

**CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES**  
**TRIP REPORT**

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**SUBJECT:** Trip Report for Observation and Sampling of Nye County Early Warning  
Drilling Program Wells  
20.06002.01.141

**DATE/PLACE:** August 26–30, 2002 and September 9–13, 2002  
Nye County, Nevada

**AUTHORS:** Bradley Werling and F. Paul Bertetti

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#### **PERSONS PRESENT:**

Center for Nuclear Waste Regulatory Analyses (CNWRA) staff traveled to Las Vegas, Nevada and Nye County, Nevada to participate in a Nye County Early Warning Drilling Program sampling event. Representatives of Nye County invited several organizations to participate and collect water samples from recently completed wells in the Early Warning Drilling Program. P. Bertetti, B. Werling, and J. Brown participated in sampling August 26–30, 2002, and B. Werling participated in sampling September 9–13, 2002. The number of organizations and individuals participating in the sampling events varied from day to day. Participants included representatives of Nye County and its subcontractors, Los Alamos National Laboratory, United States Geological Survey, the State of Nevada, and the University of Nevada at Las Vegas.

#### **BACKGROUND AND PURPOSE OF TRIP:**

Nye County, with funding from the DOE, established the Early Warning Drilling Program in fiscal year 1999. The Early Warning Drilling program is designed to protect residents of Nye County against potential radionuclide contamination and to produce data regarding the geology, chemistry, and hydrology of strata located along the potential flow path of groundwater emanating from Yucca Mountain and vicinity. CNWRA personnel participated in the recent sampling events to observe practices and procedures used on behalf of DOE to collect water samples and to obtain water samples for independent chemical analyses.

The Early Warning Drilling program has proceeded in several phases. Phase III (started in fiscal year 2001) of the Early Warning Drilling program provided for construction of nine new wells and was completed in March 2002. Phase III was the last scheduled phase of the drilling program as originally funded. Nye County submitted a proposal for additional scientific investigations, including additional Early Warning Drilling Program work, in March 2001. The proposal outlined scientific activities to be conducted by Nye County over the next five years (fiscal years 2002–2006). During the sampling event Nye County personnel noted that the next cycle of funding had been approved by DOE, with some minor modifications to the proposed activities. Nye County personnel anticipate renewed Early Warning Drilling program drilling (Phase IV) in the fall of 2002.

Most of the work during the August and September sampling event involved the recently

### Early Warning Drilling Program Locations for Phases I, II and III

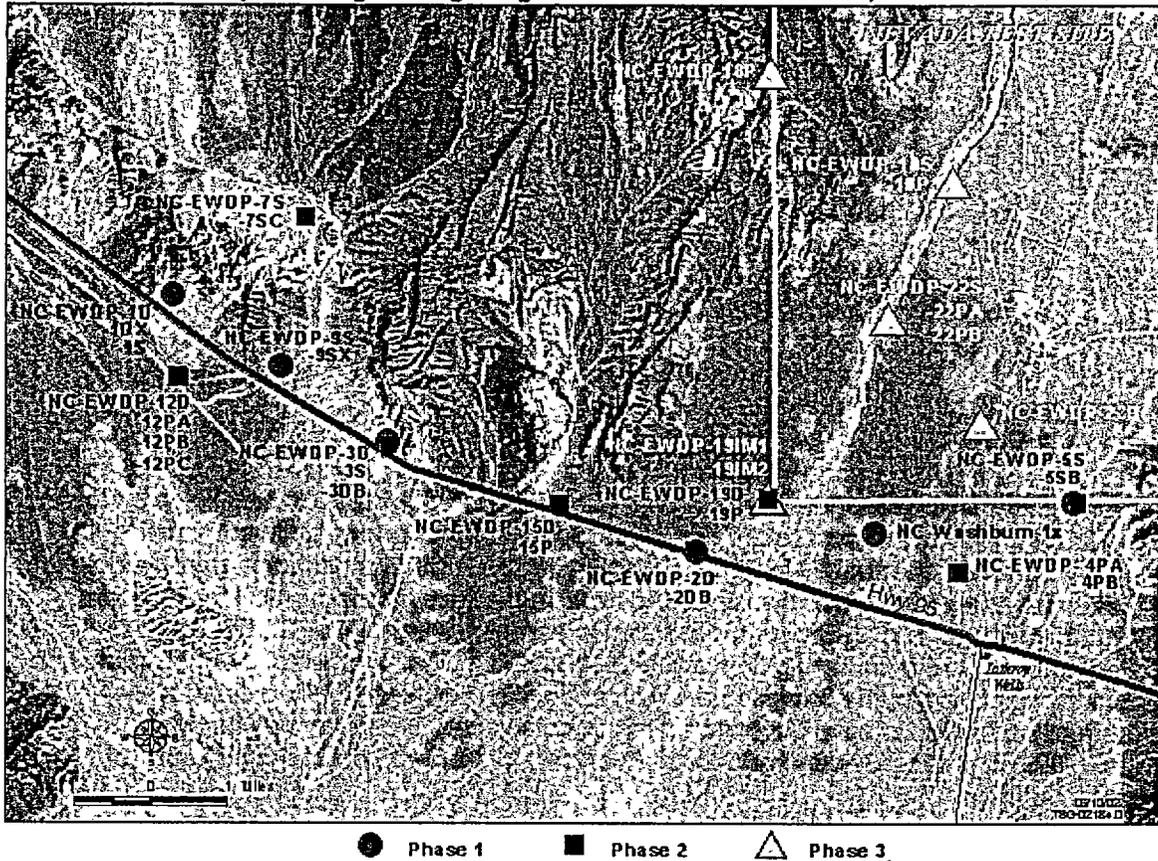


Figure 1. Approximate Locations of Early Warning Drilling Program Wells. Image Courtesy of Nye County ([www.nyecounty.com](http://www.nyecounty.com)).

completed Phase III Early Warning Drilling Program wells (NC-EWDP-10P, 18P, 22PA, 22PB, and 23P). One Phase II well (NC-EWDP-7SC) was also sampled. All of the Phase III wells sampled in August and September are located on the Nevada Test Site (see Figure 1 for approximate location of the Early Warning Drilling Program boreholes). Several of the Phase III wells are located in Fortymile Wash south of Yucca Mountain and north of the earlier Phase I and II wells. Nye County provides detailed descriptions of each borehole, including summary lithologic logs, water level data, and well completion information at their web site ([www.nyecounty.com](http://www.nyecounty.com)) under the Early Warning Drilling Program section.

In general, the depth and nature of construction for the Early Warning Drilling Program wells can be discerned from the well designation. Those designated as "P" wells are piezometers and are completed with one or multiple separate PVC pipes (2 inches in diameter) that are screened at discrete depths. "S" wells are completed with larger diameter casing and are typically screened at multiple intervals. All Phase III "S" wells have Westbay MP 55 (Westbay Industries, Inc.) monitoring systems installed. The Westbay systems include packers for isolation of groundwater production zones and ports for sampling of water chemistry and for continuous monitoring of downhole pressures (water levels). Well completion diagrams showing the screened intervals of the wells sampled during the August/September sampling events are provided in Attachment 1.

## **SUMMARY OF ACTIVITIES:**

Nye County's original plans for the August event called for sampling to take place over five consecutive days from August 26–30, 2002. Sampling during the first day took longer than originally anticipated by Nye County staff, so the schedule was adjusted to eliminate sampling of well NC–EWDP–23P during the first week. As a result, CNWRA staff were able to sample wells NC–EWDP–10P, 18P, 22PA, and 22PB (shallow zone only), but were not able to collect samples from 22PB (deep zone) or 23P. Nye County rescheduled sampling of NC–EWDP–23P, which also required additional development, to the last full week of September 2002. Nye County's plans for the September portion of the sampling event called for the sampling to take place on five consecutive days from September 9–13, 2002. Wells NC–EWDP–22S, 10S, and 7SC were slated for sampling. Sampling fell behind schedule on the first day of the second week due to electrical problems with Nye County's sampling pump. With the assistance of the pump manufacturer, the problem was fixed and the sampling started. However, the lost time resulted in the postponement in the sampling of zone 4 of NC–EWDP–7SC, which was rescheduled for the last full week of September 2002.

Sampling generally proceeded with Nye County personnel opening each well, measuring and recording the static water level, installing the pumping apparatus, and purging the well. Wells and packed zones were pumped to discharge at least three borehole or packed zone volumes prior to sampling. An exception occurred during sampling of well NC–EWDP–10P (shallow zone) where samples were taken based upon stabilization of water chemistry rather than pumping of three borehole volumes. Nye County personnel (K. Gilmore) and Los Alamos National Laboratory personnel (A. Meijer) each used in-line monitoring probes that were capable of measuring pH, conductivity, oxidation-reduction potential, dissolved oxygen, and temperature of the well discharge. Data from these in-line probes were used to monitor the adequacy of the well purging and for comparison with field measurements. Once samples were ready to be taken, each interested group collected water from the same discharge point, which was upstream of the discharge tubing for the in-line probe assemblies. The volume and type of container used for the collection of samples varied depending on the needs and interests of each organization collecting samples.

During the August sampling, CNWRA staff conducted field analyses and collected samples for subsequent laboratory analyses. During the second sampling, samples were collected, but field analyses were not conducted. For each groundwater zone, approximately 4.5 liters of water were collected and were split into subsamples for subsequent laboratory analyses. Sample type and quantities are listed in Table 1. CNWRA field analyses included measurement of temperature, pH, oxidation-reduction potential, conductivity, turbidity, dissolved oxygen, and alkalinity. Table 2 provides preliminary results of CNWRA field measurements and readings collected from the Nye County in-line monitoring probe.

## **OTHER PERTINENT ITEMS:**

Nye County recently conducted pump tests at the 10S and 22S sites. Results of the pump tests are expected to be posted on the Nye County web page in the next few weeks. Nye County personnel also indicated that Nye County has tentative plans to conduct an independent tracer test at the well 22S site. Details of the possible test were not available, but DOE will not be involved in the test.

**CONCLUSIONS:**

The Early Warning Drilling Program continues to be a source for important site characterization information that will impact the licensing process. Additional chemical and mineralogical data gained from the Phase III wells will help to bound radionuclide transport parameters used in predicting the potential for radionuclide migration and may provide information regarding the fate of water transported away from Yucca Mountain and vicinity.

**PROBLEMS ENCOUNTERED:**

None.

**PENDING ACTIONS:**

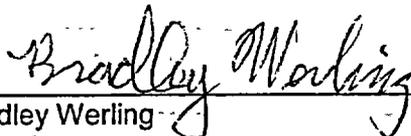
Analysis of the water samples is underway.

**RECOMMENDATIONS:**

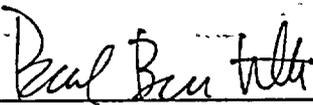
NRC and CNWRA staff should continue involvement in the Early Warning Drilling Program. Through direct participation, NRC and CNWRA personnel (i) improve communication with the public and interested parties, (ii) provide rapid response as necessary to procedural and quality assurance issues through oversight, and (iii) are better prepared to deal with DOE case for licensing through a first-hand knowledge of the collection practices and limitations of the data generated by the Early Warning Drilling Program. All of these result in helping to achieve NRC stated goals of increasing public confidence, reducing the regulatory burden, and streamlining the licensing process.

All of the Phase III wells sampled during this trip were located on the Nevada Test Site. Although obtaining badges and permission for gaining entrance to the Test Site went smoothly, none of the CNWRA personnel had a site access card. This required the CNWRA staff to be escorted or supervised by a person or persons who had a valid site access card and who was willing to act as an escort during our participation. The additional training and procedural requirements to obtain and maintain a site access card are somewhat extensive and completing the requirements was not possible given the short notice associated with this trip. It is recommended, however, that an effort be made to identify staff that may have a need for site access cards in the future and collectively arrange for training and subsequent attainment of site access cards for those staff. This would prevent the possible awkward situation of a need for CNWRA staff to complete work on the test site, but being unable to do so for lack of finding an appropriate escort.

**SIGNATURES:**

  
\_\_\_\_\_  
Bradley Werling  
Scientist

07 OCT 02  
Date

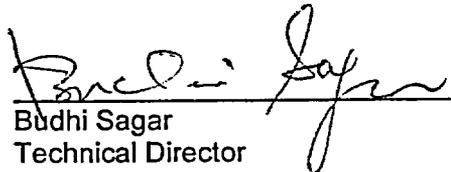
  
\_\_\_\_\_  
Paul Bertetti  
Senior Research Scientist

04 oct 02  
Date

**CONCURRENCE:**

  
\_\_\_\_\_  
English Percy, Manager  
Geohydrology and Geochemistry Element

10/4/2002  
Date

  
\_\_\_\_\_  
Budhi Sagar  
Technical Director

10/7/2002  
Date

**Table 1. Sample Types and Volumes Collected for Each Groundwater Zone During the August/September 2002 Early Warning Drilling Program Sampling Event. A total of 24 zones Were Sampled.**

Sample volume and container type	Filtration	Preservation	Analyses
250 ml [8.45 oz], amber glass	not filtered	none	stable isotope ratio, (H/D, O-16/O-18, and C-12/C-13)
250 ml [8.45 oz], amber glass	filtered, 0.45 $\mu$ m	none	stable isotope ratio, (H/D, O-16/O-18, and C-12/C-13)
1 liter [33.8 oz], high density polyethylene	not filtered	none	anions, cations, trace metals
1 liter [33.8 oz], high density polyethylene	filtered, 0.45 $\mu$ m	none	anions, cations, trace metals
2 liters [67.6], high density polyethylene	filtered, 0.45 $\mu$ m	1+1 HNO <sub>3</sub> (trace metal grade)	cations, trace metals

**Table 2. Summary of Preliminary Field Chemistry Measurements for the August/September 2002 Early Warning Drilling Program Sampling Event. Readings From the In-Line Monitoring Probe (YSI 6820 Probe with YSI 650 Monitor) Used by Nye County Personnel are for Information Only.**

Well	Zone or String	Time of Sample	Water Temperature (°C)	pH	Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	ORP (mV) (Ag/AgCl)	Turbidity (NTU)	Alkalinity (mg/L) (as CaCO <sub>3</sub> )	Measurement source
18P		13:00	34.8	8.14	328	2.91	71.7	1.0	128	CNWRA
10P	shallow	8:10	26.3	7.51	290	7.28	22.1			NYE
		8:15	26.5	7.54	290	7.08	31.9			NYE
		8:20	26.6	7.54	281	8.10	51.0			NYE
		8:30	26.7	7.56	280	7.60	60.6			NYE
		9:00	28.0	7.66	263	7.71	175.0	0.8	94	CNWRA
10P	deep	12:35	30.0	7.55	282	9.13	129.5			NYE
		14:21	29.7	7.53	273	7.78	185.2			NYE
		14:30	30.4	7.34	263	7.12	137.3	1.2	91	CNWRA
10S	zone 1	7:58	26.2	7.54	306	4.02	255.5			NYE
		8:01	27.4	7.83	282	3.84	248.9			NYE
		8:22	29.6	7.77	277	5.42	254.6			NYE
		8:41	29.8	7.67	280	6.17	256.5			NYE
10S	zone 2	13:20	30.3	8.16	385	1.11	-31.0			NYE
		14:00	31.0	8.01	310	2.76	36.6			NYE
		14:23	30.9	7.91	308	3.33	65.0			NYE
		14:31	31.0	7.88	309	3.33	76.5			NYE
22PA	shallow	14:23	28.6	7.49	283	9.22	191.4			NYE
		14:32	28.4	7.55	291	9.40	192.7			NYE

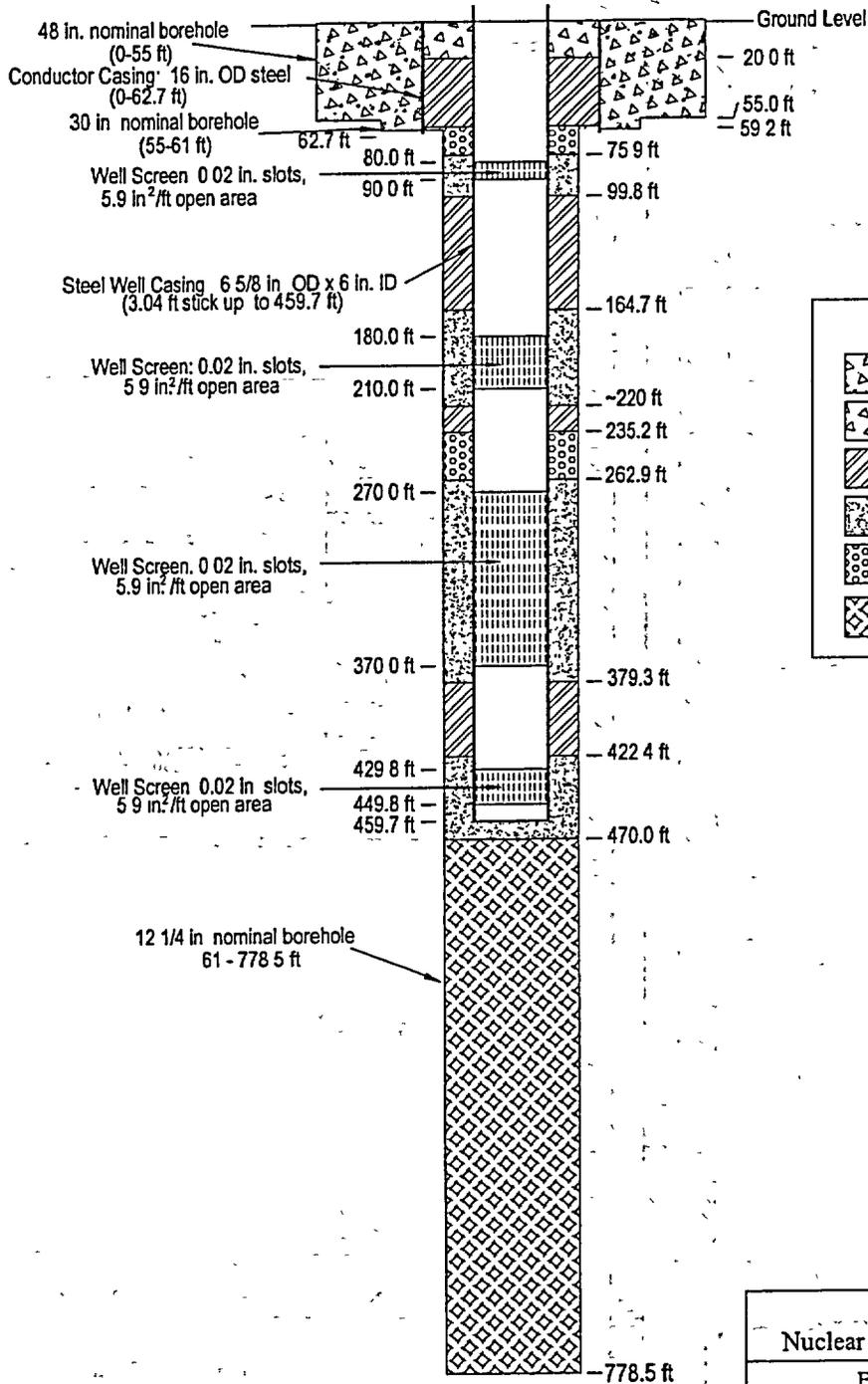
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		16:00	28.8	7.27	186	8.42	148.2	1.5	96.5	CNWRA
22PA	deep	10:51	27.9	7.33	273	8.55	128.9			NYE
		11:18	27.8	7.34	269	9.15	152.3			NYE
		11:40	28.6	7.21	261	8.10	199.6	0.3	92.5	CNWRA
22PB	shallow	13:15	29.0	7.85	321	9.31	243.1			NYE
		14:00	29.8	7.64	299	7.30	207.6	0.4	112	CNWRA
22S	zone 1	8:05	27.4	7.38	271	6.22	116.5			NYE
22S	zone 2	12:24	28.8	7.74	279	1.16	187.2			NYE
		13:10	28.8	7.79	280	0.83	-102.9			NYE
		14:00	28.8	7.76	281	1.21	-116.4			NYE
22S	zone 3	8:07	28.3	7.77	286	3.00	161.6			NYE
		8:27	28.4	7.78	287	2.66	169.1			NYE
22S	zone 4	11:59	28.2	7.70	300	2.41	154.3			NYE
		12:24	28.4	7.69	302	2.50	178.0			NYE
		12:40	28.5	7.69	303	2.61	186.6			NYE
7SC	zone 1	13:57	29.5	7.32	667	7.77	39.7			NYE
		14:39	32.2	7.52	869	6.19	65.1			NYE
		14:50	32.7	7.42	886	6.07	52.7			NYE
		15:01	33.2	7.39	905	5.97	38.6			NYE

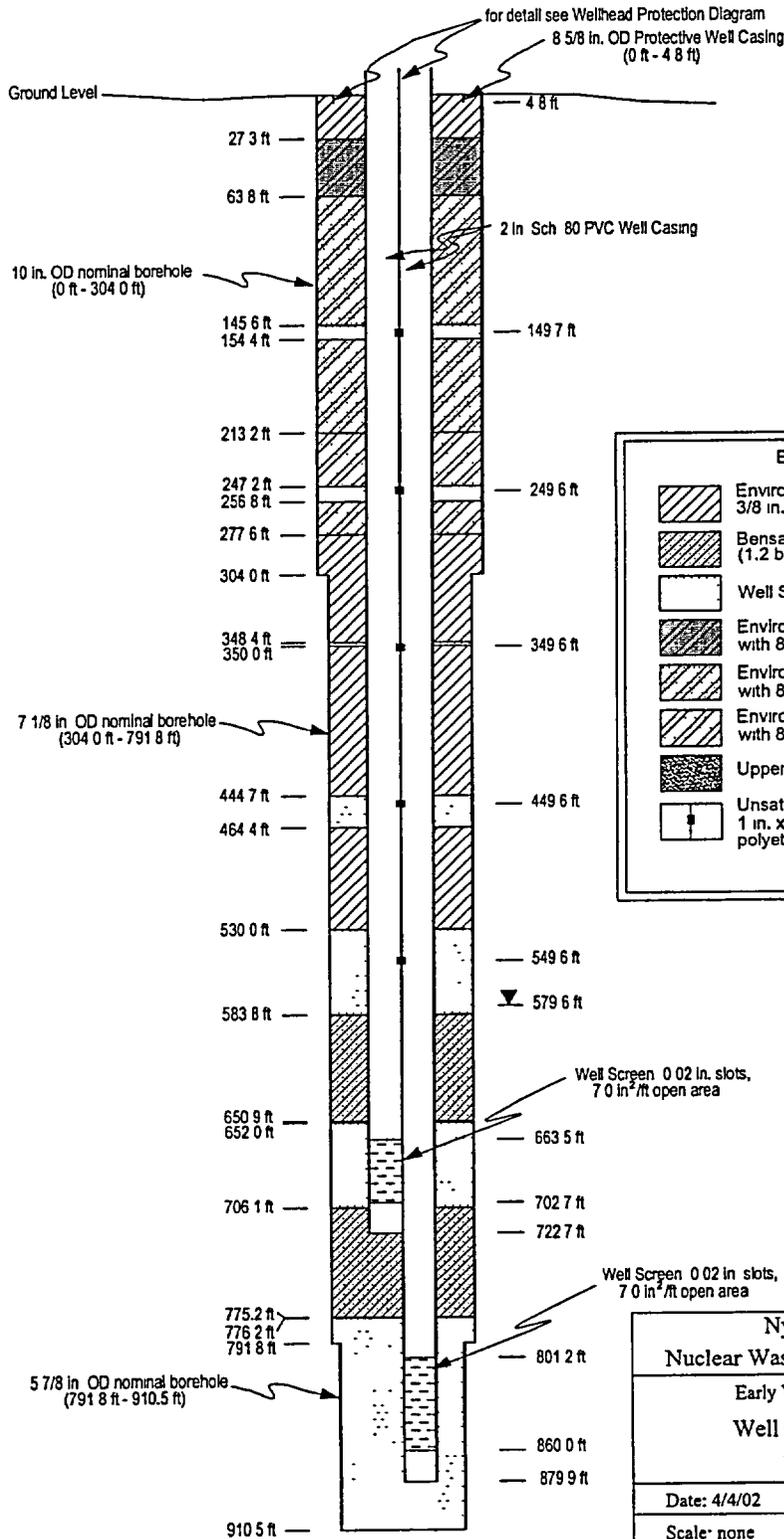
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Well	Zone or String	Time of Sample	Water Temperature (°C)	pH	Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	ORP (mV) (Ag/AgCl)	Turbidity (NTU)	Alkalinity (mg/L) (as CaCO <sub>3</sub> )	Measurement source
7SC	zone 2	10:30	23.8	7.40	855	2.09	22.0			NYE
		10:40	23.5	7.19	904	1.95	-30.2			NYE
		10:54	23.4	7.15	923	2.00	-39.4			NYE

**Attachment 1**  
**Completion Diagrams for Wells Sampled During**  
**August/September 2002**

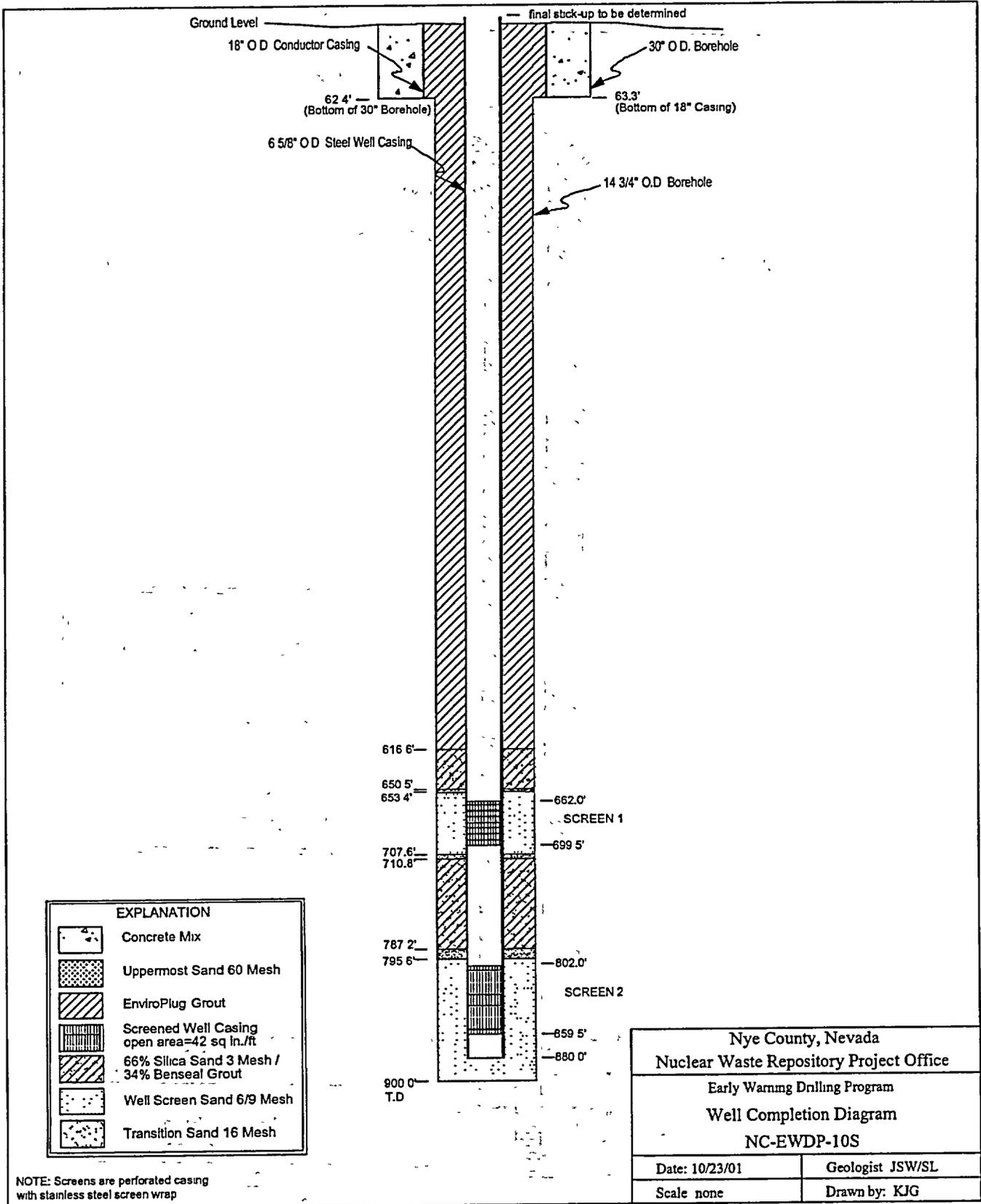


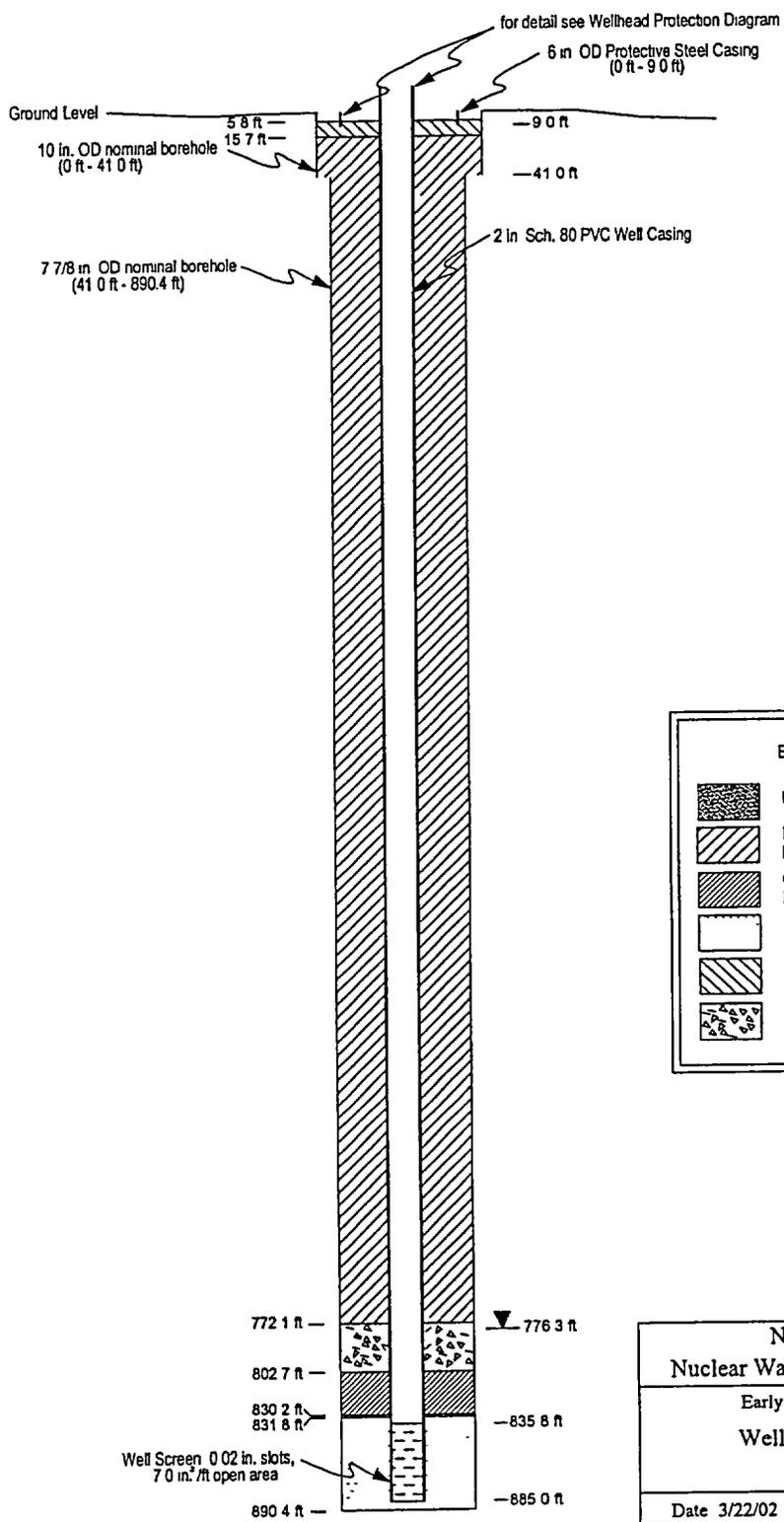
Nye County, Nevada Nuclear Waste Repository Project Office	
Early Warning Drilling Program NC - EWDP - 7SC Well Completion Diagram	
Date: 02/02	Geologist: KDD
Not to scale	Drawn by: JSW



EXPLANATION	
	Enviroplug Grout, 3/8 in. hydrated chips
	Bensand: Benseal - 8/12 sand mix (1.2 by weight)
	Well Screen Sand, 8/12 Mesh
	Enviroplug Grout, 3/8 in. hydrated chips with 8/12 sand (3 2 by weight)
	Enviroplug Grout, 3/8 in. hydrated chips with 8/12 sand (1:1 by weight)
	Enviroplug Grout, 3/8 in. hydrated chips with 8/12 sand (2.1 by weight)
	Uppermost Sand, 60 Mesh
	Unsaturated Zone Air Piezometer 1 in. x 2 ft slotted ABS tubing with 1/4 in polyethylene tubing to surface

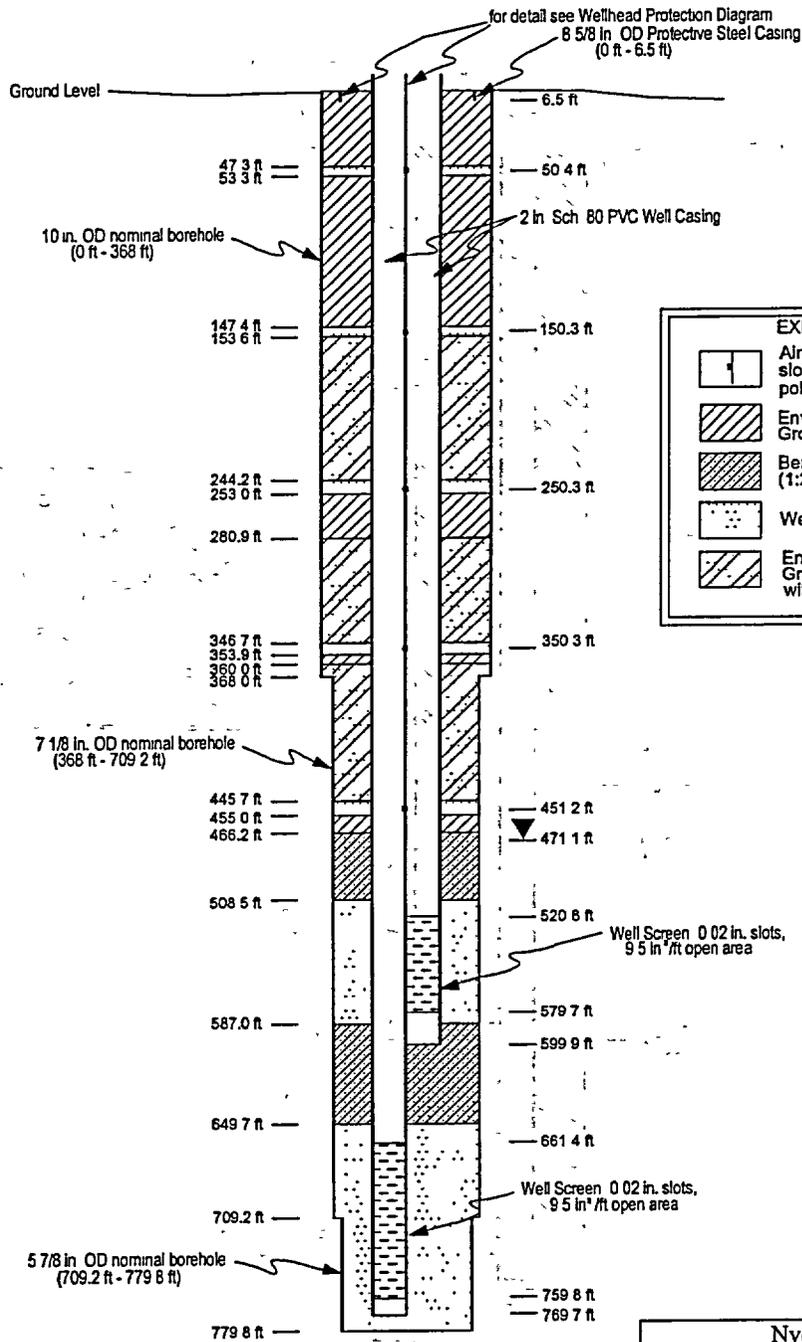
<b>Nye County, Nevada</b> <b>Nuclear Waste Repository Project Office</b> Early Warning Drilling Program <b>Well Completion Diagram</b> <b>NC-EWDP-10P</b>	
Date: 4/4/02	Geologist: JSW
Scale: none	Drawn by: KJG





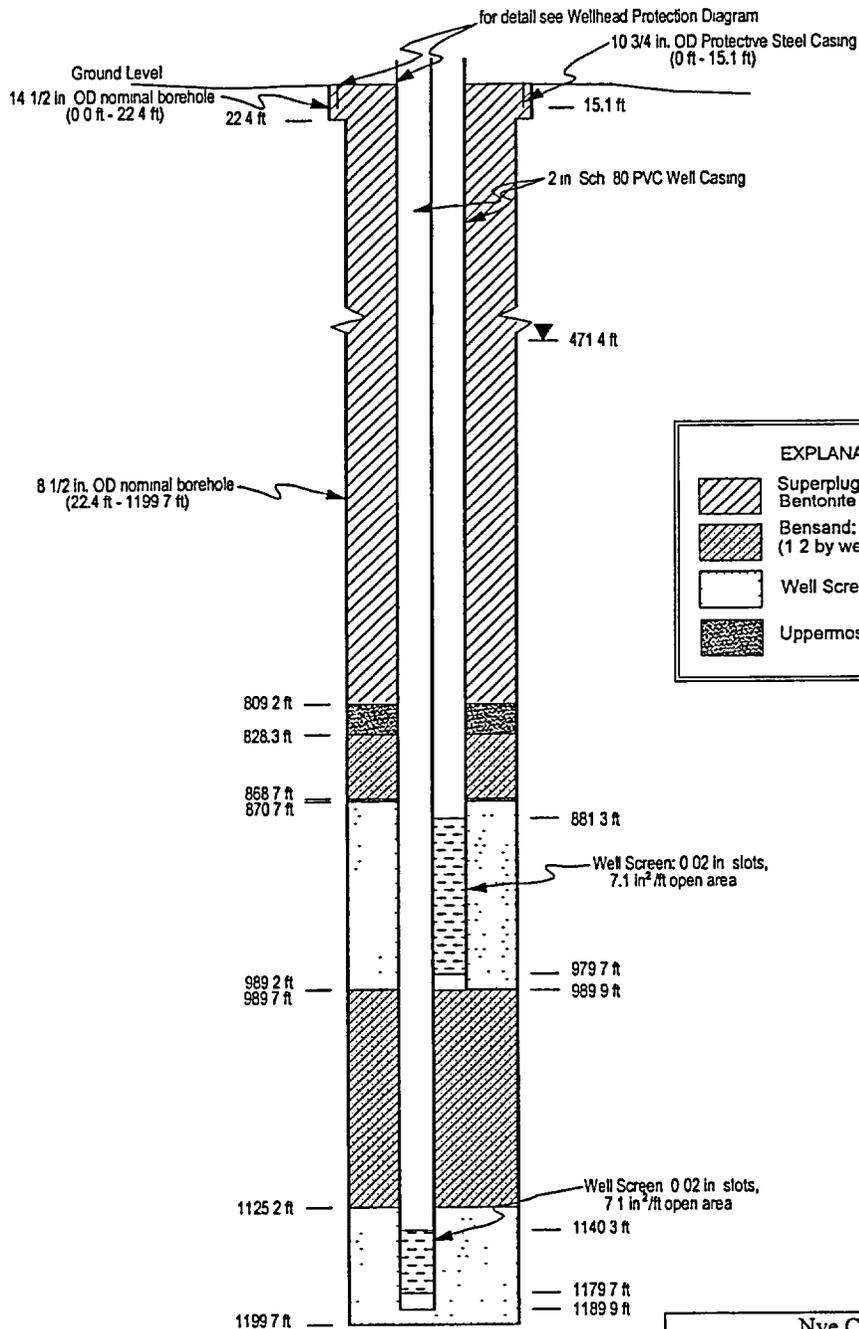
EXPLANATION	
	Uppermost Sand, 60 Mesh
	Enviroplug Grout, 3/8 in. hydrated chips
	Cetco Grout, 1/4 in. Time Release Bentonite Chips
	Well Screen Sand, 8/12 Mesh
	Cement Slurry
	Caved Material

Nye County, Nevada Nuclear Waste Repository Project Office	
Early Warning Drilling Program Well Completion Diagram NC-EWDP-18P	
Date 3/22/02	Geologist: SL
Scale: none	Drawn by: KJG

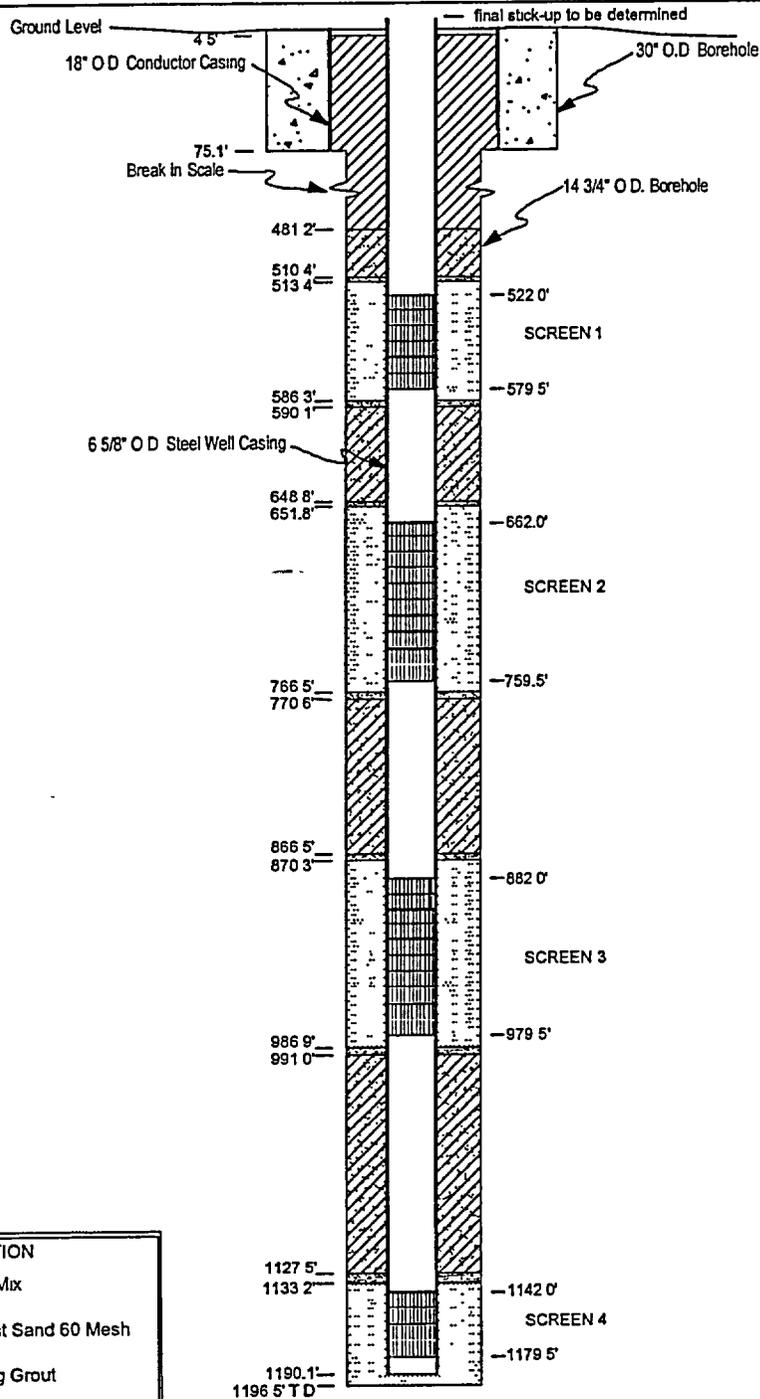


Nye County, Nevada  
Nuclear Waste Repository Project Office  
Early Warning Drilling Program  
Well Completion Diagram  
NC-EWDP-22PA

Date: 3/20/02	Geologist KDD
Scale: none	Drawn by: KJG



Nye County, Nevada	
Nuclear Waste Repository Project Office	
Early Warning Drilling Program	
Well Completion Diagram	
NC-EWDP-22PB	
Date 4/9/02	Geologist JSW
Scale: none	Drawn by: KJG



EXPLANATION	
	Concrete Mix
	Uppermost Sand 60 Mesh
	EnviroPlug Grout
	Screened Well Casing open area=42 sq in./ft
	66% Silica Sand 3 Mesh / 34% Benseal Grout
	Well Screen Sand 6/9 Mesh
	Transition Sand 16 Mesh

NOTE Screens are perforated casing with stainless steel screen wrap

Nye County, Nevada Nuclear Waste Repository Project Office	
Early Warning Drilling Program Well Completion Diagram NC-EWDP-22S	
Date 10/29/01	Geologist: JSW/KDD
Scale: none	Drawn by: KJG