NYE County NWRPO -Technical Data Report

RID No.	Transmitter	Org.	Receiver	Org.	Key word1	Title/Description
7415	Gilmore	Nye County NWRPO	QARC	Nye	29P	NC-EWDP-29P Alluvium, Non-Alluvium, and Alluvium Core Logging Forms

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Entry Date 1/31/2008 **Detailed Doc. Type** Alluvium/Non-Alluvium Logging **Keyword3** core

Data Originator Preparer Kathy Gilmore

Title of Data NC-EWDP-29P Alluvium, Non-Alluvium, and Alluvium Core Logging Forms

Description of Data Logging reports exported from drilling database (NC Drilling v3.6.mdb and v4.mdb) in .pdf format. (Alluvium, Non-Alluvium, and Core Logging Forms from 6/25/03 to 6/30/03).

Data Collection Method Borehole drilling and sampling, and borehole depth control procedures. Logs were reviewed for accuracy of field data.

Data Location(s) NC-EWDP-29P

Data Collection Period(s) 6/25/03 to 6/30/03

Data Source(s) Geologic logging of drill cuttings. Scientific Notebook #157 (RID 6285), pages 3-30, describes general drilling conditions.

Supporting Data: RIDs 6285, 6659, 6756.

Data Censoring Particle Size Distribution data (field estimates), USCS Group Symbols and density data for alluvium drill cuttings; and Particle Size Distribution data and USCS Group Symbols for alluvium core as recorded on logging forms.

Data Processing Data from field logging forms were entered into the drilling database, reviewed, and transmitted to the QARC.

Data Limitations Two slight variations on reverse circulation drilling were used for drilling unsaturated alluvium in NC-EWDP-29P. The majority of the borehole was drilled using center return reverse circulation air rotary method as was used for all reverse circulation boreholes in Phase IV (28P, 16P, 27P, 29P, 24P). Two short intervals from 180 to 203.3 ft and 280 to 303.2 ft were drilled with center-or face-return downhole air hammer method. This method was used to test whether air hammer methods provided more representative alluvium samples than rotary methods.

A third type of sample was collected from unsaturated alluvium in borehole NC-EWDP-29P. Drive core methods using a 4 in. ID by 2 or 2.5 ft long steel drive barrel lined with 3 and 6 in. long brass segment liners driven with a downhole air hammer was used to collect core samples from selected intervals in these boreholes. Drive core methods had been used previously in casing advance drilling in earlier EWDP phases. Drive core samples are considered to be less disturbed from in situ conditions than drill cuttings. This method was used in Phase IV to test the method in open hole conditions and provide a limited number of more representative samples of alluvium in a borehole primarily sampled with rotary drilling methods. Samples collected with drive core methods were initially logged on the standard Alluvium Logging Form. Subsequent to drilling, the drive core sample data was transferred to the newly developed Alluvium Core Logging Form. The new form provides more detail on core run, borehole fill and core related information. Some descriptive data not required on the new core form was left on the Alluvium Logging Form.

Samples collected from alluvium by reverse circulation air drilling methods are not entirely representative of in situ conditions due to several drilling related factors. The near surface (0 to 62.5 ft) alluvial drill cuttings samples are impacted as a result of hole erosion and related sample contamination resulting from the drilling of loose unconsolidated sediments in the near surface. A small amount of injection water was necessary to stabilize these unconsolidated sediments and repeated clean-out was required to advance the borehole. Installation of a 58 ft surface casing eliminated these hole erosion problems. Below a depth of 62.5 ft, winnowing of fines at the air cyclone separator occurred during dry drilling of the unsaturated alluvium and could account for more than 50% loss of fines. For example, the ideal sample volume for a 6 1/4 in. borehole is 4.0 gallons and sample yield was as low as 0.5 gallon in the unsaturated sediments. Evidence from other boreholes in alluvial sediments indicate that the mechanical action of the rotary bit results in sample degradation and particle size distribution bias (see discussion in report for the Early Warning Drilling Program Phase III

Boreholes, Section 2.1.2, RID 5579). In general, the mechanical action of the bit reduces large-size particles to smaller-size particles effectively decreasing the gravel-size component and effectively increasing the sand and "fines"-size component. This is a relatively minor problem in unsaturated alluvium and in the upper part of saturated alluvium where water production is low. However, in underlying saturated alluvium this drilling impact renders particle size distribution data useless. Since this borehole penetrates unsaturated alluvium only, particle sizes in drill cuttings are impacted to some extent but are considered to provide a reasonable approximation of in situ conditions.

The Alluvium Logging Form includes preliminary field estimates of grain size distribution for the 320 ft of alluvium penetrated. The estimates are made on every 2.5 ft drill cuttings sample interval and used for preliminary layering information and general planning of wells prior to receipt of laboratory data. Grain size distributions and USCS group symbols were also estimated for each 3 and 6 in. long segment of drive core. These field estimates of grain size distribution as well as USCS group symbol data should not be considered representative of geologic samples and have been censored. However, grain size distribution data determined by laboratory analysis on every second 2.5 ft drill cuttings sample interval and selected drive core 3 and 6 in. long segments are considered representative of the geologic samples (RID 5771).

In addition, some sample handling disturbance may have been introduced into samples by: 1) material accumulating on rotating splitter during wet drilling; and 2) unsaturated zone sample homogenization process and sample splitting.

Sample weights in sample density data do not include material that is lost to winnowing of unsaturated fines (dust). Although material that was "cleaned out" of the borehole after each 20 ft drill run was weighed and the data were captured in the comments section of the log, unsaturated zone sample weight data are not generally representative of the volume of the borehole drilled and should not be used in density calculations and have been censored.

In the upper section of the saturated zone from 360 to 440 ft, the water production data was estimated. Injection water was required to lift the sample and maintain a clean drill string. Beginning at 440 ft, timed volume water tests were conducted generally at 40 to 60 ft intervals to measure the production of water.

Evaluations of cementation of alluvium samples and structure of non-alluvium samples as recorded on the logging forms are difficult to accurately determine because intact pieces of in situ material are not available in cuttings.

The unit logged from 700 to 790.7 ft (T.D.) is a poorly cemented sandstone. The formation "produced" sand from approximately 720 ft to T.D. and samples from 720 ft onward would be contaminated with this sand. Because the sandstone unit is homogeneous in nature, the sample contamination is difficult to detect.

In summary, laboratory measurements of grain size distribution of alluvium drill cuttings in this borehole are considered to be modified to some extent of in situ conditions due to a number of drilling-related factors. However, for the most part, these factors were unavoidable. Disturbance from sample handling related factors is considered minimal. Except for censored data mentioned above, geologic drill cutting samples from NC-EWDP-29P are considered approximately representative of in situ conditions. Drive core samples of alluvium are considered less disturbed from in situ conditions and therefore are more representative of in situ conditions than drill cuttings. The geologic data recorded in these geologic logs are used to produce a Summary Lithologic Log.

Governing QA Docs.	TP-7.0 Rev. 3, TP-8.0 Rev. 4
Frequency of Transmittal	once per borehole
Direct Questions About Data To-	NWRPO QA Records Center