A Ground Penetrating Radar Survey of Selected Locations within the Monte Verde Archaeology Complex, Puerto Montt, Chile

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INTRODUCTION

In February of 2019 Philip Mink of the University Kentucky William S. Webb Museum of Anthropology conducted a ground-penetrating-radar (GPR) survey at the Monte Verde archaeological site complex, near the southern Chilean town of Puerto Montt (Figure 1), under the invitation of Monte Verde Foundation and Tom Dillehay, Rebecca Webb Wilson University Distinguished Professor of Anthropology, Religion, and Culture and Professor of Anthropology at Vanderbilt University. The purpose of the survey was to determine both the vertical and horizontal extents of the various sites within the Monte Verde complex. The results of the survey will be used by Dr. Dillehay to assist future investigations at the site and for the Monte Verde Foundation to manage this invaluable resource.

Figure 1. Location of the Monte Verde site complex near Puerto Montt, Chile.
INSTRUMENTATION

Geophysical methods of investigation were initially developed for the study of subsurface geological features. However, in recent years they have become more and more important for the detection of archaeological features (Smekalova et al. 2005). Geophysical remote sensing technology has been applied to archaeological research in North America since the 1930s (Aitken 1961). During the 1980s, geophysical surveys in archaeology intensified as commercial equipment and software became more readily available, a trend that continues today. The increasing availability of commercial equipment amplified the quality and quantity of data collected and the more intensive usage by archaeologists resulted in theoretical and methodological advancements. One of the techniques that is beginning to be widely used in North America is ground penetrating radar (GPR). This is a near surface geophysical method that utilizes radar waves to measure the differential reflection properties of subsurface soil strata (Conyers and Goodman 1997). Radar waves (a type of electromagnetic radiation) are transmitted into the ground and reflect off buried discontinuities (e.g., rocks, architecture, graves, and pits). Measuring the rate of reflection in a study area allows a GPR user to search for anomalies within the area of interest (Conyers 2004).

When active, electromagnetic pulses are transmitted from a control unit. The pulses then propagate waves that penetrate the ground and reflect off buried discontinuities. The rate of time it takes for the wave to travel into the ground and reflect off the buried anomaly is measured and recorded by the GPR instrument (Conyers and Goodman 1997). A portion of the wave will continue further into the ground and continue to reflect off discontinuities until finally the wave attenuates (the amplitude or intensity is too small to reflect back to the antenna). The electromagnetic properties of the soil described as relative dielectric permittivity (or the dialectic constant) can dramatically influence the depth and attenuation rate of the radar waves. High clay or salt content in soil, as well as water saturation (poorly-drained soil or subsurface water-pooling), will almost certainly result in poor GPR survey results. A more in-depth and technical discussion of GPR and archaeology can be found in Conyers and Goodman (1997) and Conyers (2004) and readers are encouraged to consult these sources for a more thorough discussion of the technical aspects of GPR.

The instrument used to conduct the survey was a Ramac GPR CU II Geo System with a 500 MHz shielded antenna. This instrument is capable of discriminating softball-sized objects (~0.04 meter) and has an optimal depth penetration of approximately 1–5 meters below the ground surface and a maximum penetration depth of approximately 3–10 meters below the surface. The CU II unit has a pulse repetition frequency of 100 kHz and the 500 MHz antenna emits broadband pulses for at least 500 MHz (250–750 MHz).

Dr. Mink and his colleagues at Kentucky have previously used GPR and other geophysical survey methods on a variety of historic and prehistoric archaeological sites (Crothers and Mink 2015). Including an assortment of site types, such as, historic structures (Mink 2015, 2014a, 2011, 2008),
battlefields (Henry, Mink, McBride 2017) cemeteries (Mink 2018, Stottman and Pollack 2006), prehistoric villages (Mink 2013a), and prehistoric artifact scatters (Handshoe and Mink2009, Mink 2014b). He has also conducted geophysical prospection, including GPR, within Grand Canyon National Park (Mink 2017a, 2013b) and at Huaca Prieta in Peru (Mink 2017b).

**METHODOLOGY**

The Monte Verde complex is composed of four archaeological sites (Monte Verde I, Monte Verde II, Chinchihuapi I and Chinchihuapi II) along the Chinchihuapi Creek (Dillehay et. al. 2015). A total of 12 GPR grids covering 21,201 m² were placed over these four sites (Figure 2). The grids were placed under the direction of Dr. Dillehay to encompass areas of interest that would further the GPR surveys goals of providing information on the vertical and horizontal limits of the site.

![Figure 2. Location of the 12 GPR grids across the Monte Verde site complex.](image)

The GPR unit rests on a wheeled cart that is pushed by the operator in a back-and-forth method across the grid on 50 cm transects (Figure 3). The 50 cm transects were utilized to ensure
sufficient and total subsurface coverage, as the radar waves spread in a conical fashion. The data collected during the field survey were processed at the University of Kentucky, William S. Webb Anthropology Museum in GPR Slice v7.

The GPR Slice results from the field survey are often presented as amplitude time slice maps. The amplitude slice map is similar to a medical CATSCAN, and can be thought of as a slice of the survey area at a particular depth. The data are initially sliced in a time unit called nanoseconds (1 billionth of a second) and later converted to a unit of space. The color scheme progresses from darker blue to light green, yellow, and red. Low reflections of soil density are represented by the darker (blue) of the color scheme, with higher reflection amplitudes increasing the brightness of the color scheme to green, yellow, then red. Thus, areas displayed as bright yellow, green, and red indicate subsurface anomalies, where the reflection of radar waves has been amplified, which suggests a cultural or natural discontinuity. The areas displayed as light to dark blue are low amplitude reflections and depending on their placement can also represent distinct cultural or natural phenomena. The GPR survey results are typically presented in a series of amplitude slice maps that can be thought of as plan maps of a site at a particular depth below the surface. Interpretations of these anomalies are based upon characteristics, such as depth, size, shape, and spatial distribution, of the higher amplitude reflections. In some instances it is clear what the amplitude anomalies represent but in most cases some type of ground-truthing (soil-cores or shovel probes) will be required to determine whether the anomalies are archaeological or natural features.

Figure 3. Philip Mink pushing the GPR across Monte Verde I Grid 5.
RESULTS

It is important to reiterate that geophysical survey techniques simply measure variations in the physical properties of the earth and do not technically record archaeological features. Instead by examining the patterns present in the collected dataset the geophysical variations in the environment can be utilized to make inferences about the archaeological phenomena (Kvamme 2008). A trained and experienced geophysical archaeologists employs their knowledge of the local archaeological record, the existing geophysical anomaly database for the local region, and the depth, shape, size, and intensity of recorded anomalies to interpret the patterns produced in the data and to identify possible archaeological features.

The GPR survey at the Monte Verde site complex did identify intriguing anomalies that require further investigations to determine whether or not they are cultural in origin. One item to note is that depths were calculated in the field using standardized values. It is possible that depths could be shallower or deeper than what the resulting maps illustrate. While additional calibrations can be completed using hyperbole fitting techniques, the best method for refining the depth is via archaeological testing. Future archaeological testing of the anomalies should be used to further rectify anomaly depths. Below I present the results of each of the GPR survey girds along with identification of the anomalies most likely to be related to human activities. The results below are presented by site (Monte Verde I, Monte Verde II, Chinchihuapi I, and Chinchihuapi II) and by individual grid.

Monte Verde I

Monte Verde I is located on the southern side of Chinchihuapi Creek and was one of the earliest areas excavated by Dillehay (Dillehay 1989, 1997, 2002, Dillehay et. al. 2015). A total of five GPR grids were collected across Monte Verde I, in areas both previously investigated and in unexcavated portions of the site. The locations were chosen under the guidance of Tom Dillehay based on his extensive knowledge of the site and in service of filling our objective of defining the horizontal and vertical boundaries of the site for both guiding future research and to better manage the site.

MV1G1

Figure 4 illustrates the results of the GPR survey of Monte Verde 1 GPR Grid 1 (MV1G1). This grid covers a total of 4,808 m² and is located across the central portion of the site and includes many of the previously excavation units. The two areas with no data include both the currently standing out building (surveyed separately) and a very disturbed area containing the previously excavated units. Two interesting sets of anomalies appear in the resulting data. In slice maps a2 and a3, which extend ~ 23 cm to 51 cm and ~46 cm to 73 cm below ground surface (bgs) respectively, bright red and yellow anomalies appear in the northwest corner of the grid. The size and shape of
these anomalies along with the fact that they appear at a depth of previous occupation features suggest that these could represent a cultural phenomenon. The second interesting set of anomalies occur from ~115cm to 230 cm bgs (maps a6 – a10) around and southeast of the current outbuilding. These anomalies do occur at a much deeper depth that previous archaeological features, indicating they are likely a natural phenomenon, but they should be explored.

**Figure 4. MV1G1 GPR survey results.**

**MV1G2**

Figure 5 illustrates the results of the GPR survey of Monte Verde 1 GPR Grid 2 (MV1G2). This grid covers a total of 1,103 m² and is located adjacent on the north side of MV1G1. One central set of high intensity anomalies (red & yellow) extends from the northwest corner of the grid to the central eastern edge of the grid is present in MV1G2. This set of anomalies begin ~100 cm bgs and continue to a depth of ~ 300 cm bgs, and corresponds with the deep set of anomalies identified in MV1G1 around the extant outbuilding. Again, the depth of these anomalies do suggest that they are likely to be natural but further investigation is warranted as they could represent more deeply buried cultural deposits.
Figure 5. MV1G2 GPR survey results.

**MV1G3**

Figure 6 illustrates the results of the GPR survey of Monte Verde 1 GPR Grid 3 (MV1G3). This triangular shaped grid covers a total of 826 m² and is across the previously excavated Geology Trench 1 from MV1G1. One set of high intensity anomalies (red & yellow) occur in the southern section of the grid (map a3 1010 -1015 y-axis 1010 -1030 x-axis). The depth of these anomalies are approximately 100 cm to 300 cm bgs, corresponding with similar anomalies in grids MV1G1 and MV1G2. Again, the depth of these anomalies would seem to indicate a natural feature but limited archaeological exploration should occur within these anomalies.
Figure 6. MV1G3 survey results.

**MV1G4**

Figure 7 illustrated the results of the GPR survey of Monte Verde 1 Grid 4 (MV1G4). This grid covers a total of 60 m² and is located within the extant outbuilding within MV1G1. While there are several high-intensity anomalies (red & yellow) but they do not have any patterning that indicates they are prehistoric in origin. The more shallow anomalies may be historic cultural debris associated with the building but other than placing a couple of soil cores in one or two of these anomalies no further archaeological investigation seems warranted based on the GPR survey results.
Figure 8 illustrates the results of the GPR survey of Monte Verde 1 Grid 5 (MV1G5). This grid covers a total of 2,033 m² and is in an unexcavated section of Monte Verde 1 east of the MV1G1 and the Monte Verde I excavation units. It should be noted that the vertical stripping along western edge of the grid is shielding noise that has a variety of potential causes due to errors associated with data collection. Even with the shielding noise several interesting anomalies appear from about 100 cm to 300 cm bgs (map a2 – 11 to 22 x axis and 4 to 12 y-axis, map a3 0 to 6 x-axis and 12 to 30 y-axis and again 11 to 22 x axis and 4 to 16 y-axis). In order to further investigate these two anomalies the data were re-processed to create thinner amplitude slices (Figure 9). Map k3 illustrate a very intense anomaly (red) occurring ~ 100 to 150 cm bgs and from ~ 37 to 42 on the y-axis and 14 to 17 on the x-axis. The size, shape and depth of this anomaly suggest a possible cultural origin. Another high intensity (red & yellow) anomaly appears in maps k3 (4 to 7 y-axis and 18 to 20 x –axis) and map k4 (4 to 16 y-axis and 12 to 22 x-axis). This set of anomalies has a square or l-shape in map k4. While this anomaly is a bit deeper 100 cm to 200 cm bgs (with some weaker reflections [yellow & green] also occurring up to 300 cm bgs) it’s shape, size and beginning depth do suggest a possible cultural origin. The large anomaly that occurred along the eastern edge of Figure 8, Map a3 does not appear until at least 200 cm bgs. While this area should at least be cored its depth suggest it is likely a natural soil or geologic feature.
Figure 8. MV1G5 survey results.

Figure 9. MV1G5 reprocessed survey results with thinner amplitude slices.
Monte Verde II

Monte Verde II is located on the northern side of Chinchihuapi Creek and was excavated by Dillehay in the 1970’s and 1980’s and contains some of the best preserved perishable materials (Dillehay 1989, 1997, 2002, Dillehay et. al. 2015). A total of three GPR grids were collected across Monte Verde II, in areas both previously investigated and in unexcavated portions of the site. The locations were chosen under the guidance of Tom Dillehay based on his extensive knowledge of the site and in service of filling our objective of defining the horizontal and vertical boundaries of the site for both guiding future research and to better manage the site.

MV2G1

Figure 10 illustrates the results of the GPR survey of Monte Verde 2 Grid 1 (MV2G1). This grid covers a total of 3,454 m² and is in a location that has archaeological excavation units along with areas that have yet to investigated archaeologically. (Note: the 0, 0 point of this grid is actually the northeast corner of the grid rather than the southwest corner as it is in almost all the other GPR grids.) The grid extends to Chinchihuapi Creek (white void on western edge of the grid). Numerous more deeply buried natural features occur throughout this grid. One obvious example is a curvilinear high-intensity (red & yellow) anomaly that extends from the southcentral edge of the grid to the eastern edge of the grid and back to the center, and extending from ~200 cm to 400 cm bgs (maps k6 – k8). Two sets of anomalies in the western half of the grid seem to be the most likely to represent cultural phenomenon. In order to better view these two anomalies MV2G1 was re-processed to create thinner amplitude slices (Figure 11).

In the southwestern corner of MV2G1 (Figure 11) map k2 illustrates a weak amplitude anomaly (light blue, green, & yellow) beginning to form approximately 50 cm to 100 cm bgs. In the next map, k3, these weak amplitude anomalies are much stronger and develop into higher intensity reflections (red & yellow). The anomaly distribution pattern and overall shape of the anomalies, along with their depth 50 cm to 150 cm bgs, is very suggestive of a cultural feature. In the northwestern corner of the grid is another possible cultural anomaly. In map k1 this location has a very low amplitude reflection (light to dark blue) but at a depth of ~ 50 cm bgs this area illustrates a very high amplitude reflection (red & yellow). In map k3 this location still has high intensity reflections but they are more diffuse and not in one single large anomaly. Such a dramatic change in reflection may be due to a natural feature such as a low topographic location that holds water but its depth is within the range of other archaeological features so it should be investigated.
Figure 10. MV2G1 survey results.

Figure 11. MV2G1 survey results reprocessed to thinner amplitude slices.
Figure 12 illustrates the results of the GPR survey of Monte Verde 2 Grid 2 (MV2G2). This grid covers 355 m² and about 10 m north of Geology Test Pit 90. A high-intensity anomaly is visible in the southeast quadrant of the grid beginning near the surface but most visible in map a2 that extend from 100 cm to 200 cm bgs. To determine if this anomaly might be of interest these data were reprocessed to create thinner amplitude slices (Figure 13). These reprocessed data illustrate not only the anomaly in the southeast corner but also an interesting anomaly in the central part of the grid (visible in both maps b3 and b4 extending from 60 cm to 100 cm bgs and 100 cm to 130 cm bgs, respectively). The anomaly in the southeast corner assumes a square like shape in maps b4 and b5 that extend 100 to 130 cm bgs and 130 cm to 160 cm bgs. The size of these anomalies is a little large but the shape and depth correspond nicely to other previously excavated cultural features, thus necessitating archaeological testing at these locales.
Figure 14 illustrates the results of the GPR survey of Monte Verde 2 Grid 3 (MV2G3). This grid covers a total of 921 m² and is located on the ridge top about 50 m northeast of MV2G2. (Note: the 0, 0 point of this grid is actually the northeast corner of the grid rather than the southwest corner as it is in almost all the other GPR grids.) A series of high intensity (red & yellow) anomalies occur in the southwest quadrant of the grid. The shape of these anomalies and their depth 100 cm to 200 cm bgs warrants further investigation. These data were also reprocessed into thinner amplitude slices (Figure 15) and the same pattern of anomalies is present. The reprocessed data indicate the anomalies begin approximately 40 cm bgs and extend to about 160 cm bgs. The anomalies should be further explored through archaeological testing.
Figure 14. MV2G3 survey results.

Figure 15. MV2G3 survey results reprocessed to thinner amplitude slices.
Chinchihuapi I

Chinchihuapi I is located on the southern side of Chinchihuapi Creek and was excavated by Dillehay in the 1970’s and 1980’s and is the eastern most site identified in the Monte Verde complex (Dillehay 1989, 1997, 2002, Dillehay et. al. 2015). A total of three GPR grids were collected across Chinchihuapi I, in areas both previously investigated and in unexcavated portions of the site. The locations were chosen under the guidance of Tom Dillehay based on his extensive knowledge of the site and in service of filling our objective of defining the horizontal and vertical boundaries of the site for both guiding future research and to better manage the site.

CH1G1

Figure 16 illustrates the results of the GPR survey of Chinchihuapi I Grid 1 (CH1G1). This grid covers a total of 437 m² and is located on a small knoll that currently contains an interpretation platform and several test excavations. Beginning near the northeast corner and extending to the center of the grid is a set of high intensity anomalies that occur at depth between 100 cm -200 cm bgs. In order to further explore these anomalies the data were reprocessed to create thinner amplitude slices (Figure 17). These anomalies are also visible in the thinner sliced maps and are most obvious in map k3 that illustrated a depth of 100 cm to 160 cm bgs. The shape size and depth of these anomalies are all suggestive of cultural features and warrant further investigation. It is possible that some of the associated anomalies are from previous archaeological excavation units but understanding how those appear in the GPR data is also important as further research at the site and with the GPR continues.

Figure 16. CH1G1 survey results.
Figure 17. CH1G1 survey results reprocessed to thinner amplitude slices.

Figure 18 illustrates the results of the GPR survey of Chinchihuapi I Grid 2 (CH1G2). This grid covers a total of 910 m² and is located adjacent to the current eastern most property boundary and near a recreation platform. The anomalies in this grid appear to be relatively uniform and extend throughout the entire depth of the GPR column, suggestive of natural soil or geologic features. Archaeological investigation in this area could be limited to soil-coring a sample of the anomalies to ensure they are indeed natural phenomena.
Figure 18. CH1G2 survey results.

**CH1G3**

Figure 19 illustrates the results of the GPR survey of Chinchihuapi I Grid 3 (CH1G3). This grid covers a total of 199 m² and is located adjacent to CH1G2 and a recreation platform. A large low-intensity anomaly (blue) is the most interesting feature identified within this grid. It begins at a depth of 110 cm bgs and extend to approximately 330 cm bgs. The size, shape and depth of the anomaly are suggestive of a natural feature and archaeological investigations should be limited to soil-cores or shovel probes.
Chinchihuapi II is located on the southern side of Chinchihuapi Creek and was excavated by Dillehay in the 1970’s and 1980’s and is located between Monte Verde I and Chinchihuapi I (Dillehay 1989, 1997, 2002, Dillehay et. al. 2015). One GPR grid was collected within Chinchihuapi II in an unexcavated portions of the site. The location were chosen under the guidance of Tom Dillehay based on his extensive knowledge of the site and in service of filling our objective of defining the horizontal and vertical boundaries of the site for both guiding future research and to better manage the site.

CH2G1

Figure 20 illustrates the results of the GPR survey of Chinchihuapi II Grid 1(CH2G1). This grid was the largest grid investigated and covers a total of 6,095 m² and is located approximately 50 m southwest of Chinchihuapi Creek. Two clusters of anomalies are of interest in this figure. They are best noted on map a2 which extends from a depth approximately 100 cm to 220 cm bgs. The first interesting cluster extends from near the southeast corner of the grid (~40.0 on the x-axis) toward the central western edge (~ 50.0 on the y-axis). The second anomaly is in the northeastern quadrant of the grid (~ 40.0 to 70.0 y-axis and 10.0 to 40.0 on the x-axis). This anomaly has a high-intensity (red & yellow) rectangular shape that surrounds a low-intensity (light & dark blue) rectangular anomaly. To further investigate these anomalies the data were reprocessed to create thinner amplitude slice maps (Figure 21). The linear anomaly that runs from southeast to northwest appears most distinct beginning approximately 110 cm bgs and extending 180 cm bgs (maps k7 –k10). The rectangular anomaly is
more defined in the reprocessed data and the first vestiges of it occur approximately 110 cm bgs and extending 180 cm bgs (maps k7–k10). The size, shape and depth of these anomalies are all suggestive of cultural features and this area should be further investigated via archaeological excavations.

Figure 20. CH2G2 survey results.

Figure 21. CH2G2 survey results reprocessed to thinner amplitude slices.
SUMMARY & CONCLUSIONS

In February 2019 Dr. Philip Mink of the William S. Webb Museum of Anthropology was invited by Dr. Tom Dillehay and the Monte Verde Foundation to conduct a GPR survey of selected locations within the Monte Verde Archaeological Complex. The objective of the GPR survey was to provide Dr. Dillehay and the Foundation data on both the horizontal and vertical extents of the various archaeological sites to better manage the site in the future and as data to help drive future investigations.

A total of 12 grids covering 21,201 m² was surveyed with a Mala CUII Geosystems radar with a 500 MHz antennae. All of the grids contained intriguing anomalies (discussed above and summarized below) that should be further investigated. In regards to anomaly depths, it should be noted that the depths noted on the amplitude slice maps were calculated in the field using standardized values. There is the possibility that anomaly depths could be shallower or deeper then what the resulting maps illustrate. While additional calibrations can be completed in the lab using hyperbole fitting techniques, the best method for refining the depth is via archaeological testing. Future archaeological testing of the anomalies should be used to further rectify anomaly depths.

Monte Verde I was divided into five grids (MV1G1-5) that encompassing areas that have been previously excavated and also areas that have not been thoroughly investigated archaeologically. MV1G1 contains two interesting sets of anomalies, one that is likely cultural and the other likely natural, both of which should be further examined. In the northeast corner of the grid appearing ~23 cm bgs and continuing to ~73 cm bgs is a set of anomalies that have a high likelihood of being cultural due to their size, shape, and appearance at a depth corresponding to known archaeological features. The second set of anomalies while definitely patterned occur beginning ~115 cm bgs and extend all the way down to at least 230 cm bgs, which is far below other identified archaeological features. MV1G2 contains one central set of anomalies that extend from the northwest corner of the grid to the central eastern edge of the grid. These anomalies correspond in depth (~100 cm to 300 cm) to the deep anomalies identified in MV1G1 but do warrant further exploration even though it is highly likely they are natural in origin. MV1G3 a triangular shaped grid on the western edge of Monte Verde I. It contains one interesting but deeply buried anomaly (~100 cm to 300 cm bgs) that corresponds to similar anomalies in MV1G1 and MV1G2. While this anomaly is likely natural in origin limited archaeological exploration should be conducted in this area to ensure that the anomaly is not cultural. MV1G4 is located within the extant out building located within MV1G1. While there are several high-intensity anomalies that occur in this grid, none seem to be suggestive of prehistoric cultural phenomenon. MV1G5 the farthest eastern grid in Monte Verde I is in an area that has undergone limited archaeological investigation. One anomaly in the north eastern quadrant of the grid is suggestive of a cultural feature due to its shape, size and depth. Another anomaly in the southeastern
quadrant of the grid is a very unique square /L-shape that is very suggestive of a cultural origin even though it is on the deeper end on where previous archaeological feature have been identified. Another large feature on the western edge of the grid seems to be too deep to be archaeological though probing the area is suggested, even though the anomaly likely is a natural feature, confirmation would help to better interpret similar features found at Monte Verde and other areas of southern Chile.

Monte Verde II was divided into 3 grids (MV2G1-3) including both previously excavated and non-excavated locations. MV2G1 has numerous examples of natural features that illustrate geological strata and gravel bars but there are two anomalies that are suggestive of a cultural origin. The large anomaly that extends from the northwestern corner of the grid extending from the surface down ~150 to 200 cm bgs dramatically jumps from a low-intensity amplitude reflection to a high-intensity amplitude reflection, which is suggestive of either a low lying water saturated area or a cultural feature. The southwestern corner of the grid contains the most probable cultural anomaly in MV2G1. This anomaly starts ~ 50 cm bgs as low-intensity reflection but by ~ 100 cm to 150 cm bgs develops into a higher-intensity set of reflections. What makes it different than the other anomaly is that the intensity change is not as dramatic and the more intense set of reflections has a distribution pattern that is very suggestive of a cultural feature. MV2G2 contains two anomalies whose shape, site, and depth are suggestive of cultural features. Both anomalies occur within the 60 cm to 160 cm bgs depth where previous investigations at the site have located archaeological features. MV2G3 contain a series of high-intensity anomalies in the southwest corner of the grid. The anomalies first appear approximately 40 cm bgs and extend to a depth of about 160 cm bgs. The size, shape and depth of these anomalies all suggest a cultural origin and further archaeological investigation is warranted at this location.

Chinchihuapi I was divided into 3 grids (CH1G1-3) and includes both previously excavated areas and locations with limited archaeological investigations. CH1G1 contain a long linear set of anomalies that extends from near the northeast corner of the grid to the center of the grid. The anomalies occur at a depth where previous archaeological investigations have identified features. While several of the anomalies in this cluster may represent previous excavation units, further archaeological investigations should be conducted. CH1G2 contains a uniform set of anomalies throughout the grid that is suggestive of natural phenomena. Archaeological testing should be limited to soil-coring or shovel probing anomalies to ensure they are natural features. CH1G3 contains a large low-intensity anomaly that occurs at depths from approximately 100 cm bgs to 330 cm bgs, suggesting a natural feature. Limited archaeological testing should be conducted to ensure that the feature is natural.

Chinchihuapi II was collected with only one GPR grid (CH2G1) in a previously unexcavated portion of the site. CH2G1 contains two very distinct cluster of anomalies. One linear set of anomalies begins in the southeast corner of the grid and extends to the center of the western edge of the grid. The second anomaly cluster is notable as it contains a low-intensity rectangular anomaly
surrounded by a high-intensity rectangular anomaly. Both of these anomaly clusters are suggestive of cultural features and archaeological test excavations should be undertaken to determine the cause of the anomalies.

All of the grid surveyed with GPR at the Monte Verde Archaeological Site Complex contained interesting anomalies. Many of these anomalies were suggestive of cultural features and should be further investigated. The results of any archaeological investigations into the GPR anomalies should be recorded and published so that a regional GPR signature database can be established. Such a database would be useful for future GPR investigation both at Monte Verde and throughout southern Chile. Overall the data provided by this survey should further both the research and management of this world heritage quality archaeological site.

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