

February 26, 2020

Mr. Nicolas J. Bryan, PLS
Energy Transfer
101. W. Third St., 3rd Floor
Williamsport, PA 17701

RE: Geophysical Survey
Sunoco Pipeline, LP Pipeline Project
Horizontal Directional Drill S3-0310 Pennsylvania Drive
Uwchlan & Upper Uwchlan Township, Chester County, Pennsylvania
RETTEW Project No. 096303002

Dear Mr. Bryan:

RETTEW Associates, Inc. completed a multi-technique geophysical survey at the S3-0310 Pennsylvania Drive horizontal directional drill (HDD) site. The purpose of the survey was to detect and delineate fractures, soft zones, or subsurface voids that could contribute to potential earth features at the site. The following report, figures, and attachments describe the methods and results of the investigation.

EXECUTIVE SUMMARY

The multi-technique geophysical survey was completed between December 28, 2019 and January 30, 2020. Three different geophysical techniques were utilized to detect and delineate subsurface features and provide a bedrock profile. These methods, and their general results, are as follows:

- Microgravity delineated alternating high- and low-density zones. The alternating density zones may indicate alternating shallow and deep rock – possibly resulting from deeper weathering along lineaments.
- Seismic refraction and multi-spectral analysis of surface waves (MASW) results confirmed the presence of depressions in the bedrock surface – correlating with low-velocity zones within rock that could represent weathered fracture zones.
- Electrical resistivity imaging (ERI) identified a relatively conductive surface layer over a discontinuous mildly resistive layer, with the discontinuities possibly supporting the presence of minor fracture zones.

Results from the geophysical techniques are consistent with each other, and with the geology as mapped by the PA Geological Survey; all suggesting that the local bedrock is fractured, with a few potential anomalous zones of concern. The gravity low on the southern edge of the survey area closely correlates with a previous earth feature, and there are no other gravity anomalies of the type that would indicate an incipient feature in other areas.

SITE DESCRIPTION

The Pennsylvania Drive HDD site is located east of Marsh Creek Reservoir between Sierra Drive and Herman O. W. Drive in Uwchlan and Upper Uwchlan Townships, Chester County, Pennsylvania (see



Figure 1). A geophysical survey was conducted over accessible areas of the HDD exit and entry locations (**Figure 2**). Portions of the exit/entry areas were inaccessible due to ground mats, construction equipment, and drilling activity at various times during the survey. **Figure 2** also shows the location of a previous earth feature near Station 14886+50.

The site bedrock geology consists of Precambrian-aged graphitic felsic gneiss in the west and felsic and intermediate gneiss in the east (The Geologic Map of Pennsylvania, PA Department of Conservation and Natural Resources Geology Interactive Map, 2017 – see **Figure 2**). The graphitic felsic gneiss includes Pickering Gneiss and small areas of marble (Berg et al., 1980). The felsic and intermediate gneiss is described as a “medium grained, light pink to greenish gray; largely quartz, feldspar, and mica; commonly gneissic, containing alteration minerals; interfingers with gabbroic gneiss” (Ibid). The Geologic Map of Pennsylvania (PA Department of Conservation and Natural Resources Geology Interactive Map, 2017) shows several contacts and major fractures and faults within a mile of the survey area, as seen on the geologic inset on **Figure 2**, upper right (Ibid).

MICROGRAVITY SURVEY

Microgravity meters measure very small local variations in gravity. Several factors can locally affect the acceleration of gravity. One factor is the local density or mass distribution of the bedrock or soils beneath the meter. Gravity highs (mass excesses) commonly represent locally shallow bedrock pinnacles or float blocks in the soil profile or zones of particularly massive bedrock. Gravity lows (mass deficiencies) may represent locally deep bedrock cutters, or clay seams where soil displaces bedrock; air-, water- or mud-filled voids within bedrock; stoping voids in the soil above bedrock; or zones where soils have been made less dense by removal of fines. Voids below the top-of-rock are not expected in the mapped gneiss bedrock.

The residual microgravity data are shown on **Figure 3**. The values depict the general plan-view shallow mass distribution beneath the survey area. Relative lower values (red) represent local mass deficiencies (air- or clay-filled voids, or locally deeper or disturbed or poorly-compacted soils). Higher values (blue) represent local mass excesses (shallow bedrock or erosional remnant float blocks). The low around Station 14886+50 coincides with the previous earth feature location. Specific survey parameters are listed in **Appendix A**.

SEISMIC MASW AND REFRACTION SURVEY

Seismic MASW and refraction methods utilize the speed of seismic waves through various geologic layers and features to characterize the subsurface geologic conditions. The methods enable determination of the general material types, and the approximate depth to bedrock, or rock profile. MASW can detect low velocities below the top of rock that might be associated with fracture zones. The principles of seismic refraction are summarized in **Appendix B**.

The seismic survey consisted of three sets of profiles centered on the 16-inch alignment and a fourth profile added on the western side further north due to access limitations further east on the west end (see blue triangles, **Figure 2**). Color-contour velocity models of the seismic profiles for the seismic refraction and MASW are presented on **Figures 4** and **5**, respectively. The vertical scale represents relative elevation in feet, and the horizontal axis represents an along-profile distance in feet. The color contours represent average seismic velocity variations (compressional or P-wave velocities for refraction, and shear or S-wave velocities for MASW), with increasing velocities from blue to yellow to orange to brown (seismic

refraction profiles, **Figure 4**), and purple to grey to tan to brown (seismic MASW profiles, **Figure 5**). Please note that high- and low-velocity data along the first and last fifteen feet of any profile have higher uncertainty. Specific seismic refraction and MASW survey parameters are listed in **Appendix A**.

ERI SURVEY

Electrical resistivity measurements involve driving an electrical current into the ground using current electrodes at the ground surface. The apparent resistivity of the subsurface is determined by measuring the potential difference, or voltage, between two potential electrodes with a known separation and position/orientation relative to the current electrodes. The depth and volume of the subsurface zone represented by the measured apparent resistivity is a function of the geometry of the current and potential electrodes. Apparent resistivities are converted to model or true resistivities by performing a joint inversion of all the measured apparent resistivities along a profile (or profiles, in the case of 3D resistivity).

Due to access limitations, only two 2D resistivity surveys were completed on the western exit/entry, while three profiles were completed on the east end (see orange dots, **Figure 2**). The apparent resistivity data were mathematically inverted using EarthImager 2D by AGI to provide a resistivity model of the subsurface. Note that the electrical resistivity profiles were performed multiple times over the survey dates due to higher than normal background noise. The best data are presented on **Figure 6** from both end of the HDD; however, the resistivity data maintained a significant amount of noise. Specific ERI survey parameters are listed in **Appendix A**.

RESULTS

The microgravity data are depicted on **Figure 3** as plan-view color contours representing the relative density of the subsurface, with blue for high-density, green for “site normal,” and red for locally low-density areas. The microgravity data displays a distinct alternating pattern of high- and low-gravity anomalies over to the pipelines. These gravity highs and lows could represent an alternating pattern of deeper and shallower rock, with the gravity lows representing deeper (and possibly less dense) soils, indicative of fracture zones. These areas would present a slightly elevated risk for potential subsurface voids following pulling of the 16-inch pipeline. Note that the most significant anomaly is the mass-deficiency around the previous subsidence feature at Station 14886+50.

The seismic refraction data are presented as cross-sectional profiles on **Figure 4**. The data indicate a general three-layer stratigraphy consisting of a residual or sedimentary soil mantle, a weathered rock zone, and competent bedrock. The uppermost layer has average P-wave velocities generally less than 5,000 feet per second (fps) with a thickness of approximately 15-25 feet. This is consistent with a relatively compact soil mantle (shaded blue to yellow). The deepest layers have velocities over 10,000 fps (shaded orange to brown), consistent with competent bedrock (Carmichael, R. S., 1989). The seismic refraction results show multiple low-velocity zones that may be indicative of fracture zones. The suspected fracture zones are highlighted in magenta on the seismic profiles.

The MASW seismic cross sections are presented on **Figure 5**. The MASW velocity models show lateral velocity changes within the bedrock layer across the profiles, and are relatively consistent with the seismic refraction models. Low-velocity zones below the bedrock surface could indicate fractures, but are not indicative of open voids in this geologic setting.

The electrical resistivity results are shown in **Figure 6**. The electrical profiles show a general three-layer model with a relatively conductive surface layer over a discontinuous mildly resistive layer over a more conductive layer. The upper layer is relatively discontinuous, with irregularities that could represent near-surface disturbances given the site development history and the driveway at approximately 14887+75. The deeper conductive (blue) anomalies below the inferred top-of-rock may represent water- or clay-bearing fractures or weathered seams within bedrock.

CONCLUSIONS

In general, the geophysical survey results display anomalies on either end of the alignment indicative of fractures that are possible locations for only slightly-elevated subsidence hazard, but no incipient subsidence features at the time of the survey. **Figure 7** summarizes the anomalous areas with various colored double-arrows. Overlapping and/or adjacent arrows indicate the highest risk of subsidence. The anomaly at Station 14886+50 (labeled A on **Figure 7**) is associated with a previous earth feature. The area of the gravity low at Station 14926+70 should be inspected by the geotechnical engineer or geologist of record to check for signs of earth movement or excessive infiltration. RETTEW also recommends continued monitoring of these locations as further drilling is conducted in the area.

LIMITATIONS

The survey described above was completed using standard and/or routinely accepted practices of the geophysical industry, and the equipment employed represents, in RETTEW's professional opinion, the best available technology. RETTEW does not accept responsibility for survey limitations due to inherent technological limitations or unforeseen site-specific conditions. We will notify you of such limitations or conditions, when they are identifiable.

We have enjoyed and appreciated the opportunity to have worked with you. If you have any questions, please do not hesitate to contact the undersigned.



Charles H. Rhine, MSc, PG
Senior Project Manager



Timothy D. Bechtel, PhD, PG
Senior Project Manager



Felicia Kegel Bechtel, MSc, PG
Director of Geophysics

Enclosures

- Figure 1: Topographic Base Map
- Figure 2: Data Coverage Map and Geologic Setting
- Figure 3: Residual Microgravity Results
- Figure 4: Seismic Refraction Survey Results
- Figure 5: Seismic MASW Survey Results
- Figure 6: Electrical Resistivity Survey Results

Figure 7: Geophysical Survey Results Summary
Appendix A: Geophysical Survey Parameters
Appendix B: Introduction to Seismic Refraction

References

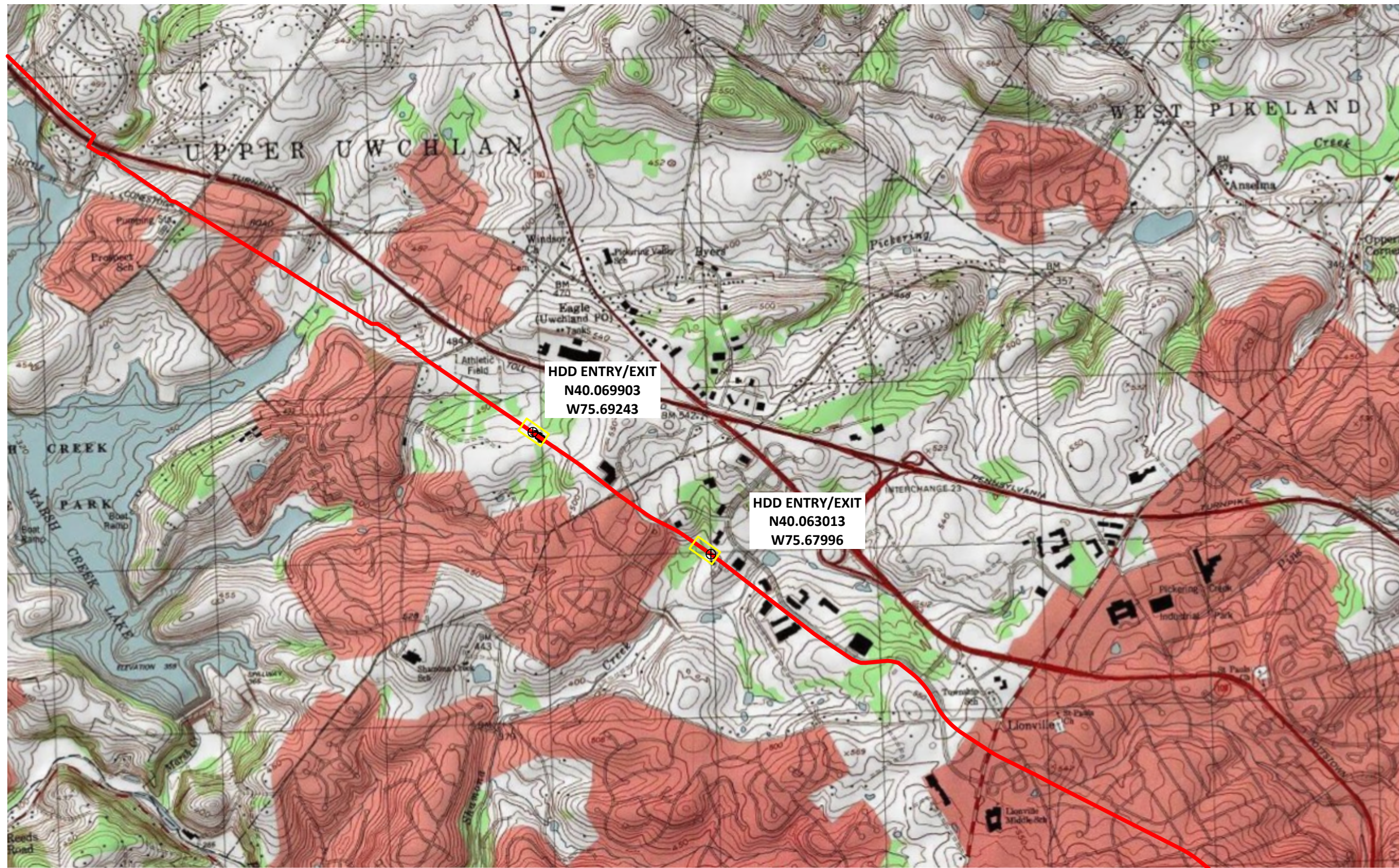
Berg, T.M., Edmunds, W.E., Geyer, A.R., and others, 1980, Geologic Map of Pennsylvania, PA Geological Survey, 4th series.

Carmichael, R. S. (1989), Physical Properties of Rocks and Minerals, CRC Press.

PA Department of Conservation and Natural Resources Geology Interactive Map, (<http://www.gis.dcnr.state.pa.us.html>), 2017.

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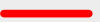
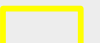

ENCLOSURES



Notes:

Basemap from USGS Topographic WMS Server, extracted 09/2019.

Geophysical Survey Legend

-  16-inch Pipeline Alignment
-  Geophysical Survey Area
-  HDD Entry/Exit Point

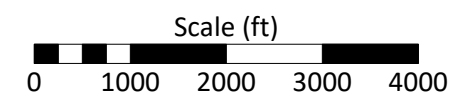


Figure 1: Topographic Basemap

S3-0310 POST 16-inch HDD PULL
PENNSYLVANIA DRIVE

UPPER UWCHLAN TOWNSHIPS

CHESTER COUNTY, PA



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Phone (717) 394-3721 Fax (717) 394-1063

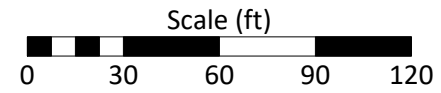
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S3-0310 UPSTREAM EXIT/ENTRY



Geophysical Survey Legend

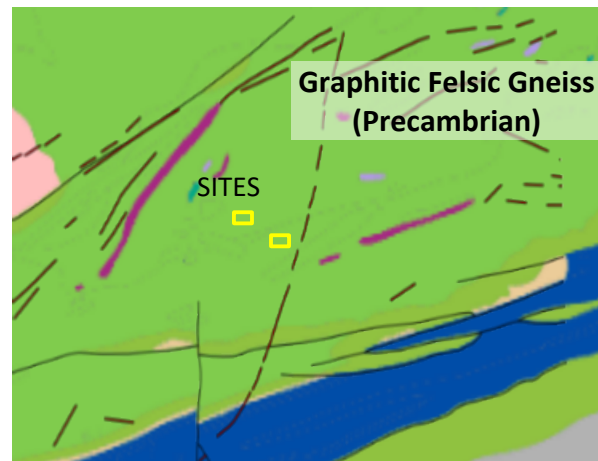
- Electrical Resistivity Station
- ◆ Microgravity Station
- ▼ Seismic Geophone Location
- 16-inch HDD from As-Built
- 16-inch Proposed Pipeline
- 20-inch Proposed Pipeline
- ⊕ HDD Entry/Exit Point
- Earth Feature



S3-0310 DOWNSTREAM EXIT/ENTRY



Geologic Setting



Notes:

Basemap from Nearmap, extracted December 2019.

Coordinates in PA South State Plane, NAD83.

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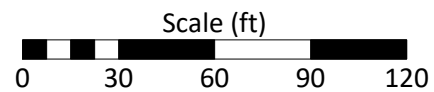
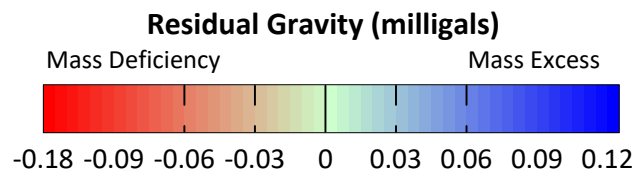
Figure 2: Data Coverage and Geologic Setting

S3-0310 POST 16-inch HDD PULL
PENNSYLVANIA DRIVE

CHESTER COUNTY, PA

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S3-0310 UPSTREAM EXIT/ENTRY



Notes:

Basemap from Nearmap, extracted December 2019.

Data from Scintrex CG-5 microgravity meter with complete Bouguer correction.

Geophysical Survey Legend

- Exit/Entry
- Microgravity Station
- 16-inch HDD from As-Built
- 16-inch Proposed Pipeline
- 20-inch Proposed Pipeline



S3-0310 DOWNSTREAM EXIT/ENTRY



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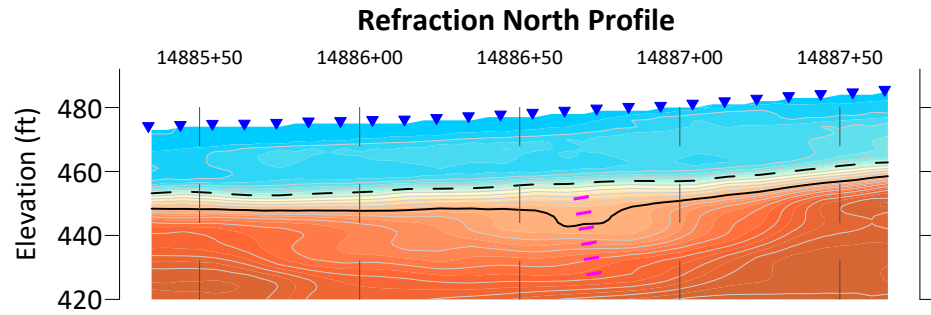
Figure 3: Residual Microgravity

S3-0310 POST 16" HDD PULL
PENNSYLVANIA DRIVE

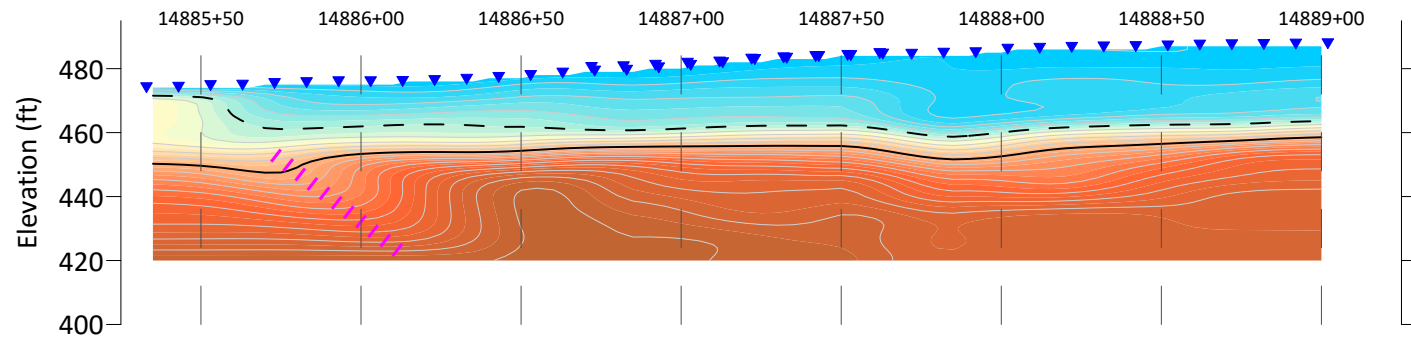
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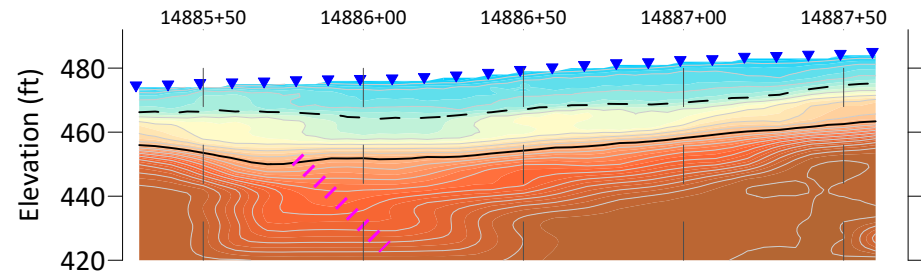
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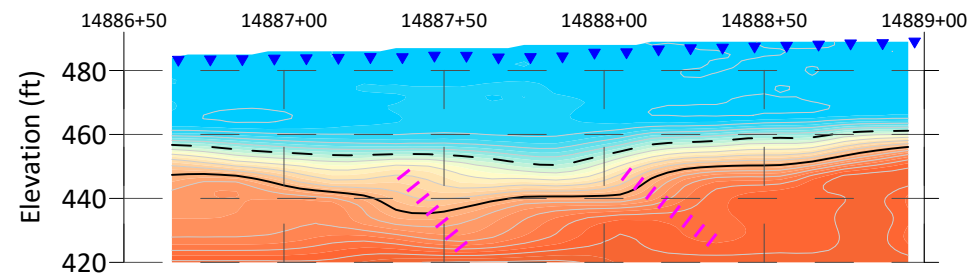
Refraction Center Profile



Refraction South Profile



Refraction 20-inch North Profile

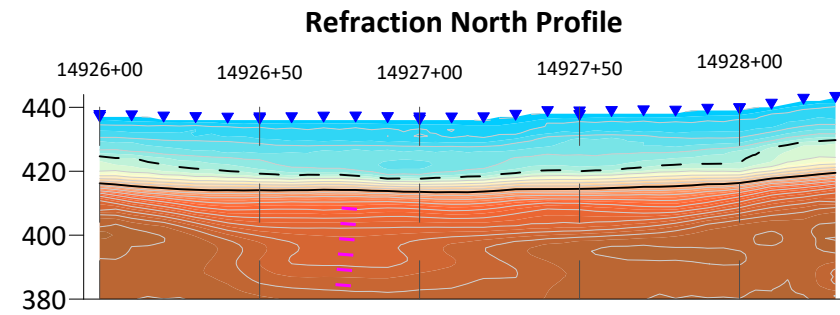


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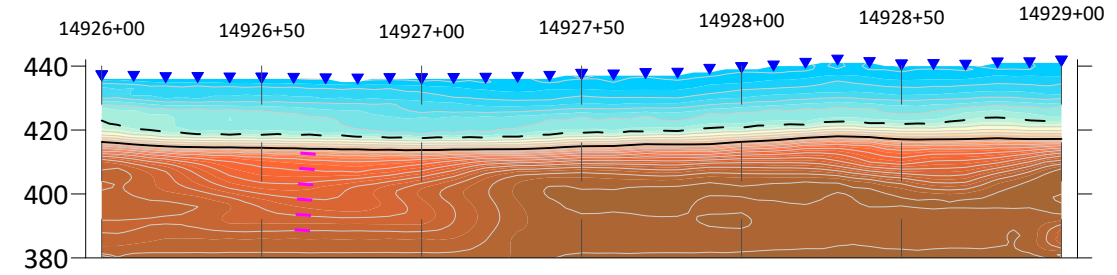
Seismic data from Geometrics 24-channel Geode with 4.0 Hz geophones.

Relative seismic velocity models from SeisImager (by Oyo Corporation) tomographic and ReMi inversions.

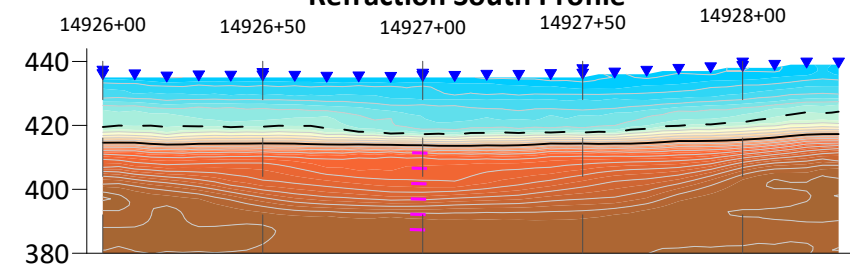
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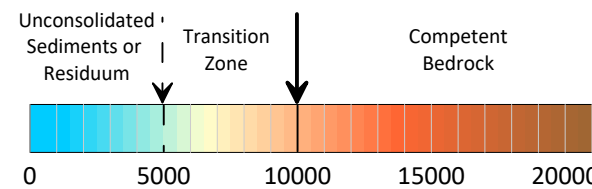
Refraction Center Profile



Refraction South Profile



Relative P-Wave Velocity (fps)



Geophysical Survey Legend

- Seismic Geophone Location
- Possible Fracture Zone
- 16-inch HDD (from AS-BUILT)

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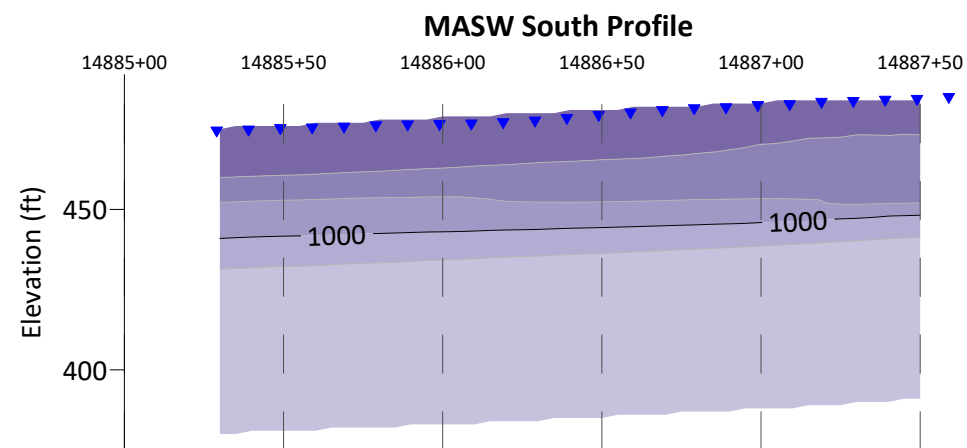
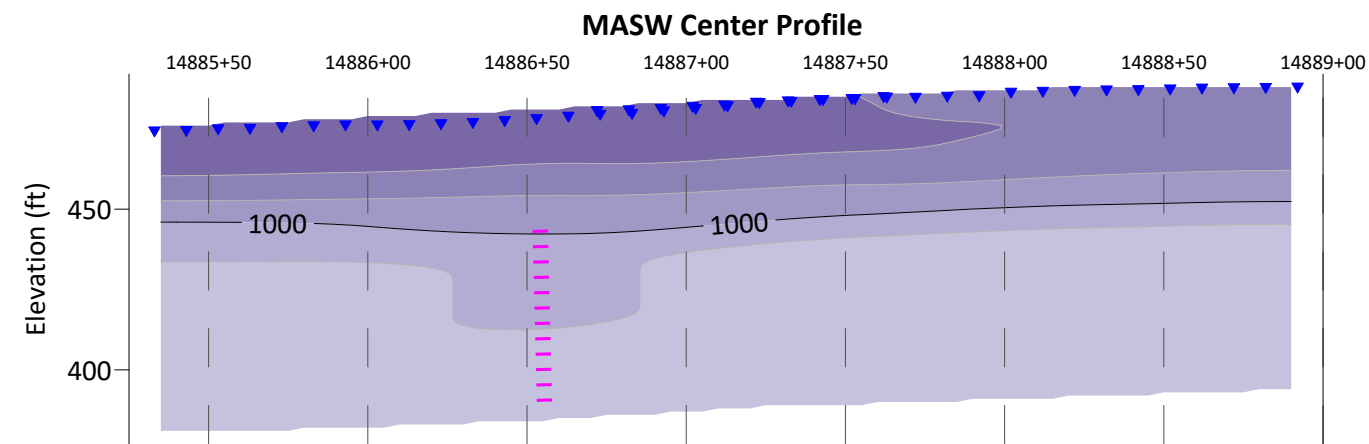
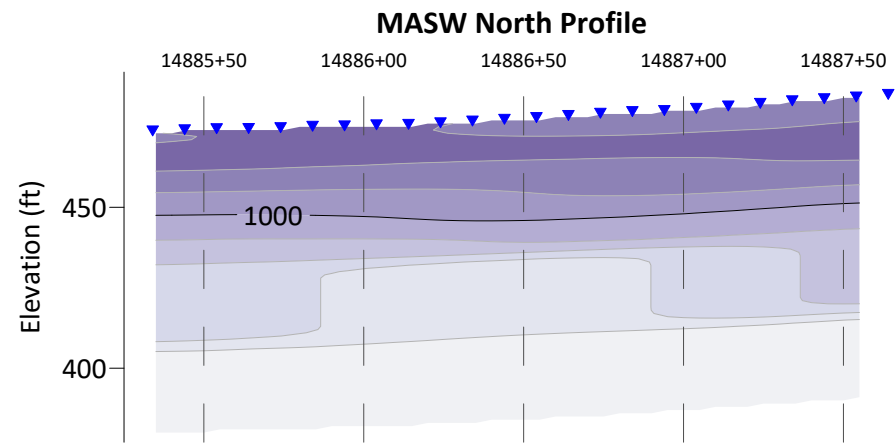
Figure 4: Seismic Refraction Survey Results

S3-0310 POST 16-inch HDD PULL
 PENNSYLVANIA DRIVE

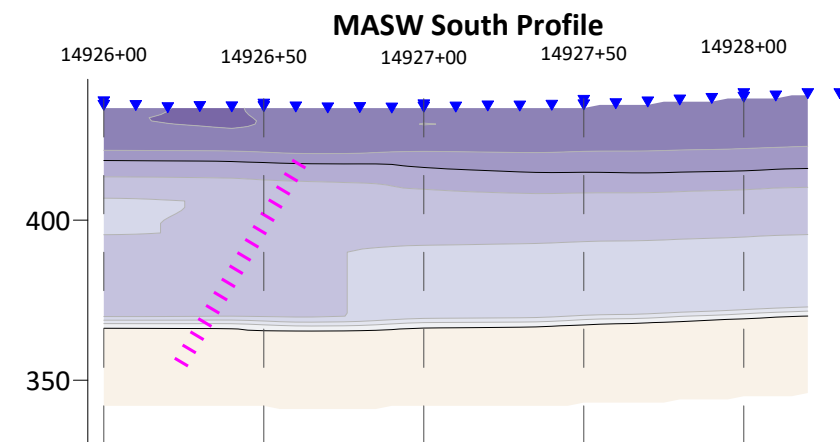
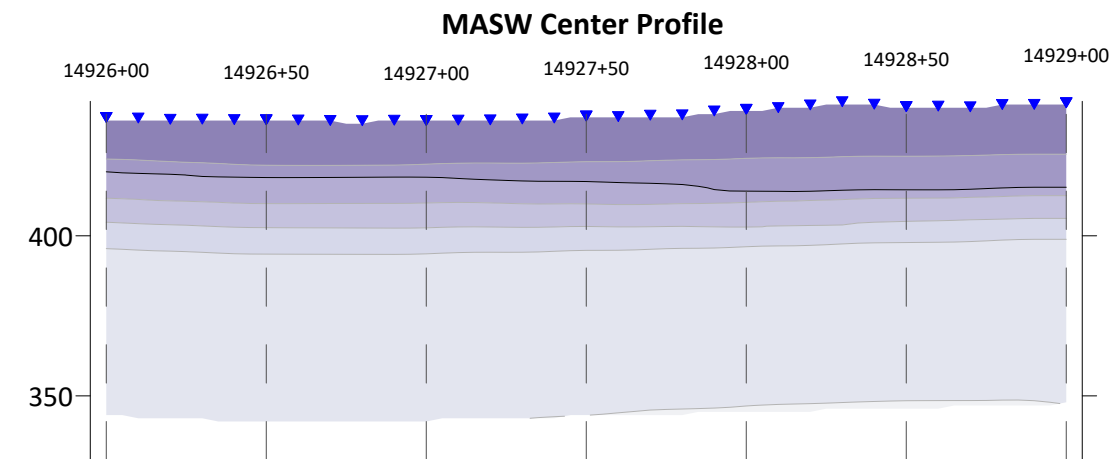
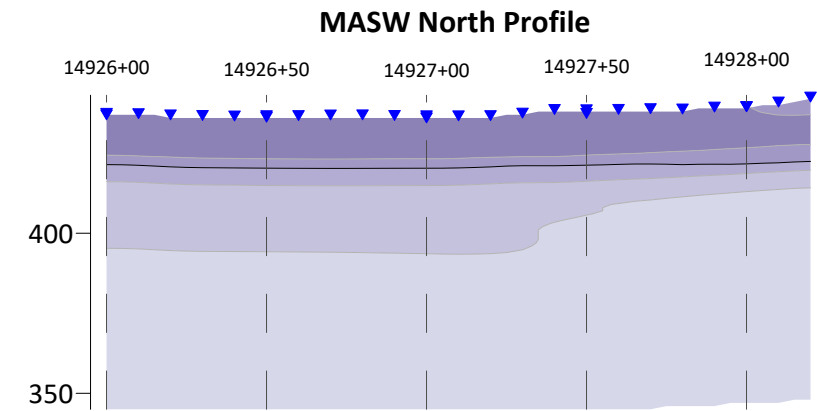
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Upstream



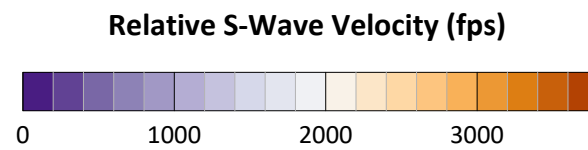
Downstream



Notes:

Seismic data from Geometrics 24-channel Geode with 4.0 Hz geophones.

Relative seismic velocity models from SeisImager (by Oyo Corporation) tomographic and ReMi inversions.



Geophysical Survey Legend

- Seismic Geophone Location
- Possible Fracture Zone
- 16-inch HDD (from AS-BUILT)

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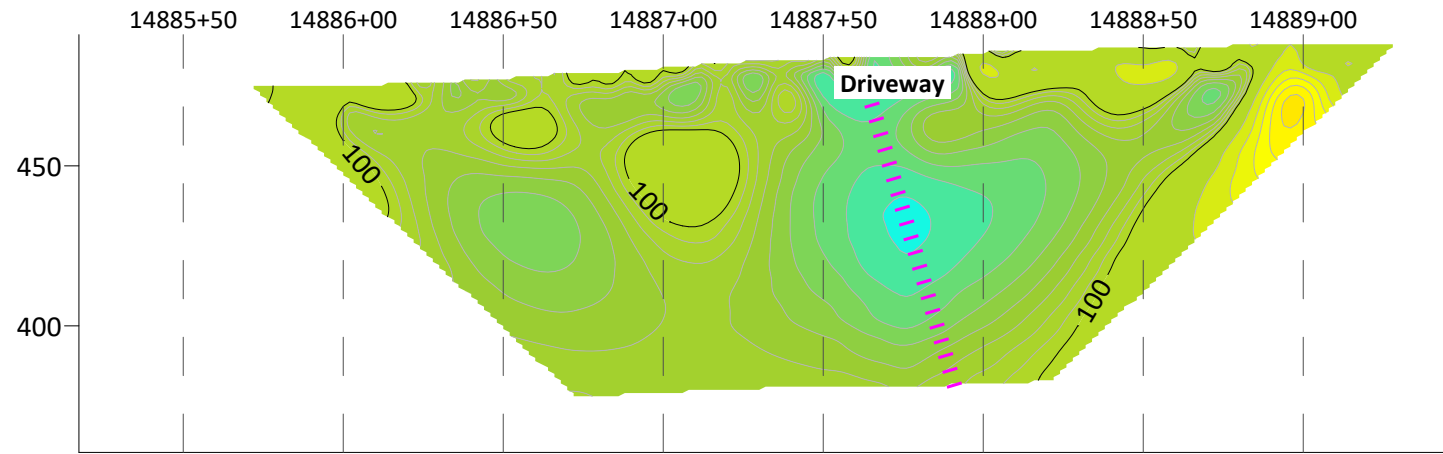
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 3020 Columbia Avenue, Lancaster, PA 17603
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Figure 5: Seismic MASW Survey Results

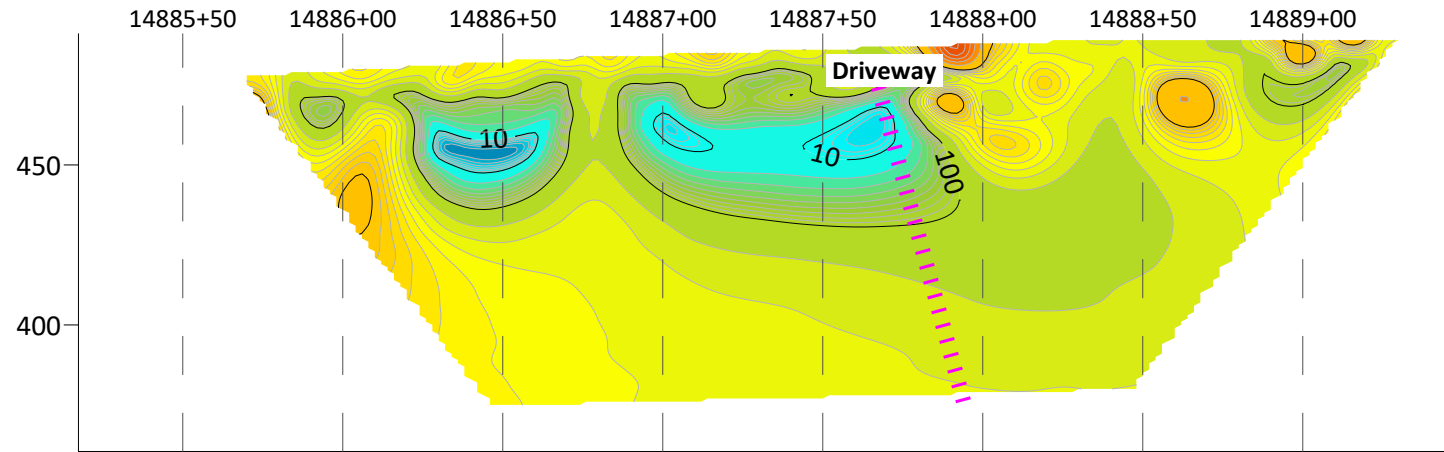
S3-0310 POST 16-inch HDD PULL
 PENNSYLVANIA DRIVE

Upstream

North Profile

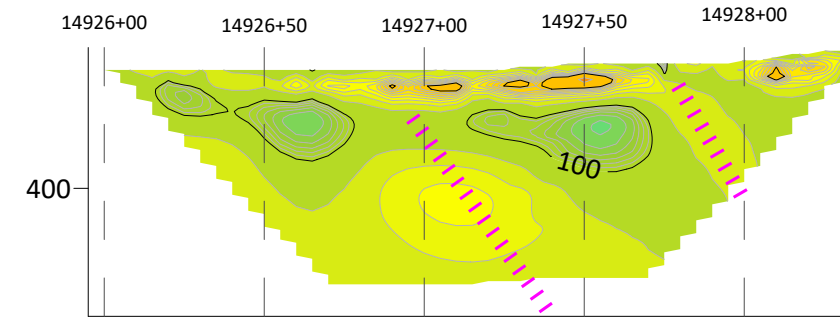


South Profile

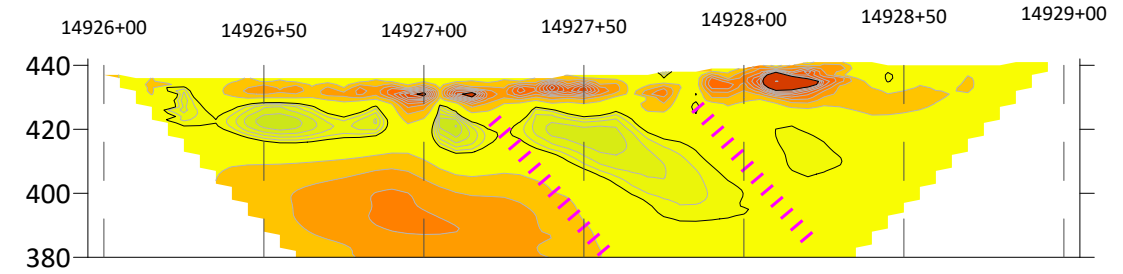


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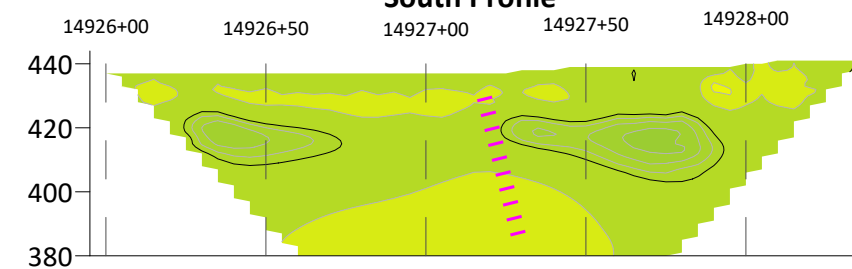
North Profile



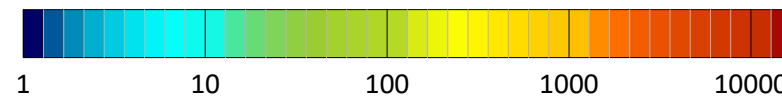
Center Profile



South Profile



Electrical Resistivity (Ohm-m)



Geophysical Survey Legend

- 135984+00 16-inch Pipeline Stationing (ft)
- Possible Fracture Zone
- 16-inch HDD (from AS-BUILT)

Notes:

Resistivity data from AGI Super Sting 56 channels, 10-ft electrode spacing.

Resistivity models from EarthImager 2D (by AGI Corporation) inversions.

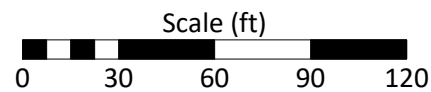
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 FIGURE NO.: 6 of 7



Figure 6: Resistivity Survey Results




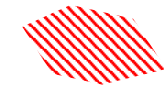



S3-0310 POST 16-inch HDD PULL
 PENNSYLVANIA DRIVE

S3-0310 UPSTREAM EXIT/ENTRY



Notes:
Basemap from Nearmap, January 2020.

Geophysical Survey Legend

-  16-inch HDD from As-Built
 -  20-inch Proposed Pipeline
 -  16-inch Proposed Pipeline
 -  Microgravity Mass Deficiencies
- Possible Fracture Zone Detected By:*
-  Electrical Imaging
 -  Seismic MASW
 -  Seismic Refraction



S3-0310 DOWNSTREAM EXIT/ENTRY



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Figure 7: Geophysical Survey Results Summary

S3-0310 POST 16-inch HDD PULL
 PENNSYLVANIA DRIVE

APPENDIX A
Geophysical Survey Parameters

Geophysical Survey Parameters -- Pennsylvania Drive S3-0310

	Spacing ¹ (feet)	Shot Interval ² (feet)	Offset ³ (feet)	Spread Length ⁴ (feet)	Array Type ⁵	Effective Depth ⁶ (feet)	Lateral Resolution ⁶ (feet)	Vertical Resolution ⁶ (percent)	System
Seismic Refraction	10	40	15	270		50	10	15	Geometrics Geode
Seismic MASW	10	10	15	270		100	10	25	Geometrics Geode
ERI	10		15	270	dipole-dipole	100	30	variable	AGI Sting R-8
MicroGravity	10		10			size-depth trade-off	depends on depth	depends on depth	Scintrex CG-5

¹ geophone, electrode, or station

² Seis (27-lb slidehammer source)

³ distance between parallel profiles

⁴ ERI or Seis

⁵ ERI

⁶ rule-of-thumb only (most depend on site-specific soil properties, sampling interval, depth, and target dimensions)

APPENDIX B
Introduction to Seismic Refraction

INTRODUCTION TO SEISMIC REFRACTION

BY TIMOTHY D. BECHTEL, PHD, PG

ENERGY

Mechanical elastic (seismic) waves generated by a hammer blow, weight drop, or explosion.

SENSITIVITY

Sensitive to elastic properties or moduli – generally strongly correlated with density.

BASIC EQUIPMENT

Recording Seismograph (generally 24 or more channels); Geophones (one for each channel); Geophone cable; Hammer or weight plus strike plate or explosives; Trigger switch.

COMMON APPLICATIONS

Determination of the depth and dip of soil horizons and bedrock surfaces. Recent processing advances allow some detection and delineation of discrete targets.

PRINCIPLES

In a uniform isotropic earth, the shock wave from a blow or explosion at the surface travels outward and downward in a hemispherical wave front like a three-dimensional ripple from a pebble in a still pond. At any point on the wave front, a straight line from the shock source to the wave front depicts the path of the seismic wave and is called a ray path (see **Figure SR-1**). In reality, there are several independent shock waves; the fast-moving primary, compressional or P wave front; the slower moving secondary, shear or S wave (both of which form hemispherical wavefronts); and several disk-like wave fronts that travel only along the surface of the earth (called surface waves or ground roll). For the purposes of most seismic refraction surveys, only the fastest moving wave front — the P wave — is considered. S-wave refraction is used in selected circumstances where complete determination of elastic moduli is desired — particularly when it may be desirable to eliminate the effects of water saturation.

In a layered earth, the hemispherical P shock wave defined by the radially distributed P ray paths are deflected according to the laws of optics (Snell's Law) at interfaces between materials with differing seismic velocities (i.e. densities or elastic properties). Figure SR-2 depicts the deflection of ray paths due to an increase in P velocity at a bedding plane. The type of deflection that a ray path will undergo is dependent upon the angle at which it strikes the interface, and falls into one of four categories:

Some direct rays (green in **Figures SR-2** and **SR-3**) travel parallel to the ground surface at the seismic velocity of the upper layer, do not strike the underlying interface, and consequently are not deflected.

Reflected rays (purple in **Figures SR-2** and **SR-3**) arise where direct rays strike the interface, and a portion of the energy is reflected symmetrically back towards the surface.



The portion of the energy of the incident direct wave that is not reflected upward is refracted or bent as it crosses the interface – making refracted waves in the lower layer (red in **Figures SR-2** and **SR-3**).

At a precise angle called the critical angle, the incident ray is refracted directly along the interface, and travels at the higher seismic velocity of the lower layer (see Critically Refracted Wave in **Figure SR-3**). As this critically refracted or head wave races along beneath the interface, it generates a secondary elastic disturbance that travels back to the surface along ray paths that define a wave front analogous to the bow wake of a ship. These returning rays again travel at the slower velocity of the upper layer.

To perform a refraction survey, a linear array of ground motion sensors or geophones is spaced out from the seismic source or shot point, forming a geophone spread. Each geophone is connected to a separate channel in a seismograph which records a wiggle trace representing the ground motion resulting from the passage of the various seismic rays.

As depicted in the time-distance (T-X) curve in Figure SR-4, the layered earth structure can be determined by analyzing the seismographic wiggle traces. At distances close to the seismic source, the first wiggle or ground motion (the first arrival after the shot) is due to passage of the direct wave travelling at the velocity of the upper layer. Reflected waves arrive later since they have by definition traveled a greater distance at the same velocity (additional later wiggles are caused by passage of the more slowly travelling S and surface waves). Beyond a distance dictated by the critical angle, the first arrival of seismic energy represents the head wave of the critically refracted ray. These refracted rays also by definition travel a greater distance than the direct wave. However, along part of their path, they have traveled at the higher velocity of the underlying more consolidated layer. At greater distances from the shot point, where the path length in the higher velocity layer becomes significant, the head wave arrivals actually race past the direct wave and become the first arrival (see labeled crossover in **Figure SR-4**). By extension, it can be shown that if a third layer with even greater velocity lies at greater depth, the head wave from this layer will become the first arrival at a sufficient distance from the shot point.

In conventional seismic refraction, only the first P wave arrivals can be reliably selected on a wiggle trace record. The later reflected P wave arrivals are generally obscured by the slower-travelling S and surface waves, and the very slow air blast or sound wave from the shot. To interpret a seismic refraction record, the first arrival travel times are measured for each wiggle trace and plotted at the appropriate point on a time-distance (T-X) curve (see Figure SR-4). In a plane-layered earth, these first arrivals define a series of line segments, each representing a discrete layer. The seismic velocity of each layer is simply the reciprocal of the slope of the associated line segment. The thickness of each layer can be calculated from the distances where the line segments intersect. The mathematics for these calculations are easily derived, and can be found in any introductory geophysics text.

True geologic strata are rarely perfectly horizontal. The effect of a dipping interface on a travel time curve cannot be recognized using a single shot point. Calculations based on a T-X curve from a single shot point should always be considered as producing apparent depths to interfaces and apparent seismic velocities for all but the uppermost layer. To determine the true depths and dips of interfaces and the true seismic velocities, it is necessary to reverse the seismic line; that is, move the shot point to a location at or beyond the farthest geophone in the spread, and repeat the shot. The calculation of true depths, dips and velocities from reversed seismic lines is also readily performed.

CAPABILITIES

Conventional seismic refraction can yield accurate measurements of depths and attitudes of soil horizons, groundwater tables, and other relatively distinct and planar strata. Modern computer analysis of multi-fold seismic refraction data (i.e. with many and overlapping shot points) can provide delineation of undulating or even irregular (as opposed to simply planar) interfaces. The latest generation of computer processing techniques require very high-fold data, but in favorable conditions, are capable of resolving even discrete targets such as foundation elements, tunnels or cavities, and can resolve gradational boundaries as well as distinct interfaces. The seismic P-wave velocities of materials are generally an indication of relative density or compaction. S-wave refraction data (collected using specialized geophones, shock sources and field procedures) can provide S-wave velocities that bear a well-constrained empirical relationship to standard penetration test (SPT) N values and therefore bearing capacity. For surveys where matching P- and S-wave velocities are determined, the dynamic elastic moduli of subsurface materials can be calculated (including Poisson's Ratio, Young's or Bulk Modulus, and Shear Modulus or Rigidity).

LIMITATIONS

Seismic data is collected at spaced geophones, and therefore does not provide continuous profile data. If geophones are spaced too widely, thin layers can be missed entirely.

Conventional refraction interpretations are only accurate where the velocity of strata increase with depth. Velocity inversions not only alter the data, but are particularly insidious since the presence of a low velocity zone at depth is not apparent in first arrival data. The latest generation of computer processing techniques do allow detection and delineation of laterally restricted low velocity zones (e.g. tunnels, cavities, gravel lenses, etc.).

Sharp or dramatic interface relief such as limestone pinnacles cannot always be resolved even with very tight geophone spacing. Therefore, refraction profiles of expectedly irregular interfaces should be assumed to represent somewhat smoothed versions of actual relief (see e.g. Figure SR-5).

Seismic records can contain noise due to heavy machinery vibrations, vehicular traffic, and sometimes even wind or distant earthquakes. Care must be taken to identify potential sources of seismic noise prior to beginning a survey.

The effective survey depth is limited to approximately 1/5 of the greatest shotpoint to geophone distance. Therefore, very deep surveys may require impractically long lines (requiring consideration of other geophysical techniques such as seismic reflection).

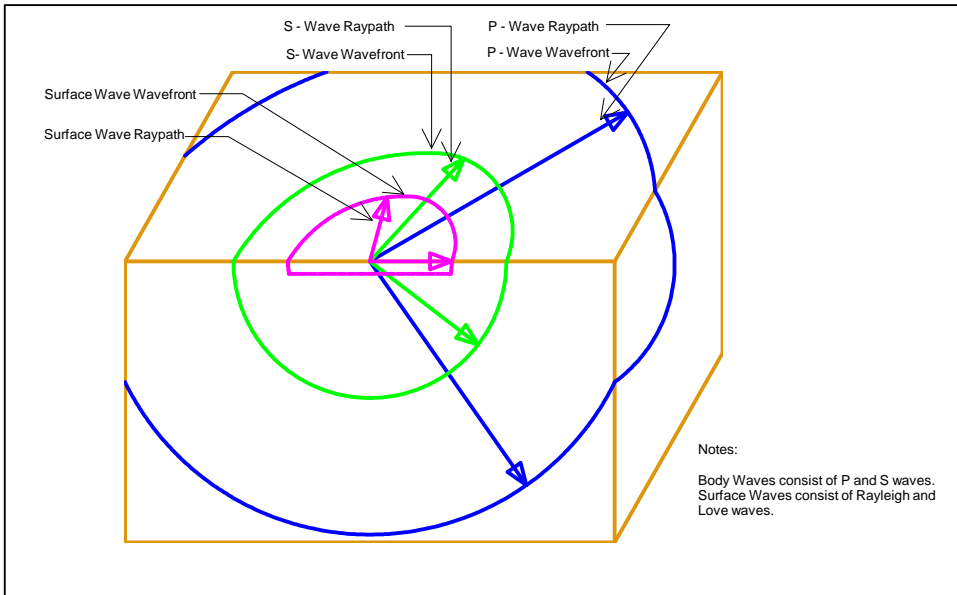


Figure SR-1

Seismic Wave Types

Rev. 04/2018

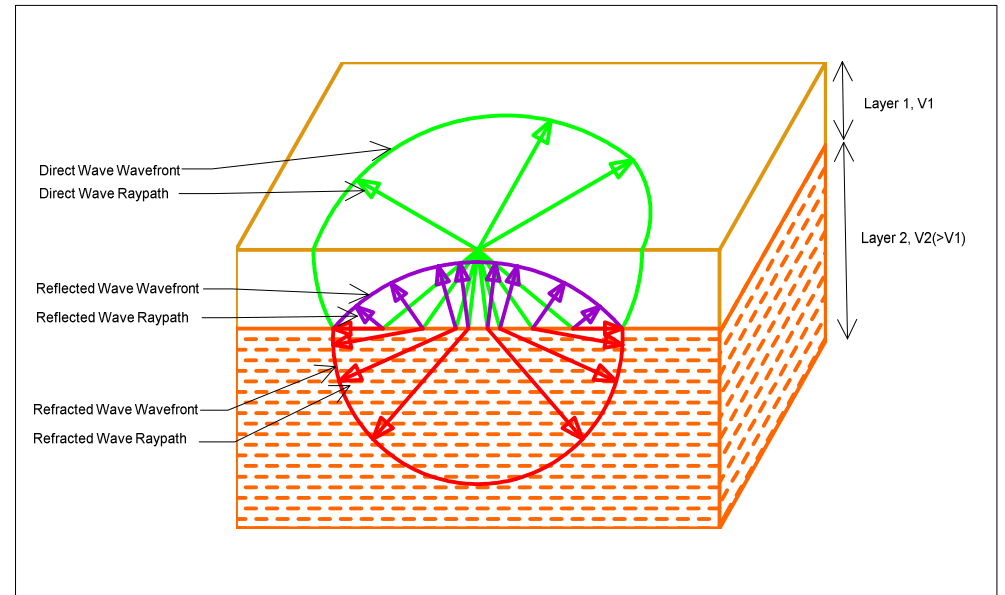


Figure SR-2

Effect of Layering
on Body Wave Raypath

Rev. 04/2018

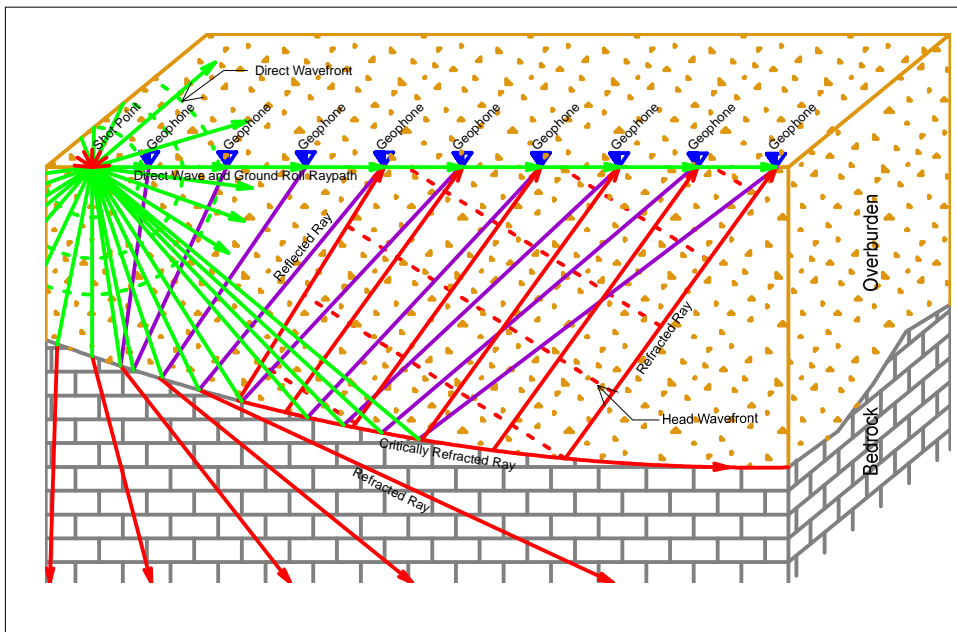


Figure SR-3

Seismic Ray Path Geometry

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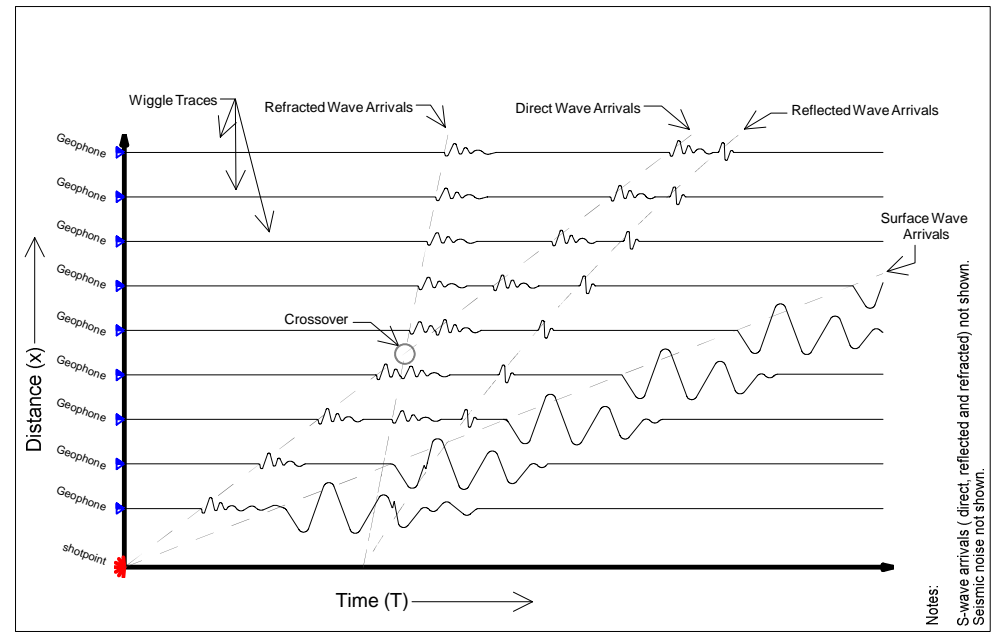


Figure SR-4

Idealized
Seismic Record
and T- X Graph

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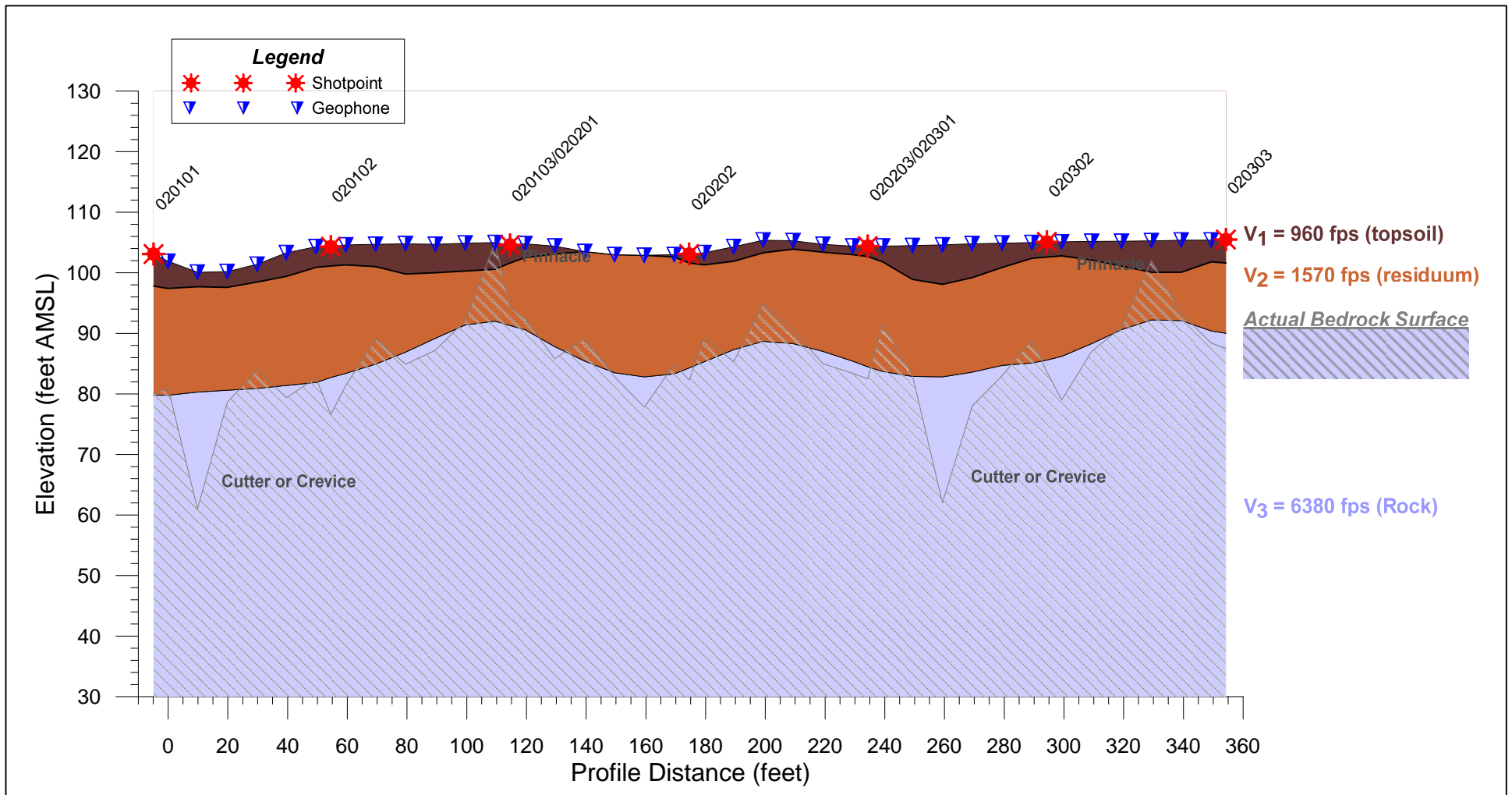


Figure SR-5

Example Karst Terrane Seismic Profile

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