NYE COUNTY NUCLEAR WASTE REPOSITORY PROJECT OFFICE

TEST PLAN

TITLE:	Revision: 1
Seismic Reflection Survey near the Southwest Corner of the Nevada Test Site	Date: 11-2-09 Page: 1 of 5

TEST PLAN NUMBER:	SUPERSEDES:
12.1	**Rev. 0**

APPROVAL

Director — Date: 10/29/09

CONCURRENCE

Geoscience Manager — Date: 10/29/09

Principal Investigator — Date: 10/29/09

Quality Assurance Officer — Date: 10/29/09

1.0 INTRODUCTION

This Nye County Nuclear Waste Repository Project Office (NWRPO) test plan (TPN) provides basic instructions for conducting a seismic reflection survey between well sites NC-EWDP-19, -29, and -24. Work plan WP-12.0, *Surface Geophysical Surveys*, provides the background, purpose, and general objectives of Independent Scientific Investigations Program (ISIP) surface geophysical surveys. This work is being conducted in cooperation with the Applied Geophysics Center (AGC) at the University of Nevada Las Vegas.

The purpose of this survey is to image the alluvium/bedrock contact near the southwestern corner of the Nevada Test Site (NTS) using the seismic reflection method with a vibratory source. This survey is also being conducted to confirm the results of other geophysical surveys conducted by

the NWRPO and the USGS in the area. Successful imaging of this contact will allow future hydrogeologic studies in the area (i.e., tracer testing from fractured volcanics into alluvium).

2.0 BACKGROUND AND PURPOSE

The NWRPO is currently conducting a natural gradient alluvial tracer test (NGTT; TPN-9.5) at Site 22, on the NTS. During the NGTT and previous tracer tests at Site 22 (TPNs -9.2, -9.3, and -9.4) it became evident that other types of tracer tests were desirable (i.e., alluvium to bedrock and bedrock to bedrock tests) to thoroughly characterize the hydraulic properties and groundwater flow characteristics of both general geologic media types in the flow path south of the proposed high-level nuclear waste repository at Yucca Mountain.

The termination of the tuff units of the Paintbrush Canyon group near the Highway 95 fault (Kelley, 2005) provides the optimal location for a bedrock to alluvium tracer test (this is the direction of groundwater flow, north to south). In order to accurately determine the locations of future wells to address this need, more detailed knowledge of the point where the volcanic units truncate (between 29P and 19D) is required. This seismic reflection survey is designed to determine the feasibility of imaging the alluvium/bedrock contact in this area as well as imaging this potential reflector as extensively as possible, given the time constraints.

3.0 SCOPE OF WORK

3.1 Responsibilities

The Principle Investigator (PI) is responsible for supervising the data collection activities described in this TPN. NWRPO personnel, including staff and contract geologists and technicians, are responsible for conducting the activities described in this TPN.

The Field Safety Supervisor (FSS) is responsible for monitoring the health and safety of workers relative to the guidelines established in the NWRPO Site Specific Health and Safety Plan (SSHASP).

The Site Supervisor is responsible for ensuring the completion of work in a safe manner according to the guidelines established in this TPN.

Nye County Field Personnel, as assigned by the PI, FSS, or Site Supervisor are responsible for the completion of the activities described in this TPN.

3.2 Survey Area

This survey will be conducted along the road between well sites -19, -29, and -24 (Figure 1). The road is located just west of the southwest corner of the NTS. The portion of the road where the seismic line will be run is approximately 4 kilometers long, and passes very close to outcrop of Topopah Spring and Tiva Canyon Tuffs. Electrical surveys in the area have determined that these units are highly resistive, but their effects on seismic data collection are unknown at this time.

The thickness of alluvium, based on drilling at well sites -19, -29, and -24 is approximately 260 meters (m), 98 m, and 123 m, respectively.

3.3 Equipment Requirements

The majority of the seismic equipment for this survey will be provided by the AGC (including the minivib, seismographs, cables, etc.). Geophones are being provided by the Incorporated Research Institutions for Seismology (IRIS), located at New Mexico Tech. Other miscellaneous equipment and field labor are being provided by the NWRPO.

3.4 Safety and Environmental Compliance

NWRPO health and safety information, responsibilities, and procedures are described in detail in the SSHASP for Seismic Testing and Data Acquisition. NWRPO personnel will adhere to the provisions of this SSHASP when conducting the activities described in this WP. In addition, the NWRPO will provide water for personnel working on this survey.

No land-disturbing activities (e.g., building of roads for access, or the use of explosives as a seismic source) are necessary for this survey; thus no permits, permissions, or waivers are necessary.

Processes to ensure compliance with applicable federal and state of Nevada requirements for the handling of hazardous, nonhazardous, and universal wastes are described in Environmental Management Procedure EP-1.0, *Waste Management*. Wastes generated during the activities described in this WP will be handled and disposed by NWRPO personnel in accordance with EP-1.0.

4.0 SURVEY DESIGN AND DATA COLLECTION

Data collection will consist of two phases: borehole seismic, and surface reflection testing and data collection. In order to determine p-wave velocity in the alluvium, borehole seismic data will be collected in NWRPO wells at sites 24 and 19, if possible. These data are collected by placing a specialized 3-axis geophone in the well, and vibrating with the minivib at surface. The one-way travel time can then be processed to obtain the p-wave velocity in the alluvium.

The second phase of data collection will consist of several days of surface testing of minivib frequency sweep, record length, field filtering options, and other parameters. Field records will be examined qualitatively in the field, and after preliminary processing where possible. Once an acceptable set of parameters has been determined by the PI, collection of data along the seismic line will begin.

Geophones will be laid out in a single line, according the spacing required by the AGC takeout cable. The seismograph system owned by the AGC is capable of collecting data on 144 channels; due to the number of geophones available (150), a single geophone will likely be used at each takeout. To improve the signal to noise ratio of the data collected, data may be stacked at the seismograph. In all cases, field parameters will be determined by the PI. Once determined, these parameters will be recorded in the scientific notebook. It must be noted that the acceptable parameters may change depending on the location along the survey line.

4.1 Data Processing

Data will be correlated with the reference signal (collected on channel 1 of the seismograph) in the field and stored on the hard drive of the seismograph. Post-processing of data will occur at the NWRPO using commercially available software packages. Required processing steps will be determined by the PI, and may include data reduction, convolution, frequency filtering, velocity analysis, common-midpoint stacking, apparent-velocity (apparent-dip) filtering, the p-τ transform, relative-amplitude processing, and migration (Telford, et al., 1990).

4.2 Records

Seismic data collected as part of this survey are recorded electronically by the seismograph. Additional survey parameters are recorded in log files on the seismograph, and will be noted in the scientific notebook, as appropriate. Electronic data, including log files, will be archived at the NWRPO Quality Assurance Records Center at the end of the survey. In addition, the use of equipment from IRIS requires that all data be published within 2 years of their collection. This will be accomplished via posting to the NWRPO website.

5.0 REFERENCES

EP-1.0, *Waste Management*, Environmental Management Procedure: Nye County Nuclear Waste Repository Project Office. Pahrump, Nevada.

Kelley, R.E., 2005, 1999 and 2004 Aeromagnetic surveys, named magnetic anomalies, existing and proposed borehole locations, map number m201425: Los Alamos National Laboratory.

Potter, C.J., et al., 2002, Geologic map of the Yucca Mountain region, Nye County, Nevada: USGS Geologic Investigations Series I-2755.

Telford, W.M., L.P. Geldart, and R.E. Sheriff, 1990, Applied geophysics, second edition: Cambridge University Press.

TPN-9.2, *Single-Well Push/Pull Tracer Tests at Well NC-EWDP-22S*, Test Plan: Nye County Nuclear Waste Repository Project Office. Pahrump, Nevada.

_TPN-9.3, *Cross-Hole, Multiple-Well Tracer Test at Site 22.*

_TPN-9.4, *Site 22 Cross-Hole Tracer Test Using Perrhenate and Iodide.*

_TPN-9.5, *Natural Gradient Cross-Hole Tracer Test at Site 22.*

WP-12.0, *Surface Geophysical Surveys,* Work Plan: Nye County Nuclear Waste Repository Project Office. Pahrump, Nevada.

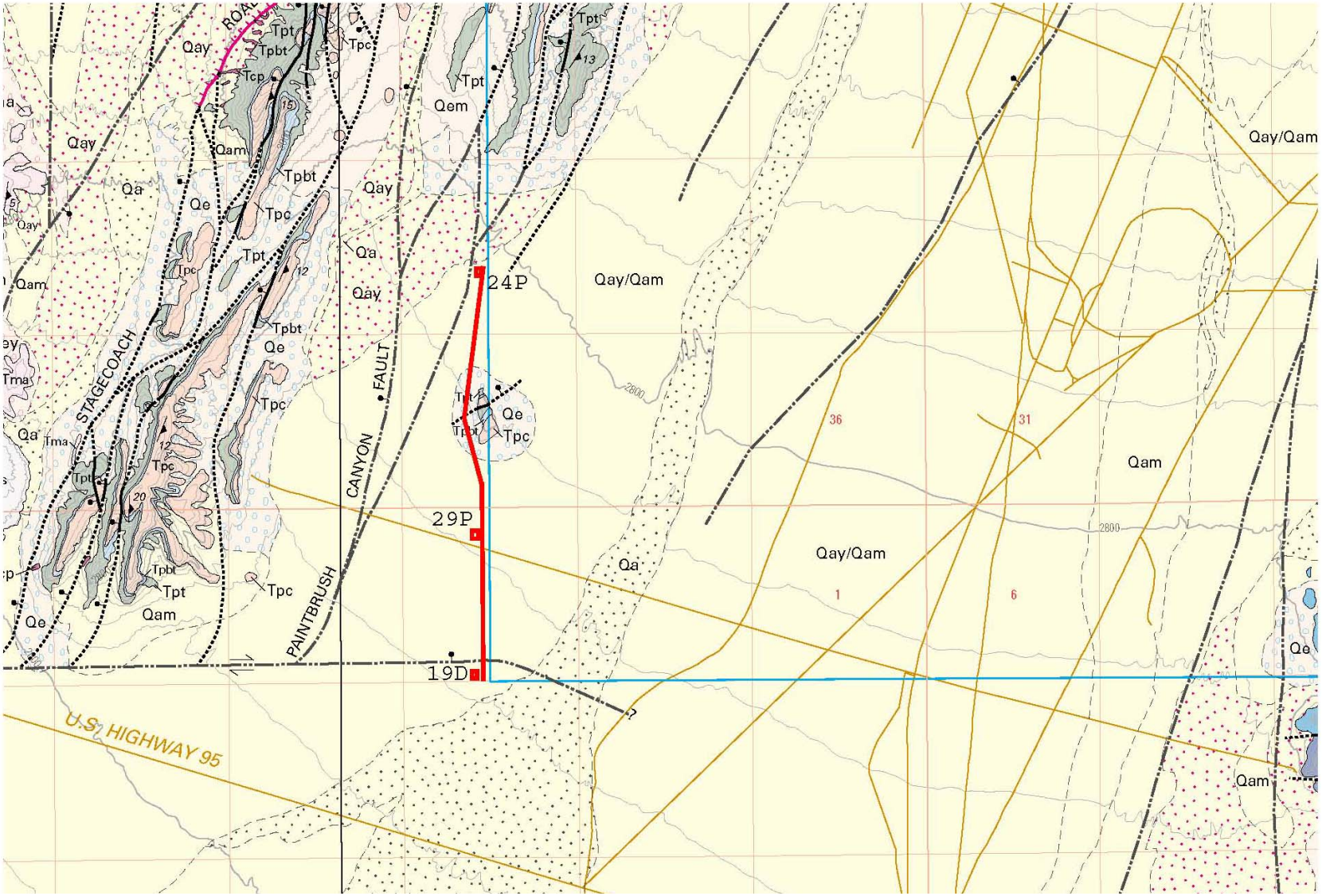

Figure 1
Seismic reflection line location. Base map modified from Potter, et al., 2002.