74.5398	42.3787	1475.2	98.8	-1.0	83.8	96.9	-156.9	-2.009	-154.9
301	73.8014	41.9414	1516.4	74.7	25.6	25.0	25.0	-154.5	-0.506	-154.0
304	72.3959	38.9167	1569.7	103.6	75.0	0.0	5.5	-152.1	-0.035	-152.1
306	73.5435	38.0603	1487.4	106.7	63.1	0.0	93.0	-154.9	-0.580	-154.3
307	72.9846	37.6572	1502.7	231.0	192.6	0.0	85.3	-153.1	-0.532	-152.6

Appendix 3. Residual gravity anomaly and computed depth to bedrock for drillholes penetrating into the Pantano? Formation (conglomerate). Grid x and Grid y are in km., altitudes and depths are in meters; gravity anomalies are in mGal. CBGA is complete Bouguer gravity anomaly; error is misfit, in mGal, between model depth to bedrock gravity effect and residual gravity anomaly. A "flag" of "*" means calculated depth is less than total depth of well even though well did not penetrate into bedrock.

Well No.	Grid x	Grid y	Surface Altitude	Total depth	Depth to water	Depth to congl.	CBGA mGal	Resid. gravity anomaly	Calc. depth to bedrk	Error mGal	flag
37	88.526	83.989	1342.6	149.4	111.3	36.6	-154.2	-2.16	291.0	0.000	
38	90.757	87.677	1398.4	213.4	173.7	0.0	-163.4	-11.35	976.0	0.006	
39	91.913	87.621	1417.3	182.9	0.0	0.0	-163.9	-11.37	978.0	-0.003	
41	92.185	81.471	1380.7	143.6	125.9	0.0	-153.3	-2.22	326.0	-0.002	
43	90.325	79.725	1356.4	271.3	101.5	0.0	-149.0	-0.99	155.0	0.002	*
48	70.402	56.670	1403.3	242.3	116.1	100.6	-164.6	-6.01	641.0	-0.002	
71	68.166	71.796	1306.7	306.0	45.4	167.6	-159.7	-8.62	632.0	-0.001	
77	59.638	65.748	1423.4	93.0	61.0	61.0	-164.1	-6.36	981.0	0.000	
78	61.335	64.394	1444.4	242.9	175.3	7.9	-161.9	-3.81	597.0	-0.002	
79	63.495	64.961	1397.2	244.1	133.8	103.6	-162.8	-4.66	524.0	-0.001	
80	63.699	65.794	1388.4	245.4	130.1	114.3	-163.3	-5.58	595.0	-0.007	
81	65.215	67.654	1349.0	246.0	86.0	128.6	-164.4	-8.80	694.0	0.003	
82	65.480	67.744	1347.2	246.0	84.4	132.3	-164.3	-8.93	717.0	0.000	
83	67.577	69.022	1325.0	305.4	64.9	193.5	-161.4	-8.66	697.0	-0.005	
86	66.508	67.175	1348.7	246.0	83.8	158.8	-163.4	-8.34	633.0	-0.001	
88	65.138	63.165	1399.0	278.0	-1.0	258.2	-163.9	-5.14	673.0	0.001	
89	65.010	62.388	1412.7	374.9	-1.0	235.0	-163.7	-4.96	652.0	0.003	

90	65.490	61.593	1414.6	216.4	145.4	210.3	-163.3	-4.69	507.0	0.006	
91	65.596	61.350	1414.6	213.7	143.3	210.9	-163.2	-4.64	502.0	-0.001	
93	66.198	62.185	1402.1	196.6	134.1	189.6	-164.0	-5.00	669.0	0.000	
94	65.779	62.360	1397.5	304.8	141.7	165.5	-164.0	-5.10	695.0	0.001	
105	72.122	67.423	1310.3	306.3	47.9	182.9	-155.6	-3.26	373.0	0.003	
118	66.525	59.970	1424.9	245.4	157.0	234.7	-164.7	-6.55	451.0	-0.005	
119	67.189	60.218	1415.8	264.3	157.0	205.7	-164.7	-6.28	434.0	0.004	
120	69.027	60.784	1356.4	184.4	114.3	117.3	-163.2	-4.27	238.0	-0.004	
121	69.663	60.756	1380.7	182.9	111.3	74.7	-163.2	-4.26	273.0	-0.002	
122	69.848	59.959	1377.7	184.1	104.2	105.2	-164.7	-5.88	382.0	-0.004	
123	70.247	59.961	1379.2	320.0	101.8	102.1	-165.1	-6.30	420.0	0.002	
124	70.221	59.529	1376.2	141.7	114.3	121.9	-165.4	-6.61	430.0	-0.002	
126	69.465	59.003	1386.8	183.5	113.4	114.3	-164.9	-6.30	409.0	0.005	
127	69.483	59.313	1394.5	165.8	120.7	123.4	-164.9	-6.19	395.0	0.007	
128	69.434	59.457	1392.9	164.6	120.4	141.7	-164.8	-6.12	378.0	-0.001	
129	69.007	59.366	1399.0	165.2	121.9	76.2	-164.5	-5.93	411.0	-0.001	
133	71.662	61.201	1356.4	152.4	85.3	85.3	-165.2	-6.70	469.0	0.002	
134	72.260	58.556	1370.1	67.1	54.9	57.6	-166.1	-7.00	1107.0	0.000	
141	71.397	56.977	1386.8	198.1	104.2	45.1	-165.5	-6.60	1044.0	-0.002	
191	70.128	50.783	1490.5	123.4	58.5	24.1	-158.3	-0.96	55.0	-0.001	*
208	73.755	48.469	1423.4	61.6	32.0	39.6	-156.6	-1.53	194.0	0.002	
234	82.581	47.704	1304.5	365.8	9.8	320.0	-176.1	-17.96	1381.0	-0.004	
236	68.830	54.565	1450.8	160.0	137.2	67.1	-158.6	-1.43	152.0	0.000	*

237	68.066	55.114	1447.8	121.9	15.5	33.5	-159.4	-2.72	390.0	-0.001	
238	68.044	54.249	1464.6	144.8	78.0	13.7	-157.6	-1.38	188.0	0.001	
239	68.095	53.729	1470.7	214.9	141.7	12.2	-156.9	-0.84	103.0	-0.002	*
242	68.865	53.546	1467.6	125.6	100.6	15.2	-157.4	-0.61	63.0	0.001	*
246	69.873	53.519	1449.3	183.2	68.9	24.4	-159.5	-1.84	253.0	-0.001	
253	84.214	47.994	1289.3	242.3	-1.0	189.0	-173.4	-15.43	1230.0	0.007	
290	91.256	45.959	1386.8	137.2	115.8	51.8	-163.5	-7.70	1203.0	0.000	
292	90.614	44.379	1364.0	100.6	79.2	51.8	-168.0	-12.16	1083.0	-0.007	
303	75.993	38.721	1414.3	122.8	98.1	111.9	-164.6	-9.76	1504.0	0.001	
330	91.468	42.391	1345.7	121.9	64.0	90.2	-168.5	-13.33	1159.0	0.006	
331	94.921	41.225	1364.0	140.2	73.2	106.7	-162.0	-8.30	823.0	0.000	
332	94.735	40.758	1348.7	85.3	64.0	67.1	-163.2	-9.57	1511.0	0.002	
339	81.941	59.060	1240.5	260.6	4.6	176.8	-161.9	-2.61	288.0	-0.003	
340	73.068	48.897	1434.1	62.5	-1.0	55.5	-155.6	-0.85	72.0	0.003	
341	73.752	48.902	1417.3	91.4	45.7	45.7	-157.0	-1.75	223.0	0.000	
348	73.300	49.664	1414.3	61.0	38.1	36.6	-156.7	-1.72	225.0	-0.001	

Appendix 4. Principal fact list for the 1521 gravity stations used int this study; anomalies computed using 2.67 gm/cc density and the IGSN71 formula. Heading abbreviations: id-station identification; lat-latitude; long-longitude; alt-altitude; og-observed gravity; thg-theoretical gravity; faa-free air gravity anomaly; sba-simmple bouguer gravity anomaly; htc-hand terrain correction; ttc-total terrain correction; cc-curvature correction; cba-complete bouguer gravity anomaly; s.d.cba-standard deviation of complete bouguer gravity anomaly.

id	lat	long	alt	og	thg	faa	sba	htc	ttc	cc	cba	s.d.cba	id
3277 421	31 20.000	-110 17.800	1636.80m	978954.220	979429.673	29.56	-153.59	0.00	2.26	1.45	-152.78	0.48	3277 421
59188-1-	31 20.100	-109 49.100	1394.50m	979014.490	979429.807	14.96	-141.08	0.00	0.30	1.35	-142.13	0.18	59188-1-
5918AG33	31 20.600	-109 45.950	1316.20m	979027.220	979430.476	2.87	-144.41	0.00	0.57	1.31	-145.15	0.21	5918AG33
59188-1-	31 20.700	-109 50.900	1409.70m	979011.480	979430.609	15.84	-141.90	0.00	0.33	1.36	-142.94	0.18	59188-1-
59188-1-	31 20.900	-109 45.600	1308.20m	979029.530	979430.877	2.31	-144.07	0.00	0.77	1.31	-144.61	0.23	59188-1-
5918AG32	31 21.000	-109 45.300	1304.60m	979028.030	979431.011	-0.43	-146.41	0.00	0.68	1.31	-147.04	0.22	5918AG32
75101	31 21.050	-109 46.000	1317.00m	979026.500	979431.078	1.80	-145.57	0.00	0.46	1.32	-146.43	0.20	75101
3277 422	31 21.300	-110 23.400	1621.20m	978953.070	979431.412	21.86	-159.55	0.00	1.20	1.44	-159.79	0.30	3277 422
3277 425	31 21.600	-110 29.200	1583.70m	978954.990	979431.814	11.81	-165.40	0.00	0.86	1.43	-165.97	0.24	3277 425
5918AG24	31 21.750	-109 45.400	1298.80m	979029.320	979432.014	-1.93	-147.27	0.00	0.87	1.31	-147.70	0.24	5918AG24
5918AG25	31 22.150	-109 45.350	1297.90m	979029.330	979432.549	-2.74	-147.97	0.00	0.98	1.31	-148.29	0.26	5918AG25
3138B003	31 22.400	-109 58.900	1405.10m	978999.960	979432.884	0.63	-156.60	0.00	0.86	1.36	-157.10	0.24	3138B003
5918HRF-	31 22.400	-110 8.300	1307.60m	979001.750	979432.884	-27.66	-173.98	0.00	0.41	1.31	-174.88	0.19	5918HRF-
20510289	31 22.800	-110 1.000	4500.00f	978997.660	979433.419	-12.54	-166.02	0.00	0.51	1.34	-166.86	0.12	20510289
3277 427	31 22.800	-110 3.400	1328.00m	979002.260	979433.419	-21.39	-169.99	0.00	0.43	1.32	-170.88	0.19	3277 427
5918HRF-	31 22.800	-110 4.400	1328.00m	979002.470	979433.419	-21.18	-169.78	0.00	0.46	1.32	-170.64	0.20	5918HRF-
20510290	31 22.800	-110 11.400	1388.40m	978992.560	979433.419	-12.46	-167.82	0.00	0.89	1.35	-168.28	0.25	20510290

3277 420 31 22.800 -110 12.400 1442.00m 978988.850 979433.419 0.36 -161.00 0.00 1.28 1.38 -161.09 0.31 3277 420

5918AG21 31 22.900 -109 45.100 1292.70m 979030.030 979433.553 -4.65 -149.30 0.00 0.66 1.30 -149.94
0.22 5918AG21

3138B002 31 22.900 -109 53.100 1474.00m 978997.980 979433.553 19.23 -145.71 0.00 0.51 1.39 -146.59
0.20 3138B002

5918HRF- 31 22.900 -110 13.300 1501.10m 978982.960 979433.553 12.57 -155.40 0.00 2.14 1.40 -154.67
0.46 5918HRF-

5918AG21 31 23.150 -109 45.500 1304.90m 979029.210 979433.888 -2.04 -148.05 0.00 0.69 1.31 -148.67
0.22 5918AG21

5918AG21 31 23.400 -109 45.800 1307.90m 979028.100 979434.223 -2.56 -148.91 0.00 0.31 1.31 -149.91
0.18 5918AG21

5918AG21 31 23.700 -109 46.150 1314.90m 979026.530 979434.624 -2.37 -149.50 0.00 0.29 1.31 -150.53
0.18 5918AG21

751010 31 24.050 -109 46.600 1315.80m 979029.000 979435.093 -0.09 -147.32 0.00 0.34 1.31 -148.30 0.19 751010

5918AG21 31 24.300 -109 46.900 1309.80m 979028.230 979435.428 -3.04 -149.61 0.00 0.43 1.31 -150.49
0.19 5918AG21

5918AG21 31 24.600 -109 47.200 1314.30m 979027.120 979435.829 -3.17 -150.24 0.00 0.48 1.31 -151.07
0.20 5918AG21

CH8 31 24.760 -110 29.360 1622.45m 978956.040 979436.043 20.58 -160.97 0.00 1.62 1.45 -160.79 0.37 CH8

3277 423 31 24.800 -110 25.500 1746.80m 978930.540 979436.097 33.38 -162.08 0.00 1.83 1.48 -161.73 0.40
3277 423

5918AG21 31 24.900 -109 47.600 1314.60m 979027.730 979436.231 -2.87 -149.97 0.00 0.71 1.31 -150.57
0.22 5918AG21

CH10 31 25.120 -110 29.830 1580.69m 978964.460 979436.526 15.64 -161.23 0.00 0.97 1.43 -161.70 0.26 CH10

5918AG22 31 25.200 -109 47.900 1342.10m 979021.280 979436.633 -1.24 -151.42 0.00 0.60 1.33 -152.14
0.21 5918AG22

CH9 31 25.230 -110 29.090 1621.54m 978956.260 979436.673 19.89 -161.55 0.00 1.33 1.45 -161.67 0.32 CH9

CH11 31 25.250 -110 29.870 1601.72m 978960.390 979436.700 17.88 -161.35 0.00 1.09 1.44 -161.69 0.28 CH11

59188-3- 31 25.280 -109 47.920 1341.70m 979025.620 979436.740 2.87 -147.26 0.00 0.59 1.33 -148.00 0.21 59188-3-

5918AG22 31 25.500 -109 48.250 1360.40m 979018.430 979437.035 1.16 -151.07 0.00 0.71 1.34 -151.70 0.22 5918AG22

75102 31 25.800 -109 48.650 1361.30m 979018.190 979437.437 0.79 -151.54 0.00 0.95 1.34 -151.92 0.26 75102

20510287 31 25.800 -109 53.400 1546.90m 978979.960 979437.437 19.81 -153.29 0.00 1.48 1.42 -153.23
0.34 20510287

3277 426 31 25.900 -110 7.300 1297.80m 979008.190 979437.570 -28.93 -174.15 0.00 0.38 1.30 -175.08 0.19
3277 426

5918SS-4 31 25.900 -110 26.200 1667.30m 978950.390 979437.570 27.24 -159.33 0.00 2.06 1.46 -158.73 0.45

5918SS-4

5918AG22 31 26.150 -109 49.000 1359.50m 979018.970 979437.905 0.55 -151.58 0.00 1.37 1.34 -151.55 0.32 5918AG22

5918HRF- 31 26.300 -110 6.500 1266.50m 979019.010 979438.106 -28.30 -170.02 0.00 0.45 1.29 -170.86
0.19 5918HRF-

5918AG22 31 26.400 -109 49.400 1390.20m 979013.110 979438.240 3.82 -151.74 0.00 1.27 1.35 -151.82 0.31 5918AG22

3138B001 31 26.600 -109 49.800 1399.00m 979012.780 979438.508 5.94 -150.61 0.00 1.90 1.36 -150.06 0.42 3138B001

5918AG22 31 26.700 -109 48.900 1365.90m 979015.830 979438.642 -1.36 -154.20 0.00 0.80 1.34 -154.74
0.24 5918AG22

5918AG22 31 26.950 -109 48.200 1341.50m 979018.000 979438.977 -7.05 -157.16 0.00 0.53 1.33 -157.96
0.20 5918AG22

5918HRF- 31 27.000 -110 11.400 1360.60m 979001.390 979439.045 -17.83 -170.08 0.00 0.61 1.34 -170.81
0.21 5918HRF-

5918AG22 31 27.050 -109 47.850 1329.30m 979018.690 979439.111 -10.25 -159.00 0.00 0.45 1.32 -159.87
0.19 5918AG22

5918AG22 31 27.200 -109 47.350 1314.00m 979020.890 979439.312 -12.97 -160.01 0.00 0.38 1.31 -160.94
0.19 5918AG22

59188-3- 31 27.200 -109 47.700 1321.00m 979020.800 979439.312 -10.91 -158.72 0.00 0.43 1.32 -159.61 0.19
59188-3-

3277 419 31 27.200 -110 15.400 1477.40m 978994.570 979439.312 11.11 -154.21 0.00 1.99 1.39 -153.61 0.43
3277 419

75100 31 27.400 -109 46.900 1298.40m 979022.250 979439.581 -16.69 -161.98 0.00 0.31 1.31 -162.98 0.18 75100

5918AG23 31 27.450 -109 46.400 1283.50m 979022.730 979439.648 -20.88 -164.50 0.00 0.26 1.30 -165.54
0.18 5918AG23

5918AG23 31 27.500 -109 45.850 1270.70m 979023.140 979439.715 -24.48 -166.67 0.00 0.21 1.29 -167.75
0.18 5918AG23

3138B004 31 27.500 -109 51.500 1828.80m 978932.570 979439.715 57.08 -147.56 0.00 5.50 1.50 -143.55
1.11 3138B004

75103 31 27.550 -109 45.350 1259.10m 979024.560 979439.782 -26.71 -167.60 0.00 0.18 1.28 -168.70 0.18 75103

3277 428 31 27.700 -110 3.200 1372.50m 979014.910 979439.983 -1.58 -155.16 0.00 0.72 1.34 -155.78 0.22 3277 428

20510291 31 28.600 -110 15.600 1425.90m 978998.560 979441.189 -2.67 -162.22 0.00 1.45 1.37 -162.14
0.34 20510291

75109 31 28.900 -109 49.900 1247.50m 979026.000 979441.592 -30.66 -170.25 0.00 9.39 1.28 -162.14 1.89 75109

3277 429 31 29.100 -110 6.700 1264.30m 979034.280 979441.860 -17.46 -158.94 0.00 0.45 1.29 -159.77 0.19
3277 429

3277 424 31 29.500 -110 28.900 1585.00m 978971.850 979442.396 18.49 -158.87 0.00 1.44 1.43 -158.86 0.34
3277 424

5918SS-5 31 29.700 -110 29.800 1581.90m 978973.140 979442.665 18.56 -158.46 0.00 1.50 1.43 -158.39 0.35
5918SS-5

20510286 31 30.000 -110 0.500 1483.80m 978993.660 979443.067 8.42 -157.62 0.00 4.42 1.39 -154.59 0.90 20510286

3097 785 31 30.200 -110 0.200 1484.40m 978995.160 979443.335 9.83 -156.27 0.00 2.22 1.39 -155.44 0.48 3097 785

3138G003 31 30.300 -109 49.400 1344.10m 979014.540 979443.469 -14.20 -164.60 0.00 0.54 1.33 -165.39
0.20 3138G003

3277 431 31 30.500 -110 1.100 1437.70m 979008.470 979443.738 8.34 -152.54 0.00 2.88 1.37 -151.04 0.60 3277 431

266200H4 31 30.630 -110 15.400 1401.50m 979004.110 979443.912 -7.36 -164.19 0.00 0.74 1.36 -164.81
0.23 266200H4

5918H-50 31 30.670 -110 28.120 1589.50m 978976.160 979443.966 22.62 -155.24 0.00 1.48 1.43 -155.20 0.34
5918H-50

26620H10 31 30.680 -110 16.300 1419.10m 979001.570 979443.979 -4.54 -163.34 0.00 0.86 1.37 -163.84
0.24 26620H10

26620T16 31 30.790 -110 0.900 1445.70m 979005.190 979444.127 7.13 -154.64 0.00 2.49 1.38 -153.53 0.53 26620T16

5918H-49 31 31.090 -110 27.500 1621.50m 978971.390 979444.529 27.15 -154.29 0.00 2.13 1.45 -153.60 0.46
5918H-49

26620T22 31 31.520 -110 11.600 1316.40m 979016.890 979445.106 -22.03 -169.33 0.00 0.36 1.32 -170.29
0.19 26620T22

266200H3 31 31.520 -110 15.400 1382.90m 979008.310 979445.106 -10.10 -164.84 0.00 0.63 1.35 -165.56
0.21 266200H3

266200H9 31 31.520 -110 17.250 1425.90m 979000.980 979445.106 -4.16 -163.72 0.00 0.87 1.37 -164.22
0.24 266200H9

26620T18 31 31.700 -110 3.050 1359.40m 979027.460 979445.348 1.56 -150.55 0.00 0.57 1.34 -151.32 0.21 26620T18

5918H-47 31 31.960 -110 29.240 1528.60m 978991.460 979445.697 17.40 -153.64 0.00 1.13 1.41 -153.93 0.28
5918H-47

59188-4- 31 32.000 -109 49.400 1316.70m 979020.470 979445.750 -19.00 -166.34 0.00 0.40 1.32 -167.25 0.19
59188-4-

26620T17 31 32.160 -110 4.100 1335.90m 979032.030 979445.965 -1.73 -151.22 0.00 0.36 1.33 -152.18 0.19 26620T17

3097 783 31 32.300 -110 11.100 1301.50m 979024.600 979446.153 -19.96 -165.60 0.00 0.32 1.31 -166.58 0.18
3097 783

26620T15 31 32.350 -110 0.600 1413.70m 979016.080 979446.220 6.06 -152.13 0.00 0.78 1.36 -152.71 0.23 26620T15

26620T21 31 32.370 -110 11.100 1301.50m 979022.390 979446.247 -22.27 -167.90 0.00 0.31 1.31 -168.90
0.18 26620T21

266200H6 31 32.400 -110 17.450 1392.00m 979008.420 979446.287 -8.36 -164.12 0.00 0.90 1.35 -164.58
0.25 266200H6

266200H8 31 32.400 -110 17.950 1425.50m 979001.680 979446.287 -4.77 -164.28 0.00 0.83 1.37 -164.82 0.24 266200H8

3277 430 31 32.700 -110 7.800 1241.70m 979045.170 979446.690 -18.38 -157.32 0.00 0.30 1.27 -158.29 0.18 3277 430

3277 491 31 32.800 -110 21.900 1610.30m 978971.820 979446.824 21.83 -158.36 0.00 2.86 1.44 -156.94 0.60 3277 491

26620T20 31 32.880 -110 10.350 1282.90m 979030.210 979446.932 -20.87 -164.42 0.00 0.27 1.30 -165.45 0.18 26620T20

3097 784 31 33.000 -110 6.300 1289.90m 979038.440 979447.093 -10.64 -154.98 0.00 0.29 1.30 -155.99 0.18 3097 784

59188-4- 31 33.100 -109 49.900 1249.10m 979027.430 979447.227 -34.37 -174.14 0.00 3.25 1.28 -172.17 0.67 59188-4-

26620T19 31 33.150 -110 7.400 1257.90m 979042.870 979447.294 -16.28 -157.04 0.00 0.26 1.28 -158.06 0.18 26620T19

26620T14 31 33.230 -110 0.950 1397.20m 979022.060 979447.401 5.77 -150.57 0.00 0.53 1.36 -151.40 0.20 26620T14

266200H5 31 33.230 -110 16.400 1385.60m 979010.640 979447.401 -9.23 -164.27 0.00 0.57 1.35 -165.06 0.21 266200H5

266200H7 31 33.230 -110 17.450 1401.50m 979008.100 979447.401 -6.86 -163.69 0.00 0.64 1.36 -164.41 0.21 266200H7

266200H2 31 33.240 -110 15.400 1365.20m 979014.850 979447.415 -11.33 -164.09 0.00 0.49 1.34 -164.94 0.20 266200H2

26620T47 31 33.260 -110 13.400 1326.50m 979022.390 979447.442 -15.75 -164.18 0.00 0.37 1.32 -165.13 0.19 26620T47

26620T48 31 33.260 -110 14.100 1335.90m 979020.170 979447.442 -15.07 -164.55 0.00 0.41 1.33 -165.47 0.19 26620T48

3277 432 31 33.300 -110 13.400 1326.50m 979022.820 979447.496 -15.37 -163.81 0.00 0.37 1.32 -164.76 0.19 3277 432

3277 490 31 33.300 -110 15.400 1365.20m 979015.560 979447.496 -10.70 -163.46 0.00 0.49 1.34 -164.31 0.20 3277 490

3277 412 31 33.400 -110 27.300 1584.30m 978983.820 979447.630 25.01 -152.27 0.00 2.08 1.43 -151.62 0.45 3277 412

5918H-39 31 33.650 -110 28.660 1481.30m 979005.070 979447.966 14.16 -151.60 0.00 1.64 1.39 -151.35 0.37 5918H-39

26620T46 31 33.900 -110 8.200 1237.80m 979052.140 979448.301 -14.22 -152.73 0.00 0.29 1.27 -153.71 0.18 26620T46

26620T13 31 33.910 -110 1.550 1370.40m 979028.100 979448.315 2.63 -150.72 0.00 0.55 1.34 -151.51 0.20 26620T13

5918H-36 31 33.970 -110 29.650 1527.00m 978993.890 979448.395 16.64 -154.23 0.00 0.94 1.41 -154.70 0.26
5918H-36

26620T39 31 34.040 -110 13.950 1332.90m 979024.650 979448.490 -12.56 -161.71 0.00 0.39 1.32 -162.65
0.19 26620T39

26620H24 31 34.120 -110 15.400 1343.30m 979018.720 979448.597 -15.39 -165.71 0.00 0.45 1.33 -166.58
0.19 26620H24

26620H11 31 34.150 -110 17.500 1391.70m 979011.280 979448.637 -7.94 -163.67 0.00 0.59 1.35 -164.43
0.21 26620H11

26620T12 31 34.400 -110 1.150 1377.40m 979027.350 979448.973 3.38 -150.75 0.00 0.71 1.35 -151.39 0.22 26620T12

3097 787 31 34.400 -110 1.800 1367.90m 979029.790 979448.973 2.89 -150.18 0.00 0.69 1.34 -150.83 0.22 3097 787

26620T49 31 34.410 -110 12.900 1312.80m 979032.030 979448.986 -11.88 -158.78 0.00 0.31 1.31 -159.78
0.18 26620T49

26620T44 31 34.470 -110 6.000 1281.70m 979047.290 979449.067 -6.29 -149.71 0.00 0.23 1.30 -150.78 0.18 26620T44

26620H12 31 34.570 -110 16.150 1364.30m 979017.960 979449.201 -10.28 -162.94 0.00 0.46 1.34 -163.82
0.20 26620H12

26620T11 31 34.580 -110 0.500 1394.80m 979023.890 979449.215 5.05 -151.03 0.00 0.72 1.35 -151.66 0.22 26620T11

3138G004 31 34.600 -109 49.500 1304.50m 979025.150 979449.241 -21.58 -167.55 0.00 0.41 1.31 -168.44
0.19 3138G004

20510292 31 34.700 -110 18.900 1396.00m 979011.760 979449.376 -6.88 -163.09 0.00 0.64 1.36 -163.80
0.21 20510292

26620T23 31 34.830 -110 9.350 1236.60m 979055.920 979449.551 -12.06 -150.43 0.00 0.27 1.27 -151.43
0.18 26620T23

26620H13 31 35.040 -110 15.400 1343.30m 979024.000 979449.833 -11.35 -161.66 0.00 0.39 1.33 -162.60
0.19 26620H13

26620T43 31 35.050 -110 4.200 1313.40m 979039.150 979449.846 -5.43 -152.40 0.00 0.28 1.31 -153.44 0.18 26620T43

26620H23 31 35.060 -110 17.400 1377.10m 979015.640 979449.859 -9.31 -163.40 0.00 0.49 1.35 -164.26
0.20 26620H23

26620H14 31 35.260 -110 16.200 1355.40m 979021.470 979450.128 -10.44 -162.11 0.00 0.43 1.34 -163.01
0.19 26620H14

3277 413 31 35.800 -110 29.600 1436.20m 979010.180 979450.854 2.47 -158.24 0.00 0.99 1.37 -158.63 0.26 3277 413

59188-4- 31 35.900 -109 46.100 1272.20m 979029.660 979450.988 -28.78 -171.13 0.00 0.11 1.29 -172.31 0.17
59188-4-

26620H15 31 35.930 -110 16.400 1348.70m 979025.670 979451.028 -9.21 -160.13 0.00 0.40 1.33 -161.06
0.19 26620H15

5918H-23 31 35.970 -110 29.000 1472.20m 979001.350 979451.082 4.51 -160.23 0.00 0.68 1.39 -160.93 0.22 5918H-23

26620T24 31 36.320 -110 10.600 1241.50m 979055.920 979451.552 -12.55 -151.47 0.00 0.25 1.27 -152.49
0.18 26620T24

26620H17 31 36.330 -110 16.400 1338.10m 979029.980 979451.566 -8.71 -158.44 0.00 0.36 1.33 -159.40
0.19 26620H17

26620H22 31 36.360 -110 17.450 1351.50m 979023.960 979451.606 -10.63 -161.86 0.00 0.42 1.33 -162.78
0.19 26620H22

26620H16 31 36.490 -110 15.950 1328.90m 979033.000 979451.781 -8.74 -157.44 0.00 0.35 1.32 -158.41
0.19 26620H16

591821U 31 36.500 -109 53.400 1414.30m 979022.860 979451.794 7.45 -150.81 0.00 0.41 1.36 -151.76 0.19 591821U

591819T 31 36.500 -109 56.100 1402.10m 979027.160 979451.794 7.99 -148.91 0.00 0.44 1.36 -149.82 0.19 591819T

266200T9 31 36.570 -110 2.950 1322.50m 979040.440 979451.889 -3.38 -151.37 0.00 0.38 1.32 -152.30 0.19 266200T9

20510285 31 36.600 -110 3.000 1322.50m 979039.960 979451.929 -3.90 -151.89 0.00 0.37 1.32 -152.83 0.19 20510285

591820S 31 36.700 -109 54.700 1388.40m 979029.790 979452.063 6.12 -149.24 0.00 0.41 1.35 -150.18 0.19 591820S

26620H18 31 36.780 -110 16.400 1333.50m 979032.530 979452.171 -8.18 -157.40 0.00 0.38 1.32 -158.34
0.19 26620H18

5918BB-1 31 36.880 -110 29.880 1466.10m 979002.620 979452.305 2.68 -161.38 0.00 0.62 1.39 -162.14 0.21 5918BB-1

26620T25 31 36.900 -110 10.800 1234.70m 979062.650 979452.332 -8.70 -146.86 0.00 0.26 1.27 -147.87
0.18 26620T25

3097 259 31 37.200 -110 20.100 1353.30m 979020.490 979452.735 -14.68 -166.11 0.00 0.52 1.33 -166.92 0.20
3097 259

26620H28 31 37.210 -110 20.200 1353.30m 979019.800 979452.749 -15.38 -166.81 0.00 0.51 1.33 -167.64
0.20 26620H28

59188-4- 31 37.400 -109 49.900 1254.30m 979037.970 979453.004 -28.00 -168.36 0.00 3.26 1.28 -166.38 0.67
59188-4-

5918BB-1 31 37.420 -110 29.440 1455.40m 979007.720 979453.031 3.75 -159.11 0.00 0.68 1.38 -159.81 0.22 5918BB-1

26620T32 31 37.440 -110 6.850 1276.20m 979056.080 979453.058 -3.19 -146.00 0.00 0.20 1.29 -147.09 0.18 26620T32

3097 788 31 37.500 -110 4.900 1307.60m 979046.330 979453.139 -3.34 -149.65 0.00 0.26 1.31 -150.70 0.18 3097 788

591815R 31 37.550 -110 0.190 1361.80m 979039.530 979453.206 6.52 -145.87 0.00 0.41 1.34 -146.80 0.19 591815R

591814R 31 37.550 -110 1.200 1352.70m 979040.680 979453.206 4.86 -146.51 0.00 0.60 1.33 -147.24 0.21 591814R

591807R 31 37.630 -110 7.800 1261.90m 979063.030 979453.313 -0.91 -142.11 0.00 0.26 1.28 -143.14 0.18 591807R

26620H21 31 37.640 -110 16.950 1320.10m 979032.900 979453.327 -13.10 -160.82 0.00 0.33 1.32 -161.80
0.18 26620H21

5918BB-1 31 37.650 -110 27.740 1399.00m 979020.710 979453.340 -0.97 -157.51 0.00 0.64 1.36 -158.23 0.21
5918BB-1

591808R 31 37.660 -110 6.610 1279.20m 979057.620 979453.354 -1.02 -144.16 0.00 0.21 1.29 -145.25 0.18 591808R

591806R 31 37.720 -110 9.010 1294.80m 979057.500 979453.434 3.59 -141.30 0.00 0.40 1.30 -142.20 0.19 591806R

26620H19 31 37.820 -110 15.850 1310.00m 979042.810 979453.569 -6.55 -153.13 0.00 0.31 1.31 -154.13
0.18 26620H19

5918BB-1 31 37.990 -110 29.530 1414.30m 979018.010 979453.797 0.60 -157.66 0.00 0.88 1.36 -158.14 0.25 5918BB-1

5918BB-2 31 38.060 -110 26.320 1383.80m 979031.360 979453.892 4.45 -150.40 0.00 0.82 1.35 -150.93 0.24 5918BB-2

3277 492 31 38.100 -110 24.100 1349.70m 979038.060 979453.946 0.57 -150.46 0.00 0.64 1.33 -151.15 0.21 3277 492

591806R 31 38.200 -110 8.560 1258.20m 979063.100 979454.080 -2.75 -143.54 0.00 0.24 1.28 -144.58 0.18 591806R

5918BB-2 31 38.200 -110 24.920 1357.90m 979036.280 979454.080 1.19 -150.76 0.00 1.31 1.34 -150.79 0.31 5918BB-2

591805R 31 38.210 -110 9.780 1220.70m 979071.110 979454.093 -6.32 -142.91 0.00 0.33 1.26 -143.84 0.18 591805R

591809R 31 38.310 -110 5.850 1310.30m 979050.710 979454.227 0.79 -145.83 0.00 0.26 1.31 -146.88 0.18 591809R

5918BB-2 31 38.410 -110 25.960 1437.10m 979022.960 979454.362 12.01 -148.79 0.00 1.00 1.37 -149.17 0.26
5918BB-2

591823Q 31 38.500 -109 52.100 1389.90m 979027.110 979454.483 1.49 -154.04 0.00 0.30 1.35 -155.09 0.18 591823Q

591812R 31 38.510 -110 2.440 1378.90m 979037.440 979454.497 8.41 -145.89 0.00 0.35 1.35 -146.89 0.19 591812R

591822Q 31 38.540 -109 53.150 1382.60m 979024.000 979454.537 -3.93 -158.64 0.00 0.74 1.35 -159.25 0.23 591822Q

591815Q 31 38.540 -110 0.210 1385.30m 979036.190 979454.537 9.09 -145.92 0.00 0.33 1.35 -146.94 0.18 591815Q

591811Q 31 38.550 -110 4.600 1371.60m 979038.680 979454.550 7.34 -146.14 0.00 0.51 1.34 -146.97 0.20 591811Q

591816Q 31 38.570 -109 59.540 1398.40m 979034.070 979454.577 10.97 -145.51 0.00 0.50 1.36 -146.36 0.20 591816Q

26620T33 31 38.570 -110 5.550 1323.40m 979047.510 979454.577 1.28 -146.81 0.00 0.30 1.32 -147.83 0.18 26620T33

26620H29 31 38.580 -110 20.500 1307.30m 979035.320 979454.591 -15.89 -162.18 0.00 0.42 1.31 -163.07
0.19 26620H29

3277 489 31 38.600 -110 20.800 1305.50m 979036.100 979454.618 -15.69 -161.78 0.00 0.45 1.31 -162.64 0.19
3277 489

5918BB-2 31 38.630 -110 24.870 1375.00m 979033.780 979454.658 3.38 -150.48 0.00 0.87 1.35 -150.95 0.24 5918BB-2

26620H20 31 38.730 -110 17.500 1290.80m 979039.210 979454.792 -17.29 -161.73 0.00 0.32 1.30 -162.71
0.18 26620H20

591808Q 31 38.890 -110 6.680 1311.30m 979054.710 979455.008 4.32 -142.42 0.00 0.25 1.31 -143.48 0.18 591808Q

591813Q 31 38.910 -110 2.160 1400.30m 979034.560 979455.035 11.59 -145.10 0.00 0.46 1.36 -146.00 0.20 591813Q

591805Q 31 38.910 -110 10.500 1204.90m 979073.970 979455.035 -9.27 -144.10 0.00 0.49 1.25 -144.86 0.20 591805Q

591817Q 31 38.960 -109 58.180 1393.90m 979035.460 979455.102 10.45 -145.53 0.00 0.32 1.35 -146.56 0.18 591817Q

5918BB-2 31 39.040 -110 25.990 1444.80m 979023.570 979455.210 14.15 -147.52 0.00 0.74 1.38 -148.16 0.23
5918BB-2

591807Q 31 39.170 -110 8.430 1278.60m 979061.210 979455.384 0.35 -142.72 0.00 0.20 1.29 -143.82 0.18 591807Q

26620H35 31 39.250 -110 23.050 1362.80m 979038.230 979455.492 3.24 -149.26 0.00 0.52 1.34 -150.08 0.20 26620H35

591810Q 31 39.280 -110 5.440 1350.00m 979043.640 979455.532 4.66 -146.40 0.00 0.42 1.33 -147.32 0.19 591810Q

591813Q 31 39.320 -110 1.950 1449.00m 979024.100 979455.586 15.60 -146.54 0.00 0.52 1.38 -147.40 0.20 591813Q

591815P 31 39.390 -110 0.590 1410.60m 979034.210 979455.680 13.77 -144.07 0.00 0.33 1.36 -145.10 0.18 591815P

591821P 31 39.410 -109 54.460 1421.00m 979021.180 979455.707 3.92 -155.08 0.00 0.47 1.37 -155.98 0.20 591821P

26620H26 31 39.410 -110 19.000 1289.90m 979038.390 979455.707 -19.31 -163.64 0.00 0.36 1.30 -164.58
0.19 26620H26

26620H30 31 39.430 -110 20.900 1325.60m 979034.780 979455.734 -11.93 -160.26 0.00 0.40 1.32 -161.18
0.19 26620H30

591808P 31 39.590 -110 7.200 1306.10m 979056.210 979455.949 3.27 -142.88 0.00 0.25 1.31 -143.94 0.18 591808P

3097 288 31 39.600 -109 57.700 1408.20m 979031.620 979455.963 10.16 -147.42 0.00 0.28 1.36 -148.50 0.18
3097 288

26620T30 31 39.730 -110 10.500 1200.90m 979073.280 979456.137 -12.30 -146.68 0.00 0.34 1.25 -147.59
0.19 26620T30

591813P 31 39.760 -110 1.840 1456.30m 979022.830 979456.178 15.99 -146.97 0.00 0.47 1.38 -147.88 0.20 591813P

5918M-16 31 39.760 -110 28.910 1505.70m 979009.330 979456.178 17.73 -150.76 0.00 1.08 1.40 -151.08 0.28
5918M-16

591819P 31 39.770 -109 56.070 1431.60m 979024.560 979456.191 10.09 -150.10 0.00 0.30 1.37 -151.18 0.18 591819P

5918M-15 31 39.960 -110 29.170 1510.30m 979008.920 979456.447 18.47 -150.53 0.00 1.05 1.41 -150.89 0.27
5918M-15

5918M-14 31 40.030 -110 29.460 1510.30m 979008.970 979456.541 18.42 -150.58 0.00 0.95 1.41 -151.03 0.26
5918M-14

591815P 31 40.150 -110 0.250 1439.90m 979029.280 979456.702 16.86 -144.26 0.00 0.35 1.38 -145.29 0.19 591815P

591810P 31 40.180 -110 5.000 1389.90m 979035.610 979456.743 7.72 -147.80 0.00 1.57 1.35 -147.58 0.36 591810P

591808P 31 40.200 -110 6.830 1307.60m 979054.750 979456.770 1.45 -144.87 0.00 0.47 1.31 -145.71 0.20 591808P

591821N 31 40.270 -109 54.470 1450.90m 979013.860 979456.864 4.67 -157.68 0.00 0.36 1.38 -158.70 0.19 591821N

591820N 31 40.280 -109 55.480 1450.20m 979015.550 979456.878 6.13 -156.15 0.00 0.34 1.38 -157.19 0.19 591820N

591816P 31 40.290 -109 58.990 1419.50m 979031.500 979456.891 12.60 -146.24 0.00 0.40 1.37 -147.21 0.19 591816P

591814N 31 40.290 -110 1.030 1426.20m 979030.410 979456.891 13.57 -146.02 0.00 0.34 1.37 -147.05 0.19 591814N

591810N 31 40.320 -110 5.500 1360.00m 979043.870 979456.931 6.57 -145.61 0.00 1.28 1.34 -145.67 0.31 591810N

26620T42 31 40.330 -110 14.800 1268.30m 979063.030 979456.945 -2.57 -144.49 0.00 0.23 1.29 -145.55
0.18 26620T42

26620H36 31 40.350 -110 23.150 1373.70m 979039.210 979456.972 6.10 -147.62 0.00 0.52 1.34 -148.44 0.20 26620H36

591813N 31 40.430 -110 2.400 1487.40m 979018.300 979457.079 20.15 -146.29 0.00 0.86 1.40 -146.82 0.24 591813N

26620H31 31 40.580 -110 21.000 1337.20m 979036.460 979457.281 -8.22 -157.85 0.00 0.40 1.33 -158.78
0.19 26620H31

26620H25 31 40.610 -110 16.500 1256.70m 979053.280 979457.321 -16.27 -156.89 0.00 0.28 1.28 -157.90
0.18 26620H25

591805N 31 40.620 -110 10.700 1196.30m 979075.780 979457.335 -12.42 -146.28 0.00 0.45 1.25 -147.08 0.19 591805N

591806N 31 40.640 -110 9.040 1242.10m 979068.330 979457.362 -5.77 -144.75 0.00 0.32 1.27 -145.71 0.18 591806N

26620H37 31 40.670 -110 22.000 1356.70m 979040.440 979457.402 1.65 -150.16 0.00 0.47 1.34 -151.02 0.20 26620H37

26620H27 31 40.750 -110 18.600 1298.80m 979041.310 979457.510 -15.44 -160.78 0.00 0.31 1.31 -161.77
0.18 26620H27

591818N 31 40.790 -109 56.900 1436.20m 979023.890 979457.563 9.47 -151.24 0.00 0.42 1.37 -152.20 0.19 591818N

591814N 31 40.790 -110 0.740 1403.00m 979034.780 979457.563 10.11 -146.88 0.00 0.36 1.36 -147.88 0.19 591814N

591811N 31 40.820 -110 4.360 1493.50m 979017.240 979457.604 20.45 -146.67 0.00 1.42 1.40 -146.65 0.33 591811N

3097 786 31 40.900 -110 1.900 1444.80m 979027.910 979457.712 15.99 -145.68 0.00 0.46 1.38 -146.60 0.20 3097 786

591811N 31 40.910 -110 3.580 1467.60m 979024.690 979457.725 19.79 -144.43 0.00 0.84 1.39 -144.98 0.24 591811N

591804N 31 40.920 -110 10.830 1210.10m 979073.290 979457.739 -11.05 -146.46 0.00 0.22 1.25 -147.50 0.18 591804N

591816N 31 40.950 -109 59.150 1530.40m 979003.190 979457.779 17.60 -153.64 0.00 1.99 1.41 -153.07 0.43 591816N

591814N 31 40.990 -110 1.250 1408.20m 979034.320 979457.833 10.99 -146.59 0.00 0.34 1.36 -147.61 0.19 591814N

591810M 31 41.140 -110 5.510 1386.80m 979039.860 979458.035 9.73 -145.45 0.00 0.99 1.35 -145.81 0.26 591810M

591809M 31 41.150 -110 6.520 1348.70m 979047.890 979458.048 5.99 -144.93 0.00 0.37 1.33 -145.89 0.19 591809M

26620H33 31 41.210 -110 23.000 1376.20m 979041.790 979458.129 8.29 -145.70 0.00 0.59 1.35 -146.46 0.21 26620H33

26620T41 31 41.220 -110 14.800 1240.50m 979069.660 979458.142 -5.71 -144.52 0.00 0.25 1.27 -145.54
0.18 26620T41

591804M 31 41.370 -110 10.970 1188.70m 979078.350 979458.344 -13.20 -146.21 0.00 0.64 1.24 -146.81 0.21 591804M

591816M 31 41.430 -109 58.550 1441.70m 979024.480 979458.425 10.89 -150.43 0.00 0.42 1.38 -151.39 0.19 591816M

6323WM41 31 41.500 -110 24.000 1410.30m 979038.920 979458.519 15.55 -142.26 0.00 0.80 1.36 -142.82
0.24 6323WM41

26620H32 31 41.540 -110 22.000 1354.20m 979039.960 979458.573 -0.77 -152.30 0.00 0.49 1.33 -153.14
0.20 26620H32

6323WM33 31 41.540 -110 22.010 1354.20m 979041.470 979458.573 0.74 -150.79 0.00 0.49 1.33 -151.63 0.20 6323WM33

591807M 31 41.560 -110 7.790 1297.80m 979058.710 979458.600 0.56 -144.66 0.00 0.79 1.30 -145.18 0.23 591807M

6323WM34 31 41.560 -110 20.990 1336.50m 979039.980 979458.600 -6.23 -155.79 0.00 0.41 1.33 -156.70
0.19 6323WM34

26620H38 31 41.580 -110 21.000 1336.50m 979038.460 979458.627 -7.78 -157.33 0.00 0.42 1.33 -158.24
0.19 26620H38

591816M 31 41.610 -109 59.530 1459.40m 979018.680 979458.668 10.31 -153.00 0.00 0.44 1.38 -153.94 0.19 591816M

6323WM42 31 41.610 -110 24.600 1416.40m 979037.310 979458.668 15.67 -142.82 0.00 1.10 1.36 -143.08
0.28 6323WM42

26620H34 31 41.640 -110 24.600 1416.40m 979035.710 979458.708 14.03 -144.46 0.00 1.13 1.36 -144.69
0.28 26620H34

591813M 31 41.690 -110 2.110 1439.60m 979029.570 979458.775 14.98 -146.11 0.00 0.74 1.38 -146.74 0.23 591813M

20510293 31 41.700 -110 22.500 1375.00m 979042.460 979458.788 7.93 -145.93 0.00 0.57 1.35 -146.70 0.21 20510293

591805M 31 41.730 -110 10.640 1183.20m 979077.850 979458.829 -15.88 -148.28 0.00 0.83 1.24 -148.69 0.24 591805M

591811M 31 41.760 -110 4.250 1447.80m 979029.220 979458.869 17.07 -144.94 0.00 0.68 1.38 -145.64 0.22 591811M

26620T40 31 41.820 -110 14.350 1228.00m 979071.760 979458.950 -8.27 -145.68 0.00 0.25 1.27 -146.70
0.18 26620T40

26620H49 31 41.830 -110 18.250 1300.00m 979048.800 979458.964 -9.04 -154.50 0.00 0.32 1.31 -155.49
0.18 26620H49

591811M 31 41.890 -110 3.920 1426.50m 979033.790 979459.044 14.89 -144.73 0.00 0.49 1.37 -145.61 0.20 591811M

591814M 31 41.900 -110 1.070 1389.90m 979037.070 979459.058 6.87 -148.66 0.00 0.36 1.35 -149.65 0.19 591814M

591815M 31 41.930 -110 0.200 1409.70m 979030.870 979459.098 6.74 -151.01 0.00 0.46 1.36 -151.91 0.20 591815M

591813M 31 41.940 -110 2.420 1418.80m 979034.680 979459.111 13.34 -145.42 0.00 0.46 1.37 -146.33 0.20 591813M

26620T38 31 42.000 -110 13.500 1214.30m 979075.210 979459.192 -9.29 -145.17 0.00 0.23 1.26 -146.20
0.18 26620T38

591821L 31 42.020 -109 54.440 1498.10m 979013.470 979459.219 16.48 -151.15 0.00 0.66 1.40 -151.89 0.22 591821L

591819L 31 42.040 -109 56.470 1468.20m 979015.820 979459.246 9.58 -154.71 0.00 0.92 1.39 -155.17 0.25 591819L

591816L 31 42.050 -109 59.530 1469.10m 979015.550 979459.259 9.58 -154.81 0.00 0.45 1.39 -155.75 0.19 591816L

591805L 31 42.050 -110 10.280 1193.30m 979075.280 979459.259 -15.77 -149.29 0.00 0.46 1.24 -150.08 0.20 591805L

591806L 31 42.070 -110 9.270 1234.40m 979068.850 979459.287 -9.55 -147.67 0.00 0.32 1.27 -148.62 0.18 591806L

591806L 31 42.070 -110 9.750 1220.10m 979070.490 979459.287 -12.32 -148.84 0.00 0.24 1.26 -149.86 0.18 591806L

591807L 31 42.080 -110 8.710 1262.50m 979064.960 979459.300 -4.78 -146.05 0.00 0.60 1.29 -146.74 0.21 591807L

3097 789 31 42.100 -110 6.200 1364.00m 979044.710 979459.327 6.25 -146.38 0.00 0.79 1.34 -146.93 0.23 3097 789

26620H47 31 42.100 -110 20.000 1319.80m 979041.360 979459.327 -10.73 -158.42 0.00 0.37 1.32 -159.36
0.19 26620H47

591809M 31 42.110 -110 5.730 1376.20m 979043.390 979459.341 8.68 -145.31 0.00 0.58 1.35 -146.08 0.21 591809M

591812M 31 42.120 -110 2.610 1408.50m 979037.640 979459.354 12.88 -144.73 0.00 0.40 1.36 -145.69 0.19 591812M

591810M 31 42.130 -110 4.660 1394.50m 979041.430 979459.367 12.34 -143.70 0.00 0.44 1.35 -144.62 0.19 591810M

591814M 31 42.160 -110 0.560 1421.60m 979028.820 979459.408 8.05 -151.03 0.00 0.43 1.37 -151.96 0.19 591814M

591813M 31 42.230 -110 1.650 1386.80m 979038.400 979459.502 6.80 -148.38 0.00 0.33 1.35 -149.40 0.18 591813M

591808M 31 42.280 -110 6.940 1330.50m 979052.920 979459.569 3.89 -144.99 0.00 1.49 1.32 -144.83 0.34 591808M

6323WM43 31 42.290 -110 26.240 1452.90m 979032.220 979459.583 20.93 -141.65 0.00 0.97 1.38 -142.06
0.26 6323WM43

591811M 31 42.320 -110 3.610 1461.80m 979026.010 979459.623 17.42 -146.15 0.00 2.17 1.39 -145.37 0.47 591811M

591810M 31 42.340 -110 5.210 1356.40m 979047.230 979459.650 6.10 -145.67 0.00 0.43 1.34 -146.58 0.19 591810M

26620H48 31 42.340 -110 21.000 1331.70m 979040.780 979459.650 -7.96 -156.98 0.00 0.46 1.32 -157.84
0.20 26620H48

591812L 31 42.360 -110 2.850 1399.30m 979039.530 979459.677 11.61 -144.97 0.00 0.47 1.36 -145.86 0.20 591812L

3097 257 31 42.400 -110 27.200 1456.90m 979031.030 979459.731 20.82 -142.20 0.00 0.92 1.38 -142.66 0.25
3097 257

591814L 31 42.410 -110 0.840 1394.50m 979033.390 979459.744 3.92 -152.12 0.00 0.34 1.35 -153.13 0.19 591814L

591820L 31 42.450 -109 55.470 1493.50m 979007.360 979459.798 8.37 -158.75 0.00 0.72 1.40 -159.42 0.22 591820L

591821L 31 42.460 -109 54.440 1514.90m 979010.490 979459.812 18.09 -151.42 0.00 0.58 1.41 -152.25 0.21 591821L

591818L 31 42.480 -109 57.490 1475.20m 979014.160 979459.838 9.49 -155.58 0.00 0.45 1.39 -156.52 0.19 591818L

26620T29 31 42.480 -110 10.850 1182.00m 979078.780 979459.838 -16.33 -148.60 0.00 0.84 1.24 -148.99
0.24 26620T29

5918FHU- 31 42.500 -110 16.900 1286.30m 979056.670 979459.866 -6.29 -150.23 0.00 0.26 1.30 -151.27
0.18 5918FHU-

591816L 31 42.510 -109 58.690 1441.70m 979020.350 979459.879 5.31 -156.02 0.00 0.54 1.38 -156.85 0.20 591816L

591807L 31 42.510 -110 8.720 1249.70m 979067.710 979459.879 -6.56 -146.40 0.00 0.51 1.28 -147.16 0.20 591807L

26620T37 31 42.530 -110 12.500 1192.40m 979079.470 979459.906 -12.50 -145.93 0.00 0.44 1.24 -146.73
0.19 26620T37

591812L 31 42.640 -110 3.160 1397.50m 979039.530 979460.054 10.68 -145.70 0.00 0.52 1.36 -146.54 0.20 591812L

591814L 31 42.670 -110 1.070 1394.50m 979033.170 979460.094 3.35 -152.69 0.00 0.31 1.35 -153.73 0.18 591814L

591809L 31 42.690 -110 6.400 1359.40m 979049.360 979460.121 8.69 -143.43 0.00 0.80 1.34 -143.96 0.24 591809L

6323WM90 31 42.730 -110 24.300 1764.10m 978956.440 979460.175 40.54 -156.86 0.00 14.05 1.48 -144.30
2.82 6323WM90

266200T1 31 42.740 -110 4.100 1382.60m 979044.540 979460.189 10.96 -143.75 0.00 0.38 1.35 -144.72 0.19 266200T1

591814L 31 42.760 -110 0.560 1386.80m 979033.430 979460.216 1.12 -154.06 0.00 0.47 1.35 -154.95 0.20 591814L

591813L 31 42.770 -110 1.810 1367.60m 979041.360 979460.229 3.11 -149.92 0.00 0.31 1.34 -150.95 0.18 591813L

591806L 31 42.770 -110 9.720 1211.00m 979073.390 979460.229 -13.17 -148.67 0.00 0.26 1.25 -149.67 0.18 591806L

6323WM44 31 42.770 -110 27.420 1468.80m 979030.230 979460.229 23.19 -141.16 0.00 0.90 1.39 -141.65
0.25 6323WM44

591812L 31 42.780 -110 2.800 1379.20m 979041.560 979460.242 6.87 -147.46 0.00 0.35 1.35 -148.45 0.19 591812L

3035 55 31 42.800 -110 4.000 1383.50m 979044.620 979460.269 11.23 -143.58 0.00 0.41 1.35 -144.52 0.19 3035 55

3277 493 31 42.800 -110 27.400 1468.80m 979029.850 979460.269 22.77 -141.58 0.00 0.90 1.39 -142.07 0.25
3277 493

591812L 31 42.870 -110 3.480 1394.20m 979041.780 979460.364 11.60 -144.41 0.00 0.63 1.35 -145.13 0.21 591812L

5918L4S, 31 42.890 -109 47.580 1389.00m 979032.870 979460.390 1.06 -154.37 0.00 0.35 1.35 -155.37 0.19 5918L4S,

5918L4S, 31 42.890 -109 47.660 1386.70m 979034.820 979460.390 2.30 -152.87 0.00 0.35 1.35 -153.87 0.19 5918L4S,

5918L4S, 31 42.890 -109 47.730 1392.20m 979035.110 979460.390 4.29 -151.50 0.00 0.37 1.35 -152.48 0.19 5918L4S,

5918L4S, 31 42.890 -109 47.810 1392.40m 979035.690 979460.390 4.93 -150.88 0.00 0.38 1.35 -151.85 0.19 5918L4S,

5918L4S, 31 42.890 -109 47.890 1399.20m 979034.600 979460.390 5.94 -150.63 0.00 0.39 1.36 -151.60 0.19 5918L4S,

5918L4S, 31 42.890 -109 47.960 1402.60m 979034.140 979460.390 6.52 -150.42 0.00 0.40 1.36 -151.38 0.19 5918L4S,

5918L4S, 31 42.890 -109 48.040 1407.20m 979033.400 979460.390 7.20 -150.26 0.00 0.41 1.36 -151.21 0.19 5918L4S,

5918L4S, 31 42.890 -109 48.120 1409.50m 979033.040 979460.390 7.55 -150.17 0.00 0.43 1.36 -151.10 0.19 5918L4S,

5918L4S, 31 42.890 -109 48.200 1410.30m 979033.050 979460.390 7.81 -150.00 0.00 0.46 1.36 -150.90 0.20 5918L4S,

5918L4S, 31 42.890 -109 48.270 1413.40m 979032.490 979460.390 8.21 -149.95 0.00 0.50 1.36 -150.81 0.20 5918L4S,

5918L4S, 31 42.890 -109 48.350 1415.60m 979032.280 979460.390 8.67 -149.73 0.00 0.53 1.36 -150.56 0.20 5918L4S,

591821K 31 42.890 -109 54.450 1533.80m 979007.060 979460.390 19.91 -151.72 0.00 0.73 1.41 -152.40 0.23 591821K

591811L 31 42.890 -110 4.610 1347.20m 979051.210 979460.390 6.51 -144.24 0.00 0.37 1.33 -145.20 0.19 591811L

3138G006 31 42.900 -109 52.100 1530.10m 979005.490 979460.404 17.19 -154.03 0.00 0.62 1.41 -154.82
0.21 3138G006

591819K 31 42.900 -109 56.470 1536.20m 978996.850 979460.404 10.43 -161.47 0.00 0.67 1.42 -162.22 0.22 591819K

26620H46 31 42.910 -110 19.450 1307.00m 979046.210 979460.418 -10.92 -157.17 0.00 0.37 1.31 -158.11
0.19 26620H46

591811L 31 42.920 -110 4.040 1383.80m 979045.660 979460.431 12.20 -142.64 0.00 0.46 1.35 -143.53 0.20 591811L

6323WM32 31 42.940 -110 22.000 1360.00m 979041.300 979460.458 0.48 -151.70 0.00 0.60 1.34 -152.44 0.21 6323WM32

591807K 31 42.950 -110 8.720 1243.60m 979069.460 979460.471 -7.28 -146.44 0.00 0.41 1.27 -147.30 0.19 591807K

591804K 31 42.950 -110 11.480 1175.90m 979082.250 979460.471 -15.38 -146.96 0.00 0.84 1.23 -147.35 0.24 591804K

266200H1 31 42.950 -110 15.900 1274.40m 979057.600 979460.471 -9.64 -152.24 0.00 0.23 1.29 -153.31
0.18 266200H1

6323WM35 31 42.950 -110 20.990 1331.90m 979043.070 979460.471 -6.43 -155.47 0.00 0.48 1.32 -156.32
0.20 6323WM35

26620H39 31 42.950 -110 22.000 1360.00m 979039.800 979460.471 -1.04 -153.22 0.00 0.60 1.34 -153.96
0.21 26620H39

591811L 31 42.960 -110 3.790 1390.80m 979043.780 979460.485 12.43 -143.20 0.00 0.57 1.35 -143.98 0.21 591811L

26620H50 31 42.960 -110 21.000 1332.00m 979041.850 979460.485 -7.64 -156.69 0.00 0.49 1.32 -157.52
0.20 26620H50

591817K 31 42.970 -109 58.500 1428.00m 979021.500 979460.498 1.61 -158.18 0.00 0.78 1.37 -158.77 0.23 591817K

591815K 31 42.970 -109 59.940 1400.90m 979029.470 979460.498 1.22 -155.54 0.00 1.04 1.36 -155.85 0.27 591815K

591813L 31 42.970 -110 2.210 1357.60m 979044.110 979460.498 2.51 -149.41 0.00 0.36 1.34 -150.38 0.19 591813L

7510 31 43.010 -109 53.160 1548.30m 979002.560 979460.552 19.72 -153.53 0.00 0.90 1.42 -154.05 0.25 7510

591812L 31 43.050 -110 3.350 1384.10m 979042.030 979460.606 8.49 -146.39 0.00 0.65 1.35 -147.09 0.22 591812L

591808K 31 43.050 -110 7.590 1318.30m 979055.960 979460.606 2.13 -145.39 0.00 1.17 1.32 -145.54 0.29 591808K

591807K 31 43.110 -110 8.710 1241.50m 979069.250 979460.687 -8.36 -147.28 0.00 0.38 1.27 -148.17 0.19 591807K

591813K 31 43.120 -110 1.650 1388.40m 979033.410 979460.700 1.10 -154.25 0.00 0.40 1.35 -155.21 0.19 591813K

591811L 31 43.120 -110 4.210 1374.30m 979047.210 979460.700 10.56 -143.23 0.00 0.49 1.34 -144.08 0.20 591811L

591812K 31 43.130 -110 3.300 1375.30m 979043.530 979460.714 7.17 -146.72 0.00 0.49 1.35 -147.58 0.20 591812K

591813K 31 43.140 -110 2.570 1348.10m 979045.930 979460.727 1.17 -149.68 0.00 0.36 1.33 -150.65 0.19 591813K

591812K 31 43.140 -110 2.850 1369.50m 979042.750 979460.727 4.59 -148.66 0.00 0.55 1.34 -149.45 0.20 591812K

591805K 31 43.240 -110 10.120 1222.90m 979071.510 979460.862 -12.01 -148.85 0.00 0.18 1.26 -149.93 0.18 591805K

591811K 31 43.270 -110 4.170 1370.40m 979047.550 979460.902 9.49 -143.86 0.00 0.54 1.34 -144.66 0.20 591811K

26620T35 31 43.280 -110 12.800 1213.70m 979076.400 979460.916 -10.01 -145.82 0.00 0.18 1.26 -146.90
0.18 26620T35

591806K 31 43.290 -110 9.490 1232.90m 979071.210 979460.929 -9.29 -147.25 0.00 0.26 1.27 -148.26 0.18 591806K

26620T34 31 43.330 -110 11.600 1171.30m 979083.530 979460.983 -16.03 -147.09 0.00 1.24 1.23 -147.08
0.30 26620T34

591811K 31 43.340 -110 4.190 1361.20m 979049.810 979460.996 8.82 -143.50 0.00 0.40 1.34 -144.44 0.19 591811K

591809K 31 43.340 -110 6.320 1344.20m 979052.430 979460.996 6.19 -144.22 0.00 0.49 1.33 -145.06 0.20 591809K

591804K 31 43.340 -110 11.140 1181.10m 979081.170 979460.996 -15.38 -147.54 0.00 0.88 1.24 -147.90 0.25 591804K

591812K 31 43.350 -110 2.660 1346.60m 979047.540 979461.010 2.03 -148.65 0.00 0.32 1.33 -149.66 0.18 591812K

591810K 31 43.350 -110 5.170 1337.20m 979053.390 979461.010 4.98 -144.65 0.00 0.30 1.33 -145.67 0.18 591810K

591816K 31 43.370 -109 59.520 1429.50m 979022.240 979461.037 2.27 -157.68 0.00 0.67 1.37 -158.38 0.22 591816K

5918TBS- 31 43.400 -110 11.100 1211.60m 979081.540 979461.077 -5.68 -141.26 0.00 0.18 1.26 -142.33
0.18 5918TBS-

2381 31 43.400 -110 11.300 1177.10m 979080.040 979461.077 -17.82 -149.54 0.00 0.95 1.23 -149.82 0.26 2381

591814K 31 43.420 -110 1.330 1371.60m 979038.930 979461.104 1.04 -152.44 0.00 0.39 1.34 -153.39 0.19 591814K

591807K 31 43.420 -110 8.180 1273.80m 979062.830 979461.104 -5.23 -147.77 0.00 0.41 1.29 -148.65 0.19 591807K

591813K 31 43.430 -110 2.510 1372.80m 979041.460 979461.118 3.93 -149.69 0.00 0.38 1.34 -150.65 0.19 591813K

6323WM45 31 43.430 -110 29.140 1495.60m 979024.360 979461.118 24.70 -142.65 0.00 1.22 1.40 -142.83
0.30 6323WM45

591812K 31 43.480 -110 3.030 1338.70m 979049.610 979461.185 1.49 -148.31 0.00 0.31 1.33 -149.33 0.18 591812K

591823K 31 43.500 -109 52.100 1552.30m 979001.280 979461.212 19.02 -154.68 0.00 0.76 1.42 -155.34 0.23 591823K

591811K 31 43.510 -110 4.350 1348.70m 979052.390 979461.225 7.31 -143.60 0.00 0.32 1.33 -144.62 0.18 591811K

591813K 31 43.520 -110 2.290 1377.10m 979044.820 979461.239 8.49 -145.60 0.00 0.31 1.35 -146.64 0.18 591813K

591812K 31 43.520 -110 3.600 1354.80m 979048.660 979461.239 5.45 -146.15 0.00 0.34 1.33 -147.14 0.19 591812K

266200T3 31 43.560 -110 1.450 1401.50m 979031.760 979461.293 2.90 -153.92 0.00 0.38 1.36 -154.90 0.19 266200T3

591806K 31 43.580 -110 8.830 1227.70m 979073.790 979461.320 -8.71 -146.08 0.00 0.32 1.26 -147.03 0.18 591806K

591823K 31 43.600 -109 51.700 1567.60m 978999.300 979461.347 21.62 -153.79 0.00 0.86 1.43 -154.36 0.24 591823K

591809K 31 43.620 -110 5.790 1307.60m 979060.420 979461.374 2.52 -143.80 0.00 0.27 1.31 -144.84 0.18 591809K

591812K 31 43.630 -110 3.300 1335.00m 979051.150 979461.387 1.69 -147.70 0.00 0.30 1.32 -148.72 0.18 591812K

6323WM31 31 43.630 -110 23.320 1414.50m 979042.490 979461.387 17.55 -140.73 0.00 0.97 1.36 -141.13
0.26 6323WM31

26620H40 31 43.640 -110 23.300 1414.60m 979036.350 979461.400 11.43 -146.87 0.00 0.95 1.36 -147.28
0.26 26620H40

591811K 31 43.650 -110 4.470 1340.50m 979053.030 979461.414 5.24 -144.76 0.00 0.29 1.33 -145.80 0.18 591811K

591810K 31 43.650 -110 4.940 1331.40m 979056.460 979461.414 5.86 -143.12 0.00 0.31 1.32 -144.14 0.18 591810K

591814K 31 43.660 -110 0.870 1386.80m 979034.560 979461.427 1.03 -154.15 0.00 0.41 1.35 -155.09 0.19 591814K

591806K 31 43.670 -110 9.220 1223.20m 979073.690 979461.441 -10.31 -147.19 0.00 0.24 1.26 -148.21 0.18 591806K

591818K 31 43.750 -109 56.970 1481.30m 979007.850 979461.549 3.35 -162.40 0.00 0.85 1.39 -162.95 0.24 591818K

591821J 31 43.760 -109 54.870 1549.90m 978997.640 979461.562 14.29 -159.15 0.00 0.68 1.42 -159.89 0.22 591821J

5918L3S, 31 43.780 -109 47.600 1390.20m 979034.120 979461.589 1.48 -154.08 0.00 0.42 1.35 -155.01 0.19 5918L3S,

5918L3S, 31 43.780 -109 47.910 1405.70m 979034.060 979461.589 6.20 -151.09 0.00 0.46 1.36 -151.99 0.20 5918L3S,

5918L3S, 31 43.780 -109 47.990 1408.70m 979032.560 979461.589 5.63 -152.00 0.00 0.49 1.36 -152.88 0.20 5918L3S,

5918L3S, 31 43.780 -109 48.060 1412.10m 979031.980 979461.589 6.10 -151.92 0.00 0.52 1.36 -152.76 0.20 5918L3S,

5918L3S, 31 43.780 -109 48.370 1422.20m 979031.100 979461.589 8.33 -150.81 0.00 0.78 1.37 -151.40 0.23 5918L3S,

5918L3S, 31 43.780 -109 48.450 1427.60m 979030.120 979461.589 9.02 -150.73 0.00 0.71 1.37 -151.39 0.22 5918L3S,

5918L3S, 31 43.780 -109 48.530 1433.20m 979026.140 979461.589 6.76 -153.61 0.00 0.72 1.37 -154.26 0.22 5918L3S,

5918L3S, 31 43.780 -109 48.600 1447.30m 979026.710 979461.589 11.68 -150.27 0.00 0.66 1.38 -150.99
0.22 5918L3S,

5918L3S, 31 43.780 -109 48.680 1456.90m 979025.010 979461.589 12.94 -150.08 0.00 0.64 1.38 -150.82
0.21 5918L3S,

5918L3S, 31 43.780 -109 48.760 1471.80m 979021.990 979461.589 14.52 -150.17 0.00 0.67 1.39 -150.89
0.22 5918L3S,

591822J 31 43.790 -109 52.980 1557.80m 979000.030 979461.603 19.07 -155.24 0.00 0.98 1.42 -155.69 0.26 591822J

591814K 31 43.790 -110 1.440 1401.50m 979032.780 979461.603 3.61 -153.21 0.00 0.35 1.36 -154.22 0.19 591814K

3138G007 31 43.800 -109 47.400 1380.70m 979030.030 979461.616 -5.57 -160.06 0.00 0.41 1.35 -161.00

0.19 3138G007

591818J 31 43.800 -109 57.490 1504.20m 979004.190 979461.616 6.69 -161.63 0.00 0.52 1.40 -162.51 0.20 591818J

591817J 31 43.800 -109 58.500 1472.20m 979011.650 979461.616 4.28 -160.46 0.00 0.47 1.39 -161.38 0.20 591817J

26620H45 31 43.800 -110 18.950 1296.60m 979051.440 979461.616 -10.10 -155.19 0.00 0.36 1.30 -156.13
0.19 26620H45

26620H51 31 43.810 -110 21.000 1339.00m 979042.110 979461.630 -6.36 -156.19 0.00 0.53 1.33 -156.99
0.20 26620H51

591816J 31 43.820 -109 59.520 1444.80m 979018.010 979461.643 2.16 -159.51 0.00 0.46 1.38 -160.43 0.20 591816J

591812K 31 43.820 -110 3.590 1326.80m 979052.820 979461.643 0.57 -147.90 0.00 0.37 1.32 -148.85 0.19 591812K

591804J 31 43.830 -110 11.680 1173.20m 979085.610 979461.656 -14.03 -145.31 0.00 1.04 1.23 -145.50 0.27 591804J

591807J 31 43.840 -110 8.640 1238.10m 979071.540 979461.670 -8.10 -146.64 0.00 0.27 1.27 -147.64 0.18 591807J

591808K 31 43.900 -110 7.410 1296.00m 979063.390 979461.751 1.53 -143.49 0.00 0.38 1.30 -144.41 0.19 591808K

591812K 31 43.910 -110 2.590 1362.50m 979043.180 979461.764 1.82 -150.64 0.00 0.30 1.34 -151.68 0.18 591812K

591810K 31 43.910 -110 4.690 1312.50m 979058.070 979461.764 1.29 -145.58 0.00 0.28 1.31 -146.61 0.18 591810K

591810J 31 43.970 -110 5.110 1304.20m 979061.710 979461.845 2.29 -143.65 0.00 0.28 1.31 -144.68 0.18 591810J

591810J 31 43.980 -110 4.650 1309.70m 979058.170 979461.859 0.43 -146.12 0.00 0.30 1.31 -147.13 0.18 591810J

591811J 31 43.990 -110 3.880 1320.70m 979054.170 979461.872 -0.19 -147.97 0.00 0.46 1.32 -148.83 0.20 591811J

591811J 31 44.000 -110 4.210 1315.80m 979055.740 979461.885 -0.14 -147.38 0.00 0.42 1.31 -148.28 0.19 591811J

591805J 31 44.000 -110 10.400 1229.90m 979070.180 979461.885 -12.20 -149.83 0.00 0.20 1.27 -150.89 0.18 591805J

591808J 31 44.030 -110 6.960 1278.60m 979067.750 979461.926 0.35 -142.72 0.00 0.29 1.29 -143.73 0.18 591808J

591817J 31 44.040 -109 57.920 1543.20m 978992.510 979461.939 6.71 -165.97 0.00 1.05 1.42 -166.34 0.27 591817J

591810J 31 44.040 -110 4.790 1310.90m 979057.860 979461.939 0.41 -146.28 0.00 0.27 1.31 -147.32 0.18 591810J

591809J 31 44.060 -110 5.700 1296.60m 979063.640 979461.966 1.75 -143.34 0.00 0.31 1.30 -144.33 0.18 591809J

6323WM89 31 44.060 -110 25.410 1887.60m 978934.810 979461.966 55.20 -156.02 0.00 17.87 1.50 -139.65
3.58 6323WM89

591807J 31 44.080 -110 8.310 1243.60m 979070.530 979461.993 -7.73 -146.89 0.00 0.26 1.27 -147.91 0.18 591807J

591820J 31 44.160 -109 55.430 1525.50m 979001.010 979462.101 9.59 -161.11 0.00 0.73 1.41 -161.79 0.23 591820J

26620T27 31 44.180 -110 6.400 1283.80m 979066.280 979462.128 0.28 -143.37 0.00 0.27 1.30 -144.40 0.18 26620T27

591814J 31 44.220 -110 1.490 1379.20m 979037.910 979462.182 1.28 -153.05 0.00 0.39 1.35 -154.00 0.19 591814J

591816J 31 44.250 -109 59.530 1455.40m 979016.410 979462.222 3.25 -159.61 0.00 0.43 1.38 -160.56 0.19 591816J

26620T50 31 44.270 -110 5.200 1324.70m 979053.280 979462.249 -0.22 -148.45 0.00 0.30 1.32 -149.47 0.18 26620T50

591804J 31 44.290 -110 11.420 1168.90m 979088.620 979462.276 -12.97 -143.77 0.00 1.17 1.23 -143.83 0.29 591804J

591817J 31 44.300 -109 58.480 1477.70m 979009.160 979462.289 2.81 -162.54 0.00 0.49 1.39 -163.44 0.20 591817J

591813J 31 44.300 -110 2.570 1365.50m 979043.890 979462.289 2.93 -149.87 0.00 0.29 1.34 -150.92 0.18 591813J

591812J 31 44.300 -110 3.260 1339.60m 979048.290 979462.289 -0.66 -150.56 0.00 0.36 1.33 -151.52 0.19 591812J

5918W-29 31 44.300 -110 29.840 1511.80m 979022.850 979462.289 27.02 -142.15 0.00 0.89 1.41 -142.67 0.25
5918W-29

591807J 31 44.370 -110 8.050 1254.90m 979069.100 979462.384 -6.07 -146.49 0.00 0.23 1.28 -147.54 0.18 591807J

591807J 31 44.380 -110 7.730 1257.60m 979070.390 979462.398 -3.96 -144.68 0.00 0.35 1.28 -145.62 0.19 591807J

5918W-25 31 44.380 -110 29.160 1527.00m 979022.230 979462.398 30.98 -139.89 0.00 0.93 1.41 -140.37 0.25
5918W-25

591808J 31 44.410 -110 6.870 1269.50m 979070.180 979462.438 -0.54 -142.59 0.00 0.30 1.29 -143.58 0.18 591808J

266200T2 31 44.480 -110 0.550 1423.70m 979024.220 979462.532 0.97 -158.34 0.00 0.47 1.37 -159.24 0.20 266200T2

591808J 31 44.480 -110 7.250 1265.80m 979069.280 979462.532 -2.68 -144.32 0.00 0.29 1.29 -145.31 0.18 591808J

591818J 31 44.500 -109 57.100 1500.80m 979002.140 979462.559 2.64 -165.29 0.00 0.67 1.40 -166.02 0.22 591818J

3138G005 31 44.500 -109 57.900 1493.50m 979003.010 979462.559 1.26 -165.86 0.00 0.57 1.40 -166.69 0.21 3138G005

591813J 31 44.510 -110 2.140 1389.60m 979037.640 979462.572 3.83 -151.66 0.00 0.35 1.35 -152.66 0.19 591813J

591806J 31 44.510 -110 9.310 1249.70m 979068.860 979462.572 -8.10 -147.94 0.00 0.21 1.28 -149.01 0.18 591806J

591807J 31 44.600 -110 8.440 1265.50m 979066.000 979462.694 -6.21 -147.82 0.00 0.29 1.29 -148.81 0.18 591807J

26620H41 31 44.620 -110 24.500 1478.60m 979033.600 979462.721 27.10 -138.36 0.00 1.72 1.39 -138.03
0.38 26620H41

591811J 31 44.630 -110 3.850 1347.20m 979045.920 979462.734 -1.13 -151.88 0.00 0.28 1.33 -152.93 0.18 591811J

5918W-16 31 44.640 -110 29.140 1540.80m 979020.040 979462.748 32.69 -139.72 0.00 0.99 1.42 -140.15 0.26
5918W-16

591819I 31 44.660 -109 55.980 1569.70m 978989.060 979462.774 10.60 -165.05 0.00 0.90 1.43 -165.57 0.25 591819I

591818I 31 44.670 -109 57.480 1495.00m 979003.810 979462.788 2.30 -164.99 0.00 0.74 1.40 -165.65 0.23 591818I

5918L2S, 31 44.680 -109 47.610 1398.60m 979032.320 979462.801 1.06 -155.44 0.00 0.52 1.36 -156.28 0.20 5918L2S,

5918L2S, 31 44.680 -109 47.840 1411.60m 979030.230 979462.801 2.98 -154.98 0.00 0.57 1.36 -155.77 0.21 5918L2S,

5918L2S, 31 44.680 -109 47.920 1415.40m 979029.690 979462.801 3.61 -154.77 0.00 0.58 1.36 -155.55 0.21 5918L2S,

5918L2S, 31 44.680 -109 48.070 1422.50m 979029.260 979462.801 5.37 -153.80 0.00 0.66 1.37 -154.51 0.22 5918L2S,

5918L2S, 31 44.680 -109 48.150 1426.80m 979028.890 979462.801 6.33 -153.33 0.00 0.68 1.37 -154.02 0.22 5918L2S,

5918L2S, 31 44.680 -109 48.230 1430.70m 979028.390 979462.801 7.03 -153.06 0.00 0.70 1.37 -153.73 0.22 5918L2S,

5918L2S, 31 44.680 -109 48.310 1435.10m 979027.440 979462.801 7.44 -153.15 0.00 0.74 1.37 -153.78 0.23 5918L2S,

5918L2S, 31 44.680 -109 48.380 1438.50m 979027.030 979462.801 8.08 -152.89 0.00 0.80 1.37 -153.46 0.24 5918L2S,

5918L2S, 31 44.680 -109 48.460 1442.20m 979026.500 979462.801 8.69 -152.69 0.00 0.78 1.38 -153.29 0.23 5918L2S,

5918L2S, 31 44.680 -109 48.690 1454.40m 979024.640 979462.801 10.59 -152.15 0.00 0.95 1.38 -152.59
0.26 5918L2S,

5918L2S, 31 44.680 -109 48.770 1438.20m 979024.150 979462.801 5.10 -155.83 0.00 1.67 1.37 -155.53 0.38 5918L2S,

5918L2S, 31 44.680 -109 48.850 1459.80m 979023.650 979462.801 11.27 -152.08 0.00 1.45 1.38 -152.02
0.34 5918L2S,

5918L2S, 31 44.680 -109 48.920 1464.70m 979022.830 979462.801 11.96 -151.94 0.00 1.53 1.39 -151.80
0.35 5918L2S,

5918L2S, 31 44.680 -109 49.000 1471.70m 979021.600 979462.801 12.89 -151.79 0.00 1.98 1.39 -151.20
0.43 5918L2S,

591817I 31 44.680 -109 58.500 1481.30m 979010.720 979462.801 4.97 -160.79 0.00 0.54 1.39 -161.64 0.20 591817I

26620H43 31 44.680 -110 21.000 1335.30m 979046.000 979462.801 -4.79 -154.20 0.00 0.63 1.32 -154.90
0.21 26620H43

6323WM29 31 44.680 -110 22.010 1370.60m 979044.870 979462.801 4.97 -148.40 0.00 0.79 1.34 -148.95 0.23 6323WM29

591816I 31 44.690 -109 59.010 1463.00m 979014.250 979462.815 2.84 -160.87 0.00 0.43 1.39 -161.82 0.19 591816I

591816I 31 44.690 -109 59.520 1446.30m 979019.740 979462.815 3.18 -158.66 0.00 0.47 1.38 -159.57 0.20 591816I

6323WM30 31 44.690 -110 24.040 1478.80m 979035.010 979462.815 28.47 -137.00 0.00 1.29 1.39 -137.10
0.31 6323WM30

591821I 31 44.710 -109 54.050 1572.80m 978998.120 979462.842 20.55 -155.44 0.00 0.88 1.43 -155.99 0.25 591821I

26620H42 31 44.740 -110 22.000 1370.70m 979044.000 979462.882 4.05 -149.33 0.00 0.80 1.34 -149.87 0.24 26620H42

6323WM47 31 44.740 -110 29.130 1544.70m 979021.330 979462.882 35.05 -137.80 0.00 1.02 1.42 -138.20
0.27 6323WM47

26620H44 31 44.760 -110 19.900 1310.90m 979047.610 979462.909 -10.81 -157.50 0.00 0.55 1.31 -158.26
0.20 26620H44

591812I 31 44.780 -110 2.950 1371.60m 979041.420 979462.936 1.70 -151.78 0.00 0.30 1.34 -152.83 0.18 591812I

591819I 31 44.820 -109 56.200 1531.30m 978996.940 979462.990 6.42 -164.93 0.00 0.64 1.41 -165.70 0.21 591819I

591820I 31 44.830 -109 55.030 1590.40m 978989.720 979463.004 17.42 -160.55 0.00 0.77 1.43 -161.21 0.23 591820I

591804I 31 44.830 -110 11.650 1158.20m 979090.960 979463.004 -14.66 -144.26 0.00 1.37 1.22 -144.11 0.32 591804I

26620T36 31 44.830 -110 13.100 1201.20m 979079.210 979463.004 -13.14 -147.56 0.00 0.20 1.25 -148.60
0.18 26620T36

591805I 31 44.870 -110 10.610 1188.70m 979081.070 979463.057 -15.19 -148.21 0.00 0.56 1.24 -148.89 0.21 591805I

5918W-24 31 44.880 -110 27.570 1591.10m 979013.860 979463.071 41.70 -136.34 0.00 1.50 1.44 -136.27 0.35
5918W-24

591814I 31 44.900 -110 1.340 1394.50m 979033.330 979463.098 0.51 -155.53 0.00 0.34 1.35 -156.55 0.19 591814I

5918W-23 31 44.950 -110 28.450 1562.10m 979018.870 979463.166 37.67 -137.12 0.00 1.40 1.42 -137.15 0.33
5918W-23

5918W-21 31 45.010 -110 28.020 1581.90m 979015.480 979463.246 40.31 -136.70 0.00 1.51 1.43 -136.62 0.35
5918W-21

6323WM36 31 45.020 -110 19.990 1306.30m 979050.800 979463.260 -9.39 -155.56 0.00 0.64 1.31 -156.23
0.21 6323WM36

26620D11 31 45.080 -110 5.950 1324.70m 979053.280 979463.340 -1.31 -149.55 0.00 0.34 1.32 -150.53 0.19 26620D11

6323WM91 31 45.090 -110 23.400 1570.30m 979012.780 979463.354 33.93 -141.79 0.00 4.60 1.43 -138.62
0.94 6323WM91

6323WM40 31 45.140 -110 20.980 1341.70m 979048.460 979463.421 -0.97 -151.11 0.00 0.65 1.33 -151.78
0.22 6323WM40

591809I 31 45.170 -110 6.090 1296.60m 979059.850 979463.462 -3.53 -148.62 0.00 0.27 1.30 -149.66 0.18 591809I

591812I 31 45.290 -110 3.310 1353.30m 979044.120 979463.623 -1.94 -153.37 0.00 0.34 1.33 -154.36 0.19 591812I

591808I 31 45.310 -110 7.160 1290.80m 979062.580 979463.651 -2.78 -147.22 0.00 0.26 1.30 -148.26 0.18 591808I

591816I 31 45.320 -109 59.160 1484.40m 979009.460 979463.664 3.80 -162.30 0.00 0.68 1.39 -163.01 0.22 591816I

26620D71 31 45.330 -110 13.250 1196.90m 979079.690 979463.677 -14.66 -148.60 0.00 0.23 1.25 -149.61
0.18 26620D71

591810I 31 45.350 -110 5.300 1330.50m 979050.560 979463.704 -2.61 -151.49 0.00 0.26 1.32 -152.55 0.18 591810I

26620B16 31 45.390 -110 21.000 1344.20m 979048.420 979463.758 -0.58 -150.99 0.00 0.69 1.33 -151.63
0.22 26620B16

6323WM28 31 45.400 -110 21.990 1382.50m 979047.220 979463.772 10.02 -144.68 0.00 0.94 1.35 -145.09
0.26 6323WM28

591809I 31 45.410 -110 6.390 1288.10m 979061.220 979463.785 -5.11 -149.25 0.00 0.26 1.30 -150.29 0.18 591809I

591810I 31 45.430 -110 4.710 1347.20m 979046.500 979463.812 -1.63 -152.38 0.00 0.29 1.33 -153.42 0.18 591810I

591821I 31 45.440 -109 54.860 1615.40m 978984.940 979463.826 19.52 -161.24 0.00 1.26 1.44 -161.42 0.31 591821I

591813I 31 45.460 -110 2.030 1388.40m 979035.430 979463.853 -0.03 -155.39 0.00 0.37 1.35 -156.37 0.19 591813I

6323WM88 31 45.490 -110 25.850 1895.20m 978946.050 979463.893 66.86 -145.21 0.00 10.64 1.51 -136.08
2.13 6323WM88

591822H 31 45.510 -109 53.850 1615.40m 978989.710 979463.920 24.20 -156.56 0.00 1.14 1.44 -156.86 0.29 591822H

591840 31 45.520 -109 47.900 1405.20m 979033.350 979463.933 2.99 -154.25 0.00 0.60 1.36 -155.01 0.21 591840

591836 31 45.520 -109 47.980 1408.70m 979032.730 979463.933 3.45 -154.18 0.00 0.65 1.36 -154.89 0.22 591836

591832 31 45.520 -109 48.060 1408.70m 979032.140 979463.933 2.86 -154.77 0.00 0.82 1.36 -155.31 0.24 591832

591828 31 45.520 -109 48.140 1414.50m 979031.820 979463.933 4.33 -153.95 0.00 0.86 1.36 -154.45 0.24 591828

591824 31 45.520 -109 48.210 1418.30m 979031.010 979463.933 4.69 -154.01 0.00 0.84 1.37 -154.54 0.24 591824

591820 31 45.520 -109 48.290 1424.00m 979030.240 979463.933 5.68 -153.66 0.00 0.91 1.37 -154.12 0.25 591820

591816 31 45.520 -109 48.370 1444.00m 979026.550 979463.933 8.16 -153.42 0.00 0.76 1.38 -154.04 0.23 591816

591812@ 31 45.520 -109 48.440 1473.70m 979020.510 979463.933 11.28 -153.62 0.00 0.81 1.39 -154.20 0.24 591812@

59188 31 45.520 -109 48.520 1461.10m 979023.420 979463.933 10.31 -153.19 0.00 0.78 1.38 -153.79 0.23 59188

59184 31 45.520 -109 48.600 1449.10m 979025.970 979463.933 9.15 -153.00 0.00 1.01 1.38 -153.37 0.27 59184

591820H 31 45.520 -109 55.880 1566.70m 978990.690 979463.933 10.15 -165.16 0.00 0.71 1.43 -165.88 0.22 591820H

6323WM92 31 45.530 -110 23.960 1722.70m 978976.790 979463.947 44.35 -148.42 0.00 10.57 1.47 -139.33
2.12 6323WM92

591816H 31 45.540 -109 59.530 1454.80m 979016.110 979463.960 1.02 -161.76 0.00 0.45 1.38 -162.70 0.19 591816H

26620D13 31 45.560 -110 5.700 1313.40m 979051.390 979463.987 -7.34 -154.30 0.00 0.26 1.31 -155.36 0.18 26620D13

591817I 31 45.570 -109 57.530 1533.10m 978999.310 979464.001 8.33 -163.22 0.00 0.65 1.41 -163.98 0.22 591817I

591822H 31 45.580 -109 53.290 1658.10m 978982.390 979464.014 29.95 -155.58 0.00 2.27 1.46 -154.77 0.49 591822H

26620D12 31 45.580 -110 6.700 1285.30m 979060.350 979464.014 -7.07 -150.89 0.00 0.23 1.30 -151.96 0.18 26620D12

591804H 31 45.610 -110 10.980 1214.60m 979079.540 979464.055 -9.73 -145.64 0.00 0.18 1.26 -146.72 0.18 591804H

591808H 31 45.700 -110 6.750 1287.50m 979060.100 979464.176 -6.81 -150.87 0.00 0.22 1.30 -151.95 0.18 591808H

591807H 31 45.730 -110 7.900 1277.10m 979065.110 979464.216 -5.04 -147.95 0.00 0.25 1.29 -148.99 0.18 591807H

6323WM48 31 45.830 -110 29.130 1586.40m 979013.560 979464.351 38.67 -138.84 0.00 1.30 1.43 -138.97
0.31 6323WM48

591807H 31 45.870 -110 8.680 1261.90m 979066.560 979464.405 -8.47 -149.68 0.00 0.25 1.28 -150.71 0.18 591807H

591815H 31 45.920 -110 0.220 1453.90m 979016.920 979464.472 1.05 -161.64 0.00 0.60 1.38 -162.43 0.21 591815H

26620D19 31 45.940 -110 2.600 1402.40m 979031.120 979464.499 -0.67 -157.59 0.00 0.37 1.36 -158.58 0.19 26620D19

591821H 31 45.980 -109 54.140 1609.30m 978991.610 979464.553 23.58 -156.49 0.00 1.17 1.44 -156.76 0.29 591821H

591806H 31 45.990 -110 9.660 1228.30m 979074.210 979464.567 -11.35 -148.79 0.00 0.19 1.27 -149.87 0.18 591806H

20510283 31 46.000 -110 7.000 1282.00m 979058.660 979464.580 -10.35 -153.80 0.00 0.22 1.30 -154.88
0.18 20510283

5918W-17 31 46.050 -110 27.730 1713.00m 978990.910 979464.648 54.77 -136.91 0.00 3.32 1.47 -135.06 0.69
5918W-17

591808H 31 46.090 -110 7.240 1284.70m 979059.710 979464.701 -8.58 -152.34 0.00 0.22 1.30 -153.42 0.18 591808H

6323WM93 31 46.100 -110 24.130 1746.50m 978975.960 979464.715 50.09 -145.34 0.00 9.42 1.48 -137.40
1.89 6323WM93

26620B17 31 46.120 -110 21.000 1364.30m 979047.240 979464.742 3.46 -149.20 0.00 0.83 1.34 -149.71 0.24 26620B17

6323WM46 31 46.140 -110 27.950 1700.70m 978993.440 979464.769 53.39 -136.92 0.00 2.97 1.47 -135.42
0.62 6323WM46

591804H 31 46.150 -110 11.510 1199.40m 979084.320 979464.782 -10.37 -144.58 0.00 0.25 1.25 -145.58 0.18 591804H

26620D14 31 46.260 -110 6.600 1298.40m 979053.710 979464.931 -10.59 -155.88 0.00 0.24 1.31 -156.94
0.18 26620D14

5918W-10 31 46.300 -110 29.060 1598.70m 979013.390 979464.985 41.66 -137.23 0.00 1.48 1.44 -137.19 0.34
5918W-10

6323WM70 31 46.320 -110 22.700 1648.60m 978997.850 979465.011 41.49 -142.99 0.00 6.76 1.45 -137.68
1.36 6323WM70

591822G 31 46.380 -109 53.860 1632.20m 978988.460 979465.092 26.96 -155.68 0.00 1.16 1.45 -155.97 0.29 591822G

591820G 31 46.390 -109 55.890 1578.90m 978990.970 979465.106 13.02 -163.66 0.00 0.74 1.43 -164.35 0.23 591820G

591816G 31 46.420 -109 59.540 1468.80m 979013.610 979465.146 1.66 -162.70 0.00 0.50 1.39 -163.59 0.20 591816G

591817G 31 46.430 -109 58.520 1515.50m 979003.120 979465.160 5.56 -164.02 0.00 0.62 1.41 -164.81 0.21 591817G

6323WM27 31 46.440 -110 21.990 1435.00m 979041.710 979465.173 19.30 -141.27 0.00 1.28 1.37 -141.36
0.31 6323WM27

591818G 31 46.470 -109 57.350 1511.80m 979001.460 979465.214 2.70 -166.47 0.00 0.67 1.41 -167.20 0.22 591818G

6323WM86 31 46.520 -110 26.290 2261.60m 978860.280 979465.281 92.68 -160.39 0.00 24.53 1.50 -137.36
4.91 6323WM86

6323WM49 31 46.550 -110 28.340 1653.50m 979000.310 979465.321 45.15 -139.88 0.00 2.10 1.45 -139.23
0.45 6323WM49

6323WM87 31 46.560 -110 26.810 2110.40m 978897.640 979465.335 83.36 -152.79 0.00 15.36 1.52 -138.94
3.08 6323WM87

591821G 31 46.580 -109 54.750 1594.10m 978993.250 979465.362 19.73 -158.65 0.00 0.97 1.44 -159.12 0.26 591821G

26620D10 31 46.670 -110 8.000 1251.80m 979065.140 979465.483 -14.09 -154.16 0.00 0.43 1.28 -155.01
0.19 26620D10

591806G 31 46.710 -110 9.380 1219.20m 979077.510 979465.537 -11.83 -148.25 0.00 0.30 1.26 -149.21 0.18 591806G

591822G 31 46.740 -109 53.470 1627.60m 978992.110 979465.577 28.70 -153.42 0.00 1.45 1.45 -153.42 0.34 591822G

591814G 31 46.790 -110 0.950 1409.10m 979026.350 979465.645 -4.52 -162.19 0.00 0.69 1.36 -162.86 0.22 591814G

591811G 31 46.790 -110 3.870 1353.30m 979041.360 979465.645 -6.72 -158.15 0.00 0.40 1.33 -159.08 0.19 591811G

591808G 31 46.820 -110 6.850 1312.20m 979051.660 979465.686 -9.14 -155.97 0.00 0.42 1.31 -156.86 0.19 591808G

591810G 31 46.830 -110 5.040 1336.60m 979046.250 979465.699 -7.03 -156.60 0.00 0.27 1.33 -157.65 0.18 591810G

6323WM24 31 46.850 -110 22.530 1471.50m 979037.760 979465.726 26.06 -138.60 0.00 1.80 1.39 -138.19
0.40 6323WM24

6323WM23 31 46.890 -110 20.980 1385.00m 979047.040 979465.780 8.61 -146.37 0.00 0.99 1.35 -146.73 0.26 6323WM23

6323WM26 31 46.960 -110 23.810 1573.60m 979018.030 979465.874 37.67 -138.41 0.00 2.64 1.43 -137.20
0.56 6323WM26

591822G 31 47.040 -109 53.100 1594.10m 978999.970 979465.982 25.83 -152.55 0.00 2.36 1.44 -151.63 0.50 591822G

6323WM50 31 47.050 -110 29.100 1602.00m 979011.850 979465.995 40.13 -139.13 0.00 2.07 1.44 -138.50
0.45 6323WM50

6323WM95 31 47.090 -110 24.960 1880.60m 978952.720 979466.050 66.87 -143.57 0.00 9.24 1.50 -135.83
1.86 6323WM95

591805G 31 47.100 -110 10.250 1214.60m 979081.080 979466.063 -10.20 -146.11 0.00 0.19 1.26 -147.18 0.18 591805G

591816G 31 47.110 -109 58.810 1476.80m 979010.250 979466.076 -0.17 -165.42 0.00 0.90 1.39 -165.91 0.25 591816G

591813G 31 47.150 -110 2.520 1383.80m 979031.790 979466.130 -7.36 -162.21 0.00 0.51 1.35 -163.05 0.20 591813G

5918W-4 31 47.180 -110 29.720 1508.80m 979031.470 979466.171 30.83 -138.00 0.00 1.21 1.40 -138.20 0.30 5918W-4

5918W-5 31 47.210 -110 29.240 1539.20m 979026.510 979466.211 35.21 -137.03 0.00 1.45 1.42 -136.99 0.34 5918W-5

591823F 31 47.250 -109 52.840 1578.90m 979003.530 979466.265 24.42 -152.26 0.00 1.85 1.43 -151.84 0.41 591823F

591822F 31 47.250 -109 53.850 1658.10m 978988.210 979466.265 33.52 -152.02 0.00 1.42 1.46 -152.05 0.33 591822F

591821F 31 47.270 -109 54.870 1621.50m 978990.460 979466.292 24.46 -156.98 0.00 1.08 1.45 -157.35 0.28 591821F

591819F 31 47.270 -109 56.480 1575.20m 978994.150 979466.292 13.87 -162.39 0.00 0.79 1.43 -163.03 0.23 591819F

591807F 31 47.290 -110 8.700 1232.00m 979071.650 979466.319 -14.52 -152.38 0.00 0.34 1.27 -153.30 0.19 591807F

591806F 31 47.300 -110 9.720 1218.60m 979079.030 979466.332 -11.29 -147.64 0.00 0.24 1.26 -148.66 0.18 591806F

6323WM25 31 47.320 -110 22.000 1417.30m 979047.210 979466.360 18.16 -140.43 0.00 1.76 1.37 -140.04
0.39 6323WM25

591823F 31 47.390 -109 52.520 1607.80m 978997.670 979466.454 27.28 -152.63 0.00 1.47 1.44 -152.60 0.34 591823F

26620B19 31 47.400 -110 21.000 1368.90m 979049.180 979466.467 5.09 -148.09 0.00 1.06 1.34 -148.37 0.27 26620B19

6323WM39 31 47.420 -110 20.980 1374.60m 979050.150 979466.494 7.79 -146.02 0.00 1.02 1.34 -146.35 0.27 6323WM39

6323W104 31 47.490 -110 27.840 1708.40m 978990.670 979466.589 51.17 -139.99 0.00 4.34 1.47 -137.12
0.88 6323W104

591803F 31 47.510 -110 11.950 1172.90m 979090.890 979466.616 -13.81 -145.05 0.00 0.24 1.23 -146.04 0.18 591803F

26620D18 31 47.530 -110 3.500 1381.40m 979032.960 979466.642 -7.45 -162.02 0.00 0.38 1.35 -162.99 0.19 26620D18

6323WM94 31 47.560 -110 23.190 1947.00m 978927.240 979466.683 61.23 -156.64 0.00 18.87 1.51 -139.28
3.78 6323WM94

591815F 31 47.580 -110 0.190 1440.20m 979019.000 979466.710 -3.34 -164.49 0.00 0.67 1.38 -165.20 0.22 591815F

266200D9 31 47.630 -110 9.150 1232.90m 979071.170 979466.778 -15.18 -153.14 0.00 0.31 1.27 -154.10
0.18 266200D9

591817F 31 47.660 -109 57.560 1522.50m 979004.990 979466.818 7.93 -162.44 0.00 0.75 1.41 -163.10 0.23 591817F

26620D17 31 47.660 -110 5.150 1339.90m 979042.760 979466.818 -10.62 -160.56 0.00 0.28 1.33 -161.60
0.18 26620D17

6323W103 31 47.680 -110 26.500 1884.80m 978954.990 979466.845 69.64 -141.27 0.00 6.75 1.50 -136.02
1.36 6323W103

591804F 31 47.690 -110 11.160 1179.60m 979087.780 979466.859 -15.09 -147.09 0.00 0.52 1.24 -147.80 0.20 591804F

6323WM85 31 47.690 -110 25.480 2230.80m 978867.610 979466.859 88.93 -160.69 0.00 22.45 1.51 -139.75
4.49 6323WM85

26620D16 31 47.820 -110 6.300 1323.40m 979047.180 979467.034 -11.51 -159.60 0.00 0.30 1.32 -160.61
0.18 26620D16

591817F 31 47.870 -109 58.360 1500.20m 979009.040 979467.101 4.82 -163.05 0.00 0.88 1.40 -163.57 0.25 591817F

26620B15 31 47.900 -110 15.200 1190.90m 979090.420 979467.142 -9.25 -142.51 0.00 0.58 1.24 -143.17
0.21 26620B15

591813F 31 47.930 -110 1.820 1392.90m 979028.030 979467.182 -9.37 -165.23 0.00 0.91 1.35 -165.68 0.25 591813F

26620B20 31 47.930 -110 21.000 1393.20m 979045.290 979467.182 7.98 -147.91 0.00 1.09 1.35 -148.18 0.28 26620B20

26620D49 31 48.050 -110 9.400 1225.90m 979073.220 979467.344 -15.86 -153.03 0.00 0.37 1.26 -153.92
0.19 26620D49

6323WM96 31 48.090 -110 24.140 2017.10m 978918.490 979467.398 73.38 -152.33 0.00 15.87 1.52 -137.97
3.18 6323WM96

591811F 31 48.120 -110 3.980 1350.30m 979039.890 979467.438 -10.91 -162.00 0.00 0.58 1.33 -162.76 0.21 591811F

591821E 31 48.140 -109 54.880 1649.00m 978990.810 979467.465 32.12 -152.40 0.00 1.59 1.45 -152.27 0.36 591821E

591819E 31 48.140 -109 56.490 1587.40m 978997.280 979467.465 19.59 -158.04 0.00 1.00 1.43 -158.47 0.26 591819E

591816E 31 48.140 -109 59.550 1481.90m 979014.060 979467.465 3.83 -161.99 0.00 0.63 1.39 -162.76 0.21 591816E

591809E 31 48.150 -110 6.650 1293.90m 979056.410 979467.479 -11.82 -156.61 0.00 0.34 1.30 -157.57 0.19 591809E

6323W105 31 48.160 -110 27.230 1758.00m 978982.460 979467.492 57.36 -139.36 0.00 4.24 1.48 -136.60
0.87 6323W105

6323WM22 31 48.190 -110 22.000 1462.10m 979040.640 979467.533 24.23 -139.37 0.00 1.83 1.39 -138.93
0.40 6323WM22

6323WM69 31 48.230 -110 22.460 1642.80m 978999.920 979467.587 39.19 -144.63 0.00 7.50 1.45 -138.59
1.51 6323WM69

26620D15 31 48.310 -110 8.500 1258.20m 979064.160 979467.694 -15.30 -156.09 0.00 0.24 1.28 -157.14
0.18 26620D15

591820E 31 48.450 -109 55.830 1651.40m 978988.860 979467.883 30.49 -154.30 0.00 1.52 1.45 -154.23 0.35 591820E

591813E 31 48.460 -110 1.920 1409.10m 979025.160 979467.897 -7.96 -165.63 0.00 0.63 1.36 -166.37 0.21 591813E

591803E 31 48.480 -110 11.950 1176.80m 979090.250 979467.924 -14.55 -146.23 0.00 0.30 1.23 -147.17 0.18 591803E

591812E 31 48.520 -110 2.850 1386.80m 979030.280 979467.978 -9.80 -164.98 0.00 0.51 1.35 -165.82 0.20 591812E

591810E 31 48.560 -110 5.150 1327.10m 979046.290 979468.032 -12.26 -160.76 0.00 0.40 1.32 -161.68 0.19 591810E

591818E 31 48.590 -109 57.410 1562.10m 979000.140 979468.072 14.04 -160.76 0.00 1.03 1.42 -161.15 0.27 591818E

591804E 31 48.650 -110 10.800 1211.60m 979081.000 979468.153 -13.30 -148.87 0.00 0.25 1.26 -149.88 0.18 591804E

266200D8 31 48.810 -110 9.900 1204.30m 979078.720 979468.369 -18.04 -152.80 0.00 0.37 1.25 -153.68
0.19 266200D8

6323WM19 31 48.920 -110 20.830 1394.40m 979048.760 979468.517 10.49 -145.54 0.00 1.11 1.35 -145.79
0.28 6323WM19

6323WM20 31 48.940 -110 21.580 1432.80m 979045.170 979468.544 18.71 -141.61 0.00 1.51 1.37 -141.48
0.35 6323WM20

26620B21 31 48.960 -110 20.750 1392.30m 979047.780 979468.571 8.81 -146.99 0.00 1.09 1.35 -147.25 0.28 26620B21

6323WM74 31 49.000 -110 27.580 1797.70m 978972.800 979468.625 58.81 -142.35 0.00 6.69 1.49 -137.15
1.35 6323WM74

591818D 31 49.030 -109 57.470 1578.90m 978998.350 979468.666 16.84 -159.84 0.00 1.15 1.43 -160.12 0.29 591818D

591817D 31 49.030 -109 58.490 1551.40m 979001.800 979468.666 11.80 -161.80 0.00 0.91 1.42 -162.31 0.25 591817D

591816D 31 49.030 -109 59.510 1514.60m 979009.390 979468.666 8.04 -161.44 0.00 0.76 1.41 -162.08 0.23 591816D

6323W106 31 49.050 -110 28.780 1634.30m 979002.510 979468.693 38.06 -144.82 0.00 3.07 1.45 -143.20
0.64 6323W106

591819D 31 49.060 -109 56.460 1648.40m 978984.570 979468.706 24.45 -160.00 0.00 1.79 1.45 -159.67 0.40 591819D

25140127 31 49.300 -109 49.000 1409.40m 979030.710 979469.030 -3.45 -161.16 0.00 0.33 1.36 -162.19
0.18 25140127

6323WM83 31 49.300 -110 23.150 2027.50m 978909.490 979469.030 65.96 -160.92 0.00 24.28 1.52 -138.15
4.86 6323WM83

6323WM84 31 49.370 -110 24.090 2122.00m 978888.330 979469.124 73.84 -163.61 0.00 23.44 1.52 -141.68
4.69 6323WM84

6323W107 31 49.470 -110 29.170 1535.50m 979030.680 979469.259 35.19 -136.63 0.00 1.74 1.42 -136.31
0.39 6323W107

6323WM71 31 49.480 -110 25.740 2350.30m 978841.210 979469.273 96.96 -166.03 0.00 27.13 1.49 -140.39
5.43 6323WM71

5918N-11 31 49.610 -110 29.220 1478.30m 979045.540 979469.448 32.21 -133.20 0.00 1.65 1.39 -132.95 0.37
5918N-11

26620B22 31 49.740 -110 20.650 1388.40m 979051.060 979469.623 9.83 -145.53 0.00 1.13 1.35 -145.75 0.28 26620B22

6323WM73 31 49.850 -110 27.210 1938.20m 978943.140 979469.772 71.33 -145.55 0.00 10.21 1.51 -136.85
2.05 6323WM73

6323WM38 31 49.950 -110 21.940 1478.20m 979038.400 979469.907 24.59 -140.82 0.00 2.22 1.39 -140.00
0.48 6323WM38

266200D7 31 50.020 -110 10.950 1166.20m 979087.070 979470.001 -23.08 -153.57 0.00 0.32 1.23 -154.48
0.18 266200D7

6323WM76 31 50.090 -110 28.190 1747.10m 978982.980 979470.096 51.91 -143.59 0.00 6.84 1.48 -138.23
1.38 6323WM76

6048DR52 31 50.110 -109 54.630 1712.30m 978972.390 979470.123 30.56 -161.04 0.00 4.39 1.47 -158.12
0.89 6048DR52

26620D48 31 50.250 -110 11.200 1158.50m 979088.530 979470.312 -24.30 -153.94 0.00 0.29 1.22 -154.87
0.18 26620D48

6323WM18 31 50.290 -110 20.560 1381.90m 979054.600 979470.366 10.62 -144.01 0.00 1.17 1.35 -144.19
0.29 6323WM18

6323WM64 31 50.320 -110 22.430 1767.20m 978971.850 979470.406 46.67 -151.08 0.00 10.71 1.48 -141.85
2.15 6323WM64

26620B23 31 50.330 -110 20.650 1377.10m 979053.920 979470.419 8.41 -145.69 0.00 1.30 1.35 -145.73 0.31 26620B23

6323W102 31 50.350 -110 26.660 1956.80m 978939.260 979470.446 72.51 -146.45 0.00 10.68 1.51 -137.29
2.14 6323W102

6323WM77 31 50.360 -110 28.950 1621.20m 979011.890 979470.460 41.63 -139.78 0.00 4.95 1.44 -136.28
1.00 6323WM77

26620D28 31 50.390 -110 7.800 1302.70m 979050.100 979470.501 -18.44 -164.21 0.00 0.31 1.31 -165.21
0.18 26620D28

3277 488 31 50.400 -110 20.400 1365.50m 979056.260 979470.514 7.08 -145.72 0.00 1.16 1.34 -145.90 0.29 3277 488

26620D47 31 50.620 -110 11.500 1146.40m 979091.440 979470.811 -25.63 -153.91 0.00 0.32 1.21 -154.80
0.18 26620D47

6323WM63 31 50.700 -110 21.310 1547.70m 979021.500 979470.919 28.11 -145.08 0.00 4.20 1.42 -142.30
0.86 6323WM63

6323WM68 31 50.720 -110 24.480 2238.40m 978867.960 979470.946 87.54 -162.93 0.00 23.42 1.51 -141.02
4.69 6323WM68

26620D21 31 50.780 -110 0.600 1531.30m 979011.650 979471.027 13.09 -158.26 0.00 1.01 1.41 -158.66 0.27 26620D21

6048 D 9 31 50.800 -109 59.550 1564.20m 979009.480 979471.054 21.04 -153.99 0.00 1.23 1.43 -154.18 0.30 6048
D 9

26620D22 31 50.800 -110 1.600 1493.20m 979016.610 979471.054 6.27 -160.81 0.00 0.96 1.40 -161.25 0.26 26620D22

266200D6 31 50.830 -110 11.700 1137.20m 979094.620 979471.095 -25.57 -152.82 0.00 0.37 1.21 -153.66
0.19 266200D6

6323WM17 31 50.830 -110 20.460 1394.40m 979053.900 979471.095 13.05 -142.98 0.00 1.18 1.35 -143.16
0.29 6323WM17

26620B14 31 50.920 -110 16.100 1213.40m 979086.540 979471.216 -10.26 -146.04 0.00 0.33 1.26 -146.97
0.18 26620B14

6323WM61 31 50.940 -110 22.700 1940.00m 978934.070 979471.243 61.34 -155.74 0.00 15.92 1.51 -141.33
3.19 6323WM61

6323WM75 31 50.960 -110 27.430 1781.50m 978974.300 979471.270 52.66 -146.68 0.00 6.19 1.49 -141.98
1.25 6323WM75

6048DR51 31 51.100 -109 57.390 2030.50m 978900.250 979471.459 55.21 -172.00 0.00 16.90 1.52 -156.61
3.38 6048DR51

6323WM67 31 51.190 -110 24.960 2241.50m 978870.670 979471.580 90.57 -160.25 0.00 21.69 1.51 -140.07
4.34 6323WM67

26620B24 31 51.200 -110 20.500 1388.40m 979055.000 979471.594 11.80 -143.56 0.00 1.21 1.35 -143.70
0.30 26620B24

6048 D27 31 51.240 -109 57.990 1659.60m 978987.810 979471.648 28.20 -157.50 0.00 2.80 1.46 -156.16 0.59
6048 D27

26620D27 31 51.250 -110 4.450 1400.60m 979030.790 979471.661 -8.71 -165.44 0.00 0.47 1.36 -166.33 0.20 26620D27

26620B42 31 51.290 -110 19.350 1334.70m 979062.330 979471.715 2.44 -146.91 0.00 0.77 1.32 -147.46 0.23 26620B42

25140128 31 51.300 -109 50.700 1363.40m 979044.940 979471.729 -6.11 -158.67 0.00 1.19 1.34 -158.82
0.29 25140128

5918BEN- 31 51.300 -110 21.400 1479.80m 979038.650 979471.729 23.51 -142.08 0.00 1.98 1.39 -141.49
0.43 5918BEN-

6323WM79 31 51.300 -110 27.280 1629.10m 979015.660 979471.729 46.56 -135.73 0.00 2.99 1.45 -134.19

0.62 6323WM79

26620D46 31 51.320 -110 12.050 1138.10m 979095.810 979471.756 -24.76 -152.11 0.00 0.31 1.21 -153.01
0.18 26620D46

26620B41 31 51.340 -110 18.500 1297.20m 979070.260 979471.783 -1.26 -146.42 0.00 0.65 1.30 -147.07
0.22 26620B41

26620D26 31 51.470 -110 3.500 1420.40m 979030.040 979471.958 -3.65 -162.59 0.00 0.57 1.37 -163.39 0.21 26620D26

6323WM66 31 51.510 -110 25.510 2136.60m 978895.560 979472.012 82.68 -156.40 0.00 19.84 1.52 -138.07
3.97 6323WM66

6323WM65 31 51.570 -110 24.310 2164.00m 978885.570 979472.093 81.06 -161.09 0.00 21.59 1.51 -141.01
4.32 6323WM65

6048 D29 31 51.650 -110 0.920 1513.90m 979017.390 979472.201 12.29 -157.11 0.00 1.35 1.41 -157.17 0.32 6048 D29

6323WM60 31 51.650 -110 23.030 2036.30m 978916.030 979472.201 72.04 -155.82 0.00 17.24 1.52 -140.10
3.45 6323WM60

6048 D 8 31 51.670 -109 53.830 1487.10m 979020.790 979472.228 7.40 -159.01 0.00 0.89 1.40 -159.51 0.25 6048 D 8

25140126 31 51.700 -109 48.700 1378.90m 979037.180 979472.269 -9.63 -163.92 0.00 0.29 1.35 -164.98
0.18 25140126

6323WM78 31 51.710 -110 28.330 1708.10m 978994.620 979472.282 49.34 -141.80 0.00 9.09 1.47 -134.18
1.83 6323WM78

266200D5 31 51.750 -110 12.250 1129.00m 979098.610 979472.336 -25.35 -151.68 0.00 0.29 1.20 -152.60
0.18 266200D5

6323WM21 31 51.770 -110 21.960 1459.60m 979040.370 979472.363 18.36 -144.97 0.00 4.49 1.38 -141.86
0.91 6323WM21

26620D45 31 51.950 -110 12.450 1122.90m 979100.550 979472.606 -25.56 -151.21 0.00 0.30 1.20 -152.11
0.18 26620D45

26620D25 31 52.080 -110 4.450 1407.60m 979034.890 979472.782 -3.58 -161.08 0.00 0.52 1.36 -161.93 0.20 26620D25

266200P1 31 52.100 -109 57.200 1798.30m 978956.610 979472.809 38.62 -162.61 0.00 3.17 1.49 -160.93
0.66 266200P1

26620B40 31 52.120 -110 16.950 1221.00m 979084.970 979472.836 -11.11 -147.74 0.00 0.40 1.26 -148.60
0.19 26620B40

26620B25 31 52.170 -110 20.650 1394.80m 979056.830 979472.903 14.29 -141.78 0.00 1.16 1.35 -141.98
0.29 26620B25

6323WM80 31 52.170 -110 26.510 1947.60m 978938.640 979472.903 66.59 -151.34 0.00 20.54 1.51 -132.31
4.11 6323WM80

6323WM13 31 52.210 -110 16.940 1221.00m 979086.420 979472.957 -9.78 -146.41 0.00 0.42 1.26 -147.25
0.19 6323WM13

6323W109 31 52.260 -110 22.400 1575.80m 979022.250 979473.025 35.42 -140.91 0.00 3.19 1.43 -139.15
0.66 6323W109

6048 D25 31 52.340 -109 55.890 1533.10m 979000.300 979473.133 0.19 -171.36 0.00 4.39 1.41 -168.38 0.89 6048 D25

20510282 31 52.400 -110 12.300 1120.80m 979103.760 979473.214 -23.61 -149.02 0.00 0.36 1.20 -149.86
0.19 20510282

26620B13 31 52.470 -110 17.200 1221.30m 979085.730 979473.308 -10.73 -147.39 0.00 0.44 1.26 -148.21
0.19 26620B13

6048 D10 31 52.490 -109 57.260 1761.70m 978963.890 979473.335 34.08 -163.05 0.00 3.28 1.48 -161.25 0.68
6048 D10

266200D4 31 52.630 -110 12.650 1122.00m 979102.870 979473.524 -24.44 -149.99 0.00 0.30 1.20 -150.89
0.18 266200D4

5918N-28 31 52.660 -110 24.980 1655.10m 979007.740 979473.565 44.83 -140.38 0.00 3.61 1.46 -138.22 0.74
5918N-28

6048 D15 31 52.700 -110 1.550 1474.90m 979027.910 979473.619 9.36 -155.67 0.00 1.92 1.39 -155.14 0.42 6048 D15

6323WM14 31 52.820 -110 18.590 1288.30m 979075.070 979473.781 -1.19 -145.35 0.00 0.68 1.30 -145.97
0.22 6323WM14

26620B26 31 52.870 -110 20.650 1385.90m 979060.660 979473.848 14.43 -140.65 0.00 1.00 1.35 -141.00
0.26 26620B26

26620D29 31 52.900 -110 10.300 1217.70m 979075.540 979473.889 -22.61 -158.87 0.00 0.27 1.26 -159.86
0.18 26620D29

26620D44 31 52.960 -110 12.800 1120.10m 979104.060 979473.970 -24.28 -149.62 0.00 0.29 1.20 -150.52
0.18 26620D44

26620B39 31 52.960 -110 16.050 1178.40m 979093.600 979473.970 -16.75 -148.62 0.00 0.43 1.23 -149.42
0.19 26620B39

26620D30 31 52.980 -110 9.400 1248.80m 979068.040 979473.997 -20.62 -160.36 0.00 0.30 1.28 -161.34
0.18 26620D30

26620D23 31 53.030 -110 2.600 1492.00m 979024.390 979474.064 10.67 -156.28 0.00 1.01 1.40 -156.67 0.27 26620D23

26620D58 31 53.080 -110 8.350 1284.70m 979059.640 979474.132 -18.09 -161.84 0.00 0.31 1.30 -162.83
0.18 26620D58

6323W108 31 53.100 -110 22.620 1628.20m 979010.210 979474.159 38.41 -143.79 0.00 7.55 1.45 -137.68
1.52 6323W108

6323WMW7 31 53.100 -110 23.290 1521.80m 979036.680 979474.159 32.06 -138.23 0.00 2.08 1.41 -137.56
0.45 6323WMW7

6323WM97 31 53.150 -110 25.670 1602.60m 979019.970 979474.226 40.20 -139.12 0.00 3.35 1.44 -137.21
0.69 6323WM97

6323WM99 31 53.230 -110 27.090 1628.80m 979013.560 979474.335 41.77 -140.49 0.00 6.72 1.45 -135.22
1.36 6323WM99

6323WM15 31 53.280 -110 19.320 1312.70m 979073.240 979474.402 3.88 -143.01 0.00 0.71 1.31 -143.61 0.22 6323WM15

6323WMW6 31 53.280 -110 23.940 1524.30m 979039.260 979474.402 35.17 -135.40 0.00 1.94 1.41 -134.87
0.42 6323WMW6

7510 31 53.400 -109 48.700 1346.60m 979048.560 979474.564 -10.50 -161.19 0.00 0.27 1.33 -162.25 0.18 7510

3277 487 31 53.400 -110 23.900 1524.00m 979040.550 979474.564 36.20 -134.33 0.00 1.78 1.41 -133.96 0.40
3277 487

6048DR49 31 53.440 -109 59.020 2169.50m 978873.030 979474.618 67.69 -175.07 0.00 15.66 1.51 -160.92
3.14 6048DR49

266200D3 31 53.440 -110 13.300 1106.40m 979109.120 979474.618 -24.09 -147.90 0.00 0.32 1.19 -148.77
0.18 266200D3

6323WMW8 31 53.490 -110 22.970 1481.90m 979046.210 979474.686 28.76 -137.07 0.00 1.62 1.39 -136.84
0.37 6323WMW8

5918N-27 31 53.490 -110 24.680 1505.70m 979041.310 979474.686 31.20 -137.29 0.00 1.78 1.40 -136.91 0.40
5918N-27

26620D59 31 53.510 -110 7.350 1318.00m 979053.760 979474.713 -14.28 -161.76 0.00 0.37 1.32 -162.70
0.19 26620D59

6323WM58 31 53.530 -110 25.470 1480.70m 979047.250 979474.740 29.37 -136.31 0.00 2.03 1.39 -135.68
0.44 6323WM58

26620B27 31 53.590 -110 20.500 1361.80m 979067.830 979474.821 13.20 -139.19 0.00 0.85 1.34 -139.67
0.24 26620B27

6323W100 31 53.630 -110 27.930 1500.20m 979044.980 979474.875 32.98 -134.89 0.00 3.52 1.40 -132.77
0.72 6323W100

26620D70 31 53.650 -110 14.650 1117.10m 979108.600 979474.902 -21.60 -146.60 0.00 0.33 1.19 -147.46
0.18 26620D70

6048DR50 31 53.660 -109 58.140 2060.40m 978894.300 979474.915 55.02 -175.53 0.00 13.89 1.52 -163.16
2.78 6048DR50

6048DR45 31 53.770 -109 55.150 1529.40m 979010.500 979475.064 7.32 -163.82 0.00 1.71 1.41 -163.52 0.38 6048DR45

6323WM16 31 53.830 -110 20.180 1349.60m 979070.850 979475.145 12.13 -138.89 0.00 0.78 1.33 -139.44
0.23 6323WM16

6323WM59 31 53.840 -110 26.650 1419.40m 979059.870 979475.158 22.67 -136.16 0.00 1.76 1.37 -135.77
0.39 6323WM59

6323WM12 31 53.860 -110 17.860 1225.60m 979085.440 979475.186 -11.57 -148.71 0.00 0.52 1.26 -149.46
0.20 6323WM12

6048 D16 31 54.010 -109 59.290 2155.20m 978877.550 979475.388 67.03 -174.13 0.00 15.81 1.51 -159.83 3.17
6048 D16

5918N-29 31 54.040 -110 26.680 1420.40m 979060.530 979475.429 23.36 -135.58 0.00 1.35 1.37 -135.59 0.32
5918N-29

26620D60 31 54.070 -110 6.100 1358.20m 979047.560 979475.469 -8.83 -160.81 0.00 0.49 1.34 -161.66 0.20 26620D60

6323WMW9 31 54.070 -110 20.450 1349.30m 979070.920 979475.469 11.78 -139.20 0.00 0.77 1.33 -139.76
0.23 6323WMW9

6323WMW5 31 54.080 -110 23.470 1470.30m 979051.300 979475.483 29.47 -135.05 0.00 1.32 1.39 -135.12
0.32 6323WMW5

6048 D30 31 54.190 -110 3.510 1442.60m 979036.870 979475.631 6.35 -155.07 0.00 0.82 1.38 -155.63 0.24 6048 D30

25140066 31 54.300 -109 47.700 1327.40m 979055.300 979475.780 -10.90 -159.44 0.00 0.65 1.32 -160.11
0.22 25140066

6048 D17 31 54.300 -109 53.040 1409.70m 979035.180 979475.780 -5.64 -163.38 0.00 0.49 1.36 -164.25 0.20
6048 D17

266200D2 31 54.320 -110 13.800 1110.10m 979109.930 979475.807 -23.33 -147.55 0.00 0.29 1.19 -148.45
0.18 266200D2

25140065 31 54.400 -109 45.700 1319.20m 979061.240 979475.915 -7.63 -155.24 0.00 0.13 1.32 -156.43
0.17 25140065

26620B28 31 54.410 -110 20.500 1341.10m 979071.440 979475.929 9.31 -140.75 0.00 0.72 1.33 -141.36 0.22 26620B28

26620D24 31 54.520 -110 3.100 1470.10m 979030.250 979476.077 7.77 -156.74 0.00 0.94 1.39 -157.18 0.26 26620D24

26620B10 31 54.520 -110 15.150 1096.10m 979114.410 979476.077 -23.44 -146.09 0.00 0.34 1.18 -146.93
0.19 26620B10

6323WM98 31 54.580 -110 25.690 1501.70m 979043.320 979476.158 30.50 -137.54 0.00 2.31 1.40 -136.63
0.49 6323WM98

6323W111 31 54.730 -110 28.040 1363.90m 979073.780 979476.361 18.25 -134.36 0.00 0.98 1.34 -134.72
0.26 6323W111

6323WM10 31 54.780 -110 19.200 1281.00m 979079.050 979476.429 -2.11 -145.46 0.00 0.59 1.30 -146.16
0.21 6323WM10

26620D61 31 54.790 -110 5.100 1393.50m 979042.490 979476.442 -3.99 -159.92 0.00 0.56 1.35 -160.71 0.21 26620D61

26620D31 31 54.980 -110 13.300 1129.30m 979106.640 979476.699 -21.59 -147.96 0.00 0.29 1.20 -148.87
0.18 26620D31

26620B11 31 55.050 -110 18.450 1238.70m 979084.860 979476.793 -9.72 -148.33 0.00 0.57 1.27 -149.03
0.21 26620B11

6323WM11 31 55.060 -110 18.490 1238.70m 979085.900 979476.807 -8.69 -147.30 0.00 0.55 1.27 -148.02
0.20 6323WM11

266200B9 31 55.080 -110 15.850 1095.80m 979114.460 979476.834 -24.24 -146.86 0.00 0.38 1.18 -147.66
0.19 266200B9

26620B29 31 55.200 -110 20.500 1309.10m 979076.460 979476.996 3.40 -143.09 0.00 0.66 1.31 -143.74 0.22 26620B29

6048 D14 31 55.300 -110 2.240 1482.80m 979029.620 979477.131 10.00 -155.92 0.00 1.49 1.39 -155.83 0.34 6048 D14

26620D56 31 55.360 -110 4.900 1371.60m 979042.440 979477.212 -11.56 -165.04 0.00 1.00 1.34 -165.38
0.26 26620D56

6048 D32 31 55.410 -110 1.100 1511.80m 979021.310 979477.280 10.48 -158.68 0.00 3.03 1.41 -157.06 0.63 6048 D32

26620D50 31 55.420 -110 11.900 1193.30m 979094.460 979477.293 -14.62 -148.15 0.00 0.43 1.24 -148.96
0.19 26620D50

6323WM82 31 55.450 -110 22.670 1377.70m 979072.290 979477.334 20.05 -134.11 0.00 0.83 1.35 -134.63
0.24 6323WM82

26620D57 31 55.490 -110 3.800 1433.20m 979039.580 979477.388 4.40 -155.97 0.00 0.96 1.37 -156.38 0.26 26620D57

26620D55 31 55.490 -110 6.750 1349.70m 979053.060 979477.388 -7.87 -158.90 0.00 0.42 1.33 -159.81 0.19 26620D55

26620D32 31 55.560 -110 13.950 1150.90m 979104.000 979477.483 -18.35 -147.13 0.00 0.31 1.22 -148.04
0.18 26620D32

26620D51 31 55.610 -110 10.400 1238.40m 979085.300 979477.550 -10.13 -148.70 0.00 0.42 1.27 -149.55
0.19 26620D51

26620D53 31 55.620 -110 8.650 1283.50m 979071.870 979477.563 -9.66 -153.28 0.00 0.31 1.30 -154.27 0.18 26620D53

6048 D18 31 55.630 -109 57.860 1492.00m 979021.150 979477.577 3.92 -163.03 0.00 5.07 1.40 -159.36 1.03 6048 D18

26620D52 31 55.640 -110 9.600 1264.90m 979077.640 979477.591 -9.65 -151.19 0.00 0.34 1.29 -152.14 0.19 26620D52

26620D54 31 55.650 -110 7.850 1316.40m 979062.060 979477.604 -9.36 -156.66 0.00 0.37 1.32 -157.61 0.19 26620D54

6323W110 31 55.820 -110 28.830 1328.60m 979081.310 979477.834 13.42 -135.25 0.00 0.92 1.32 -135.65
0.25 6323W110

6323WMW4 31 55.950 -110 22.110 1354.20m 979074.470 979478.010 14.30 -137.23 0.00 0.80 1.33 -137.76
0.24 6323WMW4

6048 D31 31 55.980 -110 0.010 1622.40m 978995.080 979478.050 17.60 -163.95 0.00 4.98 1.45 -160.41 1.01 6048 D31

25140393 31 56.000 -109 45.700 1294.50m 979068.690 979478.077 -9.96 -154.81 0.00 0.17 1.30 -155.94
0.18 25140393

25140129 31 56.000 -109 50.700 1333.20m 979056.470 979478.077 -10.24 -159.42 0.00 0.22 1.32 -160.53
0.18 25140129

25140130 31 56.000 -109 51.800 1348.70m 979051.710 979478.077 -10.22 -161.14 0.00 0.28 1.33 -162.19
0.18 25140130

25140131 31 56.000 -109 52.900 1368.60m 979048.570 979478.077 -7.22 -160.37 0.00 0.38 1.34 -161.33
0.19 25140131

6048DR44 31 56.000 -109 56.460 1525.20m 979013.390 979478.077 5.90 -164.77 0.00 2.27 1.41 -163.91 0.49 6048DR44

26620D33 31 56.000 -110 11.300 1215.20m 979091.550 979478.077 -11.56 -147.54 0.00 0.25 1.26 -148.55
0.18 26620D33

6048 D 7 31 56.050 -109 52.820 1368.50m 979048.420 979478.145 -7.47 -160.60 0.00 0.38 1.34 -161.56 0.19 6048
D 7

266200B7 31 56.180 -110 17.100 1116.50m 979111.660 979478.320 -22.14 -147.08 0.00 0.42 1.19 -147.85
0.19 266200B7

6323WMW3 31 56.240 -110 21.220 1308.50m 979078.280 979478.401 3.63 -142.79 0.00 0.70 1.31 -143.40 0.22 6323WMW3

26620B30 31 56.280 -110 20.500 1270.70m 979082.280 979478.455 -4.09 -146.28 0.00 0.53 1.29 -147.04
0.20 26620B30

25140068 31 56.300 -109 49.700 1316.40m 979060.060 979478.483 -12.24 -159.54 0.00 0.16 1.32 -160.70
0.18 25140068

26620D34 31 56.410 -110 10.850 1224.40m 979090.850 979478.631 -9.98 -146.98 0.00 0.25 1.26 -148.00
0.18 26620D34

26620B12 31 56.410 -110 19.700 1241.10m 979086.640 979478.631 -9.04 -147.91 0.00 0.57 1.27 -148.61
0.21 26620B12

6323WMW2 31 56.470 -110 20.440 1276.80m 979081.150 979478.712 -3.59 -146.47 0.00 0.61 1.29 -147.15
0.21 6323WMW2

6048DR43 31 56.760 -110 3.080 1601.10m 979006.600 979479.105 21.49 -157.67 0.00 4.03 1.44 -155.08 0.82 6048DR43

6048DR42 31 56.840 -110 1.330 1995.20m 978914.560 979479.213 50.88 -172.38 0.00 14.25 1.51 -159.64
2.86 6048DR42

6323W000 31 56.860 -110 17.140 1106.40m 979114.110 979479.240 -23.73 -147.53 0.00 0.39 1.19 -148.33
0.19 6323W000

26620D35 31 56.870 -110 10.300 1243.90m 979087.180 979479.253 -8.25 -147.44 0.00 0.35 1.27 -148.37
0.19 26620D35

25140132 31 56.900 -109 52.800 1345.70m 979053.870 979479.294 -10.20 -160.78 0.00 0.32 1.33 -161.79
0.18 25140132

25140133 31 56.900 -109 54.900 1372.50m 979050.100 979479.294 -5.71 -159.29 0.00 0.65 1.34 -159.98
0.22 25140133

6323WM54 31 56.910 -110 25.010 1321.90m 979087.460 979479.307 16.03 -131.89 0.00 0.61 1.32 -132.59
0.21 6323WM54

6048 D 5 31 56.920 -109 54.880 1372.50m 979050.040 979479.321 -5.79 -159.37 0.00 0.64 1.34 -160.08 0.21 6048
D 5

266200B6 31 56.960 -110 17.150 1104.00m 979113.980 979479.375 -24.73 -148.27 0.00 0.37 1.19 -149.08
0.19 266200B6

6323WM55 31 56.970 -110 26.320 1306.90m 979087.980 979479.388 11.84 -134.40 0.00 0.57 1.31 -135.13
0.21 6323WM55

26620B31 31 56.980 -110 20.550 1257.60m 979083.960 979479.402 -7.40 -148.12 0.00 0.53 1.28 -148.87
0.20 26620B31

16950300 31 57.000 -110 16.000 1097.30m 979115.830 979479.429 -25.00 -147.79 0.00 0.44 1.18 -148.53
0.19 16950300

26620D37 31 57.060 -110 10.950 1232.90m 979089.180 979479.510 -9.90 -147.86 0.00 0.29 1.27 -148.84
0.18 26620D37

26620D38 31 57.080 -110 11.900 1212.50m 979097.530 979479.537 -7.87 -143.55 0.00 0.27 1.26 -144.54
0.18 26620D38

1083001 31 57.100 -110 10.900 1233.00m 979089.900 979479.564 -9.21 -147.18 0.00 0.29 1.27 -148.16 0.18 1083001

6323WM56 31 57.110 -110 27.430 1277.70m 979092.560 979479.578 7.23 -135.74 0.00 0.54 1.29 -136.50 0.20 6323WM56

26620D39 31 57.170 -110 12.500 1200.90m 979094.250 979479.659 -14.85 -149.23 0.00 0.46 1.25 -150.02
0.20 26620D39

26620D36 31 57.210 -110 10.250 1244.80m 979086.810 979479.713 -8.81 -148.10 0.00 0.29 1.27 -149.08
0.18 26620D36

25140069 31 57.300 -109 50.300 1304.20m 979063.440 979479.835 -13.97 -159.91 0.00 0.16 1.31 -161.06
0.18 25140069

6323WMW1 31 57.350 -110 21.370 1269.10m 979084.050 979479.902 -4.26 -146.27 0.00 0.57 1.29 -146.99
0.21 6323WMW1

6323WM57 31 57.440 -110 28.250 1254.20m 979099.640 979480.024 6.61 -133.73 0.00 0.73 1.28 -134.28 0.23 6323WM57

26620D73 31 57.460 -110 6.400 1341.40m 979058.350 979480.051 -7.81 -157.91 0.00 0.42 1.33 -158.81 0.19 26620D73

266200B1 31 57.500 -110 15.650 1092.10m 979116.940 979480.105 -26.17 -148.38 0.00 0.29 1.18 -149.26
0.18 266200B1

6323WM53 31 57.500 -110 26.040 1289.60m 979092.690 979480.105 10.50 -133.80 0.00 0.51 1.30 -134.59
0.20 6323WM53

6048DR41 31 57.550 -110 1.330 1709.90m 978984.810 979480.173 32.19 -159.15 0.00 3.59 1.47 -157.03 0.74 6048DR41

3277 486 31 57.600 -110 20.800 1239.90m 979087.480 979480.240 -10.17 -148.92 0.00 0.53 1.27 -149.66 0.20
3277 486

26620B32 31 57.620 -110 20.850 1234.10m 979088.050 979480.267 -11.42 -149.51 0.00 0.47 1.27 -150.31
0.20 26620B32

25140134 31 57.700 -109 54.900 1367.30m 979052.690 979480.376 -5.80 -158.80 0.00 0.52 1.34 -159.62
0.20 25140134

3138B007 31 57.700 -110 22.500 1264.90m 979088.230 979480.376 -1.85 -143.39 0.00 0.51 1.29 -144.16
0.20 3138B007

3138B006 31 57.700 -110 23.800 1278.00m 979093.870 979480.376 7.83 -135.17 0.00 0.50 1.29 -135.97 0.20 3138B006

3138B005 31 57.700 -110 25.000 1283.20m 979096.210 979480.376 11.78 -131.81 0.00 0.50 1.30 -132.61
0.20 3138B005

3138B004 31 57.700 -110 26.000 1285.60m 979092.800 979480.376 9.11 -134.75 0.00 0.49 1.30 -135.56 0.20 3138B004

3138B003 31 57.700 -110 27.000 1261.80m 979095.060 979480.376 4.03 -137.17 0.00 0.51 1.28 -137.94 0.20 3138B003

26620D40 31 57.760 -110 12.450 1181.10m 979098.350 979480.457 -17.66 -149.82 0.00 0.34 1.24 -150.72
0.19 26620D40

25140392 31 57.800 -109 45.700 1285.30m 979072.480 979480.511 -11.44 -155.26 0.00 0.43 1.30 -156.13
0.19 25140392

6048 D12 31 57.800 -110 2.800 1516.30m 979025.420 979480.511 12.75 -156.92 0.00 1.57 1.41 -156.76 0.36 6048 D12

3277 418 31 57.800 -110 16.000 1083.30m 979118.440 979480.511 -27.79 -149.01 0.00 0.31 1.17 -149.87 0.18
3277 418

26620D64 31 57.850 -110 9.600 1252.10m 979085.190 979480.578 -9.04 -149.15 0.00 0.40 1.28 -150.03 0.19 26620D64

26620D43 31 57.860 -110 14.950 1107.60m 979114.140 979480.592 -24.68 -148.62 0.00 0.28 1.19 -149.52
0.18 26620D43

3138B011 31 57.900 -110 16.600 1077.70m 979119.560 979480.646 -28.54 -149.13 0.00 0.35 1.17 -149.95
0.19 3138B011

26620D42 31 57.960 -110 14.100 1124.10m 979111.230 979480.727 -22.63 -148.42 0.00 0.28 1.20 -149.34
0.18 26620D42

3138S001 31 58.000 -110 14.800 1106.40m 979113.230 979480.782 -26.15 -149.95 0.00 0.32 1.19 -150.82
0.18 3138S001

1083000 31 58.000 -110 17.800 1093.00m 979115.400 979480.782 -28.11 -150.42 0.00 0.36 1.18 -151.23 0.19 1083000

20510281 31 58.000 -110 18.000 1098.20m 979115.360 979480.782 -26.55 -149.43 0.00 0.36 1.18 -150.26
0.19 20510281

26620B33 31 58.000 -110 20.200 1205.80m 979091.870 979480.782 -16.84 -151.77 0.00 0.47 1.25 -152.55
0.20 26620B33

20510309 31 58.000 -110 28.300 1247.50m 979099.460 979480.782 3.61 -135.98 0.00 0.60 1.28 -136.66 0.21 20510309

6048 D13 31 58.020 -110 1.100 1667.40m 978996.100 979480.808 29.74 -156.84 0.00 3.58 1.46 -154.72 0.74 6048 D13

6323WMW0 31 58.040 -110 17.620 1094.20m 979115.560 979480.835 -27.64 -150.07 0.00 0.33 1.18 -150.92
0.18 6323WMW0

35981176 31 58.100 -110 17.700 1090.00m 979116.290 979480.917 -28.28 -150.25 0.00 0.36 1.18 -151.07
0.19 35981176

3138B002 31 58.100 -110 28.300 1230.10m 979109.140 979480.917 7.79 -129.86 0.00 0.66 1.27 -130.47 0.22 3138B002

3277 485 31 58.100 -110 28.400 1230.20m 979109.210 979480.917 7.89 -129.77 0.00 0.65 1.27 -130.39 0.22 3277 485

6323WM00 31 58.110 -110 17.880 1095.70m 979114.800 979480.930 -28.03 -150.63 0.00 0.34 1.18 -151.47
0.19 6323WM00

26620D72 31 58.160 -110 5.800 1356.40m 979055.710 979480.998 -6.77 -158.54 0.00 0.51 1.34 -159.37 0.20 26620D72

26620D41 31 58.170 -110 12.600 1168.90m 979102.120 979481.011 -18.21 -149.01 0.00 0.71 1.23 -149.52
0.22 26620D41

266200B2 31 58.240 -110 16.350 1075.30m 979119.310 979481.106 -29.99 -150.31 0.00 0.33 1.17 -151.15
0.18 266200B2

26620B34 31 58.240 -110 17.900 1127.80m 979106.750 979481.106 -26.35 -152.55 0.00 0.69 1.20 -153.06
0.22 26620B34

26620B35 31 58.280 -110 18.350 1103.40m 979112.100 979481.160 -28.58 -152.05 0.00 0.36 1.19 -152.88
0.19 26620B35

3138B009 31 58.300 -110 18.400 1103.30m 979112.460 979481.187 -28.28 -151.74 0.00 0.37 1.19 -152.55
0.19 3138B009

3138B001 31 58.300 -110 29.700 1197.80m 979111.930 979481.187 0.34 -133.69 0.00 0.49 1.25 -134.45 0.20 3138B001

266200B3 31 58.510 -110 16.350 1072.60m 979120.070 979481.471 -30.42 -150.45 0.00 0.33 1.16 -151.28
0.18 266200B3

26620B36 31 58.590 -110 19.050 1122.60m 979107.180 979481.579 -28.00 -153.62 0.00 0.38 1.20 -154.43
0.19 26620B36

25140135 31 58.600 -109 54.900 1356.70m 979056.720 979481.593 -6.26 -158.07 0.00 0.47 1.34 -158.94
0.20 25140135

26620D65 31 58.630 -110 10.100 1272.50m 979080.610 979481.633 -8.38 -150.77 0.00 0.31 1.29 -151.75
0.18 26620D65

25140388 31 58.650 -109 49.800 1284.70m 979068.460 979481.660 -16.80 -160.55 0.00 0.12 1.30 -161.73
0.17 25140388

25140387 31 58.650 -109 52.320 1312.20m 979061.640 979481.660 -15.13 -161.97 0.00 0.21 1.31 -163.07
0.18 25140387

25140389 31 58.660 -109 48.780 1281.70m 979069.830 979481.674 -16.36 -159.78 0.00 0.09 1.30 -160.99
0.17 25140389

25140391 31 58.670 -109 46.720 1281.70m 979073.860 979481.687 -12.35 -155.77 0.00 0.15 1.30 -156.91
0.18 25140391

6048 D11 31 58.670 -109 54.870 1356.60m 979056.690 979481.687 -6.41 -158.22 0.00 0.47 1.34 -159.08 0.20
6048 D11

6048 D 6 31 58.670 -109 57.860 1499.30m 979033.900 979481.687 14.81 -152.96 0.00 1.75 1.40 -152.61 0.39 6048
D 6

266200D1 31 58.670 -110 13.500 1150.90m 979107.030 979481.687 -19.53 -148.31 0.00 0.30 1.22 -149.23
0.18 266200D1

25140390 31 58.680 -109 47.750 1280.20m 979073.760 979481.701 -12.92 -156.18 0.00 0.09 1.30 -157.38
0.17 25140390

25140064 31 58.700 -109 45.700 1288.40m 979071.600 979481.728 -12.58 -156.75 0.00 0.25 1.30 -157.80
0.18 25140064

25140070 31 58.700 -109 50.900 1293.90m 979066.390 979481.728 -16.10 -160.88 0.00 0.15 1.30 -162.03
0.18 25140070

1083001 31 58.700 -110 13.500 1150.80m 979107.500 979481.728 -19.13 -147.90 0.00 0.31 1.22 -148.81 0.18 1083001

3138S002 31 58.700 -110 13.600 1150.90m 979107.490 979481.728 -19.11 -147.89 0.00 0.29 1.22 -148.82
0.18 3138S002

25140071 31 58.800 -109 51.000 1293.90m 979066.540 979481.863 -16.08 -160.87 0.00 0.15 1.30 -162.02
0.18 25140071

26620D67 31 58.840 -110 7.500 1316.10m 979068.580 979481.918 -7.25 -154.52 0.00 0.50 1.31 -155.33 0.20 26620D67

6048 D34 31 58.870 -110 2.770 1442.30m 979040.600 979481.958 3.66 -157.73 0.00 1.45 1.38 -157.66 0.34 6048 D34

1083001 31 58.900 -110 9.100 1293.80m 979077.210 979481.999 -5.58 -150.35 0.00 0.35 1.30 -151.30 0.19 1083001

26620D66 31 58.920 -110 9.200 1291.70m 979076.190 979482.026 -7.27 -151.81 0.00 0.35 1.30 -152.76 0.19 26620D66

3138S003 31 59.000 -110 12.000 1224.60m 979090.390 979482.134 -13.88 -150.91 0.00 0.28 1.26 -151.89
0.18 3138S003

6048MR48 31 59.090 -110 0.420 1911.70m 978944.070 979482.256 51.60 -162.32 0.00 12.05 1.51 -151.78
2.42 6048MR48

1083001 31 59.200 -110 27.100 1226.00m 979104.900 979482.405 0.79 -136.39 0.00 0.85 1.26 -136.81 0.24 1083001

26620D63 31 59.360 -110 11.050 1260.70m 979079.900 979482.621 -13.72 -154.79 0.00 0.35 1.28 -155.72
0.19 26620D63

3138S004 31 59.400 -110 11.000 1260.60m 979080.970 979482.675 -12.73 -153.79 0.00 0.39 1.28 -154.69
0.19 3138S004

6323W112 31 59.430 -110 27.850 1344.70m 979078.550 979482.716 10.75 -139.72 0.00 5.96 1.33 -135.09
1.20 6323W112

266200B4 31 59.490 -110 16.350 1083.00m 979118.990 979482.797 -29.62 -150.81 0.00 0.33 1.17 -151.65
0.18 266200B4

26620B38 31 59.490 -110 20.350 1156.40m 979101.420 979482.797 -24.55 -153.95 0.00 0.36 1.22 -154.81
0.19 26620B38

25140136 31 59.500 -109 54.900 1341.10m 979060.710 979482.810 -8.30 -158.37 0.00 0.38 1.33 -159.31
0.19 25140136

26620B37 31 59.530 -110 21.250 1171.00m 979100.010 979482.851 -21.51 -152.54 0.00 0.35 1.23 -153.42
0.19 26620B37

25140063 31 59.600 -109 45.700 1289.90m 979070.910 979482.946 -14.03 -158.36 0.00 0.70 1.30 -158.97
0.22 25140063

6048 D33 31 59.630 -110 1.170 1536.10m 979032.320 979482.986 23.28 -148.60 0.00 1.92 1.42 -148.10 0.42 6048 D33

26620D74 31 59.660 -110 2.500 1442.00m 979042.600 979483.027 4.50 -156.86 0.00 1.01 1.38 -157.23 0.27 26620D74

20510280 31 59.700 -110 10.500 1289.30m 979078.280 979483.081 -6.98 -151.25 0.00 0.35 1.30 -152.20
0.19 20510280

1083001 31 59.700 -110 21.900 1172.90m 979100.500 979483.081 -20.66 -151.91 0.00 0.39 1.23 -152.75 0.19 1083001

26620D68 31 59.740 -110 5.000 1358.80m 979059.530 979483.135 -4.34 -156.39 0.00 0.63 1.34 -157.10 0.21 26620D68

3138S005 31 59.800 -110 9.600 1307.50m 979071.280 979483.216 -8.50 -154.81 0.00 0.36 1.31 -155.76 0.19 3138S005

266200B5 31 59.870 -110 17.150 1078.10m 979118.670 979483.311 -31.97 -152.61 0.00 0.31 1.17 -153.46
0.18 266200B5

BENC- 1 32 12.430 -110 18.560 3263.40F 979143.532 979500.337 -49.87 -161.17 0.00 0.89 1.11 -161.39 0.20 BENC- 1

BENC- 2 32 12.440 -110 18.560 3267.40F 979143.703 979500.351 -49.33 -160.77 0.00 0.88 1.11 -161.00 0.20 BENC- 2

BN 1 31 57.770 -110 16.030 3554.00f 979118.628 979480.470 -27.58 -148.79 0.00 0.31 1.17 -149.65 0.13 BN 1

BN 2 31 58.031 -110 17.726 3610.00f 979115.613 979480.823 -25.68 -148.80 0.00 0.33 1.18 -149.66 0.13 BN 2

BN 3 31 56.008 -110 17.093 3662.70f 979112.401 979478.088 -21.20 -146.12 0.00 0.43 1.19 -146.89 0.14 BN 3

BN 4 31 55.147 -110 15.920 3613.20f 979113.815 979476.924 -23.28 -146.51 0.00 0.36 1.18 -147.34 0.13 BN 4

BN 5 31 54.792 -110 15.611 3593.80f 979114.765 979476.445 -23.67 -146.24 0.00 0.37 1.18 -147.05 0.14 BN 5

BN 6 31 54.328 -110 15.071 3596.70f 979115.036 979475.818 -22.50 -145.17 0.00 0.35 1.18 -146.00 0.13 BN 6

BN 7 31 54.315 -110 14.062 3624.60f 979112.109 979475.800 -22.79 -146.41 0.00 0.30 1.19 -147.30 0.13 BN 7

BN 8 31 57.811 -110 20.748 4033.00f 979089.429 979480.526 -11.79 -149.35 0.00 0.45 1.27 -150.16 0.14 BN 8

BN 9 31 57.736 -110 21.646 4118.50f 979087.492 979480.424 -5.59 -146.06 0.00 0.50 1.28 -146.84 0.15 BN 9

BN 10 31 57.358 -110 21.369 4163.50f 979084.179 979479.913 -4.16 -146.16 0.00 0.57 1.29 -146.88 0.16 BN 10

BN 11 31 57.154 -110 20.495 4118.00f 979086.119 979479.637 -6.22 -146.67 0.00 0.61 1.28 -147.35 0.17 BN 11

BN 12 31 56.472 -110 20.447 4189.00f 979081.293 979478.715 -3.45 -146.32 0.00 0.60 1.29 -147.02 0.16 BN 12

BN 13 31 56.244 -110 21.219 4293.00f 979078.386 979478.407 3.73 -142.69 0.00 0.70 1.31 -143.30 0.18 BN 13

BN 14 31 55.952 -110 22.114 4443.00f 979074.593 979478.012 14.43 -137.10 0.00 0.80 1.33 -137.64 0.20 BN 14

BN 15 31 55.400 -110 20.447 4289.50f 979077.384 979477.266 3.54 -142.76 0.00 0.65 1.31 -143.42 0.17 BN 15

BN 16 31 54.978 -110 20.453 4342.40f 979075.100 979476.696 6.80 -141.31 0.00 0.69 1.32 -141.94 0.18 BN 16

BN 17 31 54.054 -110 20.450 4427.00f 979070.741 979475.448 11.64 -139.35 0.00 0.77 1.33 -139.91 0.19 BN 17

BN 18 31 54.112 -110 19.201 4203.00f 979078.846 979475.526 -1.39 -144.74 0.00 0.61 1.30 -145.43 0.17 BN 18

BN 19 31 55.053 -110 18.495 4063.00f 979085.630 979476.797 -9.04 -147.62 0.00 0.54 1.27 -148.35 0.16 BN 19

BN 20 31 55.982 -110 17.021 3667.00f 979112.004 979478.053 -21.16 -146.23 0.00 0.42 1.19 -147.00 0.14 BN 20

BN 21 31 57.119 -110 17.131 3610.00f 979115.528 979479.590 -24.53 -147.66 0.00 0.35 1.18 -148.49 0.13 BN 21

BN 22 31 57.754 -110 18.397 3668.00f 979110.519 979480.449 -24.95 -150.05 0.00 0.44 1.20 -150.80 0.14 BN 22

BN 23 31 59.614 -110 18.397 3530.00f 979117.124 979482.965 -33.83 -154.23 0.00 0.36 1.17 -155.04 0.13 BN 23

BN 24 31 58.957 -110 17.884 3534.00f 979117.711 979482.076 -31.98 -152.51 0.00 0.34 1.17 -153.34 0.13 BN 24

BN 25 31 58.680 -110 16.342 3521.00f 979120.674 979481.701 -29.87 -149.95 0.00 0.33 1.16 -150.79 0.13 BN 25

BN 26 31 58.664 -110 15.835 3541.00f 979120.289 979481.679 -28.35 -149.12 0.00 0.34 1.17 -149.95 0.13 BN 26

BN 27 31 59.529 -110 16.342 3562.20f 979119.637 979482.849 -28.18 -149.67 0.00 0.31 1.17 -150.53 0.13 BN 27

BN 28 31 59.548 -110 17.114 3518.00f 979120.478 979482.875 -31.52 -151.50 0.00 0.39 1.16 -152.28 0.14 BN 28

BN 29 31 59.976 -110 17.628 3504.00f 979120.558 979483.455 -33.33 -152.84 0.00 0.32 1.16 -153.68 0.13 BN 29

BN 30 31 59.982 -110 16.652 3568.00f 979119.161 979483.462 -28.72 -150.41 0.00 0.27 1.17 -151.32 0.13 BN 30

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BN 32 31 57.976 -110 18.917 3704.00f 979107.665 979480.749 -24.71 -151.05 0.00 0.44 1.20 -151.81 0.14 BN 32

BN 33 31 57.737 -110 21.396 4081.00f 979088.773 979480.426 -7.84 -147.03 0.00 0.47 1.27 -147.83 0.15 BN 33

BN 34 31 58.303 -110 18.408 3620.00f 979112.786 979481.191 -27.93 -151.40 0.00 0.37 1.19 -152.22 0.14 BN 34

BN 35 31 58.650 -110 18.404 3600.00f 979113.411 979481.660 -29.66 -152.44 0.00 0.34 1.18 -153.28 0.13 BN 35

BN 36 31 54.326 -110 16.198 3666.00f 979108.129 979475.815 -22.89 -147.92 0.00 0.42 1.19 -148.70 0.14 BN 36

BN 37 31 54.314 -110 15.548 3625.00f 979111.771 979475.799 -23.09 -146.72 0.00 0.36 1.19 -147.55 0.13 BN 37

BN 40 31 56.925 -110 10.269 4089.00f 979087.928 979479.328 -6.83 -146.29 0.00 0.35 1.28 -147.22 0.13 BN 40

BN 41 31 57.510 -110 9.969 4104.00f 979086.425 979480.119 -7.71 -147.69 0.00 0.29 1.28 -148.68 0.13 BN 41

BN 42 31 58.182 -110 8.820 4226.00f 979077.875 979481.028 -5.70 -149.84 0.00 0.33 1.30 -150.81 0.13 BN 42

BN 43 31 58.751 -110 8.328 4304.00f 979072.323 979481.797 -4.69 -151.49 0.00 0.36 1.31 -152.44 0.13 BN 43

BN 44 31 58.949 -110 9.531 4212.50f 979080.095 979482.065 -5.79 -149.46 0.00 0.32 1.30 -150.44 0.13 BN 44

BN 45 31 58.637 -110 10.082 4175.00f 979082.049 979481.643 -6.94 -149.33 0.00 0.31 1.29 -150.32 0.13 BN 45

BN 46 31 57.710 -110 10.800 4061.00f 979089.008 979480.389 -9.45 -147.95 0.00 0.28 1.27 -148.94 0.13 BN 46

BN 47 31 58.567 -110 10.799 4106.00f 979085.627 979481.548 -9.75 -149.80 0.00 0.31 1.28 -150.76 0.13 BN 47

BN 48 31 59.059 -110 8.348 4122.00f 979085.186 979482.214 -9.36 -149.94 0.00 2.43 1.28 -148.80 0.50 BN 48

BN 49 31 59.817 -110 9.890 4257.00f 979075.872 979483.239 -7.00 -152.20 0.00 0.37 1.30 -153.13 0.14 BN 49

BN 50 31 55.421 -110 11.883 3917.00f 979095.016 979477.295 -13.88 -147.48 0.00 0.44 1.24 -148.28 0.14 BN 50

BN 51 31 55.411 -110 10.614 4003.00f 979089.885 979477.281 -10.91 -147.44 0.00 0.25 1.26 -148.45 0.12 BN 51

BN 52 31 55.551 -110 8.723 4222.00f 979072.548 979477.471 -7.85 -151.85 0.00 0.32 1.30 -152.83 0.13 BN 52

BN 53 31 51.737 -110 12.336 3685.00f 979101.640 979472.319 -24.10 -149.78 0.00 0.31 1.20 -150.67 0.13 BN 53

BN 54 31 51.953 -110 12.361 3687.00f 979113.782 979472.610 -12.06 -137.81 0.00 0.30 1.20 -138.71 0.13 BN 54

BN 55 31 50.136 -110 11.766 3748.00f 979096.134 979470.158 -21.52 -149.35 0.00 0.31 1.21 -150.25 0.13 BN 55

BN 56 31 50.164 -110 12.616 3690.00f 979104.719 979470.196 -18.42 -144.28 0.00 0.31 1.20 -145.17 0.13 BN 56

BN 57 31 49.128 -110 11.198 3918.00f 979083.481 979468.798 -16.83 -150.45 0.00 0.38 1.24 -151.32 0.14 BN 57

BN 58 31 48.490 -110 9.744 4035.00f 979073.668 979467.937 -14.78 -152.40 0.00 0.23 1.27 -153.43 0.12 BN 58

BN 59 31 46.673 -110 8.002 4106.80f 979065.777 979465.487 -13.47 -153.54 0.00 0.41 1.28 -154.40 0.14 BN 59

BN 60 31 53.331 -110 13.284 3625.00f 979109.765 979474.471 -23.76 -147.40 0.00 0.33 1.19 -148.26 0.13 BN 60

BN 61 31 53.906 -110 13.289 3649.00f 979109.350 979475.248 -22.70 -147.15 0.00 0.29 1.19 -148.06 0.13 BN 61

BN 62 31 52.819 -110 11.171 3860.00f 979087.536 979473.779 -23.21 -154.86 0.00 0.29 1.23 -155.80 0.13 BN 62

BN 63 31 52.908 -110 10.860 3925.00f 979082.425 979473.900 -22.33 -156.19 0.00 0.27 1.25 -157.17 0.13 BN 63

BN 64 31 52.989 -110 9.424 4102.00f 979069.005 979474.009 -19.21 -159.12 0.00 0.30 1.28 -160.10 0.13 BN 64

BN 65 31 53.363 -110 9.153 4137.00f 979068.847 979474.514 -16.58 -157.68 0.00 0.31 1.28 -158.66 0.13 BN 65

BN 66 31 53.599 -110 8.996 4160.00f 979068.104 979474.833 -15.48 -157.37 0.00 0.31 1.29 -158.35 0.13 BN 66

BN 67 31 54.294 -110 9.070 4166.00f 979071.293 979475.772 -12.67 -154.76 0.00 0.32 1.29 -155.73 0.13 BN 67

BN 68 31 53.372 -110 7.704 4295.00f 979056.484 979474.527 -14.11 -160.59 0.00 0.35 1.31 -161.55 0.13 BN 68

BN 69 31 53.700 -110 7.097 4363.00f 979053.416 979474.969 -11.22 -160.03 0.00 0.38 1.32 -160.97 0.14 BN 69

BN 70 31 54.074 -110 6.140 4474.00f 979048.469 979475.474 -6.24 -158.83 0.00 0.45 1.34 -159.72 0.14 BN 70

BN 71 31 54.857 -110 5.198 4598.00f 979043.518 979476.533 -0.59 -157.41 0.00 0.55 1.36 -158.22 0.16 BN 71

BN 72 31 55.478 -110 3.883 4708.00f 979040.516 979477.372 5.91 -154.66 0.00 0.88 1.37 -155.16 0.21 BN 72

BN 73 31 55.412 -110 4.906 4614.00f 979043.499 979477.282 0.15 -157.22 0.00 0.59 1.36 -157.99 0.16 BN 73

BN 74 31 55.547 -110 7.041 4410.00f 979056.838 979477.465 -5.88 -156.29 0.00 0.39 1.33 -157.23 0.14 BN 74

BN 75 31 55.679 -110 7.742 4340.00f 979062.673 979477.644 -6.80 -154.83 0.00 0.38 1.32 -155.76 0.14 BN 75

BN 76 31 54.579 -110 12.764 3707.00f 979107.413 979476.157 -20.09 -146.53 0.00 0.31 1.20 -147.42 0.13 BN 76

BN 77 31 53.915 -110 14.798 3634.40f 979111.364 979475.260 -22.07 -146.03 0.00 0.36 1.19 -146.86 0.13 BN 77

BN 78 31 53.580 -110 13.384 3618.00f 979110.722 979474.807 -23.80 -147.20 0.00 0.33 1.18 -148.05 0.13 BN 78

BN 79 31 52.566 -110 14.305 3665.00f 979108.067 979473.438 -20.67 -145.67 0.00 0.36 1.19 -146.50 0.13 BN 79

BN 80 31 51.723 -110 14.288 3708.00f 979107.634 979472.300 -15.92 -142.39 0.00 0.30 1.20 -143.29 0.13 BN 80

BN 81 31 51.693 -110 13.346 3650.00f 979110.301 979472.259 -18.67 -143.15 0.00 0.40 1.19 -143.95 0.14 BN 81

BN 82 31 54.896 -110 21.810 4525.00f 979070.244 979476.585 19.22 -135.11 0.00 0.90 1.35 -135.56 0.21 BN 82

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BN 83 31 55.151 -110 21.557 4481.00f 979072.597 979476.930 17.09 -135.74 0.00 0.94 1.34 -136.14 0.22 BN 83

BN 84 31 54.457 -110 21.151 4465.00f 979072.471 979475.992 16.40 -135.89 0.00 0.82 1.34 -136.41 0.20 BN 84

BN 85 31 54.154 -110 20.178 4428.00f 979070.150 979475.583 11.01 -140.01 0.00 0.84 1.33 -140.51 0.20 BN 85

BN 86 31 53.270 -110 19.325 4307.00f 979072.771 979474.389 3.45 -143.45 0.00 0.71 1.31 -144.05 0.18 BN 86

BN 87 31 52.921 -110 18.633 4227.00f 979074.613 979473.918 -1.76 -145.93 0.00 0.67 1.30 -146.56 0.18 BN 87

BN 88 31 52.205 -110 16.937 4006.00f 979085.680 979472.950 -10.51 -147.14 0.00 0.42 1.26 -147.98 0.14 BN 88

BN 89 31 50.932 -110 16.128 3982.00f 979087.312 979471.232 -9.41 -145.22 0.00 0.34 1.26 -146.14 0.13 BN 89

BN 90 31 48.768 -110 15.428 3948.00f 979088.763 979468.312 -8.24 -142.89 0.00 0.29 1.25 -143.85 0.13 BN 90

BN 91 31 47.487 -110 15.966 3996.00f 979083.668 979466.585 -7.09 -143.38 0.00 0.32 1.26 -144.32 0.13 BN 91

BN 92 31 45.549 -110 16.747 4152.00f 979069.379 979463.972 -4.10 -145.71 0.00 0.29 1.29 -146.71 0.13 BN 92

BN 93 31 43.805 -110 16.932 4194.00f 979063.722 979461.623 -3.46 -146.50 0.00 0.26 1.29 -147.54 0.12 BN 93

BN 94 31 43.856 -110 18.925 4254.00f 979052.350 979461.692 -9.26 -154.35 0.00 0.36 1.30 -155.29 0.13 BN 94

BN 95 31 42.904 -110 19.460 4288.00f 979047.127 979460.409 -10.00 -156.25 0.00 0.37 1.31 -157.19 0.14 BN 95

BN 96 31 41.498 -110 23.960 4627.00f 979038.337 979458.517 14.97 -142.84 0.00 0.79 1.36 -143.41 0.19 BN 96

BN 97 31 41.611 -110 24.589 4646.60f 979036.857 979458.669 15.18 -143.30 0.00 1.09 1.36 -143.57 0.25 BN 97

BN 98 31 48.918 -110 20.828 4574.70f 979048.166 979468.515 9.89 -146.14 0.00 1.11 1.35 -146.39 0.25 BN 98

BN 99 31 50.820 -110 13.099 3703.00f 979108.846 979471.081 -13.96 -140.26 0.00 0.26 1.20 -141.20 0.12 BN 99

BN100 31 47.569 -110 11.240 3934.00f 979082.740 979466.695 -13.96 -148.13 0.00 0.22 1.25 -149.16 0.12 BN100

BN101 31 47.542 -110 11.414 3922.00f 979083.627 979466.659 -14.16 -147.93 0.00 0.22 1.25 -148.96 0.12 BN101

BN102 31 47.651 -110 12.613 3746.00f 979098.856 979466.806 -15.63 -143.39 0.00 0.39 1.21 -144.21 0.14 BN102

BN103 31 46.428 -110 9.328 4035.00f 979072.576 979465.157 -13.09 -150.71 0.00 0.21 1.27 -151.76 0.12 BN103

BN104 31 45.977 -110 9.651 4022.00f 979073.361 979464.549 -12.92 -150.09 0.00 0.20 1.26 -151.16 0.12 BN104

BN105 31 45.789 -110 11.344 3958.00f 979080.899 979464.296 -11.14 -146.14 0.00 0.21 1.25 -147.18 0.12 BN105

BN106 31 46.100 -110 8.922 4068.00f 979069.884 979464.715 -12.24 -150.98 0.00 0.22 1.27 -152.03 0.12 BN106

BN107 31 45.354 -110 8.303 4083.00f 979070.331 979463.710 -9.37 -148.63 0.00 0.22 1.27 -149.68 0.12 BN107

BN108 31 46.738 -110 9.500 3985.00f 979077.507 979465.575 -13.28 -149.19 0.00 0.28 1.26 -150.17 0.13 BN108

BN109 31 47.195 -110 9.518 3980.00f 979078.072 979466.191 -13.80 -149.54 0.00 0.34 1.26 -150.46 0.13 BN109

BN110 31 47.600 -110 9.464 4027.00f 979073.956 979466.737 -14.04 -151.39 0.00 0.30 1.26 -152.35 0.13 BN110
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BN111 31 44.214 -110 12.876 3953.00f 979079.905 979462.174 -10.49 -145.31 0.00 0.26 1.25 -146.30 0.12 BN111

BN112 31 45.319 -110 13.228 3932.00f 979080.380 979463.662 -13.47 -147.58 0.00 0.23 1.25 -148.60 0.12 BN112

BN113 31 45.911 -110 13.423 3920.00f 979083.123 979464.460 -12.66 -146.35 0.00 0.25 1.24 -147.35 0.12 BN113

BN114 31 54.149 -110 3.148 4814.00f 979031.946 979475.576 9.10 -155.09 0.00 0.89 1.39 -155.58 0.21 BN114

BN115 31 54.188 -110 3.497 4733.00f 979037.140 979475.629 6.63 -154.80 0.00 0.82 1.38 -155.36 0.20 BN115

BN116 31 54.095 -110 3.925 4683.00f 979038.148 979475.503 3.06 -156.66 0.00 0.71 1.37 -157.32 0.18 BN116

BN117 31 54.149 -110 3.490 4730.00f 979037.070 979475.576 6.33 -155.00 0.00 0.85 1.38 -155.52 0.20 BN117

BN118 31 54.105 -110 4.092 4667.00f 979038.583 979475.516 1.98 -157.20 0.00 0.68 1.37 -157.89 0.18 BN118



BN119 31 54.095 -110 4.254 4648.00f 979039.542 979475.503 1.16 -157.36 0.00 0.65 1.37 -158.08 0.17 BN119

BN120 31 54.089 -110 4.445 4630.00f 979040.510 979475.495 0.45 -157.47 0.00 0.61 1.36 -158.22 0.17 BN120

BN121 31 53.968 -110 4.930 4585.00f 979041.747 979475.332 -2.38 -158.76 0.00 0.54 1.36 -159.58 0.16 BN121

BN122 31 53.861 -110 5.162 4558.00f 979042.394 979475.187 -4.13 -159.59 0.00 0.52 1.35 -160.42 0.15 BN122

BN123 31 53.906 -110 5.457 4528.00f 979044.062 979475.248 -5.34 -159.78 0.00 0.51 1.35 -160.61 0.15 BN123

BN124 31 53.748 -110 5.715 4499.00f 979045.124 979475.034 -6.79 -160.24 0.00 0.47 1.34 -161.11 0.15 BN124

BN125 31 53.820 -110 5.899 4482.00f 979046.360 979475.132 -7.25 -160.12 0.00 0.47 1.34 -160.99 0.15 BN125

LPB- 1 32 15.020 -110 42.200 2747.60F 979208.545 979503.856 -36.88 -130.59 0.00 0.91 0.98 -130.66 0.21 LPB- 1

LPB- 2 32 17.770 -110 37.250 4078.90F 979115.182 979507.594 -8.80 -147.91 0.00 0.75 1.27 -148.44 0.18 LPB- 2

LPB- 3 32 18.800 -110 32.450 4226.90F 979101.537 979508.995 -9.93 -154.09 0.00 0.73 1.30 -154.66 0.18 LPB- 3

LPB- 4 32 24.650 -110 27.650 2929.70F 979178.618 979516.960 -62.79 -162.71 0.00 0.27 1.03 -163.46 0.11 LPB- 4

RED6- 1 32 26.160 -110 28.080 3049.00F 979174.729 979519.018 -57.51 -161.51 0.00 0.22 1.06 -162.34 0.11 RED6- 1

RED6- 2 32 26.600 -110 27.000 3275.70F 979155.052 979519.618 -56.47 -168.20 0.00 0.23 1.11 -169.08 0.11 RED6- 2

RED6- 3 32 26.840 -110 26.360 3382.50F 979146.210 979519.945 -55.60 -170.97 0.00 0.18 1.13 -171.92 0.11 RED6- 3

RED6- 4 32 27.220 -110 24.800 3811.10F 979119.801 979520.463 -42.23 -172.21 0.00 0.20 1.22 -173.23 0.11 RED6- 4

RED6- 5 32 26.940 -110 22.800 4077.00F 979110.981 979520.081 -25.66 -164.72 0.00 0.24 1.27 -165.75 0.11 RED6- 5

RED6- 6 32 27.380 -110 21.160 4141.40F 979105.134 979520.681 -26.06 -167.31 0.00 0.24 1.29 -168.35 0.11 RED6- 6

RED6- 7 32 27.690 -110 20.560 4378.60F 979087.665 979521.104 -21.65 -170.99 0.00 0.32 1.32 -171.99 0.12 RED6- 7
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RED6- 8 32 27.450 -110 25.600 3516.80F 979136.853 979520.777 -53.16 -173.11 0.00 0.17 1.16 -174.10 0.11 RED6- 8

RED6- 9 32 25.830 -110 28.750 2928.20F 979183.877 979518.568 -59.28 -159.15 0.00 0.28 1.03 -159.89 0.12 RED6- 9

SAN- 1 32 25.410 -110 29.320 2890.10F 979192.015 979517.996 -54.15 -152.72 0.00 0.28 1.02 -153.45 0.12 SAN- 1

SAN- 2 32 24.430 -110 27.560 2926.70F 979179.309 979516.660 -62.08 -161.90 0.00 0.28 1.02 -162.64 0.12 SAN- 2

SAN- 3 32 23.180 -110 26.600 3005.80F 979173.954 979514.957 -58.29 -160.81 0.00 0.30 1.04 -161.55 0.12 SAN- 3

SAN- 4 32 22.210 -110 26.080 2979.90F 979174.261 979513.636 -59.10 -160.73 0.00 0.31 1.04 -161.46 0.12 SAN- 4

SAN- 5 32 17.260 -110 21.900 3158.00F 979151.751 979506.901 -58.12 -165.83 0.00 0.45 1.08 -166.46 0.14 SAN- 5

SAN- 6 32 12.440 -110 18.560 3267.40F 979143.876 979500.351 -49.16 -160.60 0.00 0.88 1.11 -160.83 0.20 SAN- 6

SPO- 114 32 12.470 -110 18.520 3267.40F 979143.680 979500.391 -49.40 -160.84 0.00 0.89 1.11 -161.06 0.20
SPO- 114

SPO- 115 32 12.950 -110 16.400 3724.40F 979117.900 979501.043 -32.86 -159.88 0.00 0.55 1.21 -160.54 0.15
SPO- 115

SPO- 116 32 11.900 -110 13.080 4591.00F 979073.200 979499.618 5.35 -151.24 0.00 0.99 1.36 -151.60 0.22 SPO- 116

SPO- 117 32 14.200 -110 25.920 4263.00F 979091.091 979502.741 -10.72 -156.12 0.00 1.45 1.31 -155.98 0.31
SPO- 117

SPO- 118 32 21.560 -110 23.480 3418.30F 979140.471 979512.751 -50.78 -167.36 0.00 0.22 1.14 -168.29 0.11
SPO- 118

SPO- 119 32 21.830 -110 19.560 4114.50F 979110.836 979513.119 -15.32 -155.65 0.00 0.23 1.28 -156.70 0.11
SPO- 119

SPO- 120 32 21.760 -110 21.760 3755.20F 979125.961 979513.024 -33.88 -161.96 0.00 0.20 1.21 -162.97 0.11
SPO- 120

SV 1 31 31.973 -110 15.397 4512.60f 979010.468 979445.714 -10.85 -164.76 0.00 0.59 1.35 -165.51 0.16 SV 1

SV 2 31 31.971 -110 15.891 4543.40f 979008.810 979445.711 -9.61 -164.57 0.00 0.63 1.35 -165.29 0.17 SV 2

SV 3 31 31.534 -110 15.919 4559.00f 979007.599 979445.125 -8.76 -164.26 0.00 0.69 1.35 -164.92 0.18 SV 3

SV 4 31 31.533 -110 16.169 4572.20f 979007.147 979445.124 -7.97 -163.92 0.00 0.72 1.35 -164.55 0.18 SV 4

SV 5 31 31.531 -110 17.230 4665.40f 979001.877 979445.121 -4.48 -163.60 0.00 0.86 1.37 -164.11 0.21 SV 5

SV 7 31 32.409 -110 17.960 4677.00f 979002.886 979446.300 -3.56 -163.07 0.00 0.83 1.37 -163.61 0.20 SV 7

SV 8 31 31.531 -110 16.656 4611.40f 979005.272 979445.121 -6.16 -163.44 0.00 0.77 1.36 -164.03 0.19 SV 8

SV 9 31 31.531 -110 16.416 4598.70f 979005.813 979445.121 -6.81 -163.66 0.00 0.73 1.36 -164.29 0.18 SV 9

SV 10 31 31.184 -110 16.868 4637.00f 979003.732 979444.655 -4.83 -162.98 0.00 0.89 1.36 -163.45 0.21 SV 10

SV 11 31 30.836 -110 16.480 4635.60f 979003.444 979444.188 -4.78 -162.89 0.00 0.87 1.36 -163.38 0.21 SV 11

SV 12 31 30.654 -110 16.318 4654.20f 979001.945 979443.944 -4.29 -163.03 0.00 0.87 1.37 -163.52 0.21 SV 12

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SV 13 31 30.674 -110 15.891 4608.70f 979004.194 979443.971 -6.34 -163.53 0.00 0.80 1.36 -164.09 0.20 SV 13

SV 14 31 30.658 -110 15.397 4586.70f 979004.888 979443.950 -7.70 -164.13 0.00 0.73 1.36 -164.76 0.18 SV 14

SV 15 31 31.099 -110 15.397 4560.80f 979006.936 979444.541 -8.67 -164.23 0.00 0.68 1.35 -164.90 0.18 SV 15

SV 16 31 31.535 -110 15.397 4536.40f 979009.244 979445.126 -9.25 -163.97 0.00 0.63 1.35 -164.69 0.17 SV 16

SV 17 31 30.513 -110 16.414 4673.80f 979000.778 979443.755 -3.42 -162.83 0.00 0.91 1.37 -163.29 0.21 SV 17

SV 18 31 29.785 -110 17.014 4729.90f 978998.632 979442.779 0.68 -160.64 0.00 1.27 1.38 -160.74 0.28 SV 18



SV 19 31 28.022 -110 15.399 4732.30f 979000.068 979440.414 4.71 -156.69 0.00 1.46 1.38 -156.61 0.31 SV 19

SV 20 31 28.910 -110 15.399 4691.30f 978999.516 979441.605 -0.89 -160.89 0.00 1.11 1.37 -161.15 0.25 SV 20

SV 21 31 29.347 -110 15.399 4665.40f 978999.831 979442.191 -3.59 -162.72 0.00 0.99 1.37 -163.09 0.23 SV 21

SV 22 31 29.785 -110 15.399 4635.40f 979001.207 979442.779 -5.63 -163.72 0.00 0.89 1.36 -164.20 0.21 SV 22

SV 23 31 30.222 -110 15.399 4608.90f 979002.984 979443.365 -6.93 -164.12 0.00 0.80 1.36 -164.68 0.20 SV 23

SV 24 31 30.447 -110 16.171 4642.10f 979002.331 979443.667 -4.76 -163.09 0.00 0.89 1.36 -163.56 0.21 SV 24

SV 25 31 30.229 -110 15.908 4633.70f 979002.256 979443.374 -5.33 -163.37 0.00 0.89 1.36 -163.85 0.21 SV 25

SV 26 31 30.004 -110 16.171 4663.90f 979000.689 979443.072 -3.76 -162.83 0.00 1.00 1.37 -163.20 0.23 SV 26

SV 27 31 29.785 -110 16.410 4691.40f 978999.431 979442.779 -2.14 -162.15 0.00 1.11 1.37 -162.41 0.25 SV 27

SV 28 31 30.234 -110 16.410 4667.20f 979000.981 979443.381 -3.47 -162.65 0.00 0.99 1.37 -163.03 0.23 SV 28

SV 29 31 30.447 -110 15.667 4600.20f 979004.128 979443.667 -6.90 -163.80 0.00 0.81 1.36 -164.35 0.20 SV 29

SV 30 31 30.009 -110 15.664 4635.50f 979001.666 979443.079 -5.46 -163.56 0.00 0.90 1.36 -164.02 0.21 SV 30

SV 31 31 30.007 -110 16.414 4787.30f 978994.560 979443.076 1.71 -161.57 0.00 1.27 1.38 -161.68 0.28 SV 31

SV 32 31 28.023 -110 17.440 5045.00f 978982.626 979440.416 16.66 -155.40 0.00 2.64 1.42 -154.18 0.54 SV 32

SV 37 31 31.753 -110 15.660 4538.50f 979008.663 979445.419 -9.92 -164.71 0.00 0.63 1.35 -165.43 0.17 SV 37

SV 38 31 30.876 -110 15.660 4581.40f 979005.700 979444.242 -7.67 -163.93 0.00 0.74 1.36 -164.55 0.19 SV 38

SV 39 31 30.879 -110 16.165 4610.50f 979004.816 979444.246 -5.83 -163.08 0.00 0.80 1.36 -163.63 0.20 SV 39

SV 40 31 31.305 -110 16.163 4599.40f 979005.334 979444.818 -6.92 -163.79 0.00 0.73 1.36 -164.42 0.18 SV 40

SV 41 31 31.306 -110 16.639 4628.30f 979004.135 979444.819 -5.41 -163.26 0.00 0.80 1.36 -163.82 0.20 SV 41
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SV 42 31 29.957 -110 15.036 4695.10f 978999.885 979443.009 -1.57 -161.70 0.00 1.05 1.37 -162.02 0.24 SV 42

SV 43 31 31.096 -110 15.909 4580.10f 979006.093 979444.538 -7.70 -163.91 0.00 0.74 1.36 -164.53 0.19 SV 43

SV 44 31 31.379 -110 15.666 4547.44f 979008.006 979444.917 -9.24 -164.33 0.00 0.69 1.35 -164.99 0.18 SV 44

SV 45 31 31.182 -110 16.426 4626.60f 979003.935 979444.653 -5.60 -163.40 0.00 0.79 1.36 -163.97 0.19 SV 45

SV 50 31 31.527 -110 14.918 4510.20f 979009.799 979445.115 -11.14 -164.97 0.00 0.59 1.34 -165.73 0.16 SV 50

SV 51 31 31.520 -110 14.409 4489.30f 979010.759 979445.106 -12.14 -165.25 0.00 0.55 1.34 -166.05 0.16 SV 51

SV 52 31 31.520 -110 13.900 4461.20f 979012.191 979445.106 -13.35 -165.50 0.00 0.51 1.34 -166.33 0.15 SV 52

SV 53 31 31.738 -110 13.900 4452.50f 979013.381 979445.399 -13.27 -165.13 0.00 0.49 1.34 -165.97 0.15 SV 53

SV 54 31 31.956 -110 13.898 4443.70f 979014.551 979445.691 -13.22 -164.78 0.00 0.48 1.33 -165.63 0.15 SV 54

SV 55 31 32.392 -110 13.892 4419.50f 979016.935 979446.277 -13.70 -164.43 0.00 0.44 1.33 -165.32 0.14 SV 55

SV 56 31 32.831 -110 13.895 4401.00f 979018.950 979446.866 -14.01 -164.11 0.00 0.42 1.33 -165.02 0.14 SV 56

SV 57 31 32.831 -110 13.384 4380.50f 979019.853 979446.866 -15.03 -164.44 0.00 0.39 1.32 -165.37 0.14 SV 57

SV 58 31 31.084 -110 13.913 4475.80f 979009.725 979444.521 -13.86 -166.51 0.00 0.55 1.34 -167.30 0.16 SV 58

SV 59 31 31.084 -110 14.420 4506.00f 979008.884 979444.521 -11.86 -165.54 0.00 0.59 1.34 -166.30 0.16 SV 59

SV 60 31 30.647 -110 14.418 4515.70f 979007.629 979443.935 -11.62 -165.63 0.00 0.64 1.35 -166.34 0.17 SV 60

SV 61 31 30.656 -110 14.927 4541.90f 979006.893 979443.947 -9.90 -164.81 0.00 0.71 1.35 -165.45 0.18 SV 61

SV 62 31 32.409 -110 15.510 4489.00f 979012.633 979446.300 -11.49 -164.59 0.00 0.56 1.34 -165.37 0.16 SV 62

SV 63 31 32.401 -110 14.912 4470.30f 979013.695 979446.289 -12.17 -164.64 0.00 0.51 1.34 -165.47 0.15 SV 63

SV 64 31 32.392 -110 14.402 4438.50f 979015.922 979446.277 -12.92 -164.30 0.00 0.48 1.33 -165.16 0.15 SV 64

SV 65 31 32.831 -110 14.405 4419.00f 979017.844 979446.866 -13.42 -164.14 0.00 0.45 1.33 -165.02 0.14 SV 65

SV 66 31 32.834 -110 14.915 4434.40f 979016.980 979446.870 -12.84 -164.09 0.00 0.49 1.33 -164.93 0.15 SV 66

SV 67 31 31.956 -110 14.407 4465.40f 979013.155 979445.691 -12.58 -164.87 0.00 0.51 1.34 -165.70 0.15 SV 67

SV 90 31 26.290 -110 13.390 4646.00f 979002.955 979438.093 1.80 -156.66 0.00 1.18 1.36 -156.84 0.26 SV 90

SV 91 31 26.285 -110 11.361 4503.00f 978999.696 979438.087 -14.89 -168.48 0.00 0.65 1.34 -169.17 0.17 SV 91

SV 92 31 26.929 -110 11.361 4464.00f 979001.475 979438.949 -17.64 -169.90 0.00 0.61 1.34 -170.62 0.17 SV 92

SV 93 31 28.118 -110 11.349 4409.00f 979005.995 979440.543 -19.89 -170.26 0.00 0.52 1.33 -171.07 0.15 SV 93

SV 94 31 32.986 -110 10.681 4230.00f 979029.167 979447.074 -20.08 -164.35 0.00 0.28 1.30 -165.37 0.13 SV 94

SV100 31 33.324 -110 17.970 4622.00f 979007.337 979447.528 -5.51 -163.15 0.00 0.69 1.36 -163.82 0.18 SV100

SV101 31 34.244 -110 10.937 4204.00f 979036.066 979448.763 -17.31 -160.70 0.00 0.25 1.30 -161.74 0.12 SV101

SV102 31 34.125 -110 11.484 4337.00f 979032.868 979448.604 -7.85 -155.77 0.00 0.96 1.32 -156.12 0.22 SV102

SV103 31 34.108 -110 13.380 4337.00f 979028.936 979448.581 -11.76 -159.68 0.00 0.37 1.32 -160.62 0.14 SV103

SV104 31 34.137 -110 14.389 4369.00f 979023.917 979448.620 -13.81 -162.82 0.00 0.38 1.32 -163.76 0.14 SV104

SV105 31 31.261 -110 0.869 4841.80f 979003.447 979444.759 14.04 -151.10 0.00 0.99 1.39 -151.50 0.23 SV105

SV106 31 32.323 -110 0.562 4625.68f 979019.109 979446.184 7.96 -149.81 0.00 0.85 1.36 -150.32 0.20 SV106

SV107 31 33.333 -110 0.990 4577.34f 979023.165 979447.540 6.11 -150.01 0.00 0.52 1.35 -150.84 0.15 SV107

SV108 31 34.167 -110 1.620 4478.19f 979030.537 979448.660 3.04 -149.70 0.00 0.73 1.34 -150.31 0.18 SV108

SV109 31 35.980 -110 2.799 4395.00f 979037.949 979451.095 0.20 -149.70 0.00 0.55 1.33 -150.48 0.16 SV109

SV110 31 35.697 -110 4.245 4290.00f 979042.449 979450.715 -4.80 -151.11 0.00 0.27 1.31 -152.15 0.13 SV110

SV111 31 36.509 -110 2.986 4337.99f 979041.375 979451.806 -2.45 -150.40 0.00 0.38 1.32 -151.34 0.14 SV111

SV112 31 37.847 -110 2.734 4457.00f 979038.648 979453.605 4.21 -147.80 0.00 0.30 1.34 -148.84 0.13 SV112

SV113 31 36.905 -110 10.763 4049.70f 979063.372 979452.339 -8.09 -146.21 0.00 0.26 1.27 -147.22 0.12 SV113

SV114 31 37.910 -110 10.420 3980.00f 979069.921 979453.690 -9.45 -145.19 0.00 0.27 1.26 -146.18 0.13 SV114

SV115 31 37.720 -110 10.364 3990.00f 979070.132 979453.434 -8.04 -144.12 0.00 0.25 1.26 -145.13 0.12 SV115

SV116 31 38.232 -110 8.597 4124.00f 979062.291 979454.123 -3.97 -144.63 0.00 0.26 1.28 -145.65 0.12 SV116

SV117 31 40.369 -110 1.895 4756.50f 979025.389 979456.997 15.72 -146.51 0.00 0.43 1.38 -147.46 0.14 SV117

SV118 31 43.868 -110 4.739 4298.30f 979057.600 979461.707 0.14 -146.46 0.00 0.29 1.31 -147.48 0.13 SV118

SV119 31 44.885 -110 6.740 4260.00f 979061.116 979463.077 -1.31 -146.61 0.00 0.34 1.31 -147.57 0.13 SV119

SV120 31 44.482 -110 10.835 3878.00f 979079.903 979462.535 -17.90 -150.17 0.00 0.73 1.24 -150.67 0.18 SV120

SV121 31 27.429 -110 42.760 4819.00f 979029.816 979439.620 43.40 -120.96 0.00 8.69 1.39 -113.66 1.74 SV121

SV122 31 25.659 -110 41.964 4719.67f 979015.980 979437.248 22.60 -138.37 0.00 14.00 1.37 -125.75 2.80 SV122

SV123 31 24.619 -110 41.610 4647.00f 979036.813 979435.854 37.99 -120.50 0.00 17.39 1.36 -104.47 3.48 SV123

SV124 31 41.534 -110 22.006 4443.00f 979040.979 979458.565 0.27 -151.27 0.00 0.49 1.33 -152.11 0.15 SV124

SV125 31 41.798 -110 18.247 4263.75f 979049.739 979458.921 -8.18 -153.60 0.00 0.31 1.31 -154.60 0.13 SV125

SV126 31 42.760 -110 15.389 4173.00f 979058.010 979460.216 -9.74 -152.06 0.00 0.24 1.29 -153.11 0.12 SV126

SV127 31 43.271 -110 12.761 3980.75f 979077.337 979460.904 -9.17 -144.94 0.00 0.18 1.26 -146.02 0.12 SV127

SV128 31 43.397 -110 11.622 3849.51f 979084.484 979461.073 -14.54 -145.83 0.00 1.20 1.23 -145.86 0.27 SV128

SV129 31 42.806 -110 11.061 3862.00f 979079.799 979460.277 -17.25 -148.97 0.00 0.89 1.23 -149.31 0.21 SV129

SV130 31 43.449 -110 11.004 3879.50f 979079.415 979461.143 -16.86 -149.17 0.00 0.66 1.24 -149.75 0.17 SV130

SV131 31 42.947 -110 20.996 4368.34f 979042.471 979460.468 -7.16 -156.15 0.00 0.49 1.32 -156.98 0.15 SV131

SV132 31 43.822 -110 20.966 4392.07f 979042.963 979461.646 -5.62 -155.42 0.00 0.53 1.33 -156.21 0.15 SV132

SV133 31 44.686 -110 20.996 4382.62f 979046.566 979462.809 -4.07 -153.54 0.00 0.62 1.33 -154.25 0.17 SV133

SV134 31 46.550 -110 20.949 4525.25f 979045.938 979465.321 6.20 -148.14 0.00 0.90 1.35 -148.59 0.21 SV134

SV135 31 47.424 -110 20.869 4501.00f 979049.712 979466.500 6.52 -147.00 0.00 0.97 1.34 -147.37 0.22 SV135

SV136 31 49.740 -110 20.569 4570.36f 979048.342 979469.623 8.55 -147.33 0.00 1.14 1.35 -147.55 0.25 SV136

SV137 31 50.719 -110 20.439 4555.13f 979051.676 979470.944 9.13 -146.23 0.00 1.15 1.35 -146.44 0.26 SV137

SV138 31 45.240 -110 6.200 4229.40f 979060.580 979463.556 -5.21 -149.46 0.00 0.30 1.30 -150.46 0.13 SV138

SV139 31 47.759 -110 9.915 4043.75f 979072.042 979466.951 -14.59 -152.51 0.00 0.21 1.27 -153.57 0.12 SV139

SV140 31 48.974 -110 9.969 3952.28f 979079.322 979468.590 -17.55 -152.35 0.00 0.30 1.25 -153.30 0.13 SV140

SV141 31 49.325 -110 11.679 3782.00f 979094.042 979469.063 -19.32 -148.31 0.00 0.27 1.22 -149.26 0.13 SV141

SV142 31 51.085 -110 11.899 3754.00f 979096.642 979471.438 -21.73 -149.76 0.00 0.30 1.21 -150.67 0.13 SV142

SV143 31 52.500 -110 12.559 3678.30f 979102.735 979473.349 -24.66 -150.12 0.00 0.31 1.20 -151.00 0.13 SV143

SV144 31 52.970 -110 12.750 3675.00f 979105.108 979473.984 -23.23 -148.57 0.00 0.30 1.20 -149.47 0.13 SV144

SV145 31 53.492 -110 13.270 3630.00f 979109.930 979474.688 -23.35 -147.15 0.00 0.32 1.19 -148.02 0.13 SV145

SV146 31 54.975 -110 13.270 3705.00f 979107.601 979476.692 -20.63 -146.99 0.00 0.30 1.20 -147.90 0.13 SV146

SV147 31 55.300 -110 14.950 3776.00f 979104.768 979477.131 -17.22 -146.01 0.00 1.06 1.22 -146.17 0.24 SV147

SV148 31 54.261 -110 13.790 3641.00f 979110.834 979475.727 -22.45 -146.63 0.00 0.29 1.19 -147.53 0.13 SV148

SV149 31 54.371 -110 15.169 3596.30f 979115.217 979475.876 -22.42 -145.07 0.00 0.35 1.18 -145.90 0.13 SV149

SV150 31 54.240 -110 13.859 3666.24f 979107.045 979475.699 -23.83 -148.88 0.00 0.31 1.19 -149.76 0.13 SV150

SV151 31 51.631 -110 13.639 3656.00f 979110.367 979472.176 -17.95 -142.65 0.00 0.38 1.19 -143.46 0.14 SV151

SV152 31 27.152 -110 9.313 4352.00f 979004.120 979439.248 -25.83 -174.26 0.00 0.42 1.32 -175.16 0.14 SV152

SV153 31 26.527 -110 5.916 4188.00f 979020.047 979438.411 -24.48 -167.32 0.00 0.39 1.29 -168.22 0.14 SV153

SV200 31 33.161 -110 8.183 4052.00f 979048.596 979447.309 -17.62 -155.82 0.00 0.35 1.27 -156.74 0.13 SV200

SV201 31 41.559 -110 21.174 4385.00f 979039.660 979458.599 -6.54 -156.10 0.00 0.43 1.33 -156.99 0.14 SV201

SW 0 31 28.071 -110 15.104 4695.68f 979002.094 979440.480 3.23 -156.93 0.00 1.33 1.37 -156.97 0.29 SW 0

SW 2 31 28.009 -110 15.188 4708.63f 979001.357 979440.397 3.79 -156.81 0.00 1.38 1.37 -156.80 0.30 SW 2

SW 3 31 27.976 -110 15.232 4711.03f 979001.419 979440.353 4.12 -156.56 0.00 1.42 1.37 -156.51 0.31 SW 3

SW 4 31 27.943 -110 15.275 4716.23f 979000.994 979440.309 4.23 -156.63 0.00 1.47 1.37 -156.53 0.31 SW 4

SW 5 31 27.910 -110 15.319 4726.47f 979000.480 979440.264 4.72 -156.48 0.00 1.50 1.38 -156.36 0.32 SW 5

SW 6 31 27.878 -110 15.362 4734.63f 978999.804 979440.221 4.86 -156.63 0.00 1.53 1.38 -156.47 0.33 SW 6

SW 7 31 27.845 -110 15.406 4741.59f 978999.669 979440.177 5.42 -156.30 0.00 1.57 1.38 -156.11 0.33 SW 7

SW 8 31 27.812 -110 15.449 4750.76f 978998.830 979440.133 5.49 -156.54 0.00 1.61 1.38 -156.31 0.34 SW 8

SW 9 31 27.780 -110 15.493 4759.23f 978998.422 979440.090 5.92 -156.40 0.00 1.65 1.38 -156.13 0.35 SW 9

SW 10 31 27.747 -110 15.537 4768.00f 978997.841 979440.046 6.21 -156.41 0.00 1.70 1.38 -156.10 0.36 SW 10

SW 11 31 27.714 -110 15.580 4776.49f 978997.423 979440.001 6.63 -156.28 0.00 1.76 1.38 -155.90 0.37 SW 11

SW 12 31 27.681 -110 15.623 4785.87f 978996.748 979439.957 6.88 -156.35 0.00 1.81 1.38 -155.92 0.38 SW 12

SW 13 31 27.649 -110 15.666 4797.28f 978996.286 979439.915 7.54 -156.08 0.00 1.87 1.39 -155.60 0.39 SW 13

SW 14 31 27.616 -110 15.710 4808.83f 978995.595 979439.870 7.97 -156.04 0.00 1.92 1.39 -155.50 0.40 SW 14

SW 15 31 27.582 -110 15.753 4819.88f 978995.135 979439.825 8.60 -155.79 0.00 1.99 1.39 -155.19 0.41 SW 15

SW 16 31 27.549 -110 15.797 4830.39f 978994.393 979439.781 8.89 -155.86 0.00 2.08 1.39 -155.17 0.43 SW 16

SW 17 31 27.518 -110 15.840 4838.14f 978987.352 979439.739 2.62 -162.39 0.00 2.18 1.39 -161.60 0.45 SW 17

SW 18 31 27.484 -110 15.884 4843.43f 978985.747 979439.693 1.56 -163.64 0.00 2.38 1.39 -162.65 0.49 SW 18

SW 19 31 27.451 -110 15.927 4856.29f 978984.152 979439.649 1.21 -164.42 0.00 2.50 1.39 -163.31 0.51 SW 19

SW 20 31 27.437 -110 15.947 4871.35f 978982.009 979439.630 0.51 -165.64 0.00 2.53 1.39 -164.50 0.52 SW 20

SW 21 31 28.107 -110 15.057 4688.53f 979002.219 979440.528 2.63 -157.28 0.00 1.30 1.37 -157.35 0.28 SW 21

SW 22 31 28.140 -110 15.014 4681.47f 979002.748 979440.572 2.45 -157.22 0.00 1.28 1.37 -157.31 0.28 SW 22

SW 23 31 28.172 -110 14.970 4676.43f 979002.722 979440.616 1.91 -157.59 0.00 1.25 1.37 -157.71 0.27 SW 23

SW 24 31 28.205 -110 14.927 4670.64f 979002.845 979440.660 1.44 -157.86 0.00 1.22 1.37 -158.00 0.27 SW 24

SW 25 31 28.238 -110 14.883 4664.41f 979002.681 979440.704 0.65 -158.44 0.00 1.20 1.37 -158.60 0.27 SW 25

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SW 26 31 28.271 -110 14.840 4658.87f 979002.636 979440.748 0.04 -158.86 0.00 1.17 1.37 -159.06 0.26 SW 26

SW 27 31 28.303 -110 14.796 4653.73f 979002.796 979440.791 -0.33 -159.05 0.00 1.15 1.37 -159.27 0.26 SW 27

SW 28 31 28.336 -110 14.752 4649.34f 979002.717 979440.836 -0.86 -159.44 0.00 1.12 1.37 -159.68 0.25 SW 28

SW 29 31 28.369 -110 14.709 4642.18f 979003.229 979440.879 -1.07 -159.40 0.00 1.10 1.36 -159.66 0.25 SW 29

SW 30 31 28.401 -110 14.665 4635.59f 979003.451 979440.923 -1.51 -159.61 0.00 1.08 1.36 -159.90 0.24 SW 30

SW 32 31 28.467 -110 14.578 4628.02f 979003.915 979441.011 -1.84 -159.69 0.00 1.04 1.36 -160.01 0.24 SW 32

SW 33 31 28.499 -110 14.535 4622.74f 979003.976 979441.054 -2.32 -159.99 0.00 1.02 1.36 -160.33 0.23 SW 33

SW 34 31 28.531 -110 14.491 4619.15f 979004.317 979441.097 -2.36 -159.91 0.00 1.00 1.36 -160.27 0.23 SW 34

SW 35 31 28.564 -110 14.446 4613.35f 979004.375 979441.141 -2.89 -160.24 0.00 0.98 1.36 -160.62 0.23 SW 35

SW 36 31 28.597 -110 14.404 4608.77f 979004.686 979441.185 -3.06 -160.25 0.00 0.96 1.36 -160.65 0.22 SW 36

SW 37 31 28.629 -110 14.359 4603.42f 979004.721 979441.228 -3.57 -160.58 0.00 0.94 1.36 -160.99 0.22 SW 37

SW 38 31 28.662 -110 14.316 4596.18f 979005.233 979441.272 -3.78 -160.54 0.00 0.91 1.36 -160.99 0.21 SW 38

SW 39 31 28.430 -110 14.401 4610.70f 979004.450 979440.961 -2.89 -160.14 0.00 1.00 1.36 -160.50 0.23 SW 39

SW 40 31 28.231 -110 14.401 4616.50f 979004.630 979440.695 -1.90 -159.35 0.00 1.06 1.36 -159.65 0.24 SW 40

SW 51 31 28.108 -110 15.143 4698.61f 979001.788 979440.530 3.15 -157.11 0.00 1.32 1.37 -157.16 0.29 SW 51

SW 52 31 28.144 -110 15.181 4698.23f 979001.734 979440.578 3.01 -157.23 0.00 1.33 1.37 -157.27 0.29 SW 52

SW 53 31 28.183 -110 15.220 4701.76f 979001.379 979440.630 2.93 -157.43 0.00 1.32 1.37 -157.48 0.29 SW 53

SW 54 31 28.219 -110 15.257 4703.03f 979001.224 979440.678 2.85 -157.56 0.00 1.32 1.37 -157.61 0.29 SW 54

SW 55 31 28.257 -110 15.296 4704.92f 979000.912 979440.730 2.66 -157.81 0.00 1.32 1.37 -157.86 0.29 SW 55

SW 56 31 28.293 -110 15.334 4708.48f 979000.486 979440.778 2.52 -158.07 0.00 1.32 1.37 -158.12 0.29 SW 56

SW 57 31 28.332 -110 15.373 4710.68f 979000.332 979440.830 2.52 -158.14 0.00 1.31 1.37 -158.20 0.29 SW 57

SW 58 31 28.369 -110 15.410 4715.45f 979000.049 979440.879 2.64 -158.19 0.00 1.30 1.37 -158.26 0.28 SW 58

SW 59 31 28.405 -110 15.450 4719.18f 978999.732 979440.928 2.63 -158.33 0.00 1.30 1.37 -158.40 0.28 SW 59



SW 60 31 28.443 -110 15.488 4722.49f 978999.256 979440.979 2.41 -158.66 0.00 1.30 1.38 -158.73 0.28 SW 60

SW 61 31 28.479 -110 15.526 4725.36f 978998.869 979441.027 2.24 -158.92 0.00 1.29 1.38 -159.01 0.28 SW 61

SW 62 31 28.517 -110 15.564 4727.44f 978998.610 979441.078 2.13 -159.11 0.00 1.29 1.38 -159.19 0.28 SW 62
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SW 63 31 28.554 -110 15.602 4725.39f 978998.629 979441.127 1.91 -159.26 0.00 1.30 1.38 -159.34 0.28 SW 63

SW 64 31 28.592 -110 15.641 4731.98f 978998.029 979441.179 1.88 -159.52 0.00 1.29 1.38 -159.60 0.28 SW 64

SW 65 31 28.629 -110 15.678 4734.62f 978997.763 979441.228 1.81 -159.67 0.00 1.28 1.38 -159.77 0.28 SW 65

SW 66 31 28.665 -110 15.718 4737.30f 978997.441 979441.277 1.69 -159.88 0.00 1.28 1.38 -159.98 0.28 SW 66

SW 71 31 28.033 -110 15.067 4693.44f 979002.262 979440.429 3.23 -156.84 0.00 1.33 1.37 -156.88 0.29 SW 71

SW 72 31 27.996 -110 15.028 4692.30f 979002.365 979440.380 3.28 -156.76 0.00 1.33 1.37 -156.80 0.29 SW 72

SW 73 31 27.958 -110 14.990 4691.29f 979002.523 979440.329 3.39 -156.61 0.00 1.33 1.37 -156.65 0.29 SW 73

SW 74 31 27.922 -110 14.951 4691.24f 979002.612 979440.280 3.53 -156.48 0.00 1.33 1.37 -156.52 0.29 SW 74

SW 75 31 27.884 -110 14.914 4691.02f 979002.735 979440.229 3.68 -156.31 0.00 1.33 1.37 -156.36 0.29 SW 75

SW 76 31 27.848 -110 14.875 4689.85f 979002.835 979440.181 3.72 -156.24 0.00 1.33 1.37 -156.28 0.29 SW 76

SW 77 31 27.809 -110 14.836 4689.84f 979002.894 979440.129 3.83 -156.13 0.00 1.33 1.37 -156.17 0.29 SW 77

SW 78 31 27.772 -110 14.799 4687.55f 979003.111 979440.079 3.88 -156.00 0.00 1.32 1.37 -156.05 0.29 SW 78

SW 79 31 27.736 -110 14.760 4686.44f 979003.161 979440.031 3.87 -155.96 0.00 1.32 1.37 -156.02 0.29 SW 79

SW 80 31 27.698 -110 14.722 4685.52f 979003.273 979439.980 3.95 -155.86 0.00 1.32 1.37 -155.91 0.29 SW 80

SW 81 31 27.661 -110 14.683 4683.58f 979003.425 979439.930 3.97 -155.77 0.00 1.32 1.37 -155.82 0.29 SW 81

SW 82 31 27.623 -110 14.646 4680.75f 979003.487 979439.879 3.82 -155.83 0.00 1.32 1.37 -155.88 0.29 SW 82

SW 83 31 27.587 -110 14.606 4677.84f 979003.593 979439.831 3.70 -155.85 0.00 1.32 1.37 -155.90 0.29 SW 83

SW 84 31 27.549 -110 14.569 4675.71f 979003.726 979439.781 3.68 -155.79 0.00 1.32 1.37 -155.84 0.29 SW 84

SW 85 31 27.512 -110 14.530 4673.95f 979003.917 979439.731 3.76 -155.66 0.00 1.32 1.37 -155.71 0.29 SW 85

SW 86 31 27.475 -110 14.493 4669.95f 979004.116 979439.681 3.63 -155.65 0.00 1.32 1.37 -155.70 0.29 SW 86

SW 87 31 27.437 -110 14.453 4667.82f 979004.178 979439.630 3.54 -155.66 0.00 1.31 1.37 -155.72 0.29 SW 87

SW 88 31 27.401 -110 14.416 4662.82f 979004.364 979439.582 3.30 -155.73 0.00 1.31 1.37 -155.79 0.29 SW 88

SW 94 31 28.033 -110 14.401 4625.66f 979005.383 979440.429 -0.02 -157.78 0.00 1.11 1.36 -158.03 0.25 SW 94

SX 1 31 32.945 -110 13.967 4372.40f 979025.376 979447.019 -10.43 -159.55 0.00 0.43 1.32 -160.45 0.14 SX 1

SX 2 31 34.959 -110 12.254 4253.00f 979037.593 979449.724 -12.14 -157.19 0.00 0.31 1.30 -158.19 0.13 SX 2

SX 3 31 36.341 -110 10.622 4073.00f 979056.640 979451.581 -11.87 -150.79 0.00 0.25 1.27 -151.81 0.12 SX 3

SX 4 31 35.768 -110 9.346 4047.00f 979063.018 979450.811 -7.17 -145.20 0.00 0.26 1.27 -146.21 0.12 SX 4

SX 5 31 34.828 -110 9.163 4056.80f 979056.914 979449.548 -11.09 -149.45 0.00 0.25 1.27 -150.47 0.12 SX 5

SX 6 31 32.403 -110 17.437 4642.00f 979004.159 979446.292 -5.57 -163.89 0.00 0.75 1.36 -164.50 0.19 SX 6

SX 7 31 32.397 -110 16.421 4567.00f 979009.229 979446.283 -7.54 -163.31 0.00 0.64 1.35 -164.02 0.17 SX 7

SX 8 31 32.725 -110 17.437 4558.00f 979008.781 979446.724 -9.28 -164.73 0.00 0.82 1.35 -165.27 0.20 SX 8

SX 9 31 32.725 -110 15.396 4480.00f 979015.718 979446.724 -9.67 -162.47 0.00 0.53 1.34 -163.28 0.15 SX 9

SX 10 31 32.724 -110 14.402 4428.00f 979018.967 979446.722 -11.31 -162.33 0.00 0.46 1.33 -163.21 0.15 SX 10

SX 11 31 32.725 -110 13.379 4352.00f 979023.159 979446.724 -14.27 -162.70 0.00 0.46 1.32 -163.56 0.15 SX 11

SX 12 31 32.724 -110 12.339 4319.00f 979025.665 979446.722 -14.86 -162.17 0.00 0.35 1.32 -163.13 0.13 SX 12

SX 13 31 32.464 -110 11.049 4270.00f 979023.362 979446.373 -21.42 -167.06 0.00 0.31 1.31 -168.05 0.13 SX 13

SX 14 31 32.520 -110 11.565 4319.00f 979017.195 979446.448 -23.06 -170.36 0.00 0.35 1.32 -171.33 0.13 SX 14

SX 15 31 32.316 -110 11.165 4326.00f 979014.624 979446.175 -24.70 -172.24 0.00 0.44 1.32 -173.12 0.14 SX 15

SX 16 31 26.333 -110 14.912 4809.00f 978995.678 979438.151 9.79 -154.22 0.00 2.29 1.39 -153.32 0.47 SX 16

SX 17 31 26.939 -110 15.406 4866.00f 978992.285 979438.963 10.95 -155.02 0.00 2.28 1.39 -154.13 0.47 SX 17

SX 18 31 26.355 -110 6.874 4222.00f 979014.010 979438.180 -27.09 -171.09 0.00 0.35 1.30 -172.04 0.13 SX 18

SX 19 31 25.850 -110 7.317 4257.00f 979008.532 979437.504 -28.60 -173.79 0.00 0.37 1.30 -174.73 0.14 SX 19

SX 20 31 22.529 -110 5.273 4328.00f 979000.464 979433.056 -25.55 -173.16 0.00 0.35 1.32 -174.13 0.13 SX 20

SX 21 31 34.581 -110 15.396 4436.00f 979021.175 979449.216 -10.84 -162.14 0.00 0.43 1.33 -163.04 0.14 SX 21

SX 22 31 32.975 -110 15.403 4444.60f 979019.762 979447.059 -9.29 -160.88 0.00 0.58 1.33 -161.64 0.16 SX 22

SX 23 31 32.979 -110 17.442 4566.00f 979012.031 979447.065 -5.61 -161.34 0.00 0.72 1.35 -161.98 0.18 SX 23

SX 24 31 35.015 -110 15.403 4406.00f 979024.772 979449.799 -10.65 -160.92 0.00 0.39 1.33 -161.86 0.14 SX 24

SX 25 31 32.977 -110 16.424 4495.70f 979015.450 979447.062 -8.80 -162.14 0.00 0.67 1.34 -162.81 0.18 SX 25

SX 26 31 32.725 -110 16.414 4546.00f 979011.385 979446.724 -7.80 -162.85 0.00 0.61 1.35 -163.59 0.17 SX 26

SX 27 31 34.272 -110 21.517 4823.00f 978999.300 979448.801 4.08 -160.42 0.00 1.03 1.39 -160.77 0.23 SX 27

SX 28 31 35.000 -110 21.208 4706.00f 979005.920 979449.779 -1.28 -161.78 0.00 0.82 1.37 -162.34 0.20 SX 28

SX 29 31 33.918 -110 20.763 4811.00f 978999.363 979448.326 3.49 -160.60 0.00 1.00 1.39 -160.98 0.23 SX 29

SX 30 31 33.515 -110 19.972 4755.00f 979000.914 979447.785 0.32 -161.86 0.00 0.95 1.38 -162.29 0.22 SX 30

SX 31 31 33.888 -110 20.529 4848.00f 978998.095 979448.285 5.74 -159.61 0.00 1.16 1.39 -159.84 0.26 SX 31

SX 32 31 32.479 -110 19.515 4977.00f 978989.261 979446.394 10.93 -158.82 0.00 2.23 1.41 -158.00 0.46 SX 32

SX 33 31 33.612 -110 18.709 4761.00f 978998.320 979447.915 -1.84 -164.22 0.00 1.68 1.38 -163.92 0.35 SX 33

SX 34 31 29.561 -110 16.140 4829.10f 978993.654 979442.478 5.33 -159.37 0.00 1.68 1.39 -159.08 0.35 SX 34

SX 35 31 29.561 -110 16.338 4857.40f 978992.103 979442.478 6.44 -159.23 0.00 1.79 1.39 -158.83 0.38 SX 35

SX 36 31 29.579 -110 15.839 4782.10f 978996.878 979442.502 4.11 -158.99 0.00 1.39 1.38 -158.98 0.30 SX 36

SY 1 31 22.785 -110 12.405 4731.00f 978989.182 979433.399 0.72 -160.64 0.00 1.29 1.38 -160.73 0.28 SY 1

SY 2 31 22.795 -110 11.800 4649.00f 978991.871 979433.413 -4.32 -162.88 0.00 1.01 1.37 -163.23 0.23 SY 2

SY 3 31 22.787 -110 11.366 4577.90f 978993.641 979433.402 -9.22 -165.36 0.00 0.86 1.35 -165.85 0.21 SY 3

SY 4 31 22.793 -110 10.227 4457.50f 978992.915 979433.410 -21.27 -173.30 0.00 0.61 1.34 -174.03 0.17 SY 4

SY 5 31 22.785 -110 9.839 4410.30f 978993.828 979433.399 -24.79 -175.21 0.00 0.55 1.33 -175.99 0.16 SY 5

SY 6 31 22.785 -110 9.337 4368.00f 978995.512 979433.399 -27.08 -176.06 0.00 0.49 1.32 -176.89 0.15 SY 6

SY 7 31 22.779 -110 8.062 4296.90f 979002.016 979433.391 -27.25 -173.81 0.00 0.39 1.31 -174.73 0.14 SY 7

SY 8 31 22.794 -110 7.352 4267.30f 979004.568 979433.411 -27.51 -173.05 0.00 0.37 1.31 -173.99 0.14 SY 8

SY 10 31 22.797 -110 3.420 4370.00f 979002.504 979433.415 -19.92 -168.96 0.00 0.39 1.32 -169.90 0.14 SY 10

SY 11 31 24.527 -110 2.146 4585.00f 978998.643 979435.731 -5.88 -162.26 0.00 0.54 1.36 -163.08 0.16 SY 11

SY 12 31 24.526 -110 1.209 4667.00f 978997.838 979435.730 1.02 -158.15 0.00 0.68 1.37 -158.84 0.18 SY 12

SY 13 31 24.529 -110 0.677 4739.00f 978996.897 979435.734 6.85 -154.78 0.00 0.77 1.38 -155.39 0.19 SY 13

SY 14 31 23.662 -110 0.711 4644.00f 978997.222 979434.573 -0.60 -158.99 0.00 0.67 1.36 -159.68 0.18 SY 14

SY 15 31 22.731 -110 1.826 4467.30f 978998.755 979433.327 -14.43 -166.79 0.00 0.45 1.34 -167.68 0.14 SY 15

SY 16 31 22.507 -110 0.105 4533.50f 979001.465 979433.027 -5.20 -159.82 0.00 0.59 1.35 -160.58 0.16 SY 16

SY 17 31 23.352 -110 13.752 5048.70f 978976.441 979434.158 17.08 -155.11 0.00 2.33 1.42 -154.20 0.48 SY 17

SY 18 31 23.589 -110 13.976 5050.90f 978976.822 979434.475 17.35 -154.91 0.00 2.34 1.42 -153.99 0.48 SY 18

SY 19 31 23.658 -110 14.061 5063.60f 978976.357 979434.568 17.99 -154.71 0.00 2.36 1.42 -153.77 0.49 SY 19

SY 20 31 23.695 -110 14.113 5054.40f 978976.887 979434.617 17.61 -154.78 0.00 2.40 1.42 -153.80 0.49 SY 20

SY 21 31 23.828 -110 14.279 5044.80f 978978.841 979434.796 18.48 -153.58 0.00 2.58 1.42 -152.42 0.53 SY 21

SY 22 31 24.022 -110 14.390 5044.20f 978980.472 979435.055 19.79 -152.25 0.00 2.69 1.42 -150.97 0.55 SY 22

SY 23 31 24.180 -110 14.397 5039.20f 978980.446 979435.267 19.09 -152.78 0.00 2.63 1.42 -151.57 0.54 SY 23

SY 24 31 24.307 -110 14.418 5046.00f 978980.288 979435.437 19.40 -152.70 0.00 2.62 1.42 -151.50 0.54 SY 24

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SY 25 31 24.547 -110 14.406 4983.20f 978984.021 979435.758 16.91 -153.05 0.00 2.52 1.41 -151.94 0.52 SY 25

SY 26 31 24.541 -110 13.902 4904.90f 978986.820 979435.750 12.35 -154.94 0.00 1.92 1.40 -154.42 0.40 SY 26

SY 27 31 24.541 -110 13.398 4829.10f 978990.439 979435.750 8.84 -155.86 0.00 1.54 1.39 -155.71 0.33 SY 27

SY 28 31 24.094 -110 13.384 4880.30f 978986.467 979435.152 10.28 -156.17 0.00 1.67 1.40 -155.89 0.35 SY 28

SY 29 31 23.669 -110 13.400 4926.20f 978982.943 979434.582 11.65 -156.37 0.00 1.80 1.40 -155.97 0.38 SY 29

SY 30 31 23.662 -110 13.899 5025.70f 978978.444 979434.573 16.51 -154.90 0.00 2.18 1.41 -154.13 0.45 SY 30

SY 31 31 24.919 -110 14.409 4872.00f 978991.370 979436.257 13.30 -152.86 0.00 2.52 1.40 -151.74 0.52 SY 31

SY 33 31 26.007 -110 14.549 4850.30f 978992.213 979437.714 10.65 -154.78 0.00 2.00 1.39 -154.17 0.42 SY 33

SY 34 31 24.541 -110 12.866 4747.20f 978993.919 979435.750 4.63 -157.29 0.00 1.25 1.38 -157.41 0.27 SY 34

SY 35 31 24.540 -110 12.383 4689.10f 978994.698 979435.749 -0.06 -159.99 0.00 1.06 1.37 -160.30 0.24 SY 35

SY 36 31 24.541 -110 11.853 4623.80f 978995.695 979435.750 -5.20 -162.90 0.00 0.90 1.36 -163.36 0.21 SY 36

SY 37 31 24.541 -110 11.364 4564.10f 978996.689 979435.750 -9.82 -165.49 0.00 0.78 1.35 -166.06 0.19 SY 37

SY 38 31 24.810 -110 10.945 4509.00f 978997.280 979436.110 -14.77 -168.56 0.00 0.67 1.34 -169.23 0.18 SY 38

SY 39 31 25.401 -110 9.325 4365.40f 978998.713 979436.902 -27.63 -176.52 0.00 0.45 1.32 -177.39 0.14 SY 39

SY 40 31 23.626 -110 13.370 4883.00f 978984.937 979434.525 9.64 -156.91 0.00 1.77 1.40 -156.53 0.37 SY 40


SY 41 31 23.712 -110 13.429 4933.80f 978982.632 979434.640 11.99 -156.28 0.00 1.82 1.40 -155.87 0.38 SY 41

SY 42 31 23.755 -110 13.457 4934.40f 978982.750 979434.698 12.11 -156.19 0.00 1.82 1.40 -155.77 0.38 SY 42

SY 43 31 23.798 -110 13.488 4930.60f 978983.169 979434.755 12.11 -156.05 0.00 1.81 1.40 -155.65 0.38 SY 43

SY 44 31 23.841 -110 13.516 4898.20f 978985.718 979434.813 11.56 -155.50 0.00 1.82 1.40 -155.08 0.38 SY 44

SY 45 31 23.884 -110 13.544 4928.00f 978983.718 979434.871 12.30 -155.78 0.00 1.82 1.40 -155.36 0.38 SY 45

SY 46 31 23.927 -110 13.574 4927.60f 978983.944 979434.928 12.43 -155.63 0.00 1.82 1.40 -155.21 0.38 SY 46

SY 47 31 23.970 -110 13.603 4928.60f 978983.943 979434.985 12.47 -155.63 0.00 1.83 1.40 -155.20 0.38 SY 47

SY 48 31 23.014 -110 13.630 4924.10f 978984.219 979433.706 13.60 -154.34 0.00 2.83 1.40 -152.91 0.58 SY 48

SY 49 31 23.057 -110 13.660 4914.50f 978984.986 979433.763 13.41 -154.21 0.00 2.92 1.40 -152.69 0.59 SY 49

SY 50 31 25.409 -110 13.674 4747.00f 978997.305 979436.913 6.83 -155.07 0.00 1.52 1.38 -154.93 0.32 SY 50

SY 51 31 25.416 -110 13.392 4725.00f 978997.941 979436.922 5.39 -155.77 0.00 1.34 1.38 -155.80 0.29 SY 51
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SY 52 31 25.417 -110 12.888 4688.70f 978998.276 979436.923 2.31 -157.61 0.00 1.12 1.37 -157.86 0.25 SY 52

SY 53 31 25.417 -110 12.382 4636.90f 978997.447 979436.923 -3.39 -161.54 0.00 0.96 1.36 -161.94 0.22 SY 53

SY 54 31 24.328 -110 13.801 4902.00f 978986.546 979435.465 12.09 -155.10 0.00 1.88 1.40 -154.62 0.39 SY 54

SY 55 31 24.105 -110 12.372 4710.60f 978992.654 979435.167 0.50 -160.16 0.00 1.13 1.37 -160.40 0.25 SY 55

SY 56 31 23.666 -110 12.311 4702.20f 978992.261 979434.579 -0.09 -160.47 0.00 1.15 1.37 -160.69 0.26 SY 56

SY 57 31 23.669 -110 13.835 4798.10f 978988.558 979434.582 5.22 -158.43 0.00 3.78 1.39 -156.03 0.76 SY 57

SY991 31 22.785 -110 12.405 4731.00f 978989.153 979433.399 0.69 -160.67 0.00 1.29 1.38 -160.76 0.28 SY991

TGE-A412 32 16.610 -110 4.500 5354.20F 979018.120 979506.017 15.61 -167.00 0.00 0.94 1.45 -167.51 0.21 TGE-A412

TGE-A414 32 16.450 -110 4.680 5131.40F 979023.971 979505.799 0.74 -174.28 0.00 0.68 1.43 -175.02 0.17 TGE-A414

TGE-A416 32 16.030 -110 4.920 5117.90F 979032.158 979505.228 8.23 -166.33 0.00 0.69 1.42 -167.06 0.17 TGE-A416

TGE-A418 32 16.090 -110 5.310 5118.70F 979031.143 979505.310 7.21 -167.38 0.00 0.69 1.42 -168.11 0.17 TGE-A418

TGE-A420 32 15.850 -110 5.720 5020.30F 979035.059 979504.983 2.20 -169.03 0.00 0.60 1.41 -169.84 0.16 TGE-A420

TGE-A422 32 15.660 -110 6.040 4974.00F 979035.796 979504.725 -1.16 -170.81 0.00 0.57 1.41 -171.64 0.15 TGE-A422

TGE-A424 32 15.420 -110 6.450 4927.00F 979037.060 979504.399 -3.99 -172.03 0.00 0.54 1.40 -172.89 0.15 TGE-A424

TGE-A426 32 15.180 -110 6.840 4876.70F 979038.889 979504.073 -6.56 -172.89 0.00 0.51 1.40 -173.77 0.14 TGE-A426

TGE-A428 32 14.960 -110 7.130 4809.40F 979042.009 979503.774 -9.47 -173.50 0.00 0.45 1.39 -174.44 0.14 TGE-A428

TGE-A430 32 14.760 -110 0.450 4796.60F 979041.623 979503.502 -10.79 -174.38 0.00 1.24 1.39 -174.53 0.27
TGE-A430

TGE-A432 32 14.540 -110 7.770 4759.80F 979043.374 979503.203 -12.20 -174.54 0.00 0.43 1.38 -175.49 0.13
TGE-A432

TGE-A434 32 14.310 -110 8.180 4713.40F 979046.627 979502.891 -12.99 -173.75 0.00 0.41 1.37 -174.72 0.13
TGE-A434

TGE-A436 32 14.080 -110 8.520 4686.70F 979048.089 979502.578 -13.73 -173.58 0.00 0.41 1.37 -174.54 0.13
TGE-A436

TGE-A438 32 13.830 -110 9.160 4655.70F 979050.558 979502.239 -13.83 -172.62 0.00 0.44 1.37 -173.55 0.13
TGE-A438

TGE-A440 32 13.630 -110 9.250 4627.50F 979053.818 979501.967 -12.95 -170.78 0.00 0.40 1.36 -171.74 0.13
TGE-A440

TGE-A442 32 13.390 -110 9.640 4585.40F 979059.531 979501.641 -10.87 -167.27 0.00 0.38 1.36 -168.24 0.13
TGE-A442

TGE-A444 32 13.160 -110 10.000 4542.30F 979066.676 979501.329 -7.47 -162.39 0.00 0.49 1.35 -163.25 0.14
TGE-A444

TGE-A446 32 12.970 -110 10.340 4574.60F 979068.669 979501.070 -2.18 -158.20 0.00 0.47 1.35 -159.09 0.14
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TGE-A446

TGE-A448 32 12.770 -110 10.670 4525.70F 979068.935 979500.799 -6.24 -160.60 0.00 1.13 1.35 -160.81 0.25
TGE-A448

TGE-A450 32 12.570 -110 10.960 4646.00F 979065.030 979500.527 1.44 -157.02 0.00 0.82 1.36 -157.57 0.19 TGE-A450

TGE-A452 32 12.480 -110 11.120 4770.20F 979062.781 979500.405 10.99 -151.71 0.00 0.72 1.38 -152.37 0.18
TGE-A452

TGE-A454 32 12.310 -110 11.370 4787.20F 979061.711 979500.174 11.75 -151.53 0.00 0.84 1.38 -152.07 0.20
TGE-A454

TGE-A456 32 11.930 -110 11.940 4790.00F 979061.636 979499.658 12.45 -150.92 0.00 0.83 1.38 -151.47 0.19
TGE-A456

TGE-A458 32 11.730 -110 12.320 4717.80F 979065.792 979499.387 10.09 -150.82 0.00 0.84 1.37 -151.35 0.20
TGE-A458

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TGE-A462 32 11.410 -110 12.830 4681.70F 979067.768 979498.952 9.11 -150.57 0.00 0.90 1.37 -151.04 0.21 TGE-A462

TGE-A464 32 11.170 -110 13.200 4766.80F 979061.394 979498.626 11.06 -151.52 0.00 1.80 1.38 -151.10 0.37
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TGE-A466 32 11.960 -110 13.560 4595.70F 979072.174 979499.699 4.68 -152.06 0.00 2.05 1.36 -151.37 0.42 TGE-A466

TGE-A468 32 10.740 -110 13.900 4446.80F 979081.008 979498.043 1.17 -150.49 0.00 1.10 1.34 -150.73 0.24 TGE-A468

TGE-A470 32 10.610 -110 14.130 4326.20F 979087.753 979497.866 -3.25 -150.80 0.00 0.95 1.32 -151.16 0.22
TGE-A470

TGE-A472 32 10.340 -110 14.560 4217.70F 979093.436 979497.500 -7.40 -151.25 0.00 1.01 1.30 -151.54 0.23
TGE-A472

TGE-A474 32 10.090 -110 14.960 4105.80F 979098.999 979497.160 -12.02 -152.05 0.00 1.02 1.28 -152.31 0.23
TGE-A474

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TGE-A476

TGE-A478 32 9.660 -110 15.640 3908.70F 979107.004 979496.577 -21.96 -155.27 0.00 1.23 1.24 -155.28 0.27
TGE-A478

TGE-A480 32 9.470 -110 15.920 3815.00F 979111.223 979496.319 -26.29 -156.41 0.00 1.00 1.22 -156.63 0.22
TGE-A480

TGE-A482 32 9.280 -110 16.300 3714.30F 979116.091 979496.061 -30.63 -157.32 0.00 1.04 1.20 -157.48 0.23
TGE-A482

TGE-A484 32 9.070 -110 16.640 3650.50F 979119.350 979495.776 -33.09 -157.60 0.00 1.06 1.19 -157.73 0.23
TGE-A484

TGE-A486 32 8.870 -110 16.880 3520.50F 979127.839 979495.505 -36.55 -156.63 0.00 0.94 1.16 -156.85 0.21
TGE-A486

TGE-A488 32 8.630 -110 17.140 3452.40F 979132.185 979495.179 -38.28 -156.03 0.00 0.90 1.15 -156.28 0.21
TGE-A488

TGE-A489 32 8.450 -110 17.380 3316.00F 979141.562 979494.935 -41.49 -154.59 0.00 1.33 1.12 -154.38 0.28
TGE-A489

TGE-A491 32 8.240 -110 17.700 3376.00F 979138.229 979494.650 -38.90 -154.04 0.00 0.84 1.13 -154.33 0.20
TGE-A491

TGE-A493 32 7.950 -110 18.040 3420.30F 979135.902 979494.257 -36.66 -153.32 0.00 1.03 1.14 -153.43 0.23
TGE-A493

TGE-A495 32 7.640 -110 18.410 3634.40F 979121.990 979493.837 -30.02 -153.98 0.00 0.80 1.19 -154.37 0.19
TGE-A495

TGE-A497 32 7.440 -110 18.660 3480.30F 979130.647 979493.566 -35.59 -154.29 0.00 0.75 1.16 -154.69 0.18
TGE-A497

TGE-A498 32 7.120 -110 18.960 3585.60F 979124.756 979493.132 -31.14 -153.43 0.00 0.88 1.18 -153.73 0.20
TGE-A498

TGE-A500 32 6.880 -110 19.350 3475.40F 979129.075 979492.806 -36.86 -155.39 0.00 0.76 1.15 -155.79 0.18
TGE-A500

TGE-A502 32 6.740 -110 19.540 3506.20F 979126.224 979492.617 -36.62 -156.21 0.00 0.73 1.16 -156.64 0.18
TGE-A502

TGE-A504 32 6.440 -110 19.920 3539.10F 979123.278 979492.210 -36.07 -156.78 0.00 0.77 1.17 -157.17 0.18
TGE-A504

TGE-A506 32 6.080 -110 20.400 3496.50F 979127.393 979491.721 -35.47 -154.73 0.00 1.26 1.16 -154.62 0.27
TGE-A506

TGE-A508 32 5.830 -110 20.680 3629.50F 979120.906 979491.383 -29.11 -152.90 0.00 0.71 1.19 -153.38 0.17
TGE-A508

TGE-A510 32 5.580 -110 21.000 3623.80F 979120.244 979491.044 -29.97 -153.57 0.00 0.67 1.19 -154.08 0.17
TGE-A510

TGE-A512 32 5.360 -110 21.270 3638.80F 979123.136 979490.745 -25.37 -149.48 0.00 0.67 1.19 -150.00 0.17
TGE-A512

TGE-A514 32 5.040 -110 21.660 3651.80F 979114.418 979490.312 -32.43 -156.98 0.00 0.68 1.19 -157.50 0.17
TGE-A514

TGE-A516 32 4.820 -110 21.940 3552.90F 979119.848 979490.014 -36.01 -157.18 0.00 0.78 1.17 -157.57 0.19
TGE-A516

TGE-A518 32 4.620 -110 22.200 3582.70F 979116.998 979489.743 -35.78 -157.98 0.00 0.69 1.18 -158.46 0.17
TGE-A518

TGE-A521 32 4.250 -110 22.690 3580.60F 979116.397 979489.242 -36.08 -158.20 0.00 0.78 1.18 -158.60 0.19
TGE-A521

TGE-A523 32 4.040 -110 22.990 3589.90F 979116.819 979488.957 -34.50 -156.94 0.00 0.84 1.18 -157.28 0.20
TGE-A523

TGE-A525 32 3.880 -110 23.400 3669.90F 979112.984 979488.740 -30.59 -155.76 0.00 0.99 1.20 -155.97 0.22
TGE-A525

TGE-A527 32 3.770 -110 23.740 3855.80F 979105.161 979488.591 -20.79 -152.30 0.00 1.61 1.23 -151.92 0.34
TGE-A527

TGE-A529 32 3.160 -110 24.160 3761.80F 979111.140 979487.765 -22.82 -151.12 0.00 3.64 1.21 -148.70 0.73
TGE-A529

TGE-A530 32 3.440 -110 24.640 3844.20F 979106.928 979488.144 -19.67 -150.78 0.00 1.00 1.23 -151.01 0.22
TGE-A530

TGE-A532 32 3.320 -110 24.960 3941.50F 979102.053 979487.982 -15.23 -149.66 0.00 0.86 1.25 -150.05 0.20
TGE-A532

TGE-A534 32 3.200 -110 25.720 3897.60F 979104.721 979487.819 -16.53 -149.46 0.00 1.14 1.24 -149.56 0.25
TGE-A534

TGE-A536 32 3.010 -110 25.720 3658.20F 979106.854 979487.562 -36.65 -161.41 0.00 4.13 1.19 -158.48 0.83
TGE-A536

TGE-A538 32 2.880 -110 26.080 4090.80F 979085.008 979487.386 -17.64 -157.16 0.00 0.99 1.28 -157.45 0.22
TGE-A538

TGE-A540 32 2.870 -110 26.300 4314.00F 979079.080 979487.372 -2.57 -149.71 0.00 2.11 1.31 -148.91 0.43 TGE-A540

TGE-A542 32 2.890 -110 26.720 4153.90F 979090.636 979487.399 -6.09 -147.77 0.00 0.93 1.29 -148.13 0.21 TGE-A542

TGE-A544 32 2.890 -110 27.160 4239.30F 979086.197 979487.399 -2.50 -147.09 0.00 0.96 1.30 -147.43 0.22 TGE-A544

TGE-A546 32 2.910 -110 27.720 4257.30F 979084.875 979487.427 -2.16 -147.36 0.00 1.12 1.30 -147.55 0.25 TGE-A546

TGE-A548 32 2.910 -110 28.150 4209.30F 979087.362 979487.427 -4.19 -147.75 0.00 1.24 1.30 -147.81 0.27 TGE-A548

TS 1 31 42.800 -110 4.000 4539.00f 979044.846 979460.269 11.46 -143.35 0.00 0.41 1.35 -144.29 0.14 TS 1

ASA1131 31 34.888 -110 20.801 1431.03m 979006.910 979449.628 -1.17 -161.30 0.00 0.79 1.37 -161.88 0.16 ASA1131

ASA1775 31 39.827 -110 14.825 1282.11m 979060.726 979456.268 0.07 -143.40 0.00 0.23 1.30 -144.47 0.06 ASA1775

ASA257 31 33.075 -110 11.340 1305.85m 979025.338 979447.193 -18.92 -165.04 0.00 0.32 1.31 -166.03 0.07 ASA257

ASA303 31 32.757 -110 9.412 1287.58m 979032.204 979446.767 -17.27 -161.34 0.00 0.30 1.30 -162.34 0.07 ASA303

ASA39 31 32.789 -110 21.912 1609.92m 978972.097 979446.810 22.01 -158.14 0.00 2.77 1.44 -156.81 0.56 ASA39

ASA807 31 35.893 -110 19.566 1379.20m 979016.960 979450.979 -8.46 -162.79 0.00 0.55 1.35 -163.59 0.12 ASA807

Awads 31 39.395 -110 15.911 1290.62m 979049.197 979455.687 -8.26 -152.67 0.00 0.28 1.30 -153.70 0.07 Awads

BYPASS 31 34.175 -110 15.790 1362.02m 979018.528 979448.671 -9.88 -162.29 0.00 0.45 1.34 -163.18 0.10 BYPASS

Busby 31 32.811 -110 17.418 1410.13m 979006.427 979446.839 -5.31 -163.10 0.00 0.70 1.36 -163.77 0.14 Busby

D-22-20_ 131 31.777 -110 16.127 1390.43m 979008.841 980932.472-1494.79-1650.38 0.00 0.00 1.35-1651.73 0.03
D-22-20_

D-23-21_ 31 27.132 -110 15.389 1477.48m 978994.823 979439.221 11.48 -153.85 0.00 2.04 1.39 -153.20 0.41 D-23-21_

HUBBARD 31 38.750 -110 16.749 1305.08m 979039.995 979454.819 -12.13 -158.17 0.00 0.30 1.31 -159.18 0.07 HUBBARD

HUNTER 31 24.141 -110 14.594 1561.64m 978975.521 979435.214 22.14 -152.61 0.00 2.97 1.42 -151.06 0.59 HUNTER

LSP6 31 33.234 -110 8.705 1241.05m 979047.239 979447.407 -17.22 -156.10 0.00 0.29 1.27 -157.08 0.07 LSP6

MW3 31 35.032 -110 14.905 1333.77m 979027.925 979449.822 -10.35 -159.60 0.00 0.37 1.32 -160.55 0.08 MW3

MW4 31 35.492 -110 13.899 1316.58m 979036.146 979450.440 -8.05 -155.37 0.00 0.32 1.32 -156.37 0.07 MW4

MW5 31 36.542 -110 12.374 1282.82m 979051.007 979451.851 -5.02 -148.56 0.00 0.26 1.30 -149.60 0.06 MW5

MW6 31 36.155 -110 16.488 1342.88m 979028.949 979451.331 -8.03 -158.29 0.00 0.37 1.33 -159.25 0.08 MW6

Nicks 31 26.909 -110 15.419 1486.75m 978992.502 979438.923 12.31 -154.05 0.00 2.33 1.40 -153.12 0.47 Nicks

PUEBLO 31 31.041 -110 15.386 1394.60m 979006.916 979444.463 -7.24 -163.29 0.00 0.69 1.35 -163.96 0.14 PUEBLO

RICH 31 32.394 -110 14.402 1357.18m 979015.954 979446.279 -11.56 -163.43 0.00 0.49 1.34 -164.27 0.10 RICH

SUNRISE 31 30.864 -110 10.851 1313.11m 979015.584 979444.226 -23.47 -170.40 0.00 0.36 1.31 -171.36 0.08 SUNRISE

TW7 31 37.245 -110 17.194 1328.84m 979031.292 979452.796 -11.48 -160.17 0.00 0.36 1.32 -161.14 0.08 TW7

TW9 31 36.350 -110 14.292 1311.78m 979038.958 979451.593 -7.87 -154.66 0.00 0.32 1.31 -155.65 0.07 TW9

UPS 31 33.255 -110 12.814 1327.10m 979024.039 979447.435 -13.91 -162.41 0.00 0.37 1.32 -163.36 0.08 UPS

RAMSEY 31 27.942 -110 17.542 1550.31m 978980.089 979440.307 18.12 -155.36 0.00 2.91 1.42 -153.87 0.58 RAMSEY

GCPR7_ 31 29.818 -110 17.004 1445.54m 978998.725 979442.823 1.92 -159.83 0.00 1.22 1.38 -159.99 0.25 GCPR7_

GCPR6_ 31 29.789 -110 17.027 1445.74m 978998.827 979442.784 2.13 -159.65 0.00 1.24 1.38 -159.79 0.25 GCPR6_

GCPR5_ 31 29.770 -110 17.042 1445.97m 978998.894 979442.759 2.29 -159.51 0.00 1.27 1.38 -159.62 0.26 GCPR5_

GCPR4_ 31 29.762 -110 17.043 1445.24m 978999.081 979442.747 2.26 -159.46 0.00 1.28 1.38 -159.56 0.26 GCPR4_

GCPR3_ 31 29.753 -110 17.040 1445.24m 978999.086 979442.736 2.28 -159.44 0.00 1.28 1.38 -159.54 0.26 GCPR3_

GCPR2_ 31 29.723 -110 17.064 1446.32m 978999.062 979442.695 2.63 -159.21 0.00 1.31 1.38 -159.28 0.26 GCPR2_

GCPR1_ 31 29.680 -110 17.105 1447.33m 978999.109 979442.638 3.05 -158.91 0.00 1.35 1.38 -158.94 0.27 GCPR1_

GCPL7_ 31 30.235 -110 16.439 1426.97m 979001.278 979443.382 -1.81 -161.49 0.00 0.97 1.37 -161.89 0.20 GCPL7_

GCPL6_ 31 30.181 -110 16.439 1426.66m 979001.200 979443.310 -1.91 -161.55 0.00 0.99 1.37 -161.93 0.20 GCPL6_

GCPL5_ 31 30.155 -110 16.440 1426.63m 979001.138 979443.275 -1.95 -161.59 0.00 1.00 1.37 -161.95 0.20 GCPL5_

GCPL4_ 31 30.124 -110 16.415 1422.21m 979002.139 979443.233 -2.27 -161.41 0.00 1.04 1.37 -161.74 0.21 GCPL4_

GCPL3_ 31 30.105 -110 16.415 1423.27m 979001.852 979443.208 -2.20 -161.46 0.00 1.03 1.37 -161.80 0.21 GCPL3_

GCPL2_ 31 30.079 -110 16.413 1426.63m 979001.114 979443.173 -1.87 -161.51 0.00 1.01 1.37 -161.87 0.20 GCPL2_

GCPL1_ 31 30.029 -110 16.410 1429.27m 979000.548 979443.105 -1.55 -161.49 0.00 1.02 1.37 -161.84 0.21 GCPL1_

GCCC3_ 31 30.213 -110 15.892 1416.47m 979002.522 979443.353 -3.78 -162.28 0.00 0.88 1.36 -162.76 0.18 GCCC3_

GCCC2_ 31 30.102 -110 16.214 1422.35m 979001.707 979443.204 -2.63 -161.79 0.00 0.97 1.37 -162.18 0.20 GCCC2_

GCCC1_ 31 29.893 -110 16.581 1433.94m 978999.958 979442.923 -0.52 -160.98 0.00 1.11 1.37 -161.24 0.22 GCCC1_

GCASTAT2 31 29.687 -110 17.542 1460.35m 978996.562 979442.647 4.50 -158.91 0.00 1.41 1.38 -158.88 0.28 GCASTAT2

GCASTAT1 31 29.741 -110 18.070 1476.42m 978998.990 979442.719 11.82 -153.39 0.00 1.59 1.39 -153.19
0.32 GCASTAT1

ANTELOPE 31 29.690 -110 16.945 1443.84m 978999.204 979442.651 2.05 -159.51 0.00 1.29 1.38 -159.60 0.26 ANTELOPE

HU-1 31 22.830 -110 24.136 5563.00f 978936.991 979433.459 26.68 -163.05 0.00 1.63 1.47 -162.89 0.44 HU-1

HU-2 31 22.667 -110 23.348 5395.00f 978950.447 979433.241 24.56 -159.44 0.00 1.59 1.45 -159.31 1.05 HU-2

HU-3 31 22.689 -110 22.763 5428.00f 978949.052 979433.271 26.24 -158.89 0.00 1.83 1.46 -158.52 1.07 HU-3

HU-4 31 22.483 -110 21.434 5575.00f 978941.600 979432.995 32.88 -157.26 0.00 2.24 1.47 -156.49 1.10 HU-4

HU-5 31 22.771 -110 21.829 5512.00f 978946.170 979433.381 31.14 -156.85 0.00 2.38 1.46 -155.93 1.11 HU-5

HU-6 31 25.497 -110 26.180 5742.00f 978932.250 979437.031 35.19 -160.65 0.00 2.33 1.48 -159.80 0.56 HU-6

HU-7 31 25.493 -110 25.015 5823.00f 978929.843 979437.025 40.41 -158.20 0.00 1.90 1.49 -157.78 1.07 HU-7

HU-8 31 26.512 -110 24.175 5908.00f 978928.402 979438.391 45.59 -155.91 0.00 2.67 1.49 -154.73 1.14 HU-8

HU-9 31 27.136 -110 23.956 6024.00f 978921.712 979439.227 48.97 -156.49 0.00 3.16 1.50 -154.83 1.19 HU-9

HU-10 31 27.937 -110 23.326 6370.00f 978897.220 979440.300 55.92 -161.33 0.00 5.38 1.51 -157.47 1.47 HU-10

HU-11 31 26.115 -110 24.453 5945.00f 978924.043 979437.859 45.24 -157.52 0.00 2.84 1.49 -156.18 1.15 HU-11

HU-12 31 31.333 -110 29.430 5074.00f 978984.032 979444.856 16.35 -156.70 0.00 1.22 1.42 -156.90 1.03 HU-12

HU-13 31 30.031 -110 29.042 5164.00f 978974.419 979443.109 16.95 -159.18 0.00 1.23 1.43 -159.38 1.04 HU-13

HU-14 31 29.141 -110 28.788 5237.00f 978970.033 979441.915 20.62 -158.00 0.00 2.27 1.44 -157.16 1.10 HU-14

HU-15 31 28.857 -110 28.214 5372.00f 978960.709 979441.534 24.37 -158.85 0.00 1.47 1.45 -158.83 1.05 HU-15

HU-16 31 28.439 -110 27.625 5429.00f 978957.457 979440.974 27.04 -158.13 0.00 2.04 1.46 -157.54 1.09 HU-16

HU-17 31 27.923 -110 27.749 5608.00f 978948.282 979440.282 35.38 -155.89 0.00 1.94 1.47 -155.42 1.08 HU-17

HU-18 31 27.268 -110 27.137 5573.00f 978949.558 979439.404 34.24 -155.83 0.00 1.66 1.47 -155.64 1.06 HU-18

HU-19 31 33.996 -110 24.035 4937.00f 978995.942 979448.430 11.81 -156.57 0.00 1.90 1.40 -156.08 1.07 HU-19

HU-20 31 34.510 -110 26.565 4985.00f 978992.357 979449.121 12.05 -157.97 0.00 1.19 1.41 -158.19 1.03 HU-20

HU-21 31 35.302 -110 25.962 4799.00f 979002.946 979450.185 4.09 -159.59 0.00 0.95 1.39 -160.03 1.02 HU-21

HU-22 31 34.262 -110 25.236 5070.00f 978989.216 979448.788 17.23 -155.69 0.00 1.58 1.42 -155.53 0.44 HU-22

HU-23 31 33.813 -110 24.906 5100.00f 978986.534 979448.184 17.97 -155.97 0.00 2.73 1.42 -154.66 1.14 HU-23

HU-24 31 34.782 -110 24.728 4943.00f 978997.317 979449.486 12.69 -155.90 0.00 1.25 1.40 -156.05 1.04 HU-24

HU-25 31 35.449 -110 24.250 4801.00f 979004.140 979450.382 5.27 -158.48 0.00 0.91 1.39 -158.95 1.02 HU-25

HU-26 31 35.467 -110 24.612 4799.00f 979004.933 979450.406 5.85 -157.83 0.00 0.90 1.39 -158.31 1.02 HU-26

HU-27 31 35.426 -110 25.018 4856.00f 979002.397 979450.351 8.73 -156.89 0.00 0.99 1.39 -157.30 1.02 HU-27

HU-28 31 36.742 -110 24.433 4646.00f 979016.037 979452.120 0.86 -157.60 0.00 0.71 1.36 -158.26 1.02 HU-28

HU-29 31 36.134 -110 24.636 4737.00f 979010.199 979451.303 4.39 -157.17 0.00 0.82 1.38 -157.73 1.02 HU-29

HU-30 31 36.135 -110 23.997 4702.00f 979009.745 979451.304 0.65 -159.72 0.00 0.82 1.37 -160.28 1.02 HU-30

HU-31 31 36.019 -110 23.294 4687.00f 979009.681 979451.148 -0.67 -160.53 0.00 0.85 1.37 -161.05 1.02 HU-31

HU-32 31 28.868 -110 20.214 5195.00f 978975.648 979441.549 22.65 -154.53 0.00 3.75 1.43 -152.21 1.25 HU-32

HU-33 31 28.379 -110 21.080 5389.00f 978960.289 979440.893 26.19 -157.61 0.00 7.09 1.45 -151.97 1.74 HU-33

HU-34 31 27.825 -110 21.700 5747.00f 978935.727 979440.151 36.02 -159.99 0.00 7.92 1.48 -153.55 1.88 HU-34

HU-35 31 27.256 -110 22.544 6199.00f 978911.374 979439.388 54.92 -156.51 0.00 4.54 1.51 -153.47 1.36 HU-35

HU-36 31 27.488 -110 22.193 6125.00f 978915.437 979439.699 51.71 -157.19 0.00 5.39 1.50 -153.30 1.47 HU-36

HU-37 31 34.886 -110 25.202 4951.00f 978996.205 979449.626 12.19 -156.67 0.00 1.18 1.40 -156.89 1.03 HU-37

HU-38 31 36.644 -110 25.338 4623.00f 979019.615 979451.988 2.40 -155.27 0.00 0.71 1.36 -155.92 1.02 HU-38

HU-39 31 36.167 -110 25.629 4682.00f 979013.482 979451.347 2.46 -157.23 0.00 0.94 1.37 -157.66 1.02 HU-39

HU-40 31 36.488 -110 26.632 4733.00f 979010.377 979451.779 3.72 -157.71 0.00 0.84 1.38 -158.25 1.02 HU-40

HU-41 31 35.646 -110 26.835 4750.00f 979009.390 979450.647 5.46 -156.55 0.00 0.88 1.38 -157.04 1.02 HU-41

HU-42 31 36.857 -110 23.434 4618.00f 979017.956 979452.274 -0.01 -157.51 0.00 0.72 1.36 -158.16 0.15 HU-42

HU-43 31 36.940 -110 22.685 4650.00f 979018.096 979452.386 3.03 -155.57 0.00 1.36 1.37 -155.57 1.04 HU-43

HU-44 31 35.447 -110 23.623 4769.00f 979005.105 979450.379 3.23 -159.42 0.00 0.92 1.38 -159.89 1.02 HU-44

HU-45 31 29.460 -110 19.525 5049.00f 978984.769 979442.343 17.25 -154.95 0.00 2.60 1.42 -153.77 1.13 HU-45

HU-46 31 29.716 -110 19.074 4970.00f 978989.320 979442.686 14.04 -155.47 0.00 1.99 1.41 -154.89 1.08 HU-46

HU-47 31 30.238 -110 19.062 4940.00f 978990.629 979443.386 11.82 -156.66 0.00 1.76 1.40 -156.31 1.07 HU-47

HU-48 31 30.692 -110 19.175 4912.00f 978992.496 979443.995 10.45 -157.08 0.00 1.58 1.40 -156.90 1.05 HU-48

HU-49 31 31.007 -110 19.739 4945.00f 978991.071 979444.418 11.70 -156.95 0.00 1.76 1.40 -156.60 1.07 HU-49

HU-50 31 31.579 -110 19.755 4890.00f 978994.149 979445.186 8.84 -157.94 0.00 1.54 1.40 -157.79 1.05 HU-50

HU-51 31 32.095 -110 20.036 4823.00f 978998.828 979445.878 6.53 -157.96 0.00 1.47 1.39 -157.88 1.05 HU-51

HU-52 31 32.554 -110 20.158 4786.00f 979001.347 979446.494 4.96 -158.28 0.00 1.31 1.38 -158.35 1.04 HU-52

HU-53 31 32.879 -110 20.577 4848.00f 978998.269 979446.931 7.27 -158.08 0.00 1.33 1.39 -158.14 0.40 HU-53

HU-54 31 32.218 -110 22.685 5241.00f 978970.927 979446.043 17.76 -160.99 0.00 6.07 1.44 -156.36 1.58 HU-54

HU-55 31 31.530 -110 22.985 5420.00f 978957.675 979445.120 22.26 -162.60 0.00 7.79 1.45 -156.26 1.85 HU-55

HU-56 31 31.071 -110 23.299 5625.00f 978944.750 979444.504 29.22 -162.63 0.00 9.10 1.47 -155.00 2.08 HU-56

HU-57 31 30.650 -110 23.516 5810.00f 978934.390 979443.939 36.82 -161.34 0.00 10.81 1.48 -152.02 2.38 HU-57

HU-58 31 30.146 -110 23.946 5975.00f 978924.298 979443.263 42.91 -160.88 0.00 9.09 1.49 -153.28 2.08 HU-58

HU-59 31 29.938 -110 24.385 6162.00f 978915.119 979442.984 51.59 -158.58 0.00 7.40 1.50 -152.68 1.79 HU-59

HU-60 31 33.645 -110 25.482 5234.00f 978978.186 979447.959 22.45 -156.07 0.00 2.48 1.44 -155.02 1.12 HU-60

HU-61 31 32.686 -110 25.484 5537.00f 978956.408 979446.671 30.44 -158.41 0.00 6.77 1.46 -153.10 1.69 HU-61

HU-62 31 32.170 -110 25.211 5752.00f 978938.774 979445.979 33.71 -162.47 0.00 10.21 1.48 -153.74 2.28 HU-62

HU-63 31 33.296 -110 25.505 5289.00f 978972.493 979447.490 22.39 -158.00 0.00 3.99 1.44 -155.45 1.28 HU-63

HU-64 31 36.996 -110 22.144 4475.00f 979022.670 979452.461 -8.93 -161.56 0.00 0.62 1.34 -162.27 1.01 HU-64

HU-65 31 36.089 -110 22.286 4597.00f 979012.947 979451.242 -5.96 -162.75 0.00 0.68 1.36 -163.43 1.01 HU-65

HU-66 31 35.405 -110 22.299 4685.00f 979005.778 979450.323 -3.94 -163.73 0.00 0.84 1.37 -164.26 1.02 HU-66

sp001 31 22.779 -110 12.398 4728.00f 978989.399 979433.391 0.66 -160.60 0.00 1.28 1.38 -160.69 0.28 sp001

sp002 31 28.027 -110 8.548 4248.00f 979015.597 979440.421 -25.30 -170.19 0.00 0.35 1.30 -171.14 1.01 sp002

sp003 31 28.035 -110 9.328 4302.00f 979010.371 979440.432 -25.46 -172.19 0.00 0.37 1.31 -173.13 1.01 sp003

sp004 31 28.033 -110 10.346 4363.00f 979004.884 979440.429 -25.21 -174.02 0.00 0.44 1.32 -174.90 1.01 sp004

sp005 31 28.026 -110 11.364 4415.00f 979005.705 979440.420 -19.49 -170.07 0.00 0.53 1.33 -170.87 1.01 sp005

sp006 31 28.035 -110 12.378 4467.00f 979007.073 979440.432 -13.25 -165.60 0.00 0.67 1.34 -166.27 1.01 sp006

sp007 31 28.036 -110 13.391 4545.00f 979007.153 979440.433 -5.83 -160.85 0.00 0.84 1.35 -161.36 1.02 sp007

sp008 31 26.354 -110 6.867 4221.50f 979014.262 979438.179 -26.89 -170.87 0.00 0.35 1.30 -171.82 0.12 sp008

sp009 31 26.356 -110 7.823 4281.00f 979008.057 979438.181 -27.50 -173.51 0.00 0.36 1.31 -174.46 1.01 sp009

sp010 31 26.284 -110 8.817 4327.00f 979003.325 979438.085 -27.81 -175.39 0.00 0.39 1.32 -176.32 1.01 sp010

sp011 31 26.288 -110 10.140 4410.00f 978999.087 979438.091 -24.25 -174.66 0.00 0.49 1.33 -175.50 1.01 sp011

sp012 31 26.285 -110 12.373 4582.00f 979000.729 979438.087 -6.43 -162.71 0.00 0.86 1.36 -163.20 1.02 sp012

sp013 31 26.722 -110 4.459 4347.00f 979017.302 979438.672 -12.54 -160.80 0.00 0.45 1.32 -161.67 1.01 sp013

sp014 31 28.009 -110 4.513 4310.00f 979025.038 979440.397 -10.01 -157.01 0.00 0.50 1.31 -157.82 1.01 sp014

sp015 31 28.474 -110 3.751 4420.00f 979020.665 979441.021 -4.66 -155.41 0.00 0.66 1.33 -156.08 1.01 sp015

so016 31 27.146 -110 2.722 4575.00f 979009.891 979439.240 0.92 -155.12 0.00 0.77 1.35 -155.71 1.02 so016

sp017 31 27.143 -110 1.713 4708.00f 979000.977 979439.236 4.51 -156.06 0.00 1.23 1.37 -156.21 1.04 sp017

sp018 31 27.892 -110 0.275 5330.00f 978964.542 979440.240 25.55 -156.24 0.00 3.55 1.45 -154.14 1.23 sp018

sp019 31 27.687 -110 0.792 4997.00f 978984.610 979439.965 14.58 -155.85 0.00 2.32 1.41 -154.94 1.11 sp019

sp020 31 27.398 -110 1.200 4833.00f 978993.854 979439.578 8.80 -156.04 0.00 2.02 1.39 -155.41 1.08 sp020

sp021 31 23.669 -110 7.298 4254.00f 979004.926 979434.582 -29.57 -174.66 0.00 0.37 1.30 -175.59 1.01 sp021

sp022 31 24.529 -110 6.418 4205.00f 979011.402 979435.734 -28.85 -172.27 0.00 0.36 1.30 -173.21 1.01 sp022

sp023 31 24.531 -110 7.290 4233.00f 979006.582 979435.737 -31.04 -175.42 0.00 0.36 1.30 -176.36 1.01 sp023

sp024 31 25.030 -110 7.308 4251.00f 979007.180 979436.405 -29.42 -174.41 0.00 0.36 1.30 -175.35 0.12 sp024

sp025 31 24.996 -110 7.818 4276.00f 979004.462 979436.360 -29.74 -175.58 0.00 0.37 1.31 -176.52 0.13 sp025

sp026 31 25.895 -110 5.675 4201.50f 979017.001 979437.564 -25.41 -168.71 0.00 0.40 1.30 -169.61 0.13 sp026

sp027 31 25.061 -110 5.578 4245.00f 979011.885 979436.447 -25.32 -170.10 0.00 0.38 1.30 -171.03 1.01 sp027

sp028 31 24.256 -110 5.028 4307.00f 979006.643 979435.369 -23.66 -170.55 0.00 0.34 1.31 -171.53 0.21 sp028

sp029 31 30.275 -110 4.385 4381.00f 979028.129 979443.436 -3.28 -152.70 0.00 0.45 1.32 -153.58 0.14 sp029

sp030 31 29.504 -110 4.410 4388.00f 979023.685 979442.402 -6.03 -155.69 0.00 0.49 1.33 -156.53 0.22 sp030

sp031 31 28.903 -110 4.672 4352.00f 979024.723 979441.596 -7.57 -156.00 0.00 0.46 1.32 -156.86 0.22 sp031

```
sp032 31 30.636 -110 4.998 4350.00f 979030.053 979443.920 -4.76 -153.12 0.00 0.38 1.32 -154.06 1.01 sp032

sp033 31 31.516 -110 4.997 4358.00f 979031.257 979445.101 -3.98 -152.62 0.00 0.34 1.32 -153.60 1.01 sp033

sp034 31 32.565 -110 4.998 4325.00f 979034.578 979446.509 -5.17 -152.68 0.00 0.31 1.32 -153.69 1.01 sp034

sp035 31 22.027 -110 19.270 5850.00f 978925.114 979432.385 42.86 -156.67 0.00 4.72 1.49 -153.43 1.38 sp035

sp036 31 22.125 -110 20.524 5620.00f 978939.566 979432.516 35.56 -156.12 0.00 2.60 1.47 -154.99 0.56 sp036

sp037 31 21.753 -110 17.990 6022.00f 978911.606 979432.018 45.88 -159.51 0.00 6.99 1.50 -154.01 1.72 sp037

sp038 31 21.020 -110 17.087 6573.30f 978876.490 979431.037 63.57 -160.63 0.00 8.71 1.52 -153.43 1.74 sp038

sp039 31 20.893 -110 16.193 5545.00f 978941.511 979430.867 32.10 -157.02 0.00 6.95 1.47 -151.54 1.72 sp039

sp040 31 20.857 -110 14.288 5137.60f 978969.979 979430.819 22.32 -152.91 0.00 2.47 1.43 -151.86 0.49 sp040

sp041 31 20.988 -110 13.789 5032.50f 978973.977 979430.995 16.26 -155.38 0.00 2.14 1.41 -154.65 0.47 sp041

sp042 31 21.055 -110 12.400 4692.10f 978986.461 979431.084 -3.35 -163.38 0.00 1.13 1.37 -163.62 0.23 sp042

sp043 31 21.922 -110 12.385 4660.00f 978991.612 979432.244 -2.37 -161.31 0.00 1.39 1.37 -161.29 1.04 sp043

sp044 31 23.826 -110 10.353 4448.00f 978995.023 979434.793 -21.44 -173.15 0.00 0.61 1.34 -173.87 1.01 sp044

sp045 31 24.102 -110 9.075 4345.00f 978996.586 979435.162 -29.93 -178.13 0.00 0.45 1.32 -179.00 1.01 sp045

sp046 31 25.400 -110 0.177 4803.00f 978995.094 979436.901 9.90 -153.92 0.00 1.39 1.39 -153.91 1.04 sp046

sp047 31 26.061 -110 1.597 4700.00f 979000.298 979437.786 4.53 -155.77 0.00 0.87 1.37 -156.27 1.02 sp047

sp048 31 25.227 -110 2.211 4596.00f 979000.976 979436.669 -3.45 -160.21 0.00 0.60 1.36 -160.96 1.01 sp048

sp049 31 23.664 -110 2.219 4497.00f 978998.162 979434.576 -13.48 -166.86 0.00 0.50 1.34 -167.70 1.01 sp049



sp050 31 26.949 -110 18.330 5467.00f 978950.839 979438.976 25.99 -160.47 0.00 9.35 1.46 -152.58 2.12 sp050

sp051 31 27.685 -110 17.574 5137.00f 978976.518 979439.963 19.66 -155.55 0.00 3.52 1.43 -153.45 1.23 sp051

sp052 31 28.027 -110 16.425 4890.00f 978991.606 979440.421 11.07 -155.72 0.00 1.92 1.40 -155.19 1.08 sp052

sp053 31 28.035 -110 15.424 4746.00f 979000.245 979440.432 6.16 -155.71 0.00 1.45 1.38 -155.64 0.35 sp053

sp054 31 29.338 -110 9.323 4258.00f 979015.835 979442.179 -25.88 -171.11 0.00 0.34 1.30 -172.07 1.01 sp054

sp055 31 29.337 -110 10.332 4290.00f 979011.849 979442.178 -26.86 -173.18 0.00 0.38 1.31 -174.11 1.01 sp055

sp056 31 29.347 -110 11.340 4353.00f 979010.437 979442.191 -22.36 -170.83 0.00 0.45 1.32 -171.70 1.01 sp056

sp057 31 29.345 -110 12.376 4433.00f 979008.901 979442.188 -16.37 -167.57 0.00 0.55 1.33 -168.35 1.01 sp057
```

```
sp058 31 29.337 -110 14.402 4590.00f 979004.492 979442.178 -6.01 -162.56 0.00 0.81 1.36 -163.11 1.02 sp058

sp059 31 25.769 -110 18.249 7422.00f 978831.694 979437.395 92.18 -160.96 0.00 12.12 1.50 -150.35 2.71 sp059

sp060 31 25.711 -110 17.946 7310.00f 978834.424 979437.318 84.46 -164.86 0.00 11.13 1.51 -155.24 2.53 sp060

sp061 31 25.791 -110 16.952 7087.00f 978843.530 979437.425 72.50 -169.21 0.00 15.61 1.51 -155.12 3.35 sp061

sp062 31 26.352 -110 16.646 5862.00f 978928.972 979438.176 42.05 -157.88 0.00 6.12 1.49 -153.25 1.72 sp062

sp063 31 26.452 -110 17.218 5512.00f 978948.723 979438.310 28.77 -159.23 0.00 8.90 1.46 -151.79 2.15 sp063

sp064 31 26.929 -110 16.998 5240.00f 978968.178 979438.949 22.01 -156.71 0.00 4.85 1.44 -153.29 1.55 sp064

sp065 31 26.992 -110 16.212 5013.00f 978982.644 979439.034 15.05 -155.92 0.00 3.59 1.41 -153.74 1.40 sp065

sp066 31 22.739 -110 15.792 5825.00f 978922.126 979433.337 36.57 -162.10 0.00 7.28 1.49 -156.31 1.89 sp066

sp067 31 22.181 -110 15.938 5950.00f 978911.816 979432.591 38.75 -164.18 0.00 8.34 1.49 -157.33 2.06 sp067

sp068 31 22.709 -110 15.401 5612.00f 978938.762 979433.297 33.22 -158.19 0.00 5.61 1.47 -154.05 1.65 sp068

sp069 31 23.067 -110 14.695 5290.00f 978960.013 979433.777 23.72 -156.70 0.00 4.28 1.44 -153.86 1.48 sp069

sp070 31 23.356 -110 13.812 5047.00f 978976.569 979434.164 17.05 -155.09 0.00 2.33 1.42 -154.18 1.29 sp070
```

Appendix 5. Listing of FORTRAN programs used in depth estimation.

```
c   Program bedrk_depth
c-----------------------------------------------------------------------
c---------> Function: calculate grid of depth to bedrock beneath 2 density
c       functions from gravity anomaly and depth-to-contact grids
c-----------------------------------------------------------------------
c
c-----------------------------------------------------------------------
c---------> Parameters and notes:
c       Model is pile of vertical axis cylinders with coincident axes
c       for prism beneath grid point, pile of vertical lines of mass
c       for prisms away from grid point. Requires a gravity anomaly
c       grid, a depth to bottom of density fn.1 grid, and
c       a mask grid for no computation over bedrock or control (drill
c       hole, etc) points. Mask val -100. or less means compute; >-100.
c       and <0.0 will use absolute value of mask if calculated estimate
c       is less than mask value
c       Requires a 2 files of {ztop,zbot,drho,radius}, max 101 layers
c       describing the density contrast and radius of the pile of cyls
c       for the shallow and deep density function
c-----------------------------------------------------------------------
c       date            programmer      event
c-----------------------------------------------------------------------
c       7 Jul 97        MEG             created
```

```
c       21 Jun 99       MEG     minimum depth constraint from mask added
c*-----------------------------------------------------------------------*/
c*Disclaimer: Although this program has been used by the USGS, no        */
c*warranty, expressed or implied, is made by the USGS or the United      */
c*States Government as to the accuracy and functioning of the program    */
c*and related program material nor shall the fact of distribution        */
c*constitute any such warranty, and no responsibility is assumed by the  */
c*USGS in connection therewith.                                           */
c*-----------------------------------------------------------------------*/
c
        character filnam1*50, dflt50*50, qu*80, fmt*50
        real rhoeff, gxsl, gxcy, zz(501),dgz(501),raddep
        real rho1d(101,4), rho2d(101,4)
        real rho1(101,4), rho2(101,4), zbar1(101), zbar2(101)
        character dflt1*1,qr*1
        character id*56,dflt56*56,pgm*8,id2*56,pgm2*8
        character id3*56,pgm3*8
        real z1(110), z2(110), z3(110)
        real grv(100,100), dpth(100,100), dmask(100,100)
        real zc(100,100), res(100,100), dgm(100,100)
        real*8 rms
        logical verify
        verify=.false.
        itin=5
        itout=6
```

```
      dval=1.0E+38
c
c     Values .ge. 1.0E+38 flag grid points for no compute
c
c
c     First get density functions and compute dg(mgals) vs depth to
c     contact function to use to estimate new contact depth changes
c
      io2 = 11
      odpth = 0.0
      odz = 0.1
      rhoeff = 0.0
      gxcy = 0.0
c
c     get filename & read file of depths to layers, drho, radius
c
      qu='Enter shallow density contrast & radius filename [dshlow.log]-->'
      dflt50 = 'dshlow.log'
      call ttinaa(qu, filnam1, 50, dflt50, itin, itout, verify)
      open(io2, file=filnam1, status = 'old')
      qu = 'Enter data format (<51c)[(4f10.3)]-->'
      dflt50 = '(4f10.3)'
      call ttinaa(qu, fmt, 50, dflt50, itin, itout, verify)
      nlayrs1 = 1
```

```
      write(itout,202)' Shallow density function'
202   format(a)
      write(itout,208)
208   format(6x,'ztop',6x,'zbot',6x,'drho',7x,'rad',6x,'zbar',6x,'dgcum')
500   read(io2,fmt,end=510) (rho1(nlayrs1,i), i=1,4)
      zbar1(nlayrs1) = (rho1(nlayrs1,1)+rho1(nlayrs1,2))*0.5
      rhoeff = rhoeff + rho1(nlayrs1,3)*(rho1(nlayrs1,2)-rho1(nlayrs1,1))
      zt = rho1(nlayrs1,1)
      zb = rho1(nlayrs1,2)
      dr = rho1(nlayrs1,3)
      rad = rho1(nlayrs1,4)
      gxcy = gxcy + cylfn(zt,zb,dr,rad)
      write(itout,207) (rho1(nlayrs1,i), i=1,4), zbar1(nlayrs1), gxcy
207   format(6f10.3)
      nlayrs1 = nlayrs1 + 1
      go to 500
510   nlayrs1= nlayrs1 - 1
      rhoeff = rhoeff / (rho1(nlayrs1,2) - rho1(1,1))
      gxsl = 41.908846 * rhoeff * (rho1(nlayrs1,2) - rho1(1,1))
      write(itout,204) rhoeff, gxsl, gxcy
204   format(/'Thickness weighted mean density=',f8.3/
     1 'Max.grav.effect infinite slab with this density=',f9.3/
     2 'Max.grav.effect cylinders of density model=',f9.3/)
      qu='Enter deeper density contrast & radius filename [ddeep.log]-->'
      dflt50 = 'ddeep.log'
```

```
      call ttinaa(qu, filnam1, 50, dflt50, itin, itout, verify)
      open(io2, file=filnam1, status = 'old')
      qu = 'Enter data format (<51c)[(4f10.3)]-->'
      dflt50 = '(4f10.3)'
      call ttinaa(qu, fmt, 50, dflt50, itin, itout, verify)
      rhoeff1 = 0.0
      gxcy = 0.0
      nlayrs2 = 1
      write(itout,202)' Deep density function'
      write(itout,208)
502   read(io2,fmt,end=512) (rho2(nlayrs2,i), i=1,4)
      zbar2(nlayrs2) = (rho2(nlayrs2,1)+rho2(nlayrs2,2))*0.5
      rhoeff1 = rhoeff1 + rho2(nlayrs2,3)*(rho2(nlayrs2,2)-rho2(nlayrs2,1))
      zt = rho2(nlayrs2,1)
      zb = rho2(nlayrs2,2)
      dr = rho2(nlayrs2,3)
      rad = rho2(nlayrs2,4)
      gxcy = gxcy + cylfn(zt,zb,dr,rad)
      write(itout,207) (rho2(nlayrs2,i), i=1,4), zbar2(nlayrs2), gxcy
      nlayrs2 = nlayrs2 + 1
      go to 502
512   nlayrs2 = nlayrs2 - 1
      rhoeff1 = rhoeff1 / (rho2(nlayrs2,2) - rho2(1,1))
      gxsl = 41.908846 * rhoeff1 * (rho2(nlayrs2,2) - rho2(1,1))
```

```
      write(itout,203) rhoeff1, gxsl, gxcy
203   format(/'Thickness weighted mean density=',f8.3/
     1 'Max.grav.effect infinite slab with this density=',f9.3/
     2 'Max.grav.effect cylinders of density model=',f9.3/)
      qu = 'Enter radius for depth estimates (km)[10.0]-->'
      call ttinr4(qu, raddep, 10.0, itin, itout, verify)
c
c     now get grids & estimate depth to contact
c     grv is residual (basin) anomaly, mgals
c     dpth is depth to density fn 1- i.e. contact, km;
c     dmask is mask telling whether
c     on bedrock (dval), point of computation(-1.0), or control point
c     (value is depth to contact)
c     Use USGS BGP standard grid format grids
c
      call getfile(21,'Grav grid filename:','in','unformatted')
      call getfile(22,'Contact dpth grid filename:','in','unformatted')
      call getfile(24,'Mask grid filename:','in','unformatted')

      read(21) id,pgm,ncol,nrow,nz,xo,dx,yo,dy
      read(22) id2,pgm2,ncol2,nrow2,nz2,xo2,dx2,yo2,dy2
      read(24) id3,pgm3,ncol3,nrow3,nz3,xo3,dx3,yo3,dy3
      if(nz.ne.1.or.nz2.ne.1.or.nz3.ne.1) then
       print *, '  nz not = 1 for input grid...'
       stop
```

```
      endif
      call compspecs(ncol,nrow,xo,dx,yo,dy,
     &                  ncol2,nrow2,xo2,dx2,yo2,dy2)
      call compspecs(ncol,nrow,xo,dx,yo,dy,
     &                  ncol3,nrow3,xo3,dx3,yo3,dy3)
c
c     store sqrt(dx * dy)/sqrt(pi) as radius in density fn
c     (radius of circle same area as dx*dy
c
      eqrad = sqrt(dx*dy/3.141527)
      do 40 i=1, nlayrs1
      rho1d(i,1) = rho1(i,1)
      rho1d(i,2) = rho1(i,2)
      rho1d(i,3) = rho1(i,3)
      rho1d(i,4) = raddep
40    rho1(i,4) = eqrad
      do 42 i=1, nlayrs2
      rho2d(i,1) = rho2(i,1)
      rho2d(i,2) = rho2(i,2)
      rho2d(i,3) = rho2(i,3)
      rho2d(i,4) = raddep
42    rho2(i,4) = eqrad
      do 60 j=1,nrow
      call getrow(21,ncol,z1)
```

```
        call getrow(22,ncol,z2)
        call getrow(24,ncol,z3)
        do 62 i=1,ncol
        grv(j,i) = z1(i)
        dpth(j,i) = z2(i)
        dmask(j,i) = z3(i)
c
c       load dval if any input grid is dval or gravity anomaly > 0.0
c
        if(grv(j,i).ge.0.0.or.dpth(j,i).ge.dval.or.dmask(j,i).ge.dval)
     &    zc(j,i) = dval
c
c       estimate depth to interface; if control point, enter mask value
c
        if(dmask(j,i).ge.0.0) zc(j,i) = dmask(j,i)
        if(dmask(j,i).lt.0.0) then
        zmin = dpth(j,i)
320     zmax = 5.0
        nzval = 101
        dz = (zmax - zmin)/(nzval-1)
c
c       calculate gravity as fn of interface depth
c
        do 50 k=1,nzval
        zct = zmin + (k-1)*dz
```

```
        call dgtot(0.0, zmin, zct, nlayrs1, rho1d, nlayrs2, rho2d, dg)
        zz(nzval-k+1) = zct
        dgz(nzval-k+1) = dg
50      continue
c
c       interpolate depth to bottom from g vs z fn
c
        call piksr2(nzval,dgz,zz)
        grvji = grv(j,i)
        call linterp(dgz,zz,nzval,grvji,zcji)
        if(zcji.lt.zmin) zcji = zmin
        if(zcji.gt.zmax) zcji = zmax
        if(zcji.lt.0.0) zcji = 0.0
c
c       Check if this is a deeper than constraint from a well
c
        if(dmask(j,i).gt.-100.and.zcji.lt.abs(dmask(j,i)))
     & zcji = abs(dmask(j,i))
        zc(j,i) = zcji
        endif
62      continue
60      continue
c
c       grids loaded; calculate model gravity and residual
```

```
c

300     rms = 0.0

        do 70 j=1,nrow

        do 71 i=1,ncol

        if(grv(j,i).ge.0.0.or.dpth(j,i).ge.dval.or.dmask(j,i).ge.dval) then

         dgm(j,i) = dval

         go to 71

        endif

        dgm(j,i) = 0.0

        do 72 jj=1,nrow

        do 73 ii=1,ncol

        if(zc(jj,ii).ge.dval) go to 73

        yy = (jj-j)*dy

        xx = (ii-i)*dx

        radius = sqrt(xx*xx+yy*yy)

        if(radius.gt.10.0) go to 73

        call dgtot(radius, zc(jj,ii), dpth(jj,ii), nlayrs1, rho1,

     &   nlayrs2, rho2, dg)

        dgm(j,i) = dgm(j,i) + dg

73      continue

72      continue

        resid = grv(j,i) - dgm(j,i)

        rms = rms + resid*resid

        res(j,i) = resid

71      continue
```

```
70      continue
        rmserr = sqrt(rms/(ncol*nrow))
        write(itout,'(a,f10.2)')' rms error = ',rmserr
        qu = 'another iteration (a) or stop (q)[a]'
        dflt1 = 'a'
        call ttinaa(qu,qr,1,dflt1,itin,itout,verify)
        if(qr.eq.'q'.or.qr.eq.'Q') go to 310
c
c       iterate by adjusting contact depths
c
        do 80 j=1,nrow
        do 80 i=1,ncol
        if(zc(j,i).ge.dval) go to 80
        if(dmask(j,i).ge.0.0) zc(j,i) = dmask(j,i)
        if(dmask(j,i).lt.0.0) then
        zmin = dpth(j,i)
330     zmax = 5.0
        nzval = 51
        dz = (zmax - zmin)/(nzval-1)
c
c       calculate gravity as fn of interface depth
c
        call dgtot(0.0, zmin, zc(j,i), nlayrs1, rho1d, nlayrs2, rho2d, dgcur)
        do 90 k=1,nzval
```

```
        zct = zmin + (k-1)*dz
        call dgtot(0.0, zmin, zct, nlayrs1, rho1d, nlayrs2, rho2d, dg)
        zz(nzval-k+1) = zct
        dgz(nzval-k+1) = dg - dgcur
90      continue
c
c       interpolate interface depth from g vs z fn
c
        call piksr2(nzval,dgz,zz)
        resji = res(j,i)
        call linterp(dgz,zz,nzval,resji,zcji)
        if(zcji.lt.zmin) zcji = zmin
        if(zcji.gt.zmax) zcji = zmax
        if(zcji.lt.0.0) zcji = 0.0
c
c       Check if this is a deeper than constraint from a well
c
        if(dmask(j,i).gt.-100.and.zcji.lt.abs(dmask(j,i)))
     & zcji = abs(dmask(j,i))
        zc(j,i) = zcji
        endif
80      continue
c
c       recalc model, residual
c
```

```
      go to 300
c
c     output grids
c
310   call getfile(23,'Bedrock depth grid filename:','out','unformatted')
      qu='Enter id for output grid (<57c)[Bedrk_depth bdrk depth grid]'
      dflt56='Bedrk_depth bdrk depth grid'
      call ttinaa(qu,id,56,dflt56,itin,itout,verify)
      pgm='bedrk_de'
      write(23) id,pgm,ncol,nrow,nz,xo,dx,yo,dy
      do 92 j=1,nrow
      do 93 i=1,ncol
93    z1(i) = zc(j,i)
      call putrow(23,ncol,z1)
92    continue
      close(23)
      call getfile(23,'Output resid grid filename:','out','unformatted')
      qu='Enter id for output grid (<57c)[Bedrk_depth output residual grid]'
      dflt56='grvdpth output residual grid'
      call ttinaa(qu,id,56,dflt56,itin,itout,verify)
      pgm='bedrk_de'
      write(23) id,pgm,ncol,nrow,nz,xo,dx,yo,dy
      do 94 j=1,nrow
      do 95 i=1,ncol
```

```
95      z1(i) = res(j,i)
        call putrow(23,ncol,z1)
94      continue
        close(23)
        call getfile(23,'Gravity model grid filename:','out','unformatted')
        qu='Enter id for output grid (<57c)[Bedrk_depth output grav model grid]'
        dflt56='grvdpth output grav model grid'
        call ttinaa(qu,id,56,dflt56,itin,itout,verify)
        pgm='bedrk_de'
        write(23) id,pgm,ncol,nrow,nz,xo,dx,yo,dy
        do 96 j=1,nrow
        do 97 i=1,ncol
97      z1(i) = dgm(j,i)
        call putrow(23,ncol,z1)
96      continue
900     close(21)
        close(22)
        close(23)
        close(24)
        stop
        end



cccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccc
      subroutine getfile(unit,question,inout,form)
```

```
c      Opens files...filenames not recognized by VAX will generate
c      error message and request a second try.
c      Sample call:
c           call getfile(21,'*Give input file:','in','formatted')

      integer unit
      character filename*50, status*8
      character*(*) question, inout, form

      print *, ' '
 10   write(*,101) question
 101  format(a,' ',$)
      read '(a50)', filename

      if(inout.eq.'in') then
        status='old'
      else
        status='unknown'
      endif

      if(form.eq.'formatted'.and.inout.eq.'out') then
        open(unit,file=filename,form=form,status=status,
     &  err=900)
      else
```

```
        open(unit,file=filename,form=form,status=status,err=900)
      endif

      return

 900  print *,'ERROR IN OPENING ',filename
      print *,'   try again......'
      close(unit)
      go to 10

      end



cccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccc
      subroutine compspecs(ncol,nrow,xo,dx,yo,dy,
     &                     ncol2,nrow2,xo2,dx2,yo2,dy2)
c      Compares the parameters for two grids...
c      If parameters are different, stops execution.

      if(ncol.ne.ncol2.or.nrow.ne.nrow2
     &   .or.xo.ne.xo2.or.dx.ne.dx2
     &   .or.yo.ne.yo2.or.dy.ne.dy2) then
            print *,'***ERROR...GRIDSPECS DO NOT MATCH'
            stop
      endif
```

```
      return
      end


cccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccc
      subroutine getrow(iunit,ncol,zrow)
      real zrow(ncol)
      read(iunit) dum,zrow
      return
      end


cccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccc
      subroutine putrow(iunit,ncol,zrow)
      real zrow(ncol)
      dum=0.0
      write(iunit) dum,zrow
      return
      end

        function stkcrcyl(h1,h2,nlayrs,rho)
c
c       calc dg of stack of coincident axis vert cylinders from depth h1
```

```
c       down to depth h2 using array rho for ztop,zbot,drho,rad
c       NOTE rho(nlayrs,2) must be greater than H
c
        real h1, h2, rho(101,4)
        real*8 dg
        integer nlayrs
        dg = 0.0d0
        do 50 i=1,nlayrs
        if(h1.ge.rho(i,2)) go to 50
        zt = rho(i,1)
        zb = rho(i,2)
        dr = rho(i,3)
        rad = rho(i,4)
        if(h1.ge.rho(i,1).and.h1.lt.rho(i,2)) then
                if(h2.lt.rho(i,2)) go to 57
                dg = dg + cylfn(h1,zb,dr,rad)
                go to 50
        endif
        if(h2.lt.rho(i,2)) go to 55
        dg = dg + cylfn(zt,zb,dr,rad)
50      continue
        go to 60
55      dg = dg + cylfn(zt,h2,dr,rad)
        go to 60
57      dg = dg + cylfn(h1,h2,dr,rad)
```

```
60      stkcrcyl = dg
        return
        end
        function cylfn(ztop,zbot,drho,rad)
c       gravity effect of vert. axis circular cylinder at pt on axis
        real*8 t
        t = zbot - ztop + sqrt(rad*rad + ztop*ztop)
     1    - sqrt(rad*rad + zbot*zbot)
        cylfn = 41.908846 * drho * t
        return
        end
        subroutine dgtot(r, zct, ztot, nlayrs1, rho1, nlayrs2, rho2, dg)
c
c       subroutine to calculate gravity effect of a stack of prisms
c       with density fn rho1 to depth zct, rho2 from zct to zbot
c       uses right circular cylinder if r=0, line of mass formula
c       if r > 0
c       MEG/USGS/Dec96
c
        dimension rho1(101,4),rho2(101,4)
c
c       decide whether to use cylinder or line mass formula
c
        if(r.lt.0.0001) then
```

```
c
c       r (horizontal distance) is 0 - use circular cyl on axis formula
c
        dg = stkcrcyl(0.0,zct,nlayrs1,rho1)
        dg = dg + stkcrcyl(zct,ztot,nlayrs2,rho2)
        return
        else
c
c       r (horizonatal distance > 0 - use line of mass formula
c
        dg = stklinms(r,0.0,zct,nlayrs1,rho1)
        dg = dg + stklinms(r,zct,ztot,nlayrs2,rho2)
        return
        endif
        end
        function stklinms(r,h1,h2,nlayrs,rho)
c
c       calc dg of stack of coincident axis vert mass lines from depth h1
c       down to depth h2 using array rho for ztop,zbot,drho,rad
c       NOTE rho(nlayrs,2) must be greater than H; rad is area prism
c       so rad*drho is mass/unit length
c
        real h1, h2, rho(101,4), r, lmsfn, area
        real*8 dg
        integer nlayrs
```

```
        dg = 0.0d0
        do 50 i=1,nlayrs
        if(h1.ge.rho(i,2)) go to 50
        zt = rho(i,1)
        zb = rho(i,2)
        dr = rho(i,3)
        rad = rho(i,4)*1.772454
        area = rad * rad
c note sqrt pi factor for program grvdpth only where rad stored in rho(i,4)
c       is sqrt((dx*dy)/pi) remove factor for general use
        if(h1.ge.rho(i,1).and.h1.lt.rho(i,2)) then
                if(h2.lt.rho(i,2)) go to 57
                dg = dg + lmsfn(r,h1,zb,dr,area)
                go to 50
        endif
        if(h2.lt.rho(i,2)) go to 55
        dg = dg + lmsfn(r,zt,zb,dr,area)
50      continue
        go to 60
55      dg = dg + lmsfn(r,zt,h2,dr,area)
        go to 60
57      dg = dg + lmsfn(r,h1,h2,dr,area)
60      stklinms = dg
        return
```

```
        end
        real function lmsfn(r,zt,zb,dr,area)
c       gravity effect of vertical line of mass from zt to zb,
c       horiz. distance r, area*dr mass/unit z,units km,g/cc,mgal
        real*8 t1, t2
        real area, dr, r, zt, zb
        t1 = 1.0/sqrt(r*r+zt*zt)
        t2 = 1.0/sqrt(r*r+zb*zb)
        lmsfn = area*dr*6.67*(t1-t2)
        return
        end
      SUBROUTINE PIKSR2(N,ARR,BRR)
      DIMENSION ARR(N),BRR(N)
      DO 12 J=2,N
        A=ARR(J)
        B=BRR(J)
        DO 11 I=J-1,1,-1
          IF(ARR(I).LE.A)GO TO 10
          ARR(I+1)=ARR(I)
          BRR(I+1)=BRR(I)
11      CONTINUE
        I=0
10      ARR(I+1)=A
        BRR(I+1)=B
12    CONTINUE
```

```
      RETURN
      END
        subroutine linterp(x,y,n,xx,yy)
c
c       linear interpolation on x, gives endpoint value if x outside
c       interval (x(1),x(n)). assumes x monotonic increasing.
c       assumes number smaller in abs value 1.0e-15 is zero. meg/jul97
c
        dimension x(n),y(n)
        tol = 1.0e-15
        tolinv = 1.0e15
        if(xx.lt.x(1)) then
          yy = y(1)
          return
        endif
        if(xx.gt.x(n)) then
          yy = y(n)
          return
        endif
        do 50 i=1,n-1
        if(xx.ge.x(i).and.xx.lt.x(i+1)) then
          dy = y(i+1)-y(i)
          dx = x(i+1)-x(i)
          if(abs(dx).le.tol) then
```

```
            slop = dy*tolinv
          else
            slop = dy/dx
          endif
          yy = slop*(xx-x(i))+y(i)
          return
        endif
50      continue
        end
c   Program contact_depth
c-----------------------------------------------------------------------
c---------> Function: calculate grid of depth to contact between 2 density
c       functions from gravity anomaly and total depth grids
c-----------------------------------------------------------------------
c
c-----------------------------------------------------------------------
c---------> Parameters and notes:
c       Model is pile of vertical axis cylinders with coincident axes
c       for prism beneath grid point, pile of vertical lines of mass
c       for prisms away from grid point. Requires a gravity anomaly
c       grid, a depth to bottom of density fn.2 grid, and
c       a mask grid for no computation over bedrock or control (drill
c       hole, etc) points. Mask val -100. or less means compute; >-100.
c       and <0.0 will use absolute value of mask if calculated estimate
c       is less than mask value
```

```
c       Requires a 2 files of {ztop,zbot,drho,radius}, max 101 layers
c       describing the density contrast and radius of the pile of cyls
c       for the shallow and deep density function
c-----------------------------------------------------------------------
c       date            programmer      event
c-----------------------------------------------------------------------
c       6 Dec 96        MEG             created
c       21 Jun 99       MEG     added mininimum depth constraint for mask
c*----------------------------------------------------------------------*/
c*Disclaimer: Although this program has been used by the USGS, no       */
c*warranty, expressed or implied, is made by the USGS or the United     */
c*States Government as to the accuracy and functioning of the program   */
c*and related program material nor shall the fact of distribution       */
c*constitute any such warranty, and no responsibility is assumed by the */
c*USGS in connection therewith.                                          */
c*----------------------------------------------------------------------*/
c
        character filnam1*50, dflt50*50, qu*80, fmt*50
        real rhoeff, gxsl, gxcy, zz(501),dgz(501),raddep
        real rho1d(101,4), rho2d(101,4)
        real rho1(101,4), rho2(101,4), zbar1(101), zbar2(101)
        character dflt1*1,qr*1
        character id*56,dflt56*56,pgm*8,id2*56,pgm2*8
        character id3*56,pgm3*8
```

```
      real z1(110), z2(110), z3(110)
      real grv(100,100), dpth(100,100), dmask(100,100)
      real zc(100,100), res(100,100), dgm(100,100)
      real*8 rms
      logical verify
      verify=.false.
      itin=5
      itout=6
      dval=1.0E+38
c
c     Values .ge. 1.0E+38 flag grid points for no compute
c
c
c     First get density functions and compute dg(mgals) vs depth to
c     contact function to use to estimate new contact depth changes
c
      io2 = 11
      odpth = 0.0
      odz = 0.1
      rhoeff = 0.0
      gxcy = 0.0
c
c     get filename & read file of depths to layers, drho, radius
c
      qu='Enter shallow density contrast & radius filename [dshlow.log]-->'
```

```
      dflt50 = 'dshlow.log'
      call ttinaa(qu, filnam1, 50, dflt50, itin, itout, verify)
      open(io2, file=filnam1, status = 'old')
      qu = 'Enter data format (<51c)[(4f10.3)]-->'
      dflt50 = '(4f10.3)'
      call ttinaa(qu, fmt, 50, dflt50, itin, itout, verify)
      nlayrs1 = 1
      write(itout,202)' Shallow density function'
202   format(a)
      write(itout,208)
208   format(6x,'ztop',6x,'zbot',6x,'drho',7x,'rad',6x,'zbar',6x,'dgcum')
500   read(io2,fmt,end=510) (rho1(nlayrs1,i), i=1,4)
      zbar1(nlayrs1) = (rho1(nlayrs1,1)+rho1(nlayrs1,2))*0.5
      rhoeff = rhoeff + rho1(nlayrs1,3)*(rho1(nlayrs1,2)-rho1(nlayrs1,1))
      zt = rho1(nlayrs1,1)
      zb = rho1(nlayrs1,2)
      dr = rho1(nlayrs1,3)
      rad = rho1(nlayrs1,4)
      gxcy = gxcy + cylfn(zt,zb,dr,rad)
      write(itout,207) (rho1(nlayrs1,i), i=1,4), zbar1(nlayrs1), gxcy
207   format(6f10.3)
      nlayrs1 = nlayrs1 + 1
      go to 500
510   nlayrs1= nlayrs1 - 1
```

```
      rhoeff = rhoeff / (rho1(nlayrs1,2) - rho1(1,1))
      gxsl = 41.908846 * rhoeff * (rho1(nlayrs1,2) - rho1(1,1))
      write(itout,204) rhoeff, gxsl, gxcy
204   format(/'Thickness weighted mean density=',f8.3/
     1 'Max.grav.effect infinite slab with this density=',f9.3/
     2 'Max.grav.effect cylinders of density model=',f9.3/)
      qu='Enter deeper density contrast & radius filename [ddeep.log]-->'
      dflt50 = 'ddeep.log'
      call ttinaa(qu, filnam1, 50, dflt50, itin, itout, verify)
      open(io2, file=filnam1, status = 'old')
      qu = 'Enter data format (<51c)[(4f10.3)]-->'
      dflt50 = '(4f10.3)'
      call ttinaa(qu, fmt, 50, dflt50, itin, itout, verify)
      rhoeff1 = 0.0
      gxcy = 0.0
      nlayrs2 = 1
      write(itout,202)' Deep density function'
      write(itout,208)
502   read(io2,fmt,end=512) (rho2(nlayrs2,i), i=1,4)
      zbar2(nlayrs2) = (rho2(nlayrs2,1)+rho2(nlayrs2,2))*0.5
      rhoeff1 = rhoeff1 + rho2(nlayrs2,3)*(rho2(nlayrs2,2)-rho2(nlayrs2,1))
      zt = rho2(nlayrs2,1)
      zb = rho2(nlayrs2,2)
      dr = rho2(nlayrs2,3)
      rad = rho2(nlayrs2,4)
```

```
      gxcy = gxcy + cylfn(zt,zb,dr,rad)
      write(itout,207) (rho2(nlayrs2,i), i=1,4), zbar2(nlayrs2), gxcy
      nlayrs2 = nlayrs2 + 1
      go to 502
512   nlayrs2 = nlayrs2 - 1
      rhoeff1 = rhoeff1 / (rho2(nlayrs2,2) - rho2(1,1))
      gxsl = 41.908846 * rhoeff1 * (rho2(nlayrs2,2) - rho2(1,1))
      write(itout,203) rhoeff1, gxsl, gxcy
203   format(/'Thickness weighted mean density=',f8.3/
     1 'Max.grav.effect infinite slab with this density=',f9.3/
     2 'Max.grav.effect cylinders of density model=',f9.3/)
      qu = 'Enter radius for depth estimates (km)[10.0]-->'
      call ttinr4(qu, raddep, 10.0, itin, itout, verify)
c
c     now get grids & estimate depth to contact
c     grv is residual (basin) anomaly, mgals
c     dpth is depth to bottom of basin, km; dmask is mask telling whether
c     on bedrock (dval), point of computation(-1.0), or control point
c     (value is depth to contact)
c     Use USGS BGP standard grid format grids
c
      call getfile(21,'Grav grid filename:','in','unformatted')
      call getfile(22,'Depth grid filename:','in','unformatted')
      call getfile(24,'Mask grid filename:','in','unformatted')
```

```
      read(21) id,pgm,ncol,nrow,nz,xo,dx,yo,dy
      read(22) id2,pgm2,ncol2,nrow2,nz2,xo2,dx2,yo2,dy2
      read(24) id3,pgm3,ncol3,nrow3,nz3,xo3,dx3,yo3,dy3
      if(nz.ne.1.or.nz2.ne.1.or.nz3.ne.1) then
       print *, '  nz not = 1 for input grid...'
       stop
      endif
      call compspecs(ncol,nrow,xo,dx,yo,dy,
     &                  ncol2,nrow2,xo2,dx2,yo2,dy2)
      call compspecs(ncol,nrow,xo,dx,yo,dy,
     &                  ncol3,nrow3,xo3,dx3,yo3,dy3)
c
c     store sqrt(dx * dy)/sqrt(pi) as radius in density fn
c     (radius of circle same area as dx*dy
c
      eqrad = sqrt(dx*dy/3.141527)
      do 40 i=1, nlayrs1
      rho1d(i,1) = rho1(i,1)
      rho1d(i,2) = rho1(i,2)
      rho1d(i,3) = rho1(i,3)
      rho1d(i,4) = raddep
40    rho1(i,4) = eqrad
      do 42 i=1, nlayrs2
      rho2d(i,1) = rho2(i,1)
```

```
      rho2d(i,2) = rho2(i,2)
      rho2d(i,3) = rho2(i,3)
      rho2d(i,4) = raddep
42    rho2(i,4) = eqrad
      do 60 j=1,nrow
      call getrow(21,ncol,z1)
      call getrow(22,ncol,z2)
      call getrow(24,ncol,z3)
      do 62 i=1,ncol
      grv(j,i) = z1(i)
      dpth(j,i) = z2(i)
      dmask(j,i) = z3(i)
c
c     load dval if any input grid is dval or gravity anomaly > 0.0
c
      if(grv(j,i).ge.0.0.or.dpth(j,i).ge.dval.or.dmask(j,i).ge.dval)
     &   zc(j,i) = dval
c
c     estimate depth to interface; if control point, enter mask value
c
      if(dmask(j,i).ge.0.0) zc(j,i) = dmask(j,i)
      if(dmask(j,i).lt.0.0) then
      zmin = 0.0
      zmax = dpth(j,i)
```

```
      nzval = 101
      dz = (zmax - zmin)/(nzval-1)
c
c     calculate gravity as fn of interface depth
c
      do 50 k=1,nzval
      zct = zmin + (k-1)*dz
      call dgtot(0.0, zct, zmax, nlayrs1, rho1d, nlayrs2, rho2d, dg)
      zz(nzval-k+1) = zct
      dgz(nzval-k+1) = dg
50    continue
c
c     interpolate interface depth from g vs z fn
c
      call piksr2(nzval,dgz,zz)
      grvji = grv(j,i)
      call linterp(dgz,zz,nzval,grvji,zcji)
      if(zcji.lt.zmin) zcji = zmin
      if(zcji.gt.zmax) zcji = zmax
      if(zcji.lt.0.0) zcji = 0.0
c
c     Check if this is a deeper than constraint from a well
c
      if(dmask(j,i).gt.-100.and.zcji.lt.abs(dmask(j,i)))
     & zcji = abs(dmask(j,i))
```

```
        zc(j,i) = zcji
        endif
62      continue
60      continue
c
c       grids loaded; calculate model gravity and residual
c
300     rms = 0.0
        do 70 j=1,nrow
        do 71 i=1,ncol
        if(grv(j,i).ge.0.0.or.dpth(j,i).ge.dval.or.dmask(j,i).ge.dval) then
         dgm(j,i) = dval
         go to 71
        endif
        dgm(j,i) = 0.0
        do 72 jj=1,nrow
        do 73 ii=1,ncol
        if(zc(jj,ii).ge.dval) go to 73
        yy = (jj-j)*dy
        xx = (ii-i)*dx
        radius = sqrt(xx*xx+yy*yy)
        if(radius.gt.10.0) go to 73
        call dgtot(radius, zc(jj,ii), dpth(jj,ii), nlayrs1, rho1,
     &   nlayrs2, rho2, dg)
```

```
      dgm(j,i) = dgm(j,i) + dg
73    continue
72    continue
      resid = grv(j,i) - dgm(j,i)
      rms = rms + resid*resid
      res(j,i) = resid
71    continue
70    continue
      rmserr = sqrt(rms/(ncol*nrow))
      write(itout,'(a,f10.2)')' rms error = ',rmserr
      qu = 'another iteration (a) or stop (q)[a]'
      dflt1 = 'a'
      call ttinaa(qu,qr,1,dflt1,itin,itout,verify)
      if(qr.eq.'q'.or.qr.eq.'Q') go to 310
c
c     iterate by adjusting contact depths
c
      do 80 j=1,nrow
      do 80 i=1,ncol
      if(zc(j,i).ge.dval) go to 80
      if(dmask(j,i).ge.0.0) zc(j,i) = dmask(j,i)
      if(dmask(j,i).lt.0.0) then
      zmin = 0.0
      zmax = dpth(j,i)
      nzval = 51
```

```
      dz = (zmax - zmin)/(nzval-1)
c
c     calculate gravity as fn of interface depth
c
      call dgtot(0.0, zc(j,i), zmax, nlayrs1, rho1d, nlayrs2, rho2d, dgcur)
      do 90 k=1,nzval
      zct = zmin + (k-1)*dz
      call dgtot(0.0, zct, zmax, nlayrs1, rho1d, nlayrs2, rho2d, dg)
      zz(nzval-k+1) = zct
      dgz(nzval-k+1) = dg - dgcur
90    continue
c
c     interpolate interface depth from g vs z fn
c
      call piksr2(nzval,dgz,zz)
      resji = res(j,i)
      call linterp(dgz,zz,nzval,resji,zcji)
      if(zcji.lt.zmin) zcji = zmin
      if(zcji.gt.zmax) zcji = zmax
      if(zcji.lt.0.0) zcji = 0.0
c
c     Check if this is a deeper than constraint from a well
c
      if(dmask(j,i).gt.-100.and.zcji.lt.abs(dmask(j,i)))
```

```
     & zcji = abs(dmask(j,i))
        zc(j,i) = zcji
        endif
80      continue
c
c       recalc model, residual
c
        go to 300
c
c       output grids
c
310     call getfile(23,'Contact depth grid filename:','out','unformatted')
        qu='Enter id for output grid (<57c)[grvdpth contact depth grid]'
        dflt56='contact_depth contact depth grid'
        call ttinaa(qu,id,56,dflt56,itin,itout,verify)
        pgm='contact_'
        write(23) id,pgm,ncol,nrow,nz,xo,dx,yo,dy
        do 92 j=1,nrow
        do 93 i=1,ncol
93      z1(i) = zc(j,i)
        call putrow(23,ncol,z1)
92      continue
        close(23)
        call getfile(23,'Output resid grid filename:','out','unformatted')
        qu='Enter id for output grid (<57c)[grvdpth output residual grid]'
```

```
      dflt56='contact_depth output residual grid'
      call ttinaa(qu,id,56,dflt56,itin,itout,verify)
      pgm='contact_'
      write(23) id,pgm,ncol,nrow,nz,xo,dx,yo,dy
      do 94 j=1,nrow
      do 95 i=1,ncol
95    z1(i) = res(j,i)
      call putrow(23,ncol,z1)
94    continue
      close(23)
      call getfile(23,'Gravity model grid filename:','out','unformatted')
      qu='Enter id for output grid (<57c)[grvdpth output grav model grid]'
      dflt56='contact_depth output grav model grid'
      call ttinaa(qu,id,56,dflt56,itin,itout,verify)
      pgm='contact_'
      write(23) id,pgm,ncol,nrow,nz,xo,dx,yo,dy
      do 96 j=1,nrow
      do 97 i=1,ncol
97    z1(i) = dgm(j,i)
      call putrow(23,ncol,z1)
96    continue
900   close(21)
      close(22)
      close(23)
```

```
        close(24)
        stop
        end



cccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccc
      subroutine getfile(unit,question,inout,form)
c      Opens files...filenames not recognized by VAX will generate
c      error message and request a second try.
c      Sample call:
c           call getfile(21,'*Give input file:','in','formatted')

      integer unit
      character filename*50, status*8
      character*(*) question, inout, form

      print *, ' '
 10   write(*,101) question
 101  format(a,' ',$)
      read '(a50)', filename

      if(inout.eq.'in') then
        status='old'
      else
        status='unknown'
```

```
      endif

      if(form.eq.'formatted'.and.inout.eq.'out') then
        open(unit,file=filename,form=form,status=status,
     &  err=900)
      else
        open(unit,file=filename,form=form,status=status,err=900)
      endif

      return

 900  print *,'ERROR IN OPENING ',filename
      print *,'   try again......'
      close(unit)
      go to 10

      end


cccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccc
      subroutine compspecs(ncol,nrow,xo,dx,yo,dy,
     &                     ncol2,nrow2,xo2,dx2,yo2,dy2)
c      Compares the parameters for two grids...
c      If parameters are different, stops execution.
```

```
      if(ncol.ne.ncol2.or.nrow.ne.nrow2
     &   .or.xo.ne.xo2.or.dx.ne.dx2
     &   .or.yo.ne.yo2.or.dy.ne.dy2) then
            print *,'***ERROR...GRIDSPECS DO NOT MATCH'
            stop
      endif

      return
      end


cccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccc
      subroutine getrow(iunit,ncol,zrow)
      real zrow(ncol)
      read(iunit) dum,zrow
      return
      end


cccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccc
      subroutine putrow(iunit,ncol,zrow)
      real zrow(ncol)
      dum=0.0
      write(iunit) dum,zrow
```

```
      return
      end


        function stkcrcyl(h1,h2,nlayrs,rho)
c
c       calc dg of stack of coincident axis vert cylinders from depth h1
c       down to depth h2 using array rho for ztop,zbot,drho,rad
c       NOTE rho(nlayrs,2) must be greater than H
c
        real h1, h2, rho(101,4)
        real*8 dg
        integer nlayrs
        dg = 0.0d0
        do 50 i=1,nlayrs
        if(h1.ge.rho(i,2)) go to 50
        zt = rho(i,1)
        zb = rho(i,2)
        dr = rho(i,3)
        rad = rho(i,4)
        if(h1.ge.rho(i,1).and.h1.lt.rho(i,2)) then
                if(h2.lt.rho(i,2)) go to 57
                dg = dg + cylfn(h1,zb,dr,rad)
                go to 50
        endif
```

```
      if(h2.lt.rho(i,2)) go to 55
      dg = dg + cylfn(zt,zb,dr,rad)
50    continue
      go to 60
55    dg = dg + cylfn(zt,h2,dr,rad)
      go to 60
57    dg = dg + cylfn(h1,h2,dr,rad)
60    stkcrcyl = dg
      return
      end
      function cylfn(ztop,zbot,drho,rad)
c     gravity effect of vert. axis circular cylinder at pt on axis
      real*8 t
      t = zbot - ztop + sqrt(rad*rad + ztop*ztop)
     1   - sqrt(rad*rad + zbot*zbot)
      cylfn = 41.908846 * drho * t
      return
      end
      subroutine dgtot(r, zct, ztot, nlayrs1, rho1, nlayrs2, rho2, dg)
c
c     subroutine to calculate gravity effect of a stack of prisms
c     with density fn rho1 to depth zct, rho2 from zct to zbot
c     uses right circular cylinder if r=0, line of mass formula
c     if r > 0
c     MEG/USGS/Dec96
```

```
c
        dimension rho1(101,4),rho2(101,4)
c
c       decide whether to use cylinder or line mass formula
c
        if(r.lt.0.0001) then
c
c       r (horizontal distance) is 0 - use circular cyl on axis formula
c
        dg = stkcrcyl(0.0,zct,nlayrs1,rho1)
        dg = dg + stkcrcyl(zct,ztot,nlayrs2,rho2)
        return
        else
c
c       r (horizonatal distance > 0 - use line of mass formula
c
        dg = stklinms(r,0.0,zct,nlayrs1,rho1)
        dg = dg + stklinms(r,zct,ztot,nlayrs2,rho2)
        return
        endif
        end
        function stklinms(r,h1,h2,nlayrs,rho)
c
c       calc dg of stack of coincident axis vert mass lines from depth h1
```

```
c       down to depth h2 using array rho for ztop,zbot,drho,rad
c       NOTE rho(nlayrs,2) must be greater than H; rad is area prism
c       so rad*drho is mass/unit length
c
        real h1, h2, rho(101,4), r, lmsfn, area
        real*8 dg
        integer nlayrs
        dg = 0.0d0
        do 50 i=1,nlayrs
        if(h1.ge.rho(i,2)) go to 50
        zt = rho(i,1)
        zb = rho(i,2)
        dr = rho(i,3)
        rad = rho(i,4)*1.772454
        area = rad * rad
c note sqrt pi factor for program grvdpth only where rad stored in rho(i,4)
c       is sqrt((dx*dy)/pi) remove factor for general use
        if(h1.ge.rho(i,1).and.h1.lt.rho(i,2)) then
                if(h2.lt.rho(i,2)) go to 57
                dg = dg + lmsfn(r,h1,zb,dr,area)
                go to 50
        endif
        if(h2.lt.rho(i,2)) go to 55
        dg = dg + lmsfn(r,zt,zb,dr,area)
50      continue
```

```
        go to 60
55      dg = dg + lmsfn(r,zt,h2,dr,area)
        go to 60
57      dg = dg + lmsfn(r,h1,h2,dr,area)
60      stklinms = dg
        return
        end
        real function lmsfn(r,zt,zb,dr,area)
c       gravity effect of vertical line of mass from zt to zb,
c       horiz. distance r, area*dr mass/unit z,units km,g/cc,mgal
        real*8 t1, t2
        real area, dr, r, zt, zb
        t1 = 1.0/sqrt(r*r+zt*zt)
        t2 = 1.0/sqrt(r*r+zb*zb)
        lmsfn = area*dr*6.67*(t1-t2)
        return
        end
      SUBROUTINE PIKSR2(N,ARR,BRR)
      DIMENSION ARR(N),BRR(N)
      DO 12 J=2,N
        A=ARR(J)
        B=BRR(J)
        DO 11 I=J-1,1,-1
          IF(ARR(I).LE.A)GO TO 10
```

```
          ARR(I+1)=ARR(I)
          BRR(I+1)=BRR(I)
11      CONTINUE
        I=0
10      ARR(I+1)=A
        BRR(I+1)=B
12    CONTINUE
      RETURN
      END
        subroutine linterp(x,y,n,xx,yy)
c
c       linear interpolation on x, gives endpoint value if x outside
c       interval (x(1),x(n)). assumes x monotonic increasing.
c       assumes number smaller in abs value 1.0e-15 is zero. meg/jul97
c
        dimension x(n),y(n)
        tol = 1.0e-15
        tolinv = 1.0e15
        if(xx.lt.x(1)) then
          yy = y(1)
          return
        endif
        if(xx.gt.x(n)) then
          yy = y(n)
          return
```

```
        endif
        do 50 i=1,n-1
        if(xx.ge.x(i).and.xx.lt.x(i+1)) then
          dy = y(i+1)-y(i)
          dx = x(i+1)-x(i)
          if(abs(dx).le.tol) then
            slop = dy*tolinv
          else
            slop = dy/dx
          endif
          yy = slop*(xx-x(i))+y(i)
          return
        endif
50      continue
        end
      subroutine ttinr4(qu, r4, defalt, itin,itout, verify)
c       Terminal entry of real*4 variable - F77 version
c       qu - Character string prompt que,80 C long.
c       r4 - variable to be input
c       defalt - default value if <cr> only given
c       itin,itout - read, write LUN's of terminal
c       verify - if true, asks for verification of input
c                if false no verification
c       typical call:
```

```
c     call ttinr4(que,a,1.67,itin,itout,verify)
c       MEG/ Feb 86; SUN conversion Jul 89/ MEG
c
      logical verify
      character ans*10, blank*10, qu*80
      character que(80)*1, qr*1
      real r4, defalt
      blank = '          '
      read(unit=qu, fmt=200) que
  200 format(80a1)
      call lnnobl(que, nq, 80)
  300 write(unit=itout, fmt=204)
  204 format(1h ,$)
      do 40 i = 1, nq
   40 write(unit=itout, fmt=201) que(i)
  201 format(a,$)
      read(unit=itin, fmt=101, err=300) ans
  101 format(a)
      if (ans .eq. blank) goto 910
      read(unit=ans, fmt=100) r4
  100 format(bn,f10.0)
      if (.not. verify) goto 900
      write(unit=itout, fmt=202) r4
  202 format(1x,6hValue ,1pe14.7,5h ok? ,$)
      read(unit=itin, fmt=101) qr
```

```
      if ((qr .eq. 'n') .or. (qr .eq. 'N')) goto 300
  900 return
  910 r4 = defalt
      goto 900
      end
      subroutine lnnobl(a, na, lngth)
c       determine length of string  of max length lngth with no blanks on left
c       changed to specify string max length from 80 by MEG/10Jan91
      character a(lngth), bl
      bl = ' '
      do 50 i = lngth, 1, -1
      na = i
      if (a(i) .ne. bl) goto 60
   50 continue
      na = 0
   60 return
      end
      subroutine ttinr8(qu, r8, defalt, itin,itout, verify)
c       Terminal entry of real*8 variable - F77 version
c       qu - Character string prompt que,80 C long.
c       r8 - variable to be input
c       def - default value if <cr> only given
c       itin,itout - read, write LUN's of terminal
c       verify - if true, asks for verification of input
```

```
c                if false no verification
c       typical call:
c     call ttinr8(que,a,1.67d-03,itin,itout,verify)
c       MEG/ Feb 86; SUN conversion Jul 89/ MEG
c
      logical verify
      character ans*16, blank*16, qu*80
      character que(80)*1, qr*1
      double precision r8, defalt
      blank = '                '
      read(unit=qu, fmt=200) que
  200 format(80a1)
      call lnnobl(que, nq, 80)
  300 write(unit=itout, fmt=204)
  204 format(1h ,$)
      do 40 i = 1, nq
   40 write(unit=itout, fmt=201) que(i)
  201 format(a,$)
      read(unit=itin, fmt=101, err=300) ans
  101 format(a)
      if (ans .eq. blank) goto 910
      read(unit=ans, fmt=100) r8
  100 format(bn,f16.0)
      if (.not. verify) goto 900
      write(unit=itout, fmt=202) r8
```

```
  202 format(1x,6hValue ,1pd24.17,5h ok? ,$)
      read(unit=itin, fmt=101) qr
      if ((qr .eq. 'n') .or. (qr .eq. 'N')) goto 300
  900 return
  910 r8 = defalt
      goto 900
      end
      subroutine ttini4(qu, i4, defalt, itin,itout, verify)
c       Terminal entry of integer*4 variable - F77 version
c       qu - Character string prompt que,80 C long.
c       i4 - variable to be input
c       defalt - default value if <cr> only given
c       itin,itout - read, write LUN's of terminal
c       verify - if true, asks for verification of input
c                if false no verification
c       typical call:
c     call ttini4(que,k,16,itin,itout,verify)
c       MEG/ Feb 86; SUN conversion Jul 89/ MEG
c
      logical verify
      character ans*16, blank*16, qu*80
      character que(80)*1, qr*1
      integer*4 i4, defalt
      blank = '                '
```

```
      read(unit=qu, fmt=200) que
  200 format(80a1)
      call lnnobl(que, nq, 80)
  300 write(unit=itout, fmt=204)
  204 format(1h ,$)
      do 40 i = 1, nq
   40 write(unit=itout, fmt=201) que(i)
  201 format(a,$)
      read(unit=itin, fmt=101, err=300) ans
  101 format(a)
      if (ans .eq. blank) goto 910
      read(unit=ans, fmt=100) i4
  100 format(bn,i16)
      if (.not. verify) goto 900
      write(unit=itout, fmt=202) i4
  202 format(1x,6hValue ,i16,5h ok? ,$)
      read(unit=itin, fmt=101) qr
      if ((qr .eq. 'n') .or. (qr .eq. 'N')) goto 300
  900 return
  910 i4 = defalt
      goto 900
      end
      subroutine ttini2(qu, i2, defalt, itin,itout, verify)
c       Terminal entry of integer*2 variable - F77 version
c       qu - Character string prompt que,80 C long.
```

```
c       i2 - variable to be input
c       defalt - default value if <cr> only given
c       itin,itout - read, write LUN's of terminal
c       verify - if true, asks for verification of input
c                if false no verification
c       typical call:
c     call ttini2(que,k,16,itin,itout,verify)
c       MEG/ Feb 86; SUN conversion Jul 89/ MEG
c
      logical verify
      character ans*6, blank*6, qu*80
      character que(80)*1, qr*1
      integer*2 i2, defalt
      blank = '      '
      read(unit=qu, fmt=200) que
  200 format(80a1)
      call lnnobl(que, nq, 80)
  300 write(unit=itout, fmt=204)
  204 format(1h ,$)
      do 40 i = 1, nq
   40 write(unit=itout, fmt=201) que(i)
  201 format(a,$)
      read(unit=itin, fmt=101, err=300) ans
  101 format(a)
```

```
      if (ans .eq. blank) goto 910
      read(unit=ans, fmt=100) i2
  100 format(bn,i6)
      if (.not. verify) goto 900
      write(unit=itout, fmt=202) i2
  202 format(1x,6hValue ,i6,5h ok? ,$)
      read(unit=itin, fmt=101) qr
      if ((qr .eq. 'n') .or. (qr .eq. 'N')) goto 300
  900 return
  910 i2 = defalt
      goto 900
      end
      subroutine ttinaa(qu, cs, ncs, defalt, itin,itout, verify)
c       Terminal entry of character string - F77 version
c       qu - 80C string of prompt que
c       cs - character string to be input-array of c*1 but can
c       be equivalenced to char string in calling pgm
c       ncs - # characters in cs
c       defalt - default string for cs
c       itin,itout - read, write LUN's of terminal
c       verify - if true, asks for verification of input
c                if false no verification
c       typical call:
c     call ttinaa(que,fnam,16,defalt,itin,itout,verify)
c       MEG/ Dec 85; SUN conversion Jul 89/ MEG
```

```
c
      logical verify
      character css(80)
      character qu*80
      character que(80)*1, qr*1
c      character defalt(*), cs(*) replaced with following:
      character*(*) cs,defalt
      read(unit=qu, fmt=200) que
  200 format(80a1)
      call lnnobl(que, nq, 80)
  300 write(unit=itout, fmt=204)
  204 format(' ',$)
      do 40 i = 1, nq
   40 write(unit=itout, fmt=201) que(i)
  201 format(a1,$)
      read(unit=itin, fmt=101, err=300) css
  101 format(80a1)
      call lnnobl(css, kcss, 80)
c     <cr> go to default
      if (kcss .eq. 0) goto 910
      write(cs,'(80a)')(css(i),i=1,ncs)
      if (.not. verify) goto 900
      write(unit=itout, fmt=202) (css(i),i = 1, ncs)
  202 format(1x,17hCharacter string /1x,80a:)
```

```
      write(unit=itout, fmt=203)
  203 format(5h ok? ,$)
      read(unit=itin, fmt=101) qr
      if ((qr .eq. 'n') .or. (qr .eq. 'N')) goto 300
  900 return
  910 cs = defalt
      goto 900
      end
c   Program dg4ztcandzbr
c-----------------------------------------------------------------------
c---------> Function: calculate gravity anomaly from
c        2 density functions  with known depth to interface between
c        density functions and known depth to bottom.
c-----------------------------------------------------------------------
c
c-----------------------------------------------------------------------
c---------> Parameters and notes:
c       Model is pile of vertical axis cylinders on coincident axis
c       Requires a 2 files of {ztop,zbot,drho,radius}, max 101 layers each
c       describing the density contrast and radius of the pile of cyls
c       for the shallow and deep density function
c
c       and a third file of gravity anomaly and  and r/ro to use if total
c       model gravity is less than specified amount. I.e., if gravity anom
c       aly was 9 mgal, table might be 3.0, 1.0, 9.0,0.5,
```

```
c       meaning to use whole cylinder(s) gravity effect for first 3 mgal
c       and use factor from r / r0 =.5 for each cylinder gravity effect
c       from 3mgal to 9 mgal Note factor nonlinear but r/r0=1.0 is whole
c       cylinder and r/r0 = 0.0 is half the cylinder; r is radius to plane
c       cutting cylinder, ro is radius of cylinder
c       This would be appropriate for a well over the range front fault
c       where 3mgal due to fill over pediment, rest due to fill against
c       hanging wall
c-----------------------------------------------------------------------
c       date            programmer      event
c-----------------------------------------------------------------------
c       26 Dec 96       MEG             created
c       27 Apr 99       MEG     cylinder factor as fn of grav anomaly added
c
c*---------------------------------------------------------------------*/
c*Disclaimer: Although this program has been used by the USGS, no       */
c*warranty, expressed or implied, is made by the USGS or the United     */
c*States Government as to the accuracy and functioning of the program   */
c*and related program material nor shall the fact of distribution       */
c*constitute any such warranty, and no responsibility is assumed by the */
c*USGS in connection therewith.                                          */
c*---------------------------------------------------------------------*/
c
        character filnam1*50, dflt50*50, qu*80, fmt*50, ids*20
```

```
      real rhoeff, gxsl, gxcy
      real rho1(101,4), rho2(101,4), zbar1(101), zbar2(101), fvsdg(21,2)
      real fdg(6), fro(6)
      logical verify
      data fdg/0.500,0.803,0.915,0.966,0.991,1.000/
      data fro/0.0,0.2,0.4,0.6,0.8,1.0/
c
c
c
      itin = 5
      itout = 6
      io2 = 11
      verify = .false.
      odpth = 0.0
      odz = 0.1
      rhoeff = 0.0
      gxcy = 0.0
      gxslc = 0.0
c
c     enter identification string
c
      qu='Enter identification string (<21c) [dpth2fun estimate]-->'
      dflt50 = 'dpth2fun estimate'
      call ttinaa(qu, ids, 20, dflt50, itin, itout, verify)
c
```

```
c       get filename & read file of depths to layers, drho, radius
c
        qu='Enter shallow density contrast filename [dshlow.log]-->'
        dflt50 = 'dshlow.log'
        call ttinaa(qu, filnam1, 50, dflt50, itin, itout, verify)
        open(io2, file=filnam1, status = 'old')
        qu = 'Enter data format (<51c)[(4f10.3)]-->'
        dflt50 = '(4f10.3)'
        call ttinaa(qu, fmt, 50, dflt50, itin, itout, verify)
        nlayrs1 = 1
        write(itout,202)' Shallow density function'
202     format(a)
        write(itout,208)
208     format(6x,'ztop',6x,'zbot',6x,'drho',7x,'rad',6x,'zbar',4x,'cum dg',
     1 2x,'cum slab')
500     read(io2,fmt,end=510) (rho1(nlayrs1,i), i=1,4)
        zbar1(nlayrs1) = (rho1(nlayrs1,1)+rho1(nlayrs1,2))*0.5
        rhoeff = rhoeff + rho1(nlayrs1,3)*(rho1(nlayrs1,2)-rho1(nlayrs1,1))
        zt = rho1(nlayrs1,1)
        zb = rho1(nlayrs1,2)
        dr = rho1(nlayrs1,3)
        rad = rho1(nlayrs1,4)
        gxcy = gxcy + cylfn(zt,zb,dr,rad, 1.0)
        gxslc = gxslc + 41.908846 * dr * (zb-zt)
```

```
      write(itout,207) (rho1(nlayrs1,i), i=1,4), zbar1(nlayrs1), gxcy, gxslc
207   format(7f10.3)
      nlayrs1 = nlayrs1 + 1
      go to 500
510   nlayrs1= nlayrs1 - 1
      rhoeff = rhoeff / (rho1(nlayrs1,2) - rho1(1,1))
      gxsl = 41.908846 * rhoeff * (rho1(nlayrs1,2) - rho1(1,1))
      write(itout,204) rhoeff, gxsl, gxcy
204   format(/'Thickness weighted mean density=',f8.3/
     1 'Max.grav.effect infinite slab with this density=',f9.3/
     2 'Max.grav.effect cylinders of density model=',f9.3/)
      qu='Enter deeper density contrast & radius filename [ddeep.log]-->'
      dflt50 = 'ddeep.log'
      call ttinaa(qu, filnam1, 50, dflt50, itin, itout, verify)
      open(io2, file=filnam1, status = 'old')
      qu = 'Enter data format (<51c)[(4f10.3)]-->'
      dflt50 = '(4f10.3)'
      call ttinaa(qu, fmt, 50, dflt50, itin, itout, verify)
      rhoeff = 0.0
      gxcy = 0.0
      gxslc = 0.0
      nlayrs2 = 1
      write(itout,202)' Deep density function'
      write(itout,209)
209   format(6x,'ztop',6x,'zbot',6x,'drho',7x,'rad',6x,'zbar',4x,'cum dg',
```

```
     1 2x,'cum slab')
502     read(io2,fmt,end=512) (rho2(nlayrs2,i), i=1,4)
        zbar2(nlayrs2) = (rho2(nlayrs2,1)+rho2(nlayrs2,2))*0.5
        rhoeff = rhoeff + rho2(nlayrs2,3)*(rho2(nlayrs2,2)-rho2(nlayrs2,1))
        zt = rho2(nlayrs2,1)
        zb = rho2(nlayrs2,2)
        dr = rho2(nlayrs2,3)
        rad = rho2(nlayrs2,4)
        gxcy = gxcy + cylfn(zt,zb,dr,rad, 1.0)
        gxslc = gxslc + 41.908846 * dr * (zb-zt)
        write(itout,211) (rho2(nlayrs2,i), i=1,4), zbar2(nlayrs2), gxcy, gxslc
211     format(7f10.3)
        nlayrs2 = nlayrs2 + 1
        go to 502
512     nlayrs2 = nlayrs2 - 1
        rhoeff = rhoeff / (rho2(nlayrs2,2) - rho2(1,1))
        gxsl = 41.908846 * rhoeff * (rho2(nlayrs2,2) - rho2(1,1))
        write(itout,203) rhoeff, gxsl, gxcy
203     format(/'Thickness weighted mean density=',f8.3/
     1 'Max.grav.effect infinite slab with this density=',f9.3/
     2 'Max.grav.effect cylinders of density model=',f9.3/)
c
c       get cylinder factor vs gravity effect function
c
```

```
      qu='Enter gravity anomaly vs cylinder factor filename
     1 [fctrvsdg.dat]-->'
      dflt50 = 'fctrvsdg.dat'
      call ttinaa(qu, filnam1, 50, dflt50, itin, itout, verify)
      open(io2, file=filnam1, status = 'old')
      qu = 'Enter data format (<51c)[(2f10.3)]-->'
      dflt50 = '(2f10.3)'
      call ttinaa(qu, fmt, 50, dflt50, itin, itout, verify)
      nftr = 1
      write(itout,202)' Gravity anomaly vs cylinder factor function'
      write(itout,212)
212   format(4x,'deltag',6x,'R/Ro',4x,'factor')
503   read(io2,fmt,end=513) fvsdg(nftr,1), roverro
      call interp(fro,fdg,6,4,roverro,fvsdg(nftr,2))
      write(itout,211) fvsdg(nftr,1), roverro, fvsdg(nftr,2)
      nftr = nftr + 1
      go to 503
513   nftr = nftr - 1
c
c     get parameters
c
      ozct = 0.0
      ozmax = 0.0
300   write(qu,200) ozct
200   format('Enter depth to interface, km [',f8.3,']-->')
```

```
        call ttinr4(qu, zct, ozct, itin, itout, verify)
        write(qu,205) ozmax
205     format('Enter depth to bottom, km [',f8.3,']-->')
        call ttinr4(qu, zmax, ozmax, itin, itout, verify)
c
c       calculate gravity for zTc and ztot
c
c       write(itout,202)'   ztot     deltag'
c       call dgtot(0.0, zct, zmax, nlayrs1, rho1, nlayrs2, rho2, dg)
        call dgtot1(zct, zmax, nlayrs1, rho1, nlayrs2, rho2,
     1 nftr, fvsdg, dg)
        write(itout,'(a,a,2f9.3)') ids, ' ztot, deltag: ', zmax, dg
50      continue
        write(itout,'(1x)')
        ozct = zct
        ozmax = zmax
        qu = 'Enter 1 to quit, 0 to recalculate [0]'
        call ttini4(qu, iquit, 0, itin, itout, verify)
        if(iquit.eq.0) go to 300
        stop
        end
        function stkcrcyl(h1,h2,nlayrs,rho,c,nftr,fvsdg)
c
c       calc dg of stack of coincident axis vert cylinders from depth h1
```

```
c       down to depth h2 using array rho for ztop,zbot,drho,rad
c       NOTE rho(nlayrs,2) must be greater than H;
c       c is offset for model grav dg, removed before return
c       nftr is # entries in factor vs dg table
c       fvsdg is factor vs dg table dg first entry, f is 2nd
c        MEG mod for factor Mar99
c
        real h1, h2, rho(101,4), fvsdg(21,4), c
        real*8 dg
        integer nlayrs, nftr
        dg = c * 1.0d0
        do 50 i=1,nlayrs
        if(h1.ge.rho(i,2)) go to 50
        zt = rho(i,1)
        zb = rho(i,2)
        dr = rho(i,3)
        rad = rho(i,4)
        fctr = 1.0
        do 70 j=1,nftr
        if(dg.ge.fvsdg(j,1)) then
          fctr = fvsdg(j,2)
          go to 72
        endif
70      continue
72      continue
```

```
c       write(*,'(a,2f10.3)')'factor ',fctr,dg
        if(h1.ge.rho(i,1).and.h1.lt.rho(i,2)) then
                if(h2.lt.rho(i,2)) go to 57
                dg = dg + cylfn(h1,zb,dr,rad,fctr)
                go to 50
        endif
        if(h2.lt.rho(i,2)) go to 55
        dg = dg + cylfn(zt,zb,dr,rad,fctr)
50      continue
        go to 60
55      dg = dg + cylfn(zt,h2,dr,rad,fctr)
        go to 60
57      dg = dg + cylfn(h1,h2,dr,rad,fctr)
60      stkcrcyl = dg - c
        return
        end
        function cylfn(ztop,zbot,drho,rad,f)
c       gravity effect of vert. axis circular cylinder at pt on axis
c       multiplied by factor f
        real*8 t
        t = zbot - ztop + sqrt(rad*rad + ztop*ztop)
     1    - sqrt(rad*rad + zbot*zbot)
        cylfn = 41.908846 * drho * t * f
        return
```

```
        end
        subroutine dgtot1(zct, ztot, nlayrs1, rho1, nlayrs2, rho2,
     1 nftr, fvsdg, dg)
c
c       subroutine to calculate gravity effect of a stack coaxial cylinders
c       with density fn rho1 to depth zct, rho2 from zct to zbot
c       array fvsdg gives proportion of cylinder (<=1.0) to use if grav
c       effect is >= to fvsdg(i,1)which is a negative #
c       MEG/USGS/Dec96; Mar 99 fvsdg added
c
        dimension rho1(101,4),rho2(101,4), fvsdg(21,2)
        dg = stkcrcyl(0.0,zct,nlayrs1,rho1,0.0,nftr,fvsdg)
        dg = dg + stkcrcyl(zct,ztot,nlayrs2,rho2,dg,nftr,fvsdg)
        return
        end
0.00  0.500
0.20  0.803
0.40  0.915
0.60  0.966
0.80  0.991
1.00  1.000
c   Program dpth2fun
c-----------------------------------------------------------------------
c---------> Function: calculate depth to bottom from gravity anomaly from
c        2 density functions  with known depth to interface between
```

```
c        density functions, and a given table of proportion of each
c        cylinder to use as function of gravity anomaly.  This is to
c        obtain better estimates near the edge of basin
c-----------------------------------------------------------------------
c
c-----------------------------------------------------------------------
c---------> Parameters and notes:
c       Model is pile of vertical axis cylinders on coincident axis
c       Requires a 2 files of {ztop,zbot,drho,radius}, max 101 layers each
c       describing the density contrast and radius of the pile of cyls
c       for the shallow and deep density function
c       and a third file of gravity anomaly and r/ro to use if total
c       model gravity is less than specified amount. I.e., if gravity anom
c       aly was 9 mgal, table might be 3.0, 1.0, 9.0,0.5,
c       meaning to use whole cylinder(s) gravity effect for first 3 mgal
c       and use factor from r / r0 =.5 for each cylinder gravity effect
c       from 3mgal to 9 mgal Note factor nonlinear but r/r0=1.0 is whole
c       cylinder and r/r0 = 0.0 is half the cylinder; r is radius to plane
c       cutting cylinder, ro is radius of cylinder
c       This would be appropriate for a well over the range front fault
c       where 3mgal due to fill over pediment, rest due to fill against
c       hanging wall
c-----------------------------------------------------------------------
c       date            programmer      event
```

```
c-----------------------------------------------------------------------
c       26 Dec 96       MEG             created
c       11 Dec 96       MEG     dpth 2 bottom by bisection added
c       23 Mar 99       MEG     cylinder factor as fn of grav anomaly added
c*---------------------------------------------------------------------*/
c*Disclaimer: Although this program has been used by the USGS, no       */
c*warranty, expressed or implied, is made by the USGS or the United     */
c*States Government as to the accuracy and functioning of the program   */
c*and related program material nor shall the fact of distribution       */
c*constitute any such warranty, and no responsibility is assumed by the */
c*USGS in connection therewith.                                          */
c*---------------------------------------------------------------------*/
c
        character filnam1*50, dflt50*50, qu*80, fmt*50, ids*20
        real rhoeff, gxsl, gxcy
        real rho1(101,4), rho2(101,4), zbar1(101), zbar2(101), fvsdg(21,2)
        real fdg(6), fro(6)
        logical verify
        data fdg/0.500,0.803,0.915,0.966,0.991,1.000/
        data fro/0.0,0.2,0.4,0.6,0.8,1.0/
c
c
c
        itin = 5
        itout = 6
```

```
      io2 = 11
      verify = .false.
      odpth = 0.0
      odz = 0.1
      rhoeff = 0.0
      gxcy = 0.0
      gxslc = 0.0
c
c     enter identification string
c
      qu='Enter identification string (<21c) [dpth2fun estimate]-->'
      dflt50 = 'dpth2fun estimate'
      call ttinaa(qu, ids, 20, dflt50, itin, itout, verify)
c
c     get filename & read file of depths to layers, drho, radius
c
      qu=
     1'Enter shallow density contrast & radius filename [dshlow.log]-->'
      dflt50 = 'dshlow.log'
      call ttinaa(qu, filnam1, 50, dflt50, itin, itout, verify)
      open(io2, file=filnam1, status = 'old')
      qu = 'Enter data format (<51c)[(4f10.3)]-->'
      dflt50 = '(4f10.3)'
      call ttinaa(qu, fmt, 50, dflt50, itin, itout, verify)
```

```
      nlayrs1 = 1
      write(itout,202)' Shallow density function'
202   format(a)
      write(itout,208)
208   format(6x,'ztop',6x,'zbot',6x,'drho',7x,'rad',6x,'zbar',4x,'cum dg',
     1 2x,'cum slab')
500   read(io2,fmt,end=510) (rho1(nlayrs1,i), i=1,4)
      zbar1(nlayrs1) = (rho1(nlayrs1,1)+rho1(nlayrs1,2))*0.5
      rhoeff = rhoeff + rho1(nlayrs1,3)*(rho1(nlayrs1,2)-rho1(nlayrs1,1))
      zt = rho1(nlayrs1,1)
      zb = rho1(nlayrs1,2)
      dr = rho1(nlayrs1,3)
      rad = rho1(nlayrs1,4)
      gxcy = gxcy + cylfn(zt,zb,dr,rad, 1.0)
      gxslc = gxslc + 41.908846 * dr * (zb-zt)
      write(itout,207) (rho1(nlayrs1,i), i=1,4), zbar1(nlayrs1), gxcy, gxslc
207   format(7f10.3)
      nlayrs1 = nlayrs1 + 1
      go to 500
510   nlayrs1= nlayrs1 - 1
      rhoeff = rhoeff / (rho1(nlayrs1,2) - rho1(1,1))
      gxsl = 41.908846 * rhoeff * (rho1(nlayrs1,2) - rho1(1,1))
      write(itout,204) rhoeff, gxsl, gxcy
204   format(/'Thickness weighted mean density=',f8.3/
     1 'Max.grav.effect infinite slab with this density=',f9.3/
```

```
     2 'Max.grav.effect cylinders of density model=',f9.3/)
       qu='Enter deeper density contrast & radius filename [ddeep.log]-->'
       dflt50 = 'ddeep.log'
       call ttinaa(qu, filnam1, 50, dflt50, itin, itout, verify)
       open(io2, file=filnam1, status = 'old')
       qu = 'Enter data format (<51c)[(4f10.3)]-->'
       dflt50 = '(4f10.3)'
       call ttinaa(qu, fmt, 50, dflt50, itin, itout, verify)
       rhoeff = 0.0
       gxcy = 0.0
       gxslc = 0.0
       nlayrs2 = 1
       write(itout,202)' Deep density function'
       write(itout,209)
209    format(6x,'ztop',6x,'zbot',6x,'drho',7x,'rad',6x,'zbar',4x,'cum dg',
     1 2x,'cum slab')
502    read(io2,fmt,end=512) (rho2(nlayrs2,i), i=1,4)
       zbar2(nlayrs2) = (rho2(nlayrs2,1)+rho2(nlayrs2,2))*0.5
       rhoeff = rhoeff + rho2(nlayrs2,3)*(rho2(nlayrs2,2)-rho2(nlayrs2,1))
       zt = rho2(nlayrs2,1)
       zb = rho2(nlayrs2,2)
       dr = rho2(nlayrs2,3)
       rad = rho2(nlayrs2,4)
       gxcy = gxcy + cylfn(zt,zb,dr,rad, 1.0)
```

```
      gxslc = gxslc + 41.908846 * dr * (zb-zt)
      write(itout,211) (rho2(nlayrs2,i), i=1,4), zbar2(nlayrs2), gxcy, gxslc
211   format(7f10.3)
      nlayrs2 = nlayrs2 + 1
      go to 502
512   nlayrs2 = nlayrs2 - 1
      rhoeff = rhoeff / (rho2(nlayrs2,2) - rho2(1,1))
      gxsl = 41.908846 * rhoeff * (rho2(nlayrs2,2) - rho2(1,1))
      write(itout,203) rhoeff, gxsl, gxcy
203   format(/'Thickness weighted mean density=',f8.3/
     1 'Max.grav.effect infinite slab with this density=',f9.3/
     2 'Max.grav.effect cylinders of density model=',f9.3/)
c
c     get cylinder factor vs gravity effect function
c
      qu='Enter gravity anomaly vs cylinder factor filename
     1 [fctrvsdg.dat]-->'
      dflt50 = 'fctrvsdg.dat'
      call ttinaa(qu, filnam1, 50, dflt50, itin, itout, verify)
      open(io2, file=filnam1, status = 'old')
      qu = 'Enter data format (<51c)[(2f10.3)]-->'
      dflt50 = '(2f10.3)'
      call ttinaa(qu, fmt, 50, dflt50, itin, itout, verify)
      nftr = 1
      write(itout,202)' Gravity anomaly vs cylinder factor function'
```

```
      write(itout,212)
212   format(4x,'deltag',6x,'R/Ro',4x,'factor')
503   read(io2,fmt,end=513) fvsdg(nftr,1), roverro
      call interp(fro,fdg,6,4,roverro,fvsdg(nftr,2))
      write(itout,211) fvsdg(nftr,1), roverro, fvsdg(nftr,2)
      nftr = nftr + 1
      go to 503
513   nftr = nftr - 1
c
c     get parameters
c
      ozct = 0.0
      ozmax = 0.0
      odgobs = 0.0
300   write(qu,200) ozct
200   format('Enter depth to interface, km [',f8.3,']-->')
      call ttinr4(qu, zct, ozct, itin, itout, verify)
      write(qu,205) ozmax
205   format('Enter max depth, km [',f8.3,']-->')
      call ttinr4(qu, zmax, ozmax, itin, itout, verify)
      write(qu,210) odgobs
210   format('Enter grav.anomaly [',f8.3,']-->')
      call ttinr4(qu, dgobs, odgobs, itin, itout, verify)
      zacc = 0.001
```

```
      njmax = 40
c
c     calculate depth to bottom by bisection
c
      call dgtot1(zct, zmax, nlayrs1, rho1, nlayrs2, rho2,
     1 nftr, fvsdg, dg)
      zmid = zct
      call dgtot1(zct, zmid, nlayrs1, rho1, nlayrs2, rho2,
     1 nftr, fvsdg, dgmid)
      f = dgobs - dg
      fmid = dgobs - dgmid
c     write(*,'(a,2f9.3)')'f,fmid:',f,fmid
      if(f*fmid.ge.0.0) then
        write(itout,'(a,f9.3,a,f9.3)')'no solution between dg(zct)',
     1    dgmid,'and dg(zmax)',dg
        go to 302
      endif
      if (f.lt.0.0) then
        rtbis = zmax
        dz = zct - zmax
      else
        rtbis = zct
        dz = zmax - zct
      endif
      do 50 i=1,njmax
```

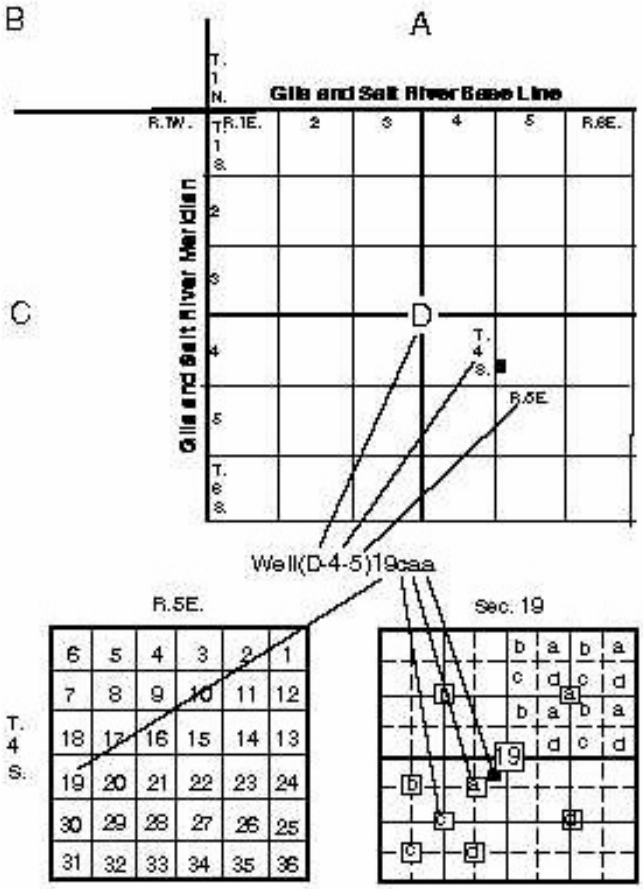
```
      dz = dz * 0.5
      zmid = rtbis + dz
      call dgtot1(zct, zmid, nlayrs1, rho1, nlayrs2, rho2,
     1 nftr, fvsdg, dgmid)
      fmid = dgobs - dgmid
c     write(*,'(a,f9.3)')'fmid:',fmid
      if(fmid.le.0.0) rtbis = zmid
      if(abs(dz).lt.zacc.or.abs(fmid).lt.0.001) go to 304
50    continue
304   write(itout,'(a,a,f9.3,a,f9.3)') ids,'depth to bottom:',zmid,
     1 ' misfit:', fmid
      write(itout,'(1x)')
      ozct = zct
      ozmax = zmax
      odgobs = dgobs
302   qu = 'Enter 1 to quit, 0 to recalculate [0]'
      call ttini4(qu, iquit, 0, itin, itout, verify)
      if(iquit.eq.0) go to 300
      stop
      end
      function stkcrcyl(h1,h2,nlayrs,rho,c,nftr,fvsdg)
c
c     calc dg of stack of coincident axis vert cylinders from depth h1
c     down to depth h2 using array rho for ztop,zbot,drho,rad
```

```
c       NOTE rho(nlayrs,2) must be greater than H;
c       c is offset for model grav dg, removed before return
c       nftr is # entries in factor vs dg table
c       fvsdg is factor vs dg table dg first entry, f is 2nd
c        MEG mod for factor Mar99
c
        real h1, h2, rho(101,4), fvsdg(21,4), c
        real*8 dg
        integer nlayrs, nftr
        dg = c * 1.0d0
        do 50 i=1,nlayrs
        if(h1.ge.rho(i,2)) go to 50
        zt = rho(i,1)
        zb = rho(i,2)
        dr = rho(i,3)
        rad = rho(i,4)
        fctr = 1.0
        do 70 j=1,nftr
        if(dg.ge.fvsdg(j,1)) then
          fctr = fvsdg(j,2)
          go to 72
        endif
70      continue
72      continue
c       write(*,'(a,2f10.3)')'factor ',fctr,dg
```

```
      if(h1.ge.rho(i,1).and.h1.lt.rho(i,2)) then
              if(h2.lt.rho(i,2)) go to 57
              dg = dg + cylfn(h1,zb,dr,rad,fctr)
              go to 50
      endif
      if(h2.lt.rho(i,2)) go to 55
      dg = dg + cylfn(zt,zb,dr,rad,fctr)
50    continue
      go to 60
55    dg = dg + cylfn(zt,h2,dr,rad,fctr)
      go to 60
57    dg = dg + cylfn(h1,h2,dr,rad,fctr)
60    stkcrcyl = dg - c
      return
      end
      function cylfn(ztop,zbot,drho,rad,f)
c     gravity effect of vert. axis circular cylinder at pt on axis
c     multiplied by factor f
      real*8 t
      t = zbot - ztop + sqrt(rad*rad + ztop*ztop)
     1   - sqrt(rad*rad + zbot*zbot)
      cylfn = 41.908846 * drho * t * f
      return
      end
```

```
      subroutine dgtot1(zct, ztot, nlayrs1, rho1, nlayrs2, rho2,
     1 nftr, fvsdg, dg)
c
c       subroutine to calculate gravity effect of a stack coaxial cylinders
c       with density fn rho1 to depth zct, rho2 from zct to zbot
c       array fvsdg gives proportion of cylinder (<=1.0) to use if grav
c       effect is >= to fvsdg(i,1)which is a negative #
c       MEG/USGS/Dec96; Mar 99 fvsdg added
c
      dimension rho1(101,4),rho2(101,4), fvsdg(21,2)
      dg = stkcrcyl(0.0,zct,nlayrs1,rho1,0.0,nftr,fvsdg)
      dg = dg + stkcrcyl(zct,ztot,nlayrs2,rho2,dg,nftr,fvsdg)
      return
      end
```

APPENDIX 6

WELL-NUMBERING SYSTEM

The well numbers used by the U.S. Geological Survey in Arizona are in accordance with the Bureau of Land Management's system of land subdivision. The land survey in most of Arizona is based on the Gila and Salt River meridian and base line, which divide the State into four quadrants. These quadrants are designate counterclockwise by the capital letters A, B, C, and D. All land northeast of the point of origin is in A quadrant, that northwest in B quadrant, that southwest in C quadrant, and that southeast in D quadrant. The first digit of a well number indicates the township, the second the range, and the third the section in which the well is situated. The lowercase letters a, b, c, and d after the section number indicate the well location within the section. The first letter denotes a particular 160-acre tract, the second a 40-acre tract, and the third a 10-acre tract. These letters are assigned in a counterclockwise direction, beginning in the northeast quarter. If the location is known to within the 10-acre tract, three lowercase letters are shown in the well number. In the example shown, well number (D-4-5)19caa designates the well as being in the NE1/4NE1/4SW1/4 sec. 19, T.4 S., R. 5 E. Where there is more than one well within a 10-acre tract, consecutive numbers beginning with 1 are added as suffixes.