APPENDIX A -- DATA COMPILATION

A.1 Data Compilation

Data were compiled from a range of public and private sources, both published and unpublished, and imported into ArcGIS to create a series of data layers for later analysis. The data collected include geologic maps at scales from 1:24,000 to 1:250,000, structural features (faults, lineaments), vent locations, ages, and types from geologic maps and other sources, heat flow from the USGS and SMU databases, groundwater temperatures (USGS, IDWR), existing regional gravity data as well as newly collected high resolution profile data, and processed potential field data yielding subsurface structural interpretations and Curie temperature depths, passive seismic velocity, magnetotelluric and crustal thickness data from *Earthscope*, regional EM data from USGS reports, the location of 56 commercially-available active source seismic lines and other public domain seismic lines, distribution, thickness and age of lacustrine sediment seals, the distribution and temperatures of thermal springs and wells from IDWR and NGDS, water chemistry and stable isotope chemistry from USGS and from partner GTO-funded projects, and He isotopes from partner GTO-funded projects. Significant data types and sources are listed below.

A.1.1 Geologic Maps

Geologic maps used for the project (many available as GIS shape files) include those published by the USGS and Idaho Geological Survey (IGS), and unpublished maps. Most of the SRP and adjacent areas are covered by 1:100,000 1º sheets or 1:125,000 county maps, most of which are compiled from mapping done originally at 1:24,000 scale (7.5' quadrangle) or in a few cases, 1:62,500 scale (15' quadrangle). A few areas are represented by older 1:250,000 scale maps (2º sheets). Primary references for the 1:100,000 to 1:250,000 maps include: *Othberg et al (2012); Worl et al (1991);, Garwood et al (2014); Jenks et al (1998); Bonnichsen and Godchaux (2006); Othberg and Stanford (1992); Skipp et al (2009); Kuntz et al (2007); Link and Stanford (1999; Long and Link (2007); Ekren et al. (1981); Worl and Johnson (1995); Kuntz et al (2007); Oriel and Platt, 1980); and Rember and Bennett (1979a, 1979b, 1979c).*

Regardless of scale, all of these maps are available in high resolution PDF format, which enables us to import the trimmed map sheets into Arc GIS or Google Earth and to rubber-sheet them into geographic coordinates as image files. These were used to compile vent locations and sizes. A GIS-based geologic map of the state provided a starting point for the overall geology as well as the distribution of lacustrine sediments in the western SRP.

Many areas of the SRP are covered by 1:24,000 scale 7.5' quadrangle maps, which provide our highest resolution maps. Although these are too detailed for regional scale analysis, they will be useful in Phase 2 when we focus on specific prospects. In addition to published maps, we also used unpublished mapping in the Mountain Home area (*e.g., Shervais et al, 2002;* 1:12,000 scale, six 7.5' quadrangles) that is currently being prepared for publication.

Primary maps used for this regional scale study (1:100,000 to 1:250,000) are listed below:

APPENDIX A -- DATA COMPILATION

Map Title	Publication Source & Number	Year	Scale
Geologic Map of the Twin Falls 30 x 60 Minute Quadrangle, Idaho.	Idaho Geological Survey, Geologic Map GM-49	2012	1:100,000.
Geologic Map of the Fairfield 30 x 60 Minute Quadrangle,	Idaho. Idaho Geological Survey, Digital Web Map, DWM-171	2014	1:100,000.
Geologic Map of the Grand View-Bruneau Area, Owyhee County, Idaho.	Idaho Geological Survey, Technical Report T-98-1	1998	1:100,000.
Geologic Map of the Murphy 30 x 60 Quadrangle, Ada, Canyon, Elmore, and Owyhee Counties, Idaho.	Idaho Geological Survey, Digital Web Map, DWM-80	2006	1:100,000.
Geologic Map of the Boise Valley and Adjoining Area, Western Snake River Plain, Idaho.	Idaho Geological Survey, Geologic Map, GM-18	1992	1:100,000.
Geologic Map of the Arco 30 x 60 Minute Quadrangle, South-Central Idaho.	Idaho Geological Survey, Geologic Map, GM-47	2009	1:100,000.
Geologic Map of the Northern and Central Parts of the Idaho National Engineering and Environmental Laboratory, Eastern Idaho.	Idaho Geological Survey, Geologic Map, GM-35	2003	1:100,000.
Geologic Map Compilation of the Pocatello 30 x 60 Minute Quadrangle, Idaho.	Idaho Geological Survey, Technical Report T-99-2	1999	1:100,000.
Geologic Map Compilation of the Malad City 30 x 60 Minute Quadrangle, Idaho.	Idaho Geological Survey, Technical Report T-07-1	2007	1:100,000.
Geologic map of the Owyhee County, Idaho, west of longitude 116 degrees W.	U.S. Geological Survey, Misc. Investigations Series Map I-1256	1981	1:125,000.
Geology and mineral deposits of the Hailey 1° x 2° quadrangle and the western part of the Idaho Falls 1° x 2° quadrangle, Idaho.	U.S. Geological Survey Bulletin 2064-A	1995	1:250,000
Geologic map of the Craters of the Moon 30' X 60' quadrangle, Idaho.	U.S. Geological Survey, Scientific Investigations Map SIM-2969	2007	1:100,000.
Geologic map of the Preston 1º X 2º quadrangle, southeastern Idaho and western Wyoming	U. S. Geological Survey Misc. Investigation Series Map I-1127	1980	1:250,000
Geologic map of the Idaho Falls quadrangle, Idaho.	Idaho Geological Survey, Geologic Map GM-12	1979	1:250,000
Geologic Map of the Hailey 1° x 2° Quadrangle, Idaho.	Idaho Geological Survey, Geologic Map, GM-10	1991	1:250,000.
Geologic map of the Twin Falls quadrangle, Idaho.	Idaho Geological Survey, Geologic Map GM-17	1979	1:250,000.
Geologic map of the Pocatello quadrangle, Idaho.	Idaho Geological Survey, Geologic Map GM-13,	1979	1:250,000.

Data links: *http://ngmdb.usgs.gov/ngmdb/ngmdb_home.html, http://mrdata.usgs.gov/geology/state/state.php?state=ID*, https://mrdata.usgs.gov/sgmc/id.html, *https://www.idahogeology.org/*

A.1.2 Heat Flow, Thermal Gradients, and Groundwater Temperatures

Heat flow and thermal gradient drill hole data were compiled from USGS and Southern Methodist University (SMU) Geothermal Lab databases (*e.g., Williams and DeAngelo, 2008; 2011; Blackwell et al., 1989; Blackwell and Richards, 2004*), plus data from the National Geothermal Data System. Some deep wells in the SMU database have multiple gradient intervals with separate conductivity measurements that are averaged for the entire well. Heat flow data are not evenly distributed, with the highest density of measurements found in the WSRP and across the border in eastern-most Oregon, near Neal Hot Springs. Gradient wells in the eastern SRP are clustered at the INL site and along the eastern edge of the plain near Island Park caldera, with scattered coverage elsewhere. Large data gaps are found in the axial region from Idaho Falls to Hagerman (on the western edge of the Central SRP (CSRP)). These gaps correspond largely to the distribution of the Snake River aquifer, which renders measurement of conductive thermal gradients impossible in all but the deepest wells. Further, if thermal gradients are estimated from bottom hole temperatures and surface temperatures, the resulting gradient will be too shallow and give erroneously low heat flow. We have used data on aquifer distribution and thickness to correct for this effect where possible, both in the Snake River Aquifer system and in the smaller but still important system on the Mountain Home plateau (see section 2.1.9 Aquifers). In addition, new heat flow data from two Hotspot wells and one older well provide important new control points within these data gaps.

Groundwater temperature reflects thermal flux from below. Groundwater and surface flow from the mountains of eastern Idaho and Wyoming is characterized by temperatures ~8ºC, which represents the baseline temperature of the Snake River aquifer in the eastern and CSRP. Groundwater temperatures increase gradually from NE to SW in this region in response to thermal flux from below the aquifer (*e.g., Blackwell et al 1992; Smith, 2004; McLing et al., 2014*). Further, ground water temperatures are uniformly high in the WSRP due to the thick insulating layer of lacustrine sediments. Because groundwater temperatures respond well to the underlying heat flux, they can be used as a proxy for heat flux to supplement the more limited heat flow database. Data links: *http://geothermal.smu.edu/gtda/, https://idwr.idaho.gov/.*

A.1.3 Volcanic Activity

Areas with high concentrations of young volcanic vents are likely to overlie magma chambers or recent sill intrusions, making them a proxy for magmatic heat centers in the crust. Vent locations for basalts and rhyolites were compiled from a range of sources and cross-checked against topographic features and geologic maps for accuracy and completeness. Radiometric ages, though rare, were compiled where available, and all vents were classified by age using radiometric ages, magnetic polarity, or stratigraphic relations from geologic maps. Vents were binned into six age groups, as follows:

Group	Age Range	Stratigraphic Age	Polarity	Weight
Group 1:	<75 ka	Holocene plus	Normal	1.0
Group 2:	75 – 400 ka	Late Pleistocene	Normal	0.95
Group 3:	400 – 780 ka	Middle Pleistocene	Normal	0.90
Group 4:	0.78 – 2.58 Ma	Early Pleistocene	Mostly Reverse	0.8
Group 5:	2.58 – 5.23 Ma	Pliocene	Mixed	0.7
Group 6:	>5.23 Ma	Miocene-older	Mixed	0.5

In order to correct for age-related degradation of small vents (e.g., cinder and spatter cones), which are over-represented in young volcanic fields, a size factor was assigned to each vent ranging from 0.1 for small cinder or spatter vents to 1.0 for shield volcanoes. Size factors were assigned using a rubric for the type of vent (rhyolite domes = 1; basalt shield ≥1 km = 1.0; small basalt shield = 0.5-0.7; basalt cinder-spatter = 0.1-0.3; satellite or rift vents =0.2-0.5; small hydrovolcanic vents/maars = 0.3-0.4; large hydrovolcanic vents/maars 0.7-1.0), with the actual value assigned based on visual observation of the relative size of each vent structure. The vent clusters located around Table Butte (near Mud Lake in the ESRP) represent parasitic vents caused by hydrovolcanic explosions when lava poured onto wet lake beds of paleo-Mud Lake. These were given a weight of 0.01.

Composition codes were assigned to track (1) Snake River Olivine Tholeiite (SROT), (2) highly evolved Craters of the Moon-type lavas, (3) Fe-rich SROT, (4) plume-type high-K alkali olivine basalts, (5) rhyolite lavas and (6) rhyolite ash flows. Since relatively few flows have published chemistry, many flows were assigned a composition code based on its location, e.g., all Holocene plus vents of the Craters of the Moon-Great Rift field are Type 2 evolved basalts, whereas all other basalts of the central and eastern SRP are SROT (*e.g., Kuntz 1992; Putirka et al 2009; Shervais et al, 2005; 2006; Shervais and Vetter 2009; Jean et al, 2013; Hughes et al 2002; Geist et al 2002*).

Sources for vent locations and ages include *Hughes* (ESRP and COM; personal communication, 2015), *Wetmore et al. (2010:* ESRP), *Hackett et al. (2002:* ESRP, < or > 400 ka), *Bonnichsen and Godchaux (2002:* WSRP and CSRP), *Bonnichsen (1982:* Bruneau-Jarbidge eruptive center basalt vents), *Wood and Clemens (2002:* WSRP and Mount Bennett Hills), *Shervais et al. (2002, 2005,* and unpublished mapping: WSRP and CSRP), *Howard et al. (1982*: Boise River South Fork), and most of the geologic maps listed above, as well as larger scale (1:24,000) maps (*e.g., Howard and Shervais, 1973; Othberg et al, 2005; Matthews et al, 2006a, 2006b; Cooke et al, 2006a, 2006b; Shervais 2006a, 2006b; Kauffman et al, 2005*).

A.1.4 Faults and Lineaments

Faults and lineaments were compiled largely from two sources: (1) USGS Quaternary fault database (QFFDB: Machette et al, 2003), and (2) Idaho Geological Survey database of Miocene and younger faults. Additional faults were compiled from geologic maps, and in the area west of Twin Falls, faults and lineaments mapped from NASA 10m DEM (Project Hotspot Final

Report). The Idaho Geological Survey (IGS) database is more extensive but contains less information on the fault segments, so where duplicate records occur the USGS record was retained and the IGS record discarded. Individual fault strands are digitized into numerous short segments, each of which is considered a separate fault segment during data processing (e.g., density counts). As discussed below, all fault segments are evaluated for slip and dilation tendency within the regional stress field, and these tendency values (0-1.0) are used as weights in the density functions.

In addition to mapped surface faults, we also digitized subsurface lineaments from maximum horizontal gradients in gravity and magnetic anomalies. These lineaments are interpreted to represent major structural discontinuities in the subsurface. These data are crucial for most of the SRP because exposed faults are rare within the plain, but these structures are known to host geothermal permeability at depth (*e.g., Shervais et al., 2014*). As with the mapped surface faults, these lineaments are evaluated for slip and dilation tendency within the regional stress field, and these tendency values are used as weights in the density functions.

Data links*: https://www.usgs.gov/natural-hazards/earthquake-hazards/hazards,*
http://web2.nbmg.unr.edu/arcgis/rest/services/ID_Data/IDActiveFaults/MapServer
http://mrdata.usgs.gov/,

A.1.5 Geophysical Data

Geophysical data used in this study included: gravity and magnetic potentials, resistivity, MT and regional stress data compiled by the USGS, including new high-resolution gravity and magnetic data produced by Project Hotspot and the distribution of subsurface lineaments derived from maximum horizontal gradients in gravity and magnetic data.

Seismic reflection and refraction lines, including lines shot by Chevron in the 1980s, are available mostly for the WSRP, with other lines in the over thrust belt of SE Idaho. Boise State University (BSU) completed the analog to digital conversion of about 210 km of seismic lines from the WSRP, including six lines from the *Seismic Data Exchange* inventory of seismic profiles from the WSRP (160 km) and seven digital profiles from other sources (50 km). This inventory does not include the short profiles collected by BSU projects. These data are publicly available, owned by participants, or for sale by the Seismic Data Exchange.

Crustal scale seismic profiling data (refraction and receiver function analyses) and earthquake seismic data (NEIC and INL) from southern Idaho are compiled and integrated into our analyses. These datasets include seismic profiles published across the WSRP by *Hill and Pakiser (1966)* and by *Sparlin et al. (1982), Peng and Humphreys (1998), and DeNosaquo et al. (2009)* for the ESRP. USArray (Earthscope) seismic and magnetotelluric results provide the lithospheric framework, crustal thickness, and identify highly conductive regions beneath southern Idaho (*e.g., Eager et al., 2001; Smith et al., 2009; Gao et al., 2009; Kelbert et al., 2012*).

Gravity data from Project Hotspot (1866 new gravity stations) were combined with gravity data from the surrounding areas (including parts of ID, OR, NV, UT, WY and MT) downloaded from the PACES data portal (*Pan-American Center for Earth and Environmental Studies, 2009*).

Existing data provided regional coverage between detailed high-resolution gravity profiles and to extend profiles beyond the plain. The regional magnetic grid used in this report was derived from the Magnetic Anomaly Map of North America (*Bankey et al., 2002*). We have also used a higher resolution grid for the State of Idaho (*McCafferty et al., 1999*).

Additional datasets integrated into our analyses include geodetic results from *Payne et al. (2013)* and local magnetotelluric and resistivity survey results. These surveys, summarized by *Stanley (1982)* across the ESRP and *Whitehead (1992, 1996)* across the SRP, have provided the framework for resistive sedimentary basin geometries and more conductive aquitards that may cap blind geothermal systems.

Data links: *http://research.utep.edu/Default.aspx?tabid=37229, http://crustal.usgs.gov/projects/namad/the_project.html*, *http://pubs.usgs.gov/of/1999/ofr-99-0371/idaho.html, http://pubs.usgs.gov/of/1999/ofr-99-0557/html/id_1st.htm*.
ID Aeromagnetic compilation map: http://pubs.usgs.gov/of/1999/ofr-99-0371/idaho.html,
Individual magnetic surveys within ID: http://pubs.usgs.gov/of/1999/ofr-99-0557/html/id_1st.htm"

A.1.6 Mechanical Properties of Reservoir Rocks

Rock mechanical properties of core, correlated with borehole geophysical logs, are available only for two deep wells drilled by Project Hotspot: the 1923 m deep Kimama drill hole and the 1812 m deep Mountain Home 2 drill site (*Kessler, 2014*). The Kimama site is typical of the CSRP and ESRP and provides an analogue for what to expect in any deep holes drilled in this part of the study area. Lithology and alteration in the Kimama core can be correlated with core from other deep drill holes in the CSRP and ESRP (e.g., the 1524 m WO-2 well on the INL site, the 343 m deep Wendell-RASA well NW of Twin Falls, and the 696 m deep Sugar City well near Rexburg, Idaho). The Mountain Home site is typical of the western SRP, and can be correlated with core from other deep holes in this area (*e.g.,* 2743 m deep Bostic 1A well, 4389 m deep JN James well, and the 2750 m deep Deer Flat well). This allows us to estimate mechanical properties at these other sites based on detailed results from Kimama and Mountain Home.

A.1.7 Geochemistry and Geothermometry of Geothermal Wells and Thermal Springs

Measured temperatures, geochemistry and geothermometry of geothermal wells and thermal spring waters were obtained from USGS, IGS, and NGDS databases, as well as from ongoing studies being carried on by researchers at INL, the University of Idaho, and LBNL. We have partnerships with two DOE-funded research projects, which have been gracious enough to share their current data with us:

– Pat Dobson and Mack Kennedy, LBNL: *Use of He isotopes for Geothermal Resource Identification in the Cascades and Snake River Plain*.

– Earl Mattson, Travis McLing, Hari Neupane (INL), Mark Conrad (LBNL), Tom Wood, Cody Cannon, Wade Worthing (U-Idaho): *Geothermometry Mapping of Deep Hydrothermal Reservoirs in Southeastern Idaho*.

These data include results from recently developed multicomponent geothermometers as well as traditional cation methods (*e.g., Spycher et al., 2014; Palmer, 2014; Neupane et al., 2014*) and new and compiled He isotope data (*Dobson et al., 2015*) (Fig. 2-8).

Measured water temperatures are used to document the occurrence of hot water springs and wells, but measured temperatures are often too low because of cooling or mixing with cooler waters. Geothermometry based on silica, cations, or multiple elemental components (*e.g., Giggenbach and Goguel, 1989; Powell and Cumming, 2010; Spycher et al., 2014; Palmer et al., 2014*) is used to circumvent this problem by estimating the temperature of the geothermal reservoir, assuming it is in equilibrium with common rock-forming minerals and their associated alteration products such as feldspar, clays, and quartz. There is often significant variation among different thermometers, which may reflect dilution with non-thermal waters or chemical disequilibrium.

He isotopes are measured in terms of $^3He/^4He$ relative to atmospheric compostion (R/Ra). ^3He is stable (not produced by radioactive decay), and is lost from the atmosphere by diffusion into space preferentially. ^4He is created by radiogenic decay of heavy elements to form alpha particles, which are basically ^4He nuclei. Since these elements (U, Th and their by-products) are concentrated in continental crust, ^4He increases in the crust over geologic time, resulting in extremely low crustal $^3He/^4He$ ratios (<0.1 R/Ra largely). Values R/Ra > 1.0 require input from a mantle reservoir that preserves primitive He isotope ratios; this is commonly accomplished by the intrusion of mantle-derived mafic magma (*e.g., Kennedy and van Soest, 2007*). Thus, high $^3He/^4He$ ratios record both relatively recent mantle-derived magmatism, and the presence of highly permeable pathways that allow this He (released by degassing magmas) to move quickly through the crust, where it is captured by groundwater and sampled.

A.1.8 Aquifer Systems

The Snake River Plain is characterized by major aquifer systems that can have a significant impact on heat flow measurements and on the drilling depth needed to achieve sufficiently high temperatures for power production. Data for the distribution, thickness, and impact of these aquifers is obtained largely from publications of the USGS and the Idaho Department of Water Resources: *Whitehead (1986), Whitehead and Lindholm (1985), Lindholm (1996), Whitehead (1992), Garabedian (1992), Newton (1991), Wood and Anderson (1981), Smith (2004),* and many others.

The most significant is Snake River Aquifer system of the ESRP-CSRP. This system is fed in the NE by inflow from the Big and Little Lost Rivers, Birch Creek, and the Yellowstone plateau, and it emerges into the Snake River in a series of spectacular springs in the Thousand Springs-Hagerman area, 200-300 km SW of its recharge areas. Deep wells on the INL site show that this aquifer extends to depths of 200 to 550 m depth in the ESRP, and the Kimama well of Project Hotspot documents a depth of 980 m in the CSRP. The base of the aquifer is defined by the change from convective, nearly isothermal gradients within the aquifer, and conductive gradients below (*Smith 2004*). The distribution and thickness of this aquifer has been delineated from electrical resistivity and well data by *Lindholm (1996)* and *Whitehead (1992)*.

The Snake River Aquifer is bounded on its southern and western margins by the Snake River canyon. In the CSRP and ESRP, aquifers flow towards the Snake River from mountain ranges in the south. This includes a low-temperature geothermal aquifer system in the Twin Falls area that constitutes an existing thermal district (*Garabedian, 1992; Lindholm, 1996; Whitehead, 1992*).

In the WSRP, aquifers are limited by the distribution of impermeable lacustrine sedimentary rocks, and surface drainages include the Bruneau, Jarbidge, Owyhee, and Boise Rivers, as well as the Snake. Gravel deposits comprise shallow aquifers in the Boise area, and a perched aquifer in the Mountain Home area. The plateau between Boise and Mountain Home is capped by up to 300 m of basalt that hosts localized aquifers. These basalts are underlain by impermeable lacustrine sediments (*Newton, 1991; Wood 1994; Wood and Clemens, 2002*).

Heat flow measurements made in the eastern Snake River Aquifer are erroneously low unless the wells measured are deep enough to penetrate the aquifer into the underlying conductive gradient. Our heat flow database has been corrected for this to the extent possible (*e.g., Williams and DeAngelo, 2014*), but it may be that some heat flow values are still affected. Similarly, the basaltic aquifer on the Mountain Home plateau in the WSRP appears to have had a similar affect on some measurements there. Again, we have endeavored to remove affected wells where we can document problems by using the thickness of the aquifer to screen for wells that are too shallow to penetrate below its base.

A.1.9 Lithology and Wireline Logs of Deep Wells

Lithologic and borehole geophysical logs were compiled for deep wells, e.g., test wells at the INL site, USGS water resource and geothermal test wells, passive geothermal wells (Boise, Twin Falls districts), and wildcat petroleum exploration wells. The most complete records are from Project Hotspot (EE0002848), which drilled deep (1.8 to 1.9 km deep) holes at three locations across the SRP (*Hotspot Final Report, National Geothermal Data System (NGDS)*). These wells provided about 5300 m of core and a complete set of wireline logs for each drill hole. Other deep holes that provided more limited data (typically lithologic logs, but some with wireline logs and temperature data) include INEL-1 and WO-2 (1524m) at the INL site, Sugar City (696m) and Wendell-RASA (343m) in the ESRP and CSRP, and MH-1 (1342m), Bostic 1A (2743m), JN James (4389m), Champlin Petroleum Upper Deer Flat No. 11-19 (2750m), and Anschutz Federal #1 (3391m) in the WSRP (*Doherty, 1979; McIntyre, 1979; Embree et al., 1978; Doherty et al, 1979; Arney et al, 1982; Whitehead and Lindholm, 1985; Hackett et al, 1994; Breckenridge et al, 2006; Jean et al, 2013*).

Most water wells in the central and eastern SRP are too shallow to reveal much information, but an exception to this is the Twin Falls Warm Water district, which contains a large number of moderately deep wells (150m to 670m depth) that tap into a low-temperature geothermal aquifer at 37ºC to 42ºC, used for passive space heating. Because they are located along the southern margin of the CSRP, these wells typically penetrate basalt and bottom in rhyolite lavas or welded ash flow tuffs. These wells lie outside the basaltic Snake River Aquifer and provide information on a distinct hydrologic system that lies largely south and west of the Snake River. Relatively shallow (≤250m) well data from the Burley and American Falls area are important for establishing the extent and thickness of lacustrine sediments from paleo-Lake Burley and paleo-Lake American Falls, which represent the most important lake seals in the ESRP (*Neal Farmer, IDWR, personal communication, 2010; Desborough et al, 1989; Phillips and Welhan, 2006, 2011*). The distribution of lacustrine sediment seals is shown in the Phase 1 Favorability Model (https://gdr.openei.org/submissions/1287), including seals due to Lake Idaho and the Camas Prairie basin.

Lithologic and other logs for INL and other wells (Wendell-RASA, Sugar City) are available from USGS open file reports (*Doherty, 1979; Anderson et al, 1996, 1997; Embree et al., 1978; Doherty et al, 1979; Whitehead and Lindholm, 1985*), water well data are maintained by the Idaho Department of Water Resources, and the Idaho Land Commission maintains records for all oil and gas wells (paper records; *Breckenridge et al 2006*). Data for all of the Project Hotspot wells has been uploaded to the NGDS (*Shervais et al, 2013, Hotspot Final Report*).

A.1.10 Cadastral Data

The Snake River Plain PFA study area encompasses a wide variety of political, land use, cultural, infrastructural, and environmental attributes. Cadastral data was assembled using the *Geothermal Prospector* mapping tool developed by NREL for the DOE Geothermal Technologies Office. *Geothermal Prospector* is designed to assist users in determining locations that are favorable to geothermal energy development.

Key regional cadastral data layers include: Political (Federal, State, Tribal lands), Land Ownership (Private, BLM restricted, NFS restricted, DOD restricted, Other restricted), Environmental (Areas of critical environmental concern, Brownfields, BLM closed areas, National Forest Service closed areas, Wilderness areas and study areas, Greater Prairie Chicken/Sage Grouse range), Infrastructure (operating geothermal plants, developing geothermal projects, Transmission corridors), and Resource (Known Geothermal Resource Areas (KGRA)).

Geothermal exploration and development is possible across the vast majority of the Snake River Plain study area. Cadastral maps show those areas in which geothermal exploration and development can be expected to be closed or restricted. Among the closed or restricted areas are certain Federal lands (BLM, NFS, Wilderness, and DOD), State lands, Tribal lands, and lands designated as environmentally sensitive under various jurisdictions. Private lands may be accessible for geothermal development on a case-by-case lease basis. Land accessibility and geothermal leasing status will be examined in finer detail in the selected fairway and prospect areas identified in Phase 2 of the SRP Geothermal Play Fairway Analysis Project.

https://maps.nrel.gov/geothermal-prospector/#/?aL=nBy5Q_%255Bv%255D%3Dt&bL=groad&cE=0&lR=0&mC=40.21244%2C-91.625976&zL=4

A.1.11 Comparisons with Existing Geothermal Systems

Information on the characteristics of known geothermal play types, hydrothermal occurrences and related subsurface model interpretations has been published by a variety of researchers and academic institutions worldwide, industry organizations such as the International Geothermal

Association and the Geothermal Resources Council, the US National Laboratories, and international research institutions. Links to much of this play type and occurrence model data can be accessed on the geothermal pages of the site Openei.org.

NREL comprehensive worldwide database of geothermal reservoir properties is available through NREL.

https://maps.nrel.gov/geothermal-prospector/#/?aL=nBy5Q_%255Bv%255D%3Dt&bL=groad&cE=0&lR=0&mC=40.21244%2C-91.625976&zL=4

Appendix B: Magnetotelluric Surveys

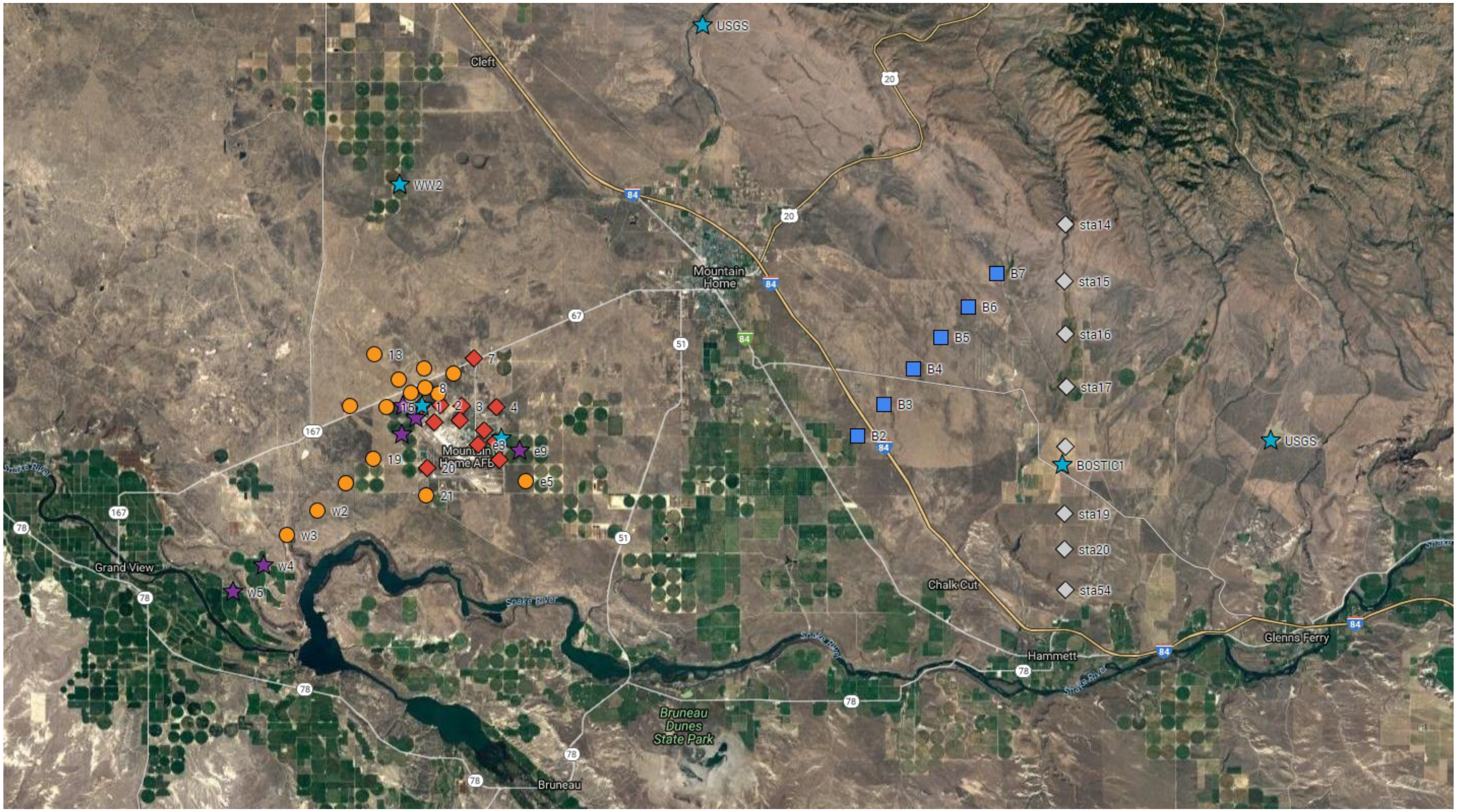

Figure B1. Location of MT stations in the Mountain Home region. Red diamonds - MH-AFB sites; orange circles - BLM sites near AFB; purple stars – private land sites; blue squares – Bostic traverse sites on BLM property; gray diamonds – Unocal stations. Existing wells (blue stars) are also shown.

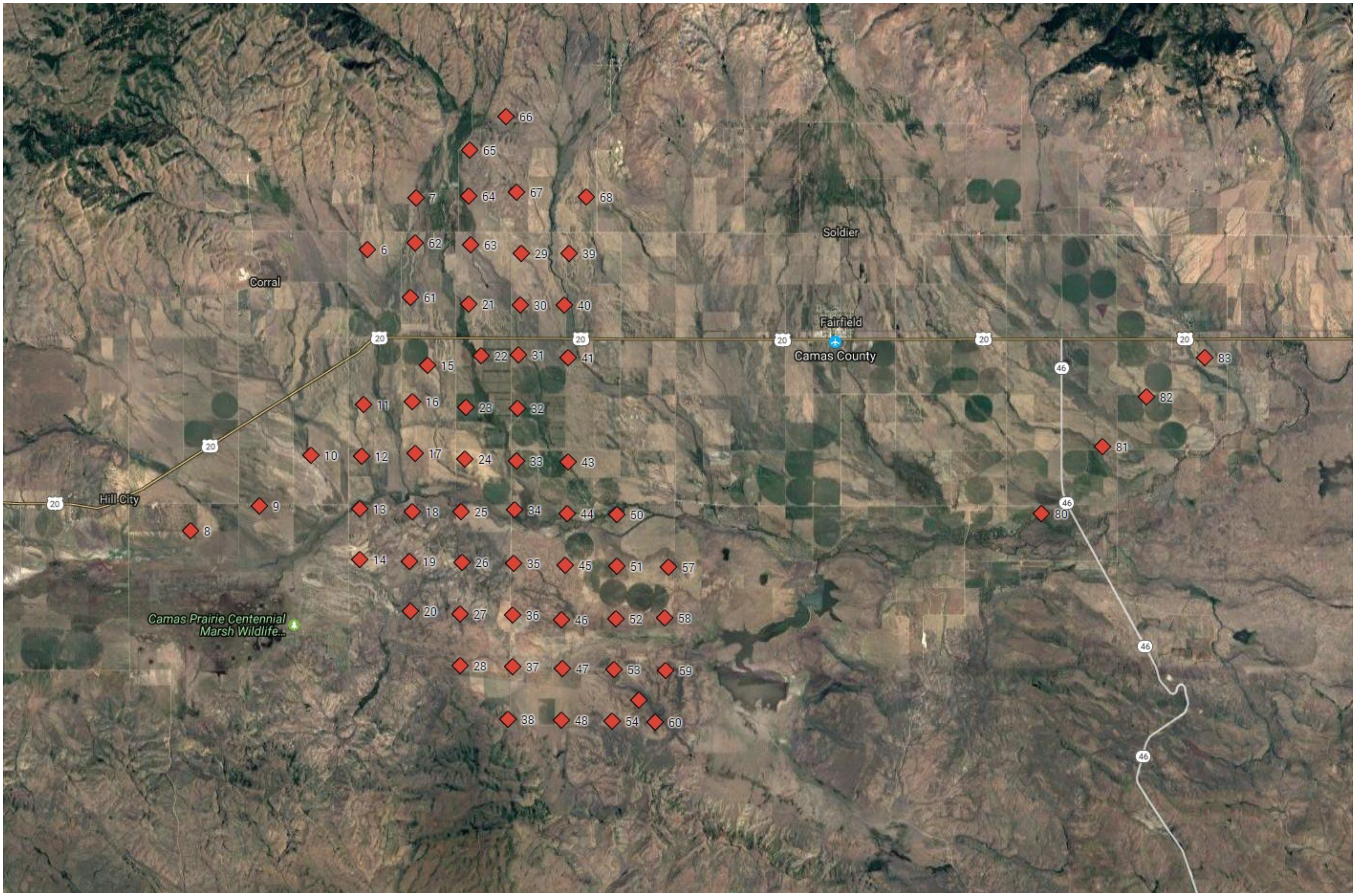

Figure B2. Location of MT stations in Camas Prairie. The array is designed to capture structures associated with The Pothole fault system.

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Appendix C: Gravity and Magnetic Surveys

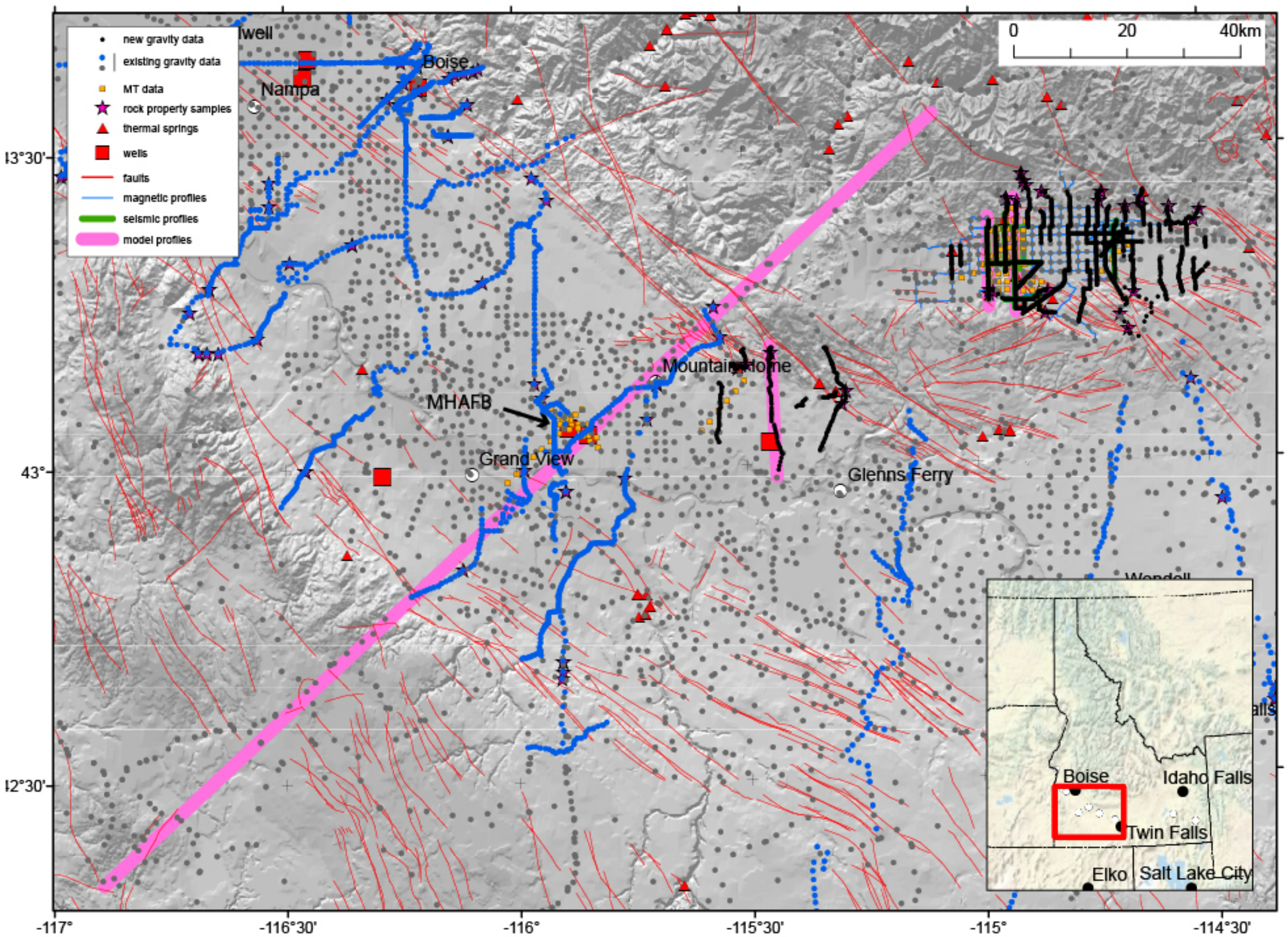

Figure C1) Shaded topographic index maps of the western SRP showing collected gravity stations, magnetic traverses, and rock property sample locations. Also shown are seismic reflection profiles, MT stations, modeled profiles, faults and thermal springs.

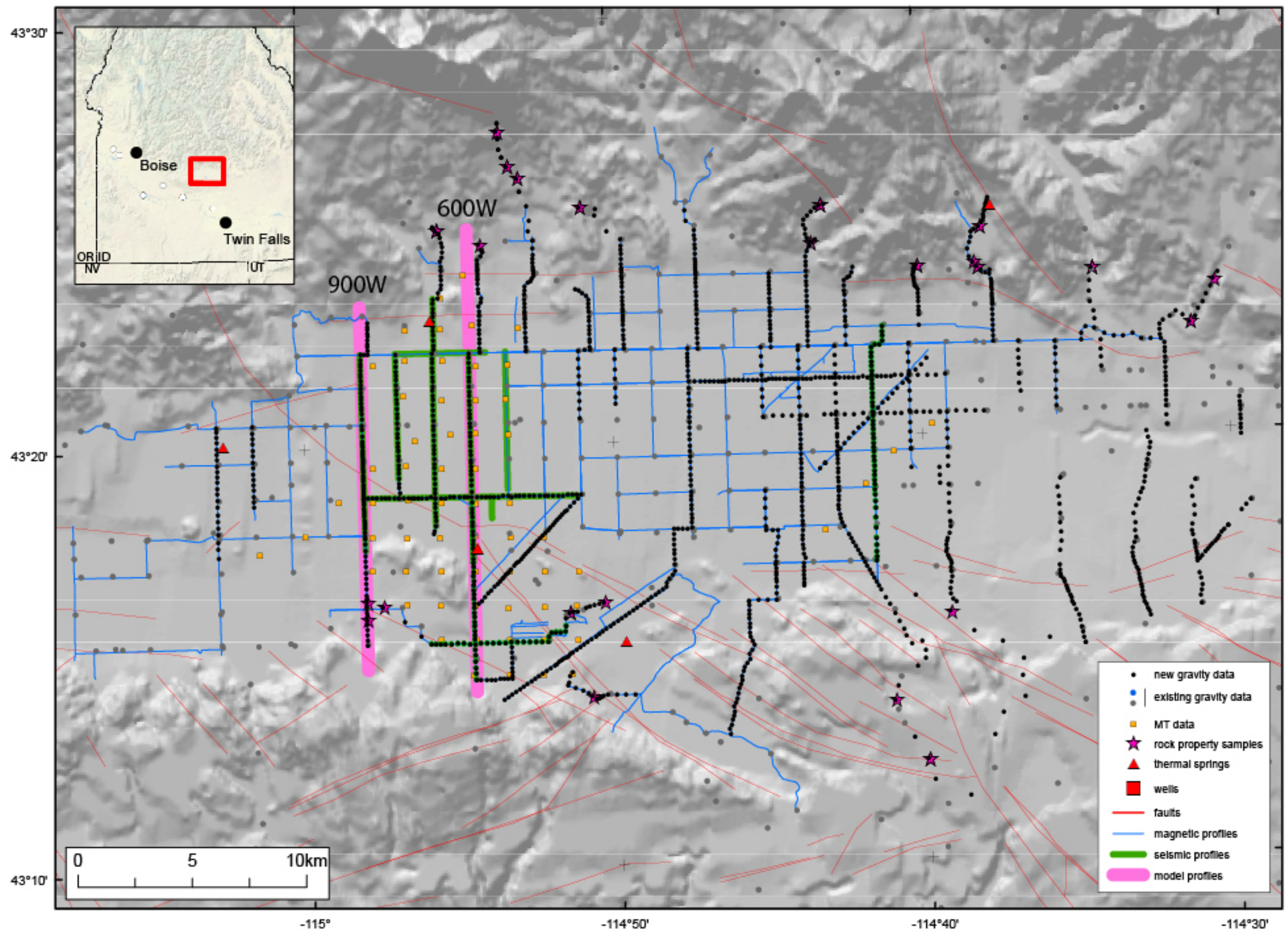

Figure C2) Shaded topographic index maps of the Camas Prairie study area showing newly collected seismic reflection profiles, MT stations, gravity stations, magnetic traverses, and rock property sample locations. Also shown are existing gravity data, modeled profiles, faults, and thermal springs.

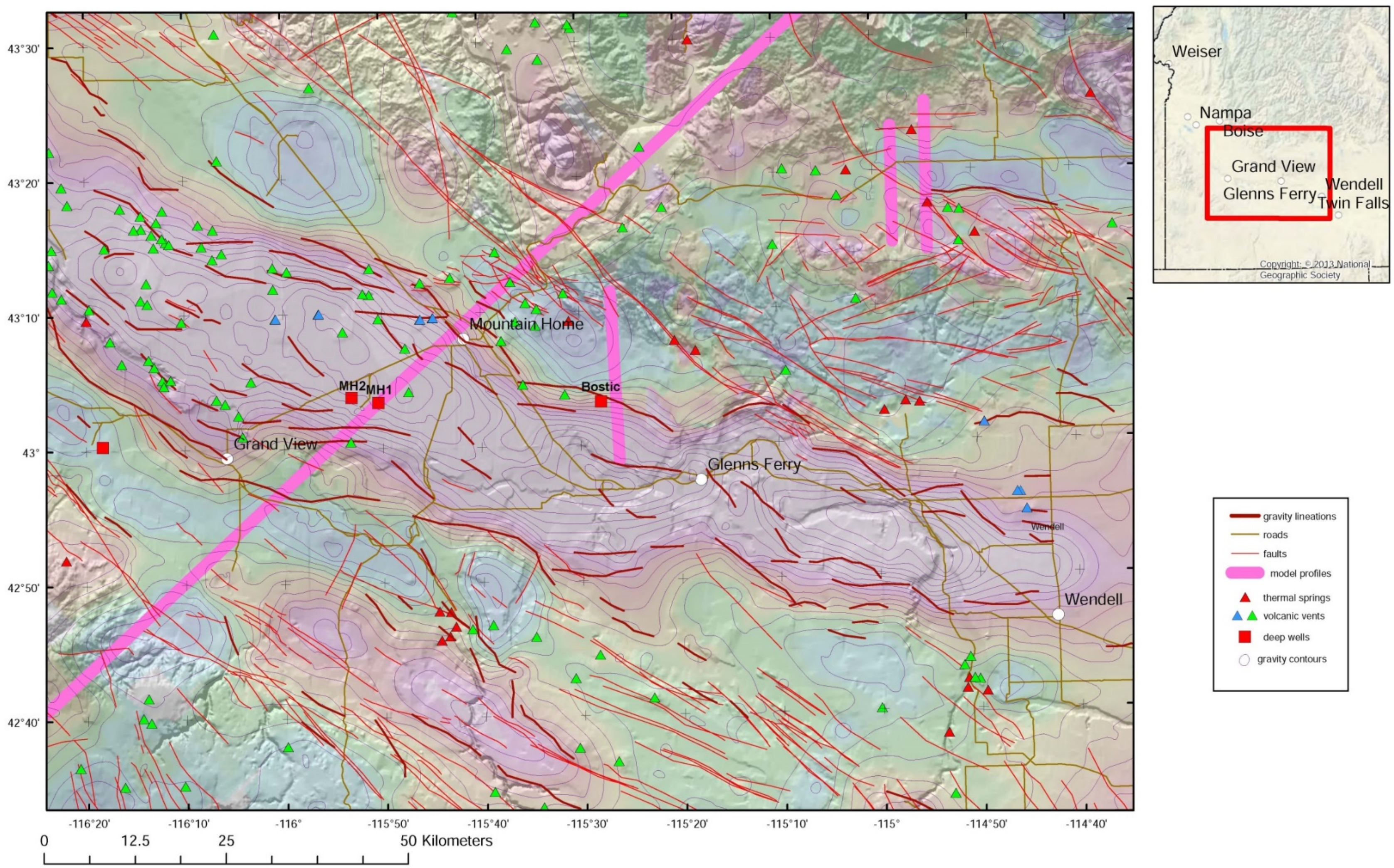

Figure C3. Colored residual isostatic gravity and shaded topographic relief map of the WSRP showing volcanic vents, thermal springs, and deep drill holes. Also shown are geophysically-inferred structural features (gravity lineations) based on maximum horizontal gradients of residual isostatic gravity. Geophysical grids are superimposed on a topographic base map. Pink lines are modeled cross-sections.

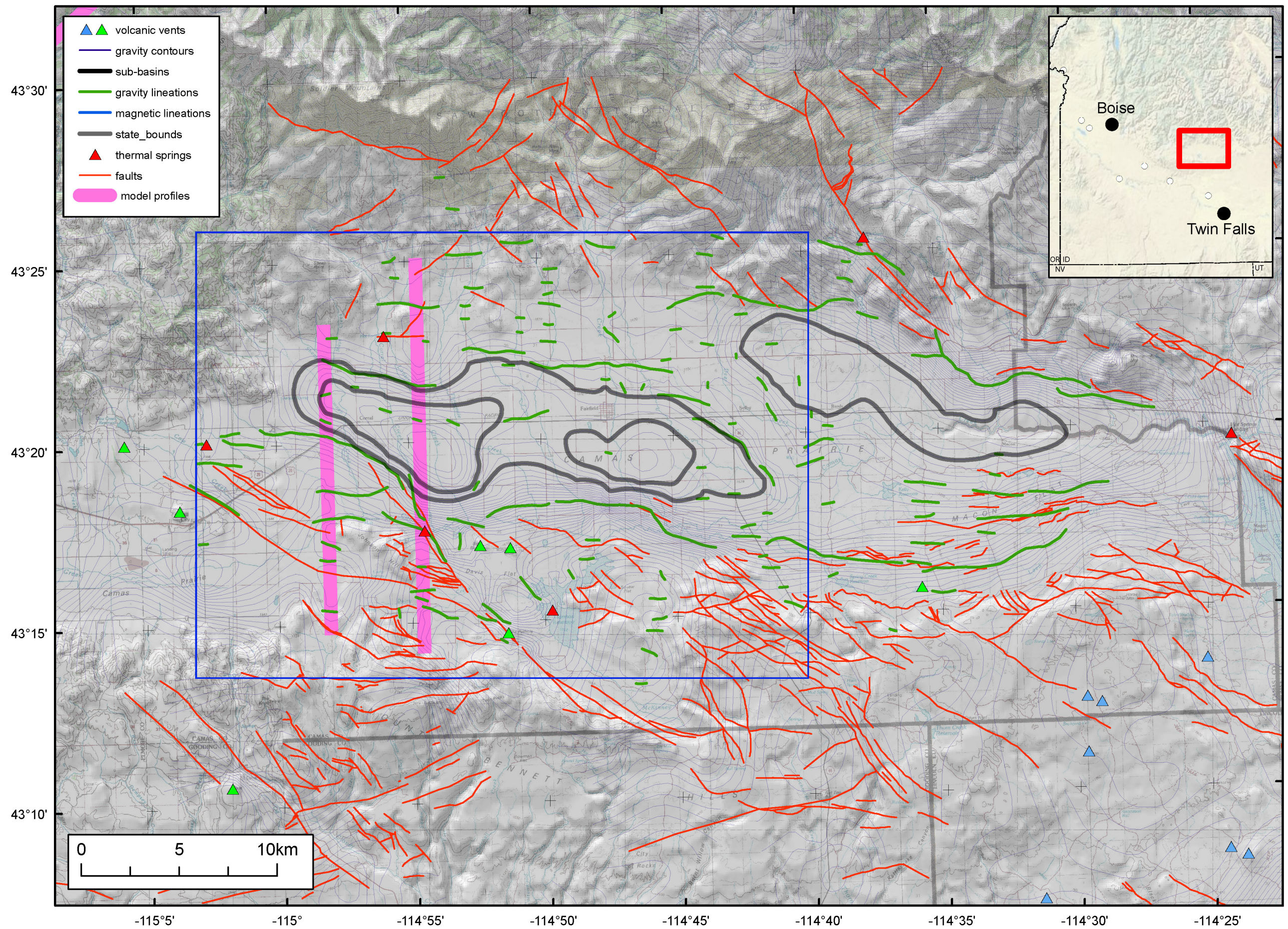

Figure C4. Topographic map of the Camas Prairie study area showing contours of the residual gravity and geophysically inferred structural features (gravity lineations) based on maximum horizontal gradients of residual gravity (green). Also shown are faults, volcanic vents, thermal springs, deep drill holes, and profile model locations. Faults (red) are derived from a number of sources, including Garwood et al (2014) and new mapping performed as part of this study. Also shown are outlines of sub-basins (thick grey lines) interpreted from gravity data. Blue triangles indicate young volcanic vents. Box idicates area of figure C5.

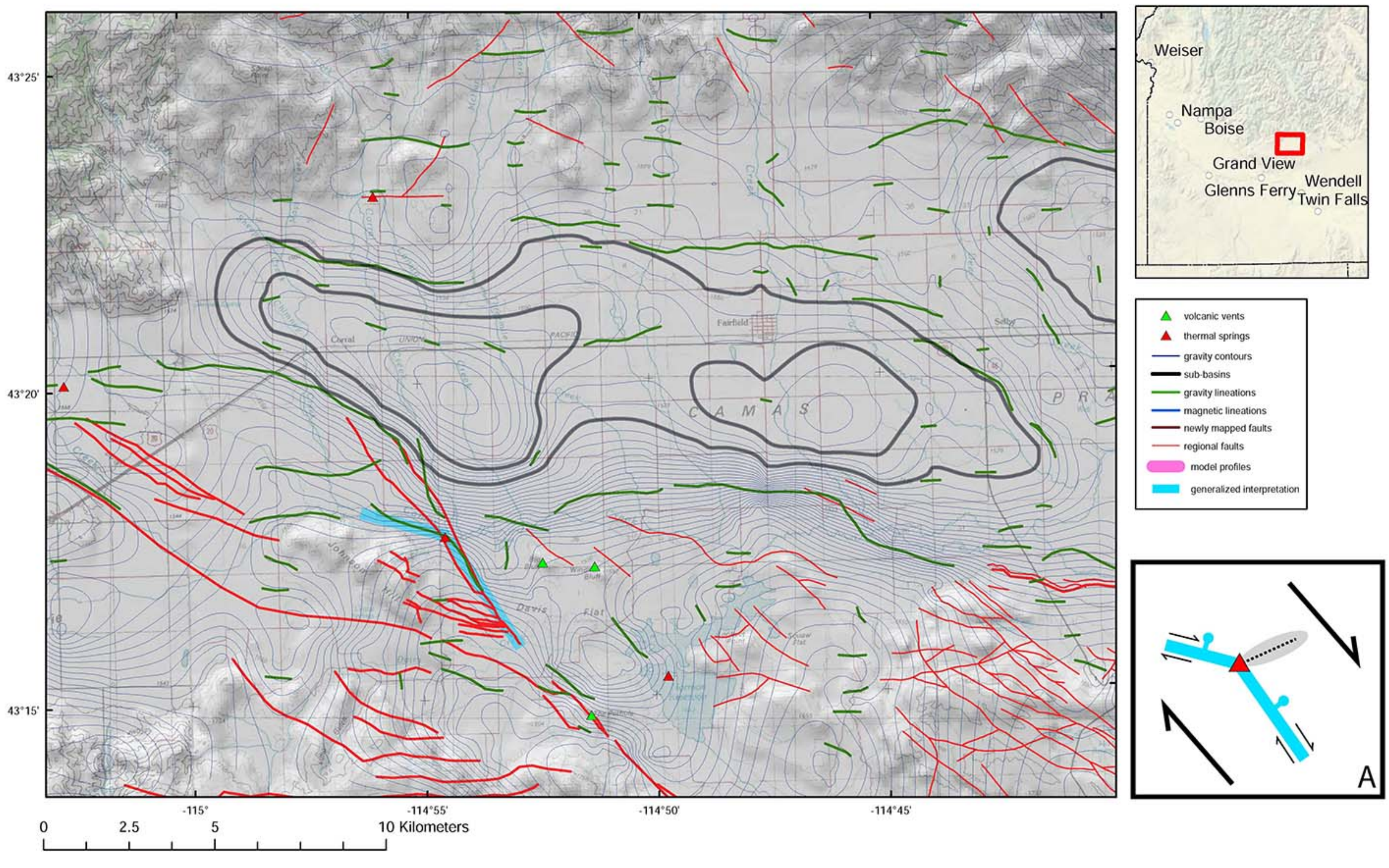

Figure C5. Topographic map of the Camas Prairie study area showing contours of the residual isostatic gravity, volcanic vents, thermal springs, deep drill holes, and profile model locations. Inset shows releasing step in Pothole system. Geophysically inferred structural features (gravity lineations) based on maximum horizontal gradients of residual isostatic gravity are shown in green. Faults (red) are derived from a number of sources including Garwood et al. (2014) and new mapping performed as part of this study.

Table D1. New Ar-Ar dates for WSRP basalts. All basalts <600 ka are high-K basalts which represent the most recent magmatic event, with vents as young as 2100 years. Older vents have low K, similar to ESRP basalts. The young high-K basalts cluster around the Boise River and on the Mountain Home trend. Ar-Ar ages by Oregon State University Geochronology Lab; ages are in ka (thousands of years), 1000 ka = 1 Ma. Whole rock analyses from the USU X-ray Fluorescence Laboratory. Uncertainty in the major element analyses is about ±1% relative for major elements, ±5% for minor elements (<1 wt%).

Sample name	Vent	**Age Ka**	±Ka	SiO2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5
16SP-06	Fall Creek	**2.1**	4.1	48.19	1.71	16.89	11.33	0.16	6.05	8.26	3.07	2.30	0.43
16SP-03-2	Smith Prairie1	**68.3**	9.3	48.59	2.04	16.93	11.64	0.17	6.20	9.84	2.92	1.65	0.48
16SP-02	Lava Creek	**87.3**	2.9	48.30	1.95	17.07	12.64	0.17	5.51	7.98	3.12	2.18	0.40
16ID-01	Powers Butte	**354.2**	4.1	47.68	2.18	16.27	11.89	0.17	6.09	9.68	3.23	1.59	0.65
16MH-05	Union Butte East	**355.8**	8.3	45.54	2.14	15.26	12.89	0.18	7.46	9.46	2.77	1.25	0.52
16MH-08	Little Joe Butte	**519.1**	10.6	46.54	2.84	14.88	14.74	0.20	6.38	9.80	2.85	1.04	0.57
16SP-07	Pothole Basalt	**692.1**	20.9	45.79	3.10	14.00	15.43	0.19	6.36	9.22	2.54	0.64	0.44
16MH-06	Crater Ring East	**789.4**	55.7	45.67	3.57	13.73	17.13	0.22	6.66	9.28	2.44	0.43	0.62
16MH-07	Lockman West	**1220**	30	45.44	4.26	12.35	17.34	0.23	6.30	10.57	2.47	0.57	0.96
MH2-658	MH Core	**2190**	0.01	45.05	3.28	13.76	16.75	0.21	7.89	9.05	2.11	0.49	0.77
MH2-3308	MH Core	**3260**	0.02	44.31	3.60	13.66	16.99	0.23	6.59	10.26	2.33	0.69	1.03
MH2-5957	MH Core	**4540**	10	43.48	3.60	12.35	18.87	0.24	8.03	9.07	2.18	0.64	1.13

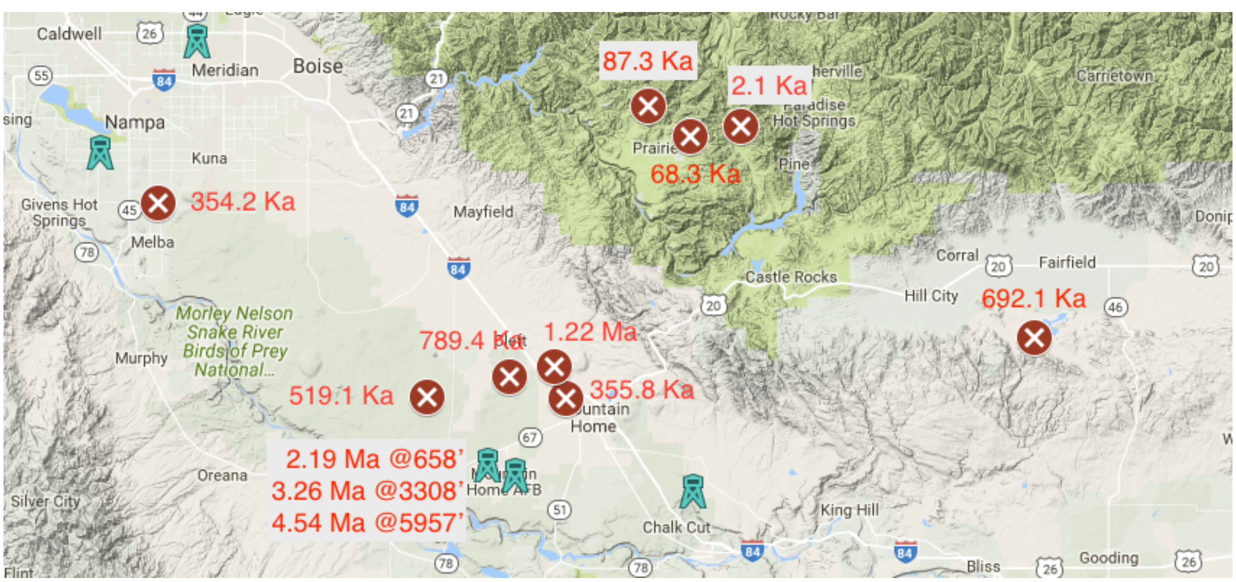

Figure D1. Map with locations of newly dated basalts, which range in age from 4.54 Ma (bottom of MH-2 well) to 2.1 Ka (Fall Creek).

Appendix E. CCRS Maps

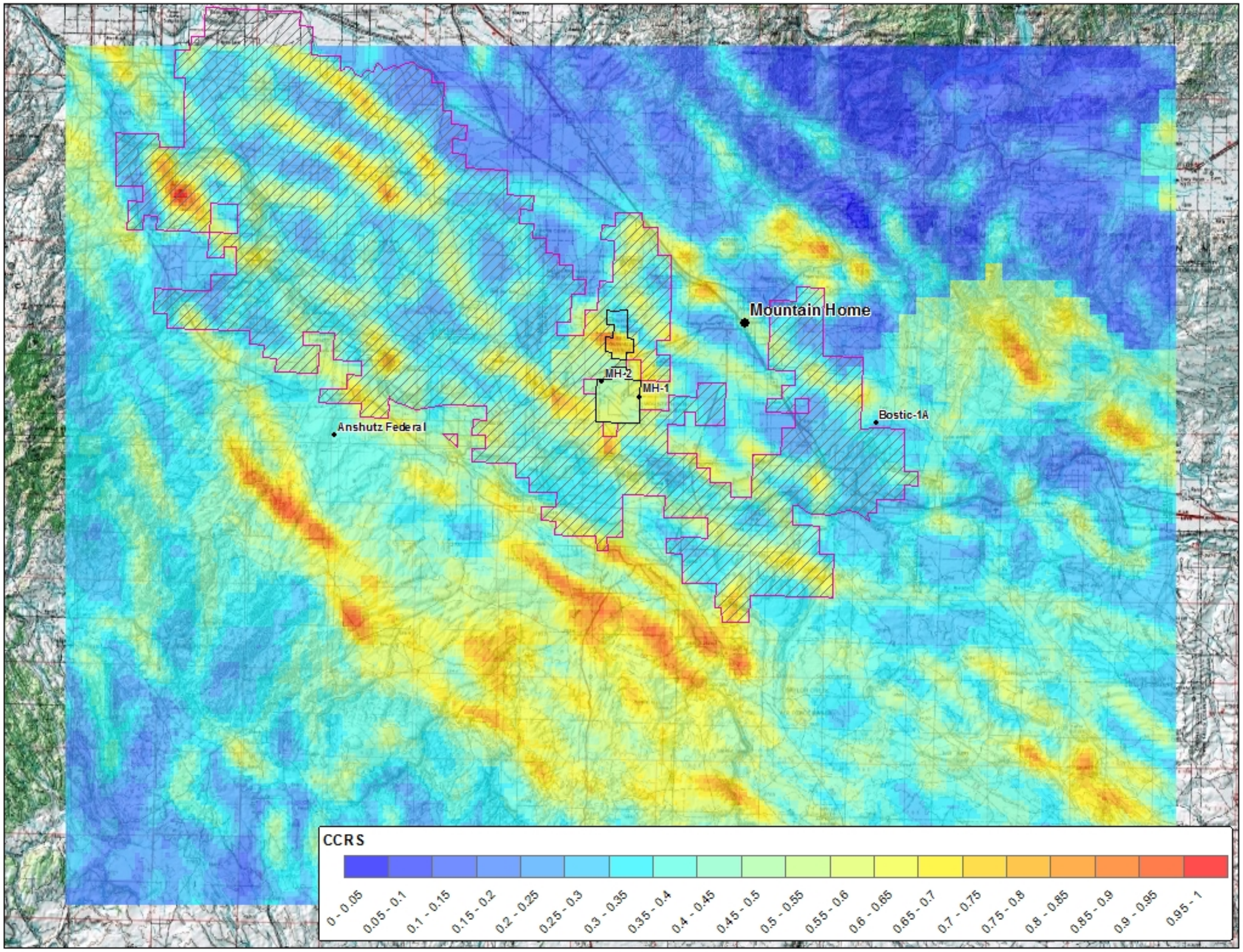

Figure E1. Phase 1 CCRS map of the Mountain Home region created using a 2500 m search radius and 500 m grid size. Phase 1 data was reprocessed at the same scale as the new Phase 2 data (Figure E2) for a direct comparison of how results changed.

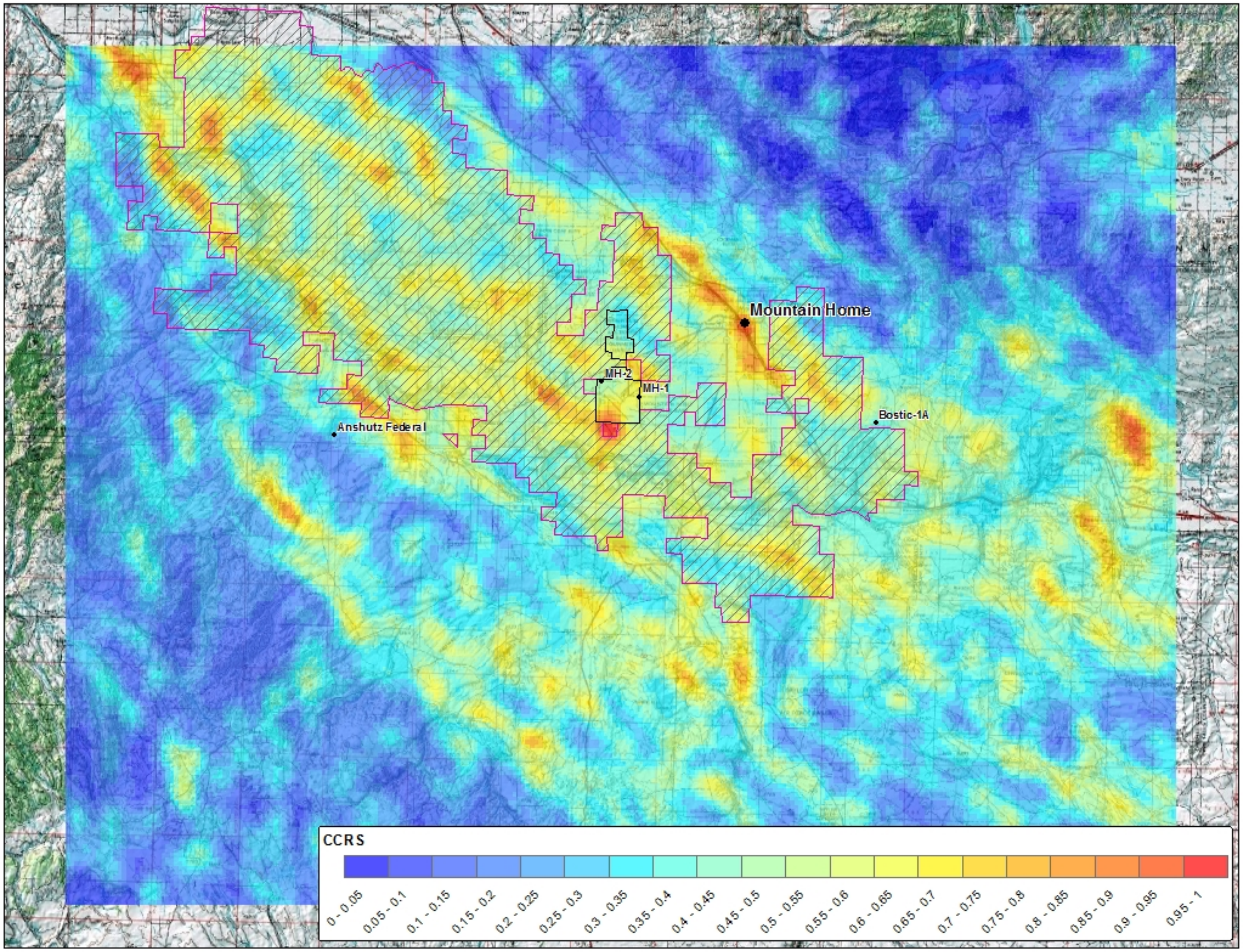

Figure E2. Phase 2 CCRS map of the Mountain Home region created using a 2500 m search radius and 500 m grid size. Note location of high CCRS south of MH-2 and MH-1, along the boundary of the MH-AFB- this is our primary drilling target for Phase 3.

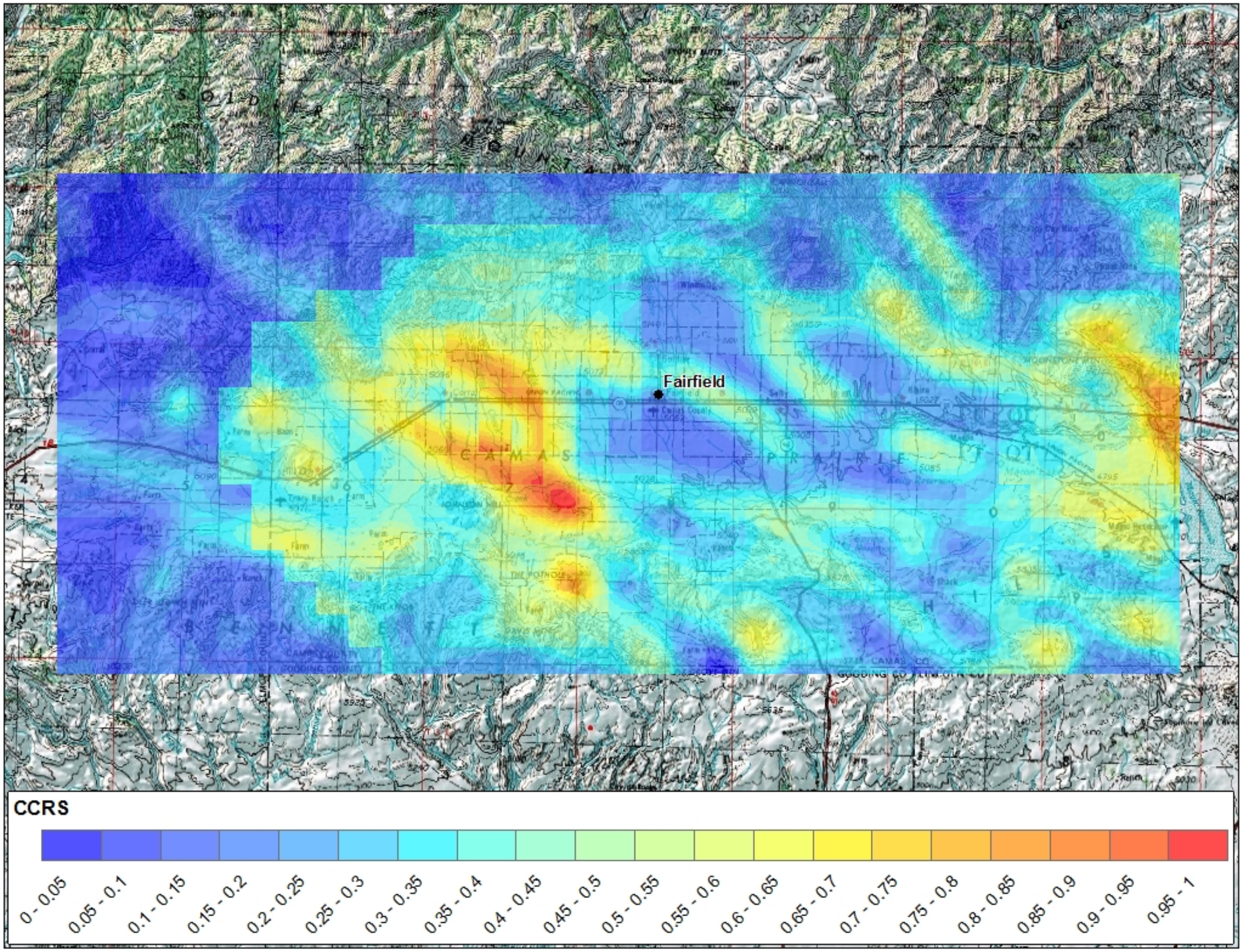

Figure E3. Phase 1 CCRS map of the Camas Prairie created using a 2500 m search radius and 100 m grid size. Phase 1 data was reprocessed at the same scale as the new Phase 2 data (Figure E4) for a direct comparison of how results changed.

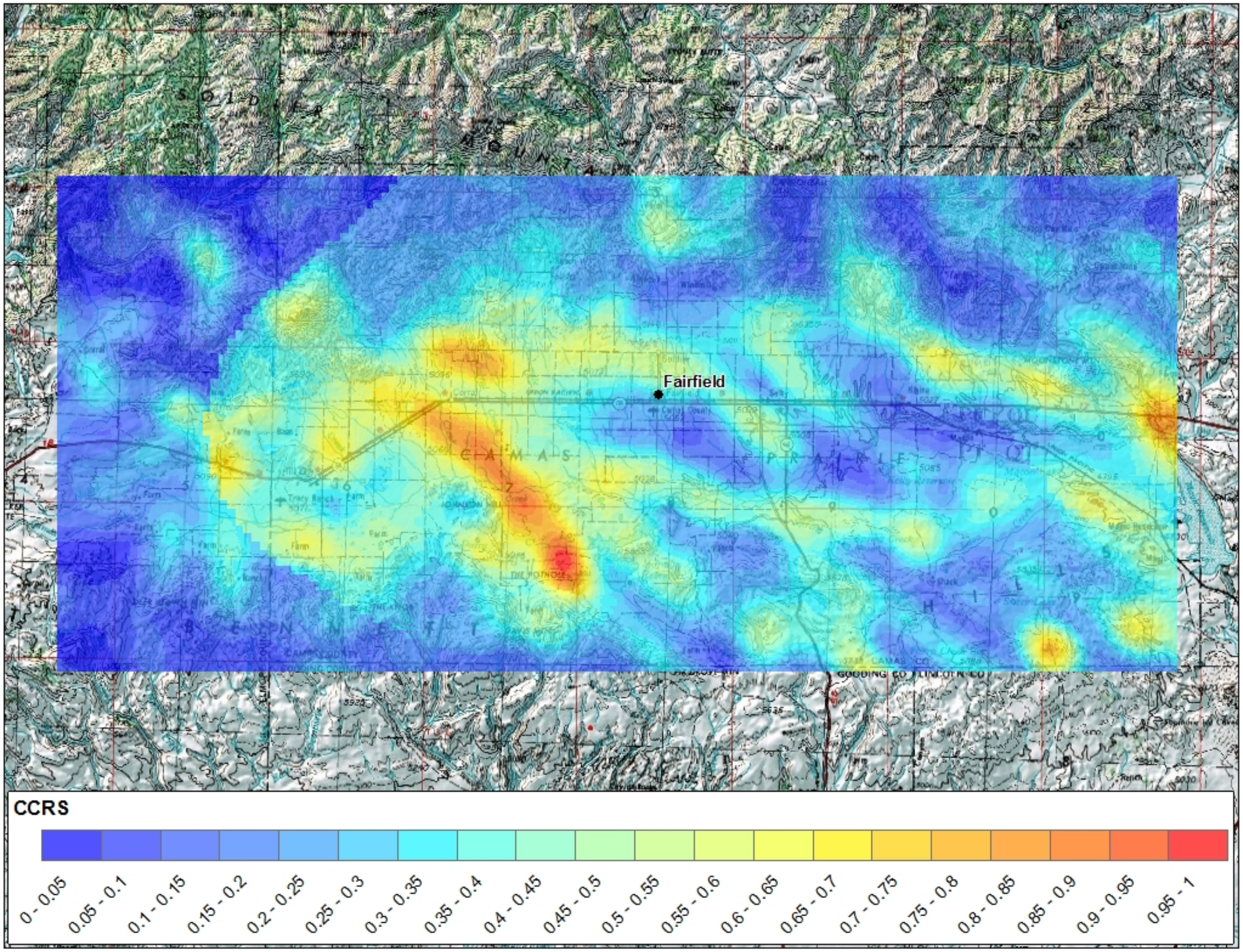

Figure E4. Phase 2 CCRS map of the Camas Prairie created using a 2500 m search radius and 100 m grid size. Note that the lineament of high CCRS is more defined than in Phase 1, reflecting the NW-SE trend of the Pot Hole fault.