



Nye County Department
of Natural Resources and Federal Facilities

Results of Recent Nye County Well Testing

Presented to: The Nuclear Waste Technical Review Board

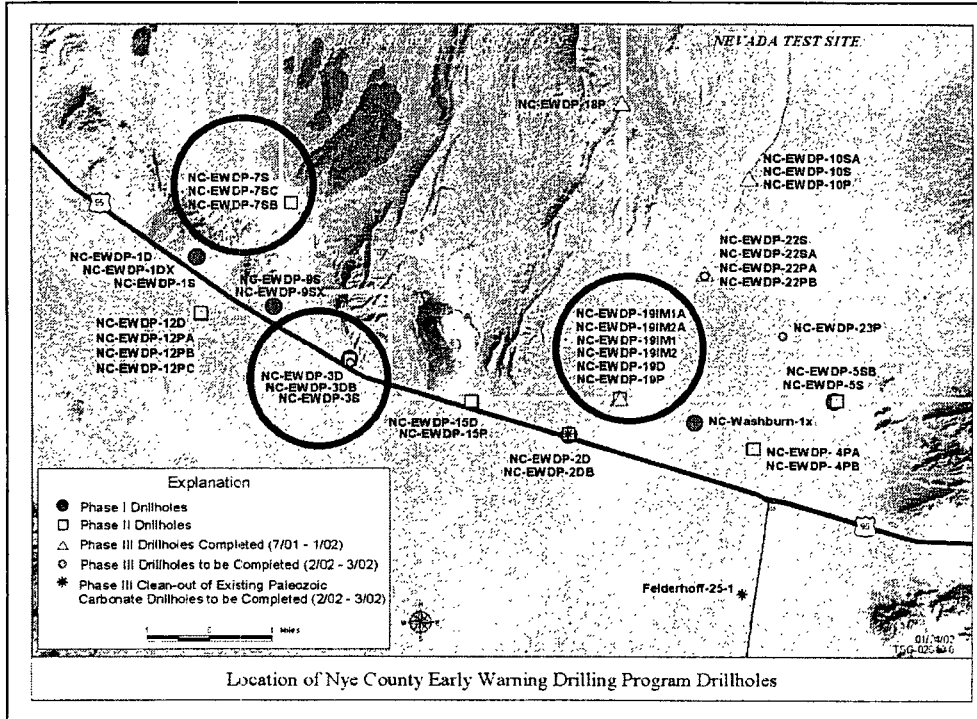
Presented by: Dave Cox, P.E., Questa Engineering Corporation



January 29, 2002

Pahrump, Nevada

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Recent Nye County Testing

- NC-EWDP-7SC and -7S, March, 2001
- NC-EWDP-3S and -3D, April, 2001
- ATC Area:
 - NC-EWDP-19IM1, -19IM2, -19D and -19P, October, 2001

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NC-EWDP-7SC Testing March, 2001

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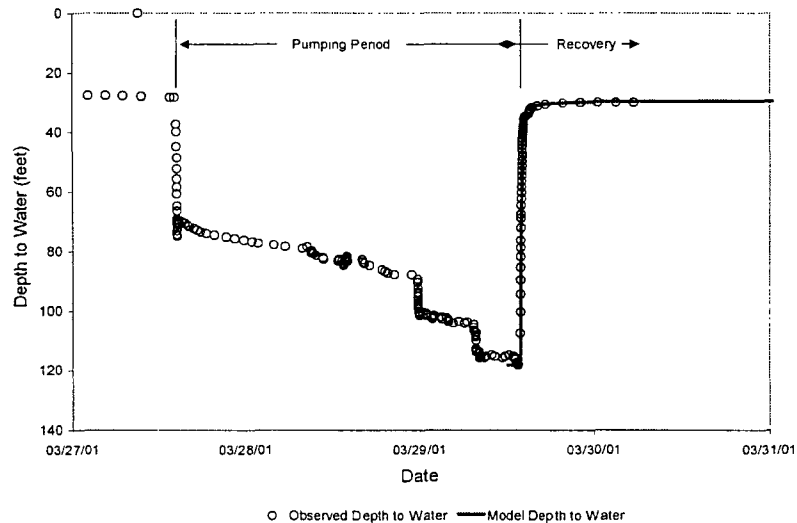
NC-EWDP-7SC Testing

- A pump/spinner test was run on NC-EWDP-7SC. Four intervals are screened from 80-90 ft (Alluvium), 180-210 ft (Tertiary Ash Fall Tuff), 270-370 ft (Tertiary Sediments) and 430-450 ft (Tertiary Sediments). Most of the flow came from the upper two intervals, which have higher heads than the lower intervals.
- Results of a 48-hr pump test at 45 gpm, and 17-hr recovery indicate $T = 1,950 \text{ ft}^2/\text{day}$, $k = 2.2 \text{ darcy}$. Permeability is 40x lower near the well (10-20 ft distance) because of lost circulation material (LCM) added while drilling. Progressive plugging was observed during pumping.
- Well NC-EWDP-7S showed a classic interference response. Well -7S is completed from 28-53 ft (Alluvium), and is 28 ft from well -7SC. $T = 1,950 \text{ ft}^2/\text{day}$, $k = 2.2 \text{ darcy}$, $S = 0.11 \text{ ft/ft}$.

These results have not yet been subjected to the full Nye County QA review process, and should be considered preliminary and subject to revision.

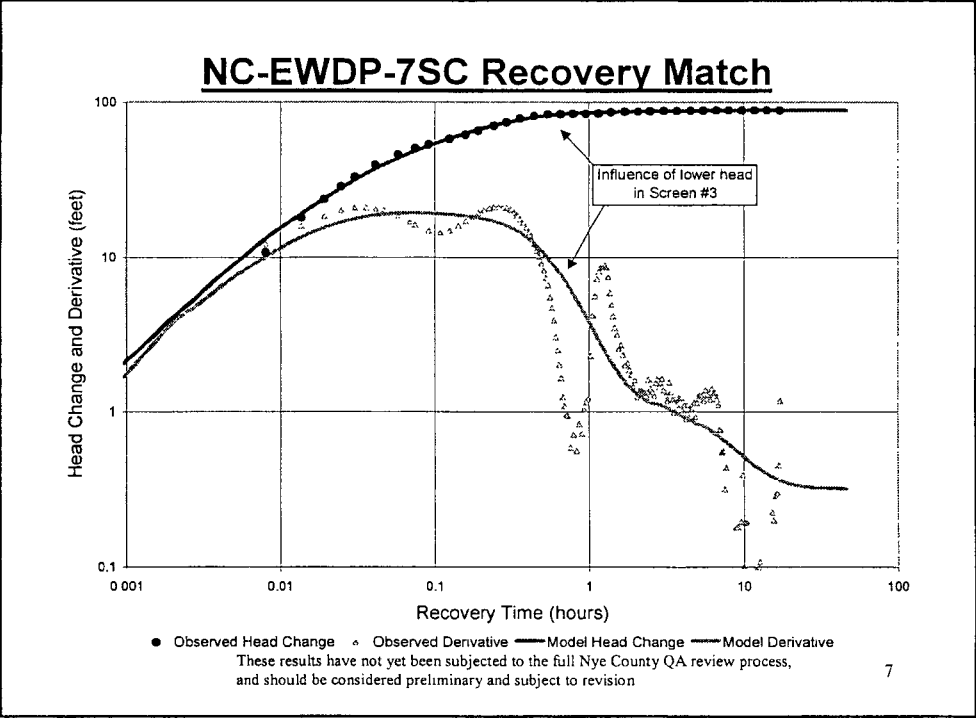
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NC-EWDP-7SC Pump Test Results



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NC-EWDP-3S Testing April, 2001

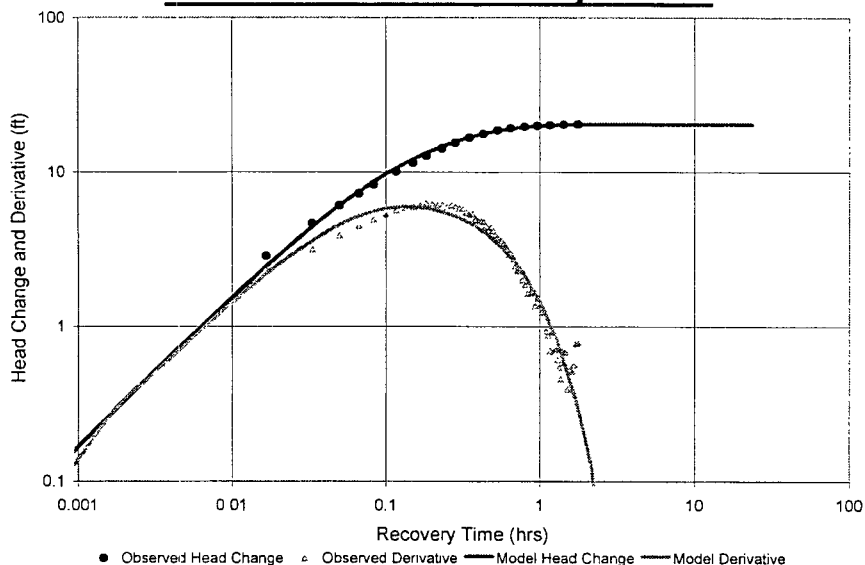
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NC-EWDP-3S Pump Test

- A 24-hr pump test (with 2-hr recovery) was run Apr. 7-8, 2001 on well NC-EWDP-3S at 41 gpm. Production came from an open hole section at 296-550 ft (Tertiary Sediments).
- The head response indicated reduced permeability of 0.17 darcy near the well, caused by grouting. The permeability of the aquifer outside the damaged region could not be determined from this test. (A 1999 test of -3D prior to grouting operations indicated a permeability of 14 darcy.)
- Heads were monitored in well NC-EWDP-3D during and after the -3S Pump Test. Well -3D is open from 521-2500 ft, and is 18 ft from -3S at 520-540 ft depth. The interference response was consistent with the -3S interpretation.

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NC-EWDP-3S Recovery Match

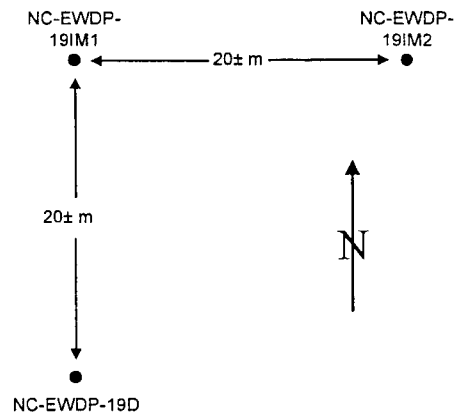


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Nye County ATC Testing October, 2001

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ATC Well Layout (Locations Approximate)



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NC-EWDP-19D Wellbore Information

(-19IM1 and -19IM2 are Completed Similarly)

Screen Number	Slotted Interval		Gravel Pack		Thickness (ft)	Rock Type
	Top	Bottom	Top	Bottom		
1	413	431	409	437	29	Alluvium
2	498	516	490	519	29	Alluvium
3	578	676	568	691	123	Alluvium
4	723	795	717	795	78	Alluvium
5	882	980	834	1061	227	Tuff
6	1122	1220	1109	1220	111	Tuff
7	1297	1380	1253	1456	204	Tertiary Sediments

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Alluvial Tracer Complex

- Nye County tests on NC-EWDP-19D (the first well in the Alluvial Tracer Complex or ATC) included:
 - May 10, 2000 - Non-pumping spinner log to evaluate crossflow
 - May 11, 2000 - Pump/spinner test
 - May 12-14, 2000 – 48-hr. Pump test
 - May 15, 2000 – 24-hr. Recovery
- Two new ATC monitor wells have been drilled and completed:
 - NC-EWDP-19IM1, about 20 m north of -19D
 - NC-EWDP-19IM2, about 20 m east of -19IM1
- In Oct., 2001, pump tests were conducted in NC-EWDP-19IM1 and -19IM2 to evaluate aquifer properties.

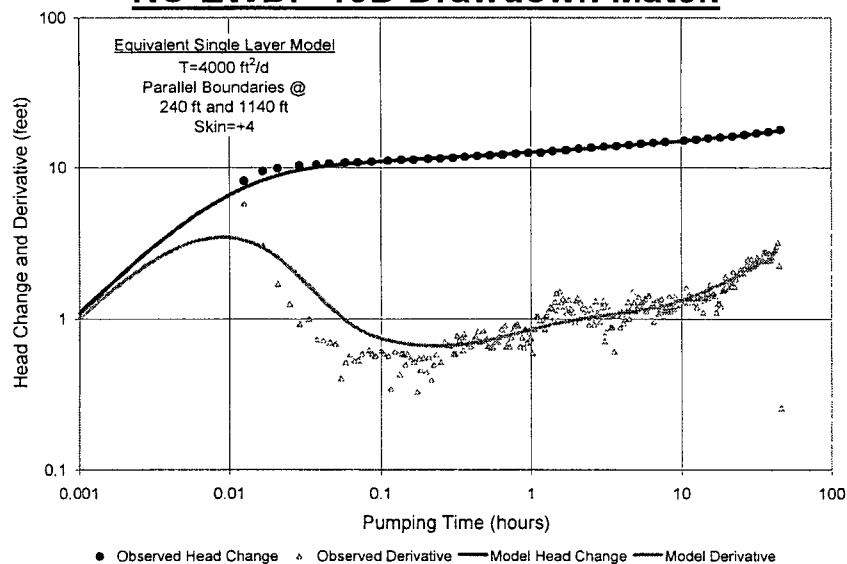
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Review of May 2000 NC-EWDP-19D Testing

- Spinner and pump/spinner tests indicated:
 - The upper alluvial zones (Screens #1 and 2) contributed little flow.
 - Screen #3 had the greatest flow, followed by Screen #4.
 - Screen #5, at the top of the tuff, had higher head than the alluvial zones. Most of the flow from Screen #5 came from a fracture at 955 ft depth.
 - Screens #6 & 7 did not contribute significantly.
- Pump test results indicated:
 - Pumped at 156 gpm with 18 ft of drawdown.
 - $T = 4,000 \text{ ft}^2/\text{day}$, $k = 2.3$ darcy for $h = 485$ ft. open in Screens #1-5.
 - Multiple barriers are present, with flow occurring in a zone about 1400 ft wide (about 400 m).

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NC-EWDP-19D Drawdown Match



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Oct. 2001 NC-EWDP-19IM1 & -19IM2 Pump Tests

- Pump tests were conducted on the new monitor wells:
 - IM1 – 49.5-hr. pump test 10/4-6/01 at 120 gpm with 72-hr. recovery
 - IM2 – 48-hr. pump test 10/9-11/01 at 156 gpm with 94-hr. recovery

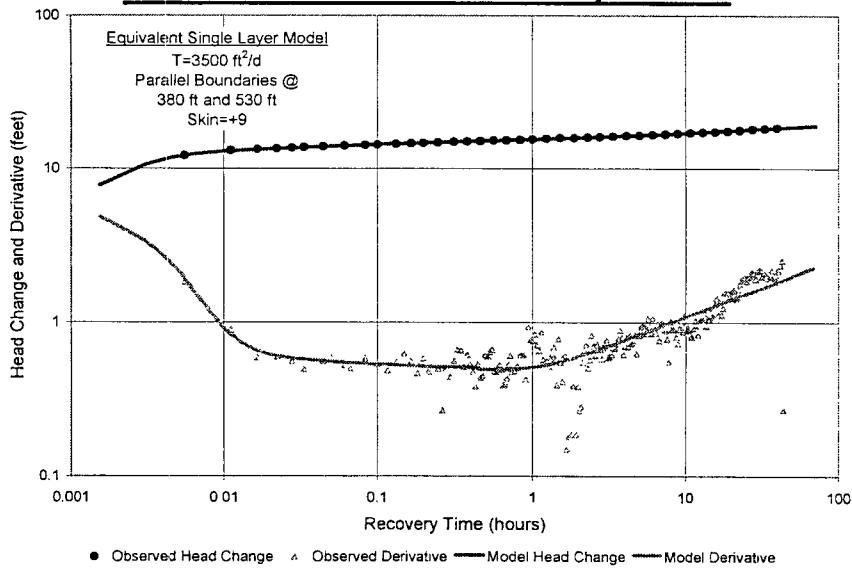
- Preliminary results similar to that of –19D:
 - Permeability of 2.1 and 2.3 darcy for –IM1 and –IM2, respectively
 - Effect of multiple boundaries evident in the response of both tests

- The interference response of the non-pumping wells (–19D and –19P) is being evaluated.

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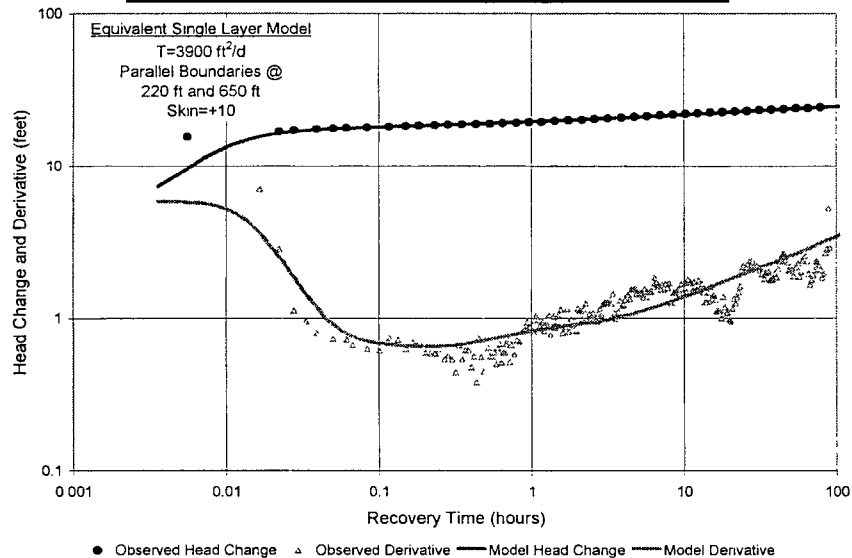
NC-EWDP-19IM1 Recovery Match



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NC-EWDP-19IM2 Recovery Match



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Summary

- The test results indicated permeability of 2 darcy or more at distances of 10-20 ft from NC-EWDP-7S and NC-EWDP-3S, but low permeability immediately around the wells because of lost circulation material (LCM) or grouting.
- The NC-EWDP-19IM1 and -19IM2 testing confirmed the previous NC-EWDP-19D results (T = 3,500-4,000 ft²/day, avg. k = 2.1-2.3 darcy), and confirmed multiple flow barriers are present several hundred ft from the wells. Definitive interference was observed between the -19D, -19IM1 and -19IM2.

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Lessons Learned

- Well testing has again demonstrated its usefulness at characterizing the aquifer system and identifying artifacts introduced during well drilling and completion.
- Drilling procedures have been changed to maintain sufficient distance between future shallow and deep wells at the same location to avoid drilling fluid movement between wells and the need for substantial grouting.

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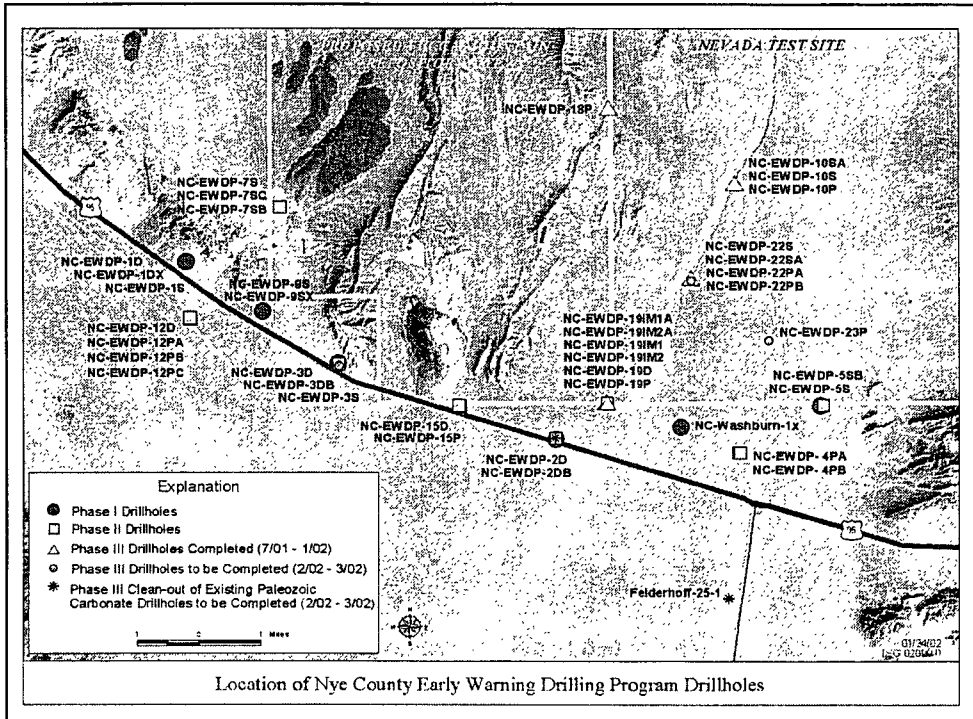
Lessons Learned (II)

- Better completions were obtained with the NC-EWDP-19IM1 and -19IM2 wells by using the information from -19D. Specific improvements included:
 - Larger screen openings were used
 - Better gravel packs were achieved
 - The need for LCM was reduced.
- The skin factors indicated on the -19IM1 and -19IM2 tests apparently resulted from multiple layers with different heads being open during the tests. There were no signs of the screen plugging observed in the -19D test.

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Nye County Early Warning Drilling Program Update

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Location of Nye County Early Warning Drilling Program Drillholes

EWDP Phase III Progress

Drillholes Completed 7/01 - 1/02

- 4 - Exploratory Boreholes ~ 900 - 1200 ft Deep
 - NC-EWDP-19IM1A, -19IM2A, -10SA, -22SA
- 4 - Multiple Screen Monitor Wells ~ 900 - 1200 ft Deep
 - NC-EWDP-19IM1, -19IM2, -10S, -22S
- 3 - Piezometers ~ 800 - 900 ft Deep
 - NC-EWDP-10P, -18P, -22PA

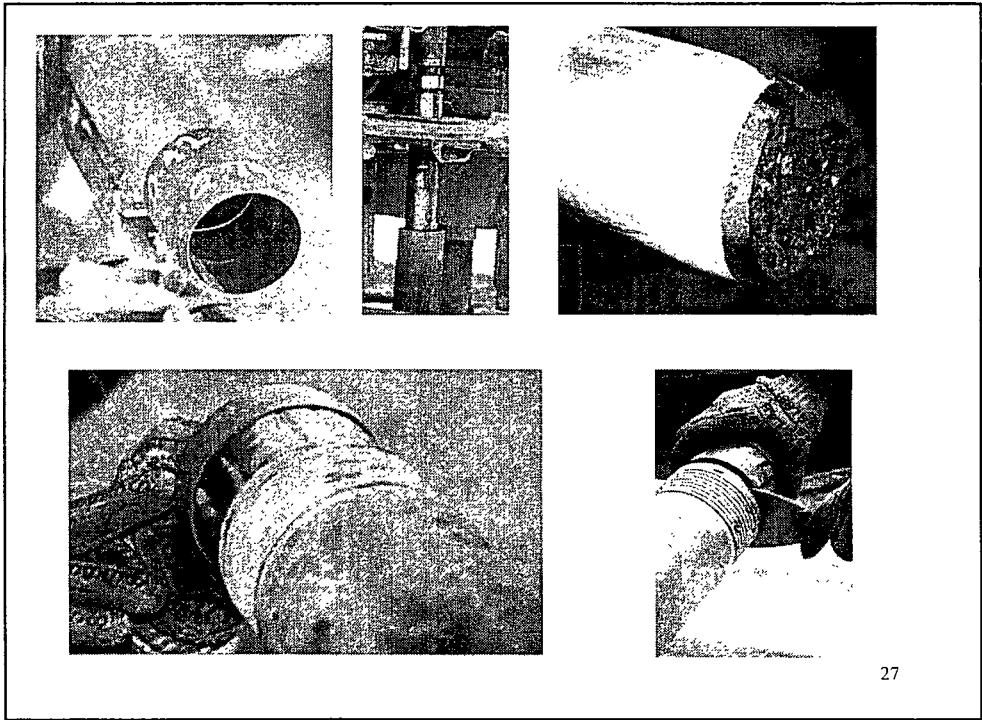
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EWDP Phase III Progress

Drive Core Samples Collected from Alluvium

- Significance
 - First Core Collected Along Alluvium Pathway
 - Core Suitable for Hydraulic and Geochemistry Testing
 - ~50 % of Core Made Available to DOE/YMP
- Location and Quantities
 - Piezometer NC-EWDP-10P
 - Vadose Zone - 3 Core Runs (2.5 ft each)
 - Saturated Zone - 3 Core Runs (2.5 ft each)
 - Piezometer NC-EWDP-22PA
 - Vadose Zone - 1 Core Run (2 ft)
 - Saturated Zone - 6 Core Runs (2 ft each)

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EWDP Phase III Work To Be Completed (2/02-3/02)

Cleanout and Test Existing Paleozoic Carbonate Wells

- **NC-EWDP-2DB**
 - Cleanout Several Hundred ft of Fill in Open Hole to ~ 3100 ft
 - Packer off and Pump Paleozoic Section
 - Collect Aquifer Test and Water Chemistry Data

- **Felderhoff-25-1**
 - Drill out 3 Cement Plugs
 - Complete a Well in Open Hole from ~500 to ~2500 ft
 - Screen Paleozoics from ~2300 to ~2500 ft
 - Pump and Collect Aquifer Test and Water Chemistry Data

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EWDP Phase III Work To Be Completed (2/02-3/02)

Piezometer Drilling and Coring

- NC-EWDP-22PB - Dual Completion - 1200 ft Deep
 - Will Yield Drive Core, Hydraulic Gradient, & Water Chemistry Data
 - Will Support Future Nye County Tracer Tests
- NC-EWDP-23P - Dual Completion - 900 ft Deep
 - Will Yield Drive Core, Hydraulic Gradient, & Water Chemistry Data
- NC-EWDP-3D - 1800 ft Single Completion
 - Cleanout Existing 2500 ft Borehole Currently Caved to ~800 ft
 - Will Yield Drive Core, Hydraulic Gradient & Water Chemistry Data

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Future Phases of Nye County Work

- DOE Cooperative Agreement and Funding Being Arranged
- Plans for Next 5 Years are Currently Being Developed
- Summary of Plans Will be Presented at the May NWTRB Meeting

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