J.H. Kleinfelder & Associates

GEOTECHNICAL CONSULTANTS
MATERIALS TESTING
EARTH RESOURCES

October 21, 1985

Kerr-McGee Chemical Corporation
P.O. Box 55
Henderson, Nevada 89015

Attention: Ms. Susan Crowley

Subject: Hazardous Waste Landfill Closure
Nevada Facility
Henderson, Nevada
Project No. L-1359-3

Gentlemen:

This letter presents a summary of the procedures used to close the Hazardous Waste Landfill and our opinion regarding conformance of the closure operations with the Closure Plan dated October 25, 1984.

Prior to beginning closure operations, the proposed low permeability clay was tested to determine the laboratory permeability in a triaxial apparatus. The laboratory tests indicated a permeability of 4.70×10^{-8} cm/sec permeability. This falls within the RCRA's guideline of 1×10^{-7} cm/sec.

On September 6, 1985, backhoe trenches were excavated by Espy Brothers, the grading contractor, to determine the actual limits of the hazardous waste landfill. Stakes were then set to indicate the extent of the low permeability clay layer. The limits of the clay layer extended at least 5 feet beyond the perimeter of the cell. The thickness of the clay ranged from 1½ feet in the northeast corner to 4 feet in the southwest corner. As the clay was placed, it was watered and mixed to bring the moisture content to approximately three percent above optimum. The clay was then compacted to a minimum of 85% of its maximum density as determined by ASTM D1557-78. The rough grading of the clay was completed on September 12, 1985. On September 16, 1985, the clay liner was checked to determine the slope. Stakes were set for a 3% slope West to East and a 1% slope North to South. On September 19, 1985, after finish grading, the slope was rechecked and found to be within tolerance.

The protective liner, HDPE-40 mil, was placed by Serrot Corporation on September 23 and 24, 1985. The installation

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procedures included 4-inch plus laps at the seams, laser welding of the seams, the placement of a copper wire inside the seams, sealing with a hot rubberized adhesive and testing the seams with a spark producing machine. If areas were found where an arc was produced between the copper wire and the spark machine, they were resealed and retested. There were two final walk-throughs to look for weak areas of the liner. All weak spots which were found were buffed and sealed with hot rubberized adhesive. This work was completed on September 24, 1985.

Espy Brothers then placed the 6-inch protective clay layer over the liner. The clay was placed by a rubber-tired loader in such a way that the loader was always manuveuring on the clay and not on the liner. This work was completed on October 8, 1985.

A one (1) foot thick drainage layer was placed over the clay. This layer consisted of onsite granular soils compacted to a minimum of 90% and a maximum of 95% of the laboratory maximum density as determined by ASTM D1557-78. This work was started on October 10, 1985 and completed on October 14, 1985.

The placement of the top cover was started by Espy Brothers on October 14, 1985. The top cover was completed and the drainage swales were finished on October 17, 1985.

On October 17, 1985 the slope of the finished landfill cover was verified and three settlement monuments were set. The bench mark for the settlement monument is monitoring well number M-5 which has a top-of-cap elevation of 1747.86. The locations of the monuments as well as their elevations as of 10-17-85 are shown on the attached Plate No. 1.

Based on the observed closure operations and our field testing, it is our opinion that the hazardous waste landfill has been closed in conformance with the intent of the Closure/Post Closure Plan for Hazardous Waste Landfill revised October 25, 1984. A copy of the plan is enclosed.

It is our pleasure to be of service. If you should have any questions, please call this office.

Respectfully submitted,

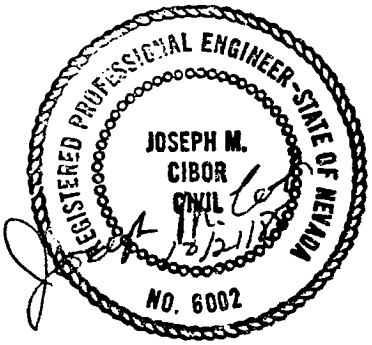
J.H. KLEINFELDER & ASSOCIATES

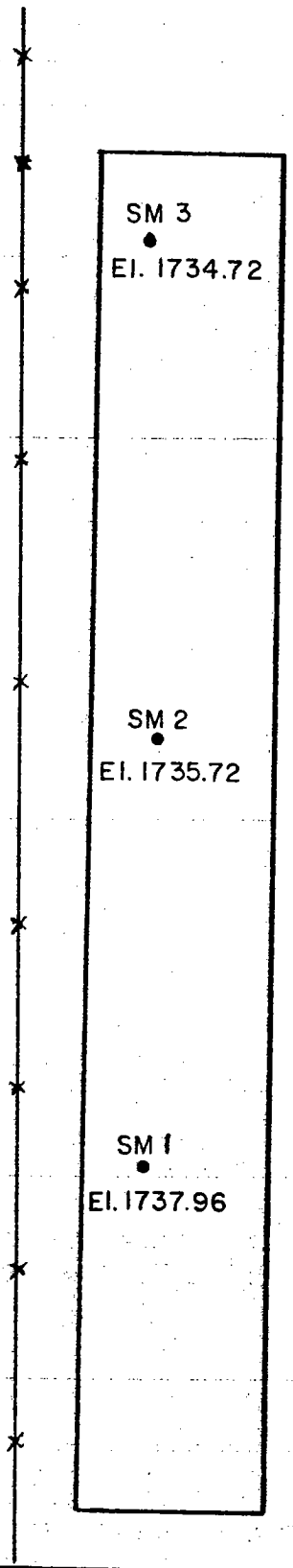
Paul A. Davis

Joseph M. Cibor, P.E.
Office Manager

PAD:JMC:dj

Enclosures: Plot Plan
Plate A
Plate B
Closure Plan





1"= 60'

SM 2: Indicates Approx. Location of Settlement Monument

BM: Well M-5, Elevation 1747.86

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PROJECT NO. L-1359-3

PLOT PLAN

PLATE 1

Test No.	Test Date	Test Location	Approx. Test	Dry Density (pcf)	Moisture Content (% of dry weight)	Code No.	Laboratory Maximum Dry Density	Percent Compaction
	1985							
1	9-12	Impermeable Layer		83	31.5	1	92	90
2	9-12	Impermeable Layer		81	30.9	1	92	88
3	9-12	Impermeable Layer		85	32.6	1	92	92
4	10-14	Drainage Layer		118	9.2	2	128	92
5	10-14	Drainage Layer		120	8.8	2	128	94
6	10-14	Drainage Layer		119	9.3	2	128	93
7	10-17	Top Layer		123	9.2	2	128	96
8	10-17	Top Layer		126	9.1	2	128	98
9	10-17	Top Layer		125	8.7	2	128	98

NOTE:

Tests performed in accordance with ASTM D-2922-81 test method.

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PROJECT NO. L-1359-3

FIELD DENSITY TEST RESULTS

PLATE A

JHK05

CODE NUMBER	MATERIAL DESCRIPTION	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (% of dry wt.)
1	CLAY, green	92	29.3
2	GRAVELLY SAND, brown	128	8.9

NOTES:

(1) Tests were performed in accordance with ASTM D1557-78 test method.

*(2) Tests with an asterisk are check point results utilizing zero-air-void curves.

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PROJECT NO. L-1359-3

COMPACTION TEST RESULTS

PLATE B

JHK14

KERR-McGEE CHEMICAL CORPORATION

HENDERSON, NEVADA FACILITY

CLOSURE/POST-CLOSURE PLAN

FOR

HAZARDOUS-WASTE LANDFILL

Revised June 13, 1984

Revised October 25, 1984

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CLOSURE/POST-CLOSURE PLAN

FOR HAZARDOUS-WASTE LANDFILL

I. BACKGROUND

The Kerr-McGee Chemical Corporation (KMCC) Facility at Henderson, Nevada is located on Lake Mead Drive, off Water Street, P. O. Box 55, Henderson, Nevada 89015.

The property comprises approximately 415 acres in the Basic Management, Inc. (BMI) industrial complex. It adjoins other industries in the complex and is bounded by public highways approximately 1/4 to 1/2 mile away on the north and south. A location map is attached in Appendix I. The closest residence is approximately 5/8 mile northeast of the landfill.

The plant has been in operation since 1945 and manufactures several electrochemical products, including manganese dioxide, sodium chlorate, and ammonium perchlorate. The facility was acquired by Kerr-McGee Chemical Corporation in 1967 by its acquisition of American Potash & Chemical Corporation, and has since been operated by KMCC.

The plant has certain environmental permits, including the following, all of which are in good standing:

- Twenty-four air emission source permits issued by Clark County, Nevada, APCD.
- Water discharge (NPDES) permit #NV0000078 for once-through noncontact cooling water. No discharge of process-related water is permitted.
- Interim status Part A authorization for the management of hazardous wastes under RCRA, administered by the Nevada DEP and U. S. EPA, Region IX.

Prior to January 25, 1983, the plant operated three onsite hazardous waste treatment, storage, or disposal units (HW-TSD units). All three units were designated hazardous because of low levels of chromium in the wastes. Two of these units were surface impoundments designated S-1 and P-1, for which closure/post-closure plans were submitted to Nevada DEP on April 9, 1984. Applicable data contained in the S-1 closure plan are included in Appendix III. An onsite HW landfill was used for the disposal of low-level chromium-bearing mud from the sodium chlorate cells. Disposal of HW to this landfill occurred before January 25, 1983, and the landfill has not received any waste since that

date. The locations of the landfill and impoundments S-1 and P-1 are shown in Figure 2, Appendix I.

After closure of the HW landfill, as well as surface impoundments S-1 and P-1, KMCC wishes to keep its generator status and dispose of all HW offsite at commercially permitted disposal facilities.

II. SUMMARY OF CLOSURE/POST-CLOSURE CARE PLAN [265.112(a)(i)]

This closure plan amends all closure plans previously prepared for the HW landfill at the Henderson Facility, and a copy is on file at the plant office. This plan, together with the closure/post-closure care plans for the surface impoundments submitted to NDEP on April 9, 1984, covers all HW TDS units at the Henderson Facility.

A copy of EPA form 3510, Part A application, as amended dated July 13, 1982, is attached in Appendix II. A survey plat, showing the location of the HW landfill cell and analytical data supporting the exclusion of ponds AP-1, AP-2, and AP-4, are also included in Appendix II.

Closure and post-closure care of the landfill will be done by the following major steps:

1. Leave contents of HW landfill in place and undisturbed.

2. Cover the landfill with a layer of compacted clay overlain with a 30-mil impervious membrane, suitably covered with native soil and topped with an erosion-resistant layer of native cover material. The cover components will extend 5 feet beyond the perimeter of the cell.

3. Grade, shape, and contour the cover to 3-5 percent slope, in accordance with engineering design and construction specifications given in Appendix IV.

4. Install diversion berms around the cell cover sufficient to protect against a once-in-25-year rainfall event.

5. Monitor and maintain site for 30 years, or petition NDEP for review when it is evident there is no impact on groundwater.

6. Proper notice will be made in the deed of the existence of the HW landfill and restricted use of the area.

7. Final closure inspection and certification by an independent registered P.E. with notification to the NDEP.

Details of the closure/post-closure care procedures are given in the pertinent sections of this plan, together with a final closure schedule.

III. CLOSURE PLAN DETAILS [265.112 and 265.310]

A. Maximum Inventory of Waste [265.112(a)(2)]

The landfill is inactive; no waste has been placed in it since January 25, 1983. All HW is now being transported offsite for disposal at the U. S. Ecology landfill in Beatty, Nevada.

The maximum volume of the cell is approximately 13,000 cubic yards. This estimate is based on the cell dimensions of 410' x 45' x 20', including 2 feet of freeboard. The cell contains an estimated 3,000 cubic yards of mud from the sodium chlorate process which was solidified with an equal volume of native soil. In addition, 2,900 cubic yards of contaminated soil from the closure of S-1 impoundment solidified with native soil was placed in the cell, together with the membrane from the bottom and sides.

The landfill was filled from back to front in truckload (approximately 20-yard) increments. The fill was solidified with native soil during operation and packed after each level or lift. The upper fill is comprised of native soil from beneath pond S-1 which was essentially clean and free of contamination. Analytical data submitted with the S-1 closure plan are provided in Appendix III.

Grab samples, taken at 4 points on the top of the landfill, were subjected to EP toxicity tests for chromium. The results are also reported in Appendix III and show no hazardous waste.

No other treatment or storage was given the waste.

As shown in Appendix IV, Cover Design and Construction Specifications, the cover and cap will extend 5 feet beyond the perimeter of the cell which insures that potentially contaminated areas will be safely covered. This is considered very conservative treatment in view of the absence of chromium in surface samples.

The surrounding area is free of contamination as determined by visual inspection, since the carbonaceous chrome-bearing waste is detectable by color.

B. Decontamination of Equipment [265.112(a)(3)]

As described above, the surface of the landfill is not hazardous. It will not be penetrated when the final cover is applied. Accordingly, no decontamination of equipment, tools, or clothing will be required.

C. Cover and Cap Design and Construction [265.112(a)(1); 265.310a]

1. Description

The existing cell will not be disturbed. No vibrating compaction equipment will be used as the fill is already compacted.

From the bottom to top, the cover will consist of the following layers:

a. A bottom low permeability layer of 1.5 feet of clay from the Clark County School District clay pit on Cheyenne Avenue, North Las Vegas, Nevada (or equivalent) will be placed over the cell.

The permeability of this clay was determined by an independent laboratory to be 4.7 x 10^{-6} cm/sec, using the falling-head method for determining saturated hydraulic conductivity. The sample was compacted at 90 percent relative compaction of ASTM D-1557 with a calculated porosity of 88 percent. A grain-size distribution was also performed by this outside consultant using ASTM D-422. The permeability of this material falls within RCRA's guideline of a saturated hydraulic conductivity of not more than 1 x 10^{-7} cm/sec. This clay will be spread in 6" lifts and compacted to 85 percent minimum relative compaction, according to ASTM D-1557. The clay will extend 5 feet in all directions beyond the perimeter of the cell to ensure that seepage does not occur around the edges. The overall dimensions of the cover will be approximately 55 feet wide by 420 feet long. The final slope of this layer will be finished at 3-5 percent.

b. A high-density polyethylene membrane, 30-mil thick, will be placed over the clay layer. The clay meets the EPA criteria for bedding

material (being no coarser than Universal Soil Classification [USCS] Sand [SP], which obviates the need for sand beds).

c. An overlying 6-inch layer of the same clay, used in the bottom layer, will be spread carefully, using rubber-tired equipment to prevent damage to the membrane. Final slope will be maintained at 3-5 percent.

d. A final cap will be placed over the clay, using 2 feet of compacted native soil (caliche), available on the site. This natural cover material is stable and erosion resistant to wind and the occasional rainfall events in the area (average: 3.76"/year, U. S. Geological Survey data).

See data in Appendix IV.

e. Final slope of the cap will be 3-5 percent.

f. The engineering design and specifications for final grade, length of run, and slope of cover and cap are provided in Appendix IV.

g. Vegetative cover will not be used since there are no suitable grasses indigenous to the area that would improve or benefit the cap stability. Native vegetation is too sparse and stalky to provide surface cover, and the arid climate precludes turf culture.

h. On completion of the final cover and cap, a benchmark will be set at a reasonable location on the top to establish the elevation. This mark will be the reference point to determine settling and subsidence that may occur during post-closure maintenance. This benchmark will also be used for reference in providing notice in the deed and to local land authorities [265.119, 265.120].

2. Surface Water Control [265.310(b)(2)(3)]

The landfill is protected from flooding by its elevation and the nearby surface contour. A dike, roughly 20 feet high running almost east to west across the north end of the cell, prevents inflow from that direction. Figure 3, Survey Plat in Appendix II, shows these features.

Other surface water run-on will be controlled by constructing a diversion drainage berm around the cover as shown in the engineering drawing in Appendix IV.

Surface pooling will be prevented by proper slope and contour of the cover. There are no obstacles to the drainage path that might lead to ponding or excessive erosion.

Calculations in Appendix IV show that run-off from the cover will not cause excessive erosion of the surface because the gravel drains rapidly and the 3-5 percent slope will allow steady drainage without erosion. The internal membrane, as well as the compacted clay, will prevent any detrimental surface water percolation into the landfill. In the remote chance that surface water penetrates the cap and upper clay cover, the membrane will intercept and drain it away from the cell contents [265.310(b)(2)].

D. Climatological Consideration [265.310(c)(4)]

The Henderson, Nevada area is in the arid southwest region of the U. S. Data obtained from the U. S. Department of Commerce, National Oceanic and Atmosphere Administration, Environmental Data Service, and the USGS lists the average precipitation as 3.76" per year. Average monthly precipitation rates are reported in inches as follows:[1]

Jan.	0.45	May	0.10	Sept.	0.27
Feb.	0.30	June	0.09	Oct.	0.22
March	0.33	July	0.44	Nov.	0.43
April	0.27	Aug.	0.49	Dec.	0.37

The 10-year, 1-hour rainfall is approximately 0.8". The once-in-25-year rainfall event is reported at 2.4" in 24 hours; the once-in-100-year event is 3.0" in 24 hours (U. S. Weather Bureau).

We have been unable to locate any recorded data on rainfall pH. The National Climatic Data Center in Asheville, North Carolina, the U. S. EPA in San Francisco, the EPA Laboratory in Las Vegas, the Clark County, Nevada APCD, and the Desert Research Institute have indicated there is no program to measure pH of rainfall at this time.

[1]Climatography of the U. S. #81, National Climatic Center, Asheville, North Carolina, August, 1973.

Average net evaporation in the Henderson area is on the order of 90-96 inches per year. Natural solar and wind evaporation rapidly removes water from surface areas, and vertical penetration of rainfall is minimal.

As previously discussed, control of rainfall by surface diversion and containment structures will protect the landfill from run-on. Subsequent penetration of rainfall will be essentially nil.

E. Leachate Collection and Recovery System

For reasons given in Sections III, C and D, we believe there will not be any leachate, and a leachate collection and recovery system will not be installed.

F. Geological and Geochemical Consideration

1. Geologic Setting

The Henderson, Nevada, Kerr-McGee Facility is located at the southern edge of the Las Vegas Valley. The Valley is similar to a large bowl (with a bedrock bottom) filled with unconsolidated alluvial deposits. The Valley fill is comprised primarily of a thick sequence (at least 2,160 feet) of Quarternary-age, fine-grained materials known collectively as the Muddy Creek formation. Lithologically, the formation is characterized by thin layers of sand with some gravel interbedded with thick layers of silt and clay. Sediments of the Muddy Creek formation are typically light-colored, ranging from reddish tan to light green or white. Overlying the Muddy Creek formation at the plantsite is a relatively thin layer of alluvial fan deposits.

These alluvial sediments consist primarily of sand and gravel (with lesser amounts of silt and clay) derived from the erosion of the McCullough Range Mountains about one mile south of the Kerr-McGee property. Alluvial fans along the mountain front have overlapped to form coalescent alluvial fans with collectively similar deposits. Alluvial fan deposition occurred during the infrequent flood runoff periods which formed two basic types of deposits within the alluvial fans. The most widespread deposits consist of poorly sorted mixtures of boulders, cobbles, gravel, sand, silt, and clay. Distinct layers may be present in the

form of gravel beds cemented with caliche (calcium carbonate). Cutting through (and encased by) these poorly sorted deposits are stream or wash deposits consisting of moderately well-sorted deposits of sand and gravel resembling "gravel trains." These deposits are probably similar to sand and gravel in the wash channels present on the surface at the site. The "gravel trains" were buried by subsequent deposits of poorly sorted sediments and are characteristically narrow and linear in configuration. Thickness of these alluvial deposits range from 20 to 50 feet in the Kerr-McGee property area, with an overall average thickness of about 40 feet.

A distinct formation change between the alluvial sediments and the Muddy Creek formation generally does not exist. Normally, a 5- to 10-foot transitional zone occurs above the Muddy Creek where clay lenses are interbedded with sand and gravel.

Two generalized geologic cross sections were prepared to show the thickness and character of the overlying alluvial fan deposits, as well as the northerly slope of the surface of the Muddy Creek formation. Figure 1 represents a typical east-west profile through the Kerr-McGee plantsite. Figure 2 represents a typical north-south profile through the Kerr-McGee plantsite. Lithologic logs for the landfill area are enclosed in Figures 3 through 5 and Tables 1 through 4.

2. Hydrologic Setting

Groundwater in the Las Vegas Valley occurs under artesian and semi-artesian conditions. Regionally, there are three principal artesian aquifer zones within the Muddy Creek formation. The so-called shallow, middle, and deep artesian zones are tapped by wells at about 200 to 450, 500 and 700 feet, respectively, in the Las Vegas Valley. A fourth water-bearing zone is found overlying the top of the Muddy Creek formation, usually in the alluvial sand and gravel.

The primary source of recharge is runoff from precipitation occurring in the surrounding mountains which infiltrates the alluvium along the Valley margins. Rainfall (less than 5 inches annually) occurring in the Valley itself is consumed by evaporation and transpiration by

vegetation. Therefore, the near-surface aquifer receives little or no direct recharge from infiltrating rainfall and is recharged by upward leakage from deeper aquifers and recharge from the infiltration of water applied to the land surface in the forms of irrigation and wastewater discharges to unlined ditches.

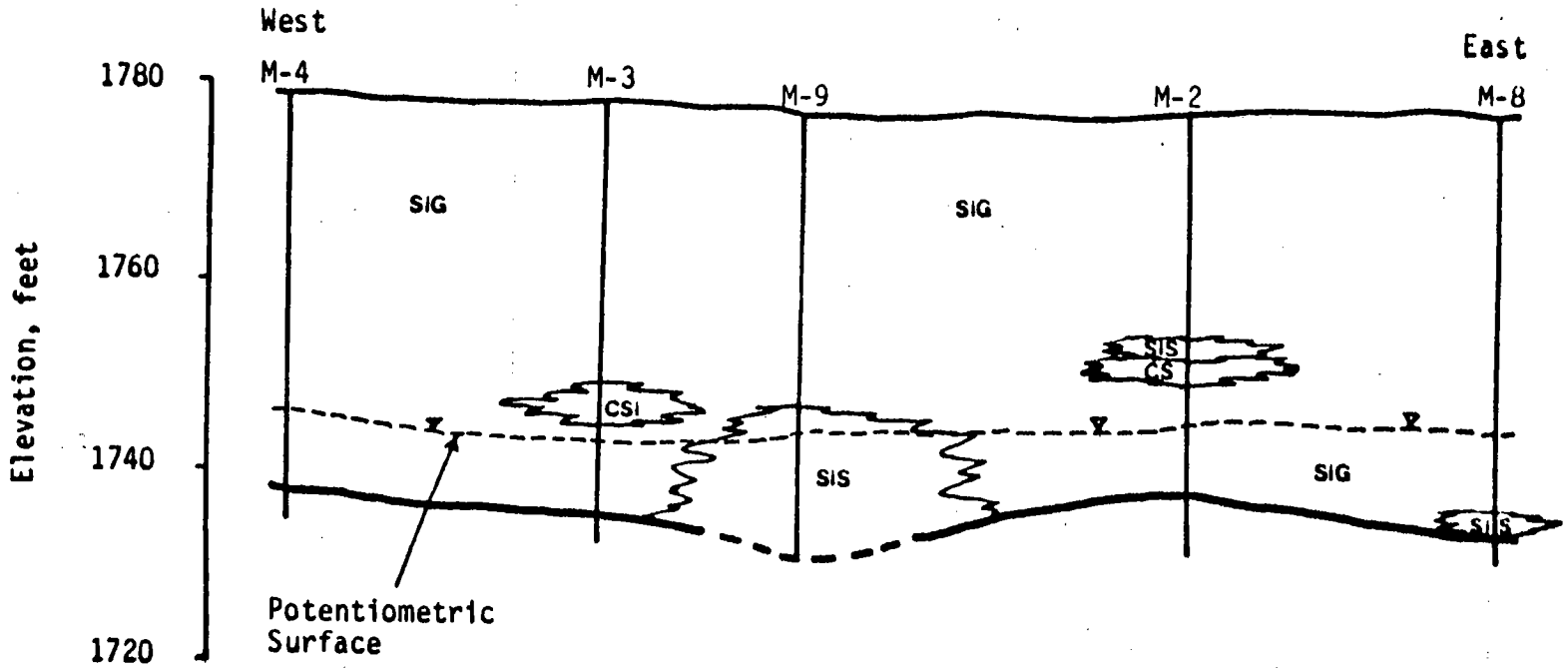
Groundwater from the shallow, middle, and deep aquifers is discharged from the system through springs and pumping wells in Las Vegas Valley. In the Henderson area, groundwater from the near-surface water-bearing alluvial deposits is discharged by seepage into Las Vegas Wash, as well as by evapotranspiration, but not by any known pumping wells.

Based on test drilling results near the Kerr-McGee plantsite, groundwater occurs in the near-surface alluvial deposits at depths ranging from about 20 feet (at the northern property boundary) to 50+ feet below land surface (at the southern property boundary). The groundwater in the near-surface alluvial deposits occur at the top of the Muddy Creek formation, perched on and/or confined by clay layers in the transitional zone above the Muddy Creek formation, and within the uppermost part of the Muddy Creek formation where it may be confined by a layer of caliche.

The alluvial-saturated zone is typically unconfined; however, varying degrees of confinement may be present, depending on the clay or caliche layers in the transitional zone above the Muddy Creek.

Estimating the saturated thickness of the near-surface water-bearing zone is made difficult by the variable layering within the transition zone above the Muddy Creek formation. However, the near-surface water-bearing zone ranges in saturated thickness from less than 1 foot in the southern area to 20+ feet at the northern property boundary.

The primary geologic factors affecting groundwater occurrence and movement in the Kerr-McGee plant area are the presence of relatively high-permeability zones in the form of "gravel trains," the slope configuration of the surface of the Muddy Creek formation, and the lithology of the Muddy Creek formation. These factors affect the distribution of permeability, the



EXPLANATION:

S = Sand/Sandy

C = Clay/Clayey

Si = Silt/Silty

G = Gravel/Gravelly

FIGURE 1: Generalized East-West Geological Cross-Section through the Kerr-McGee Henderson Facility.

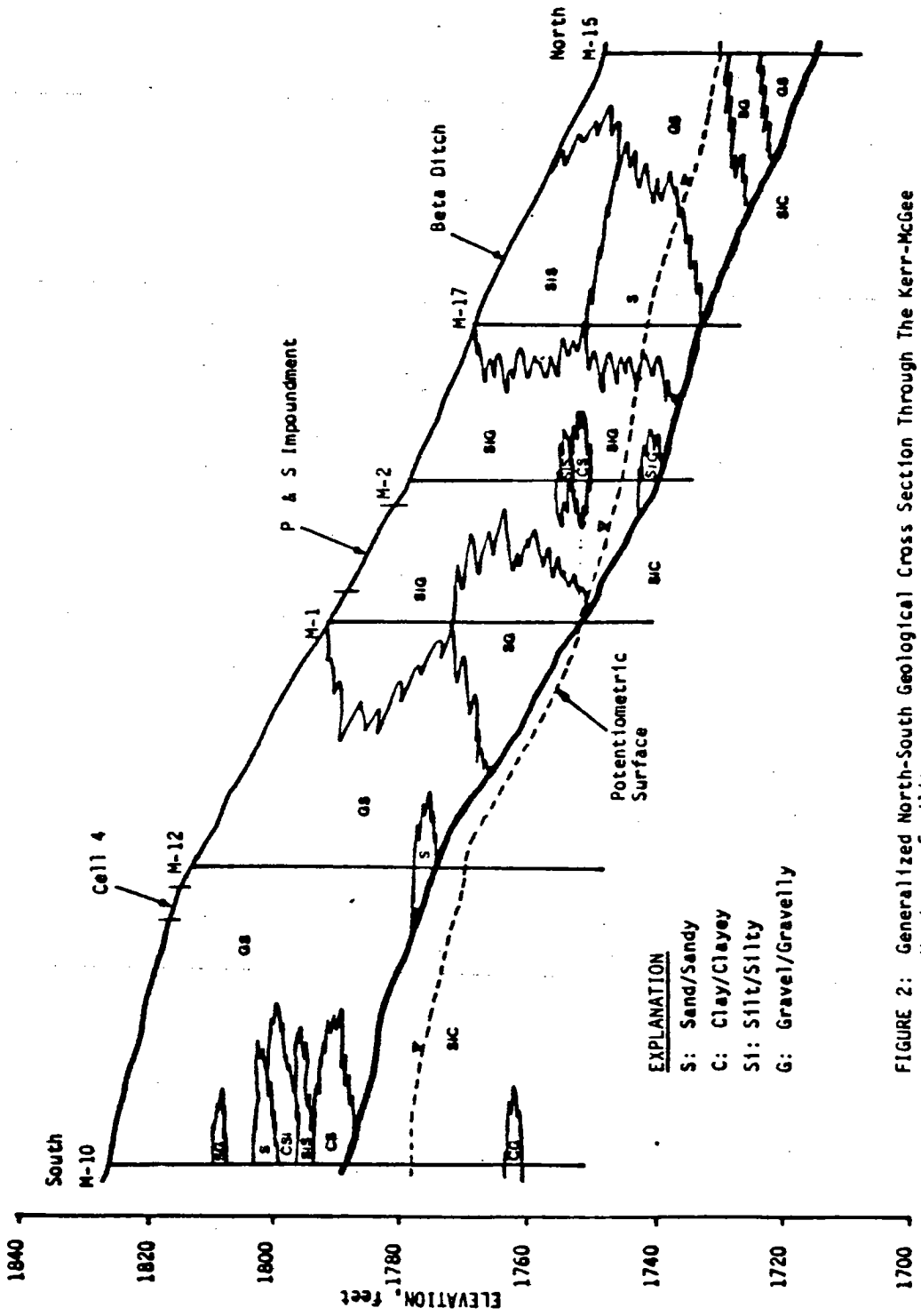
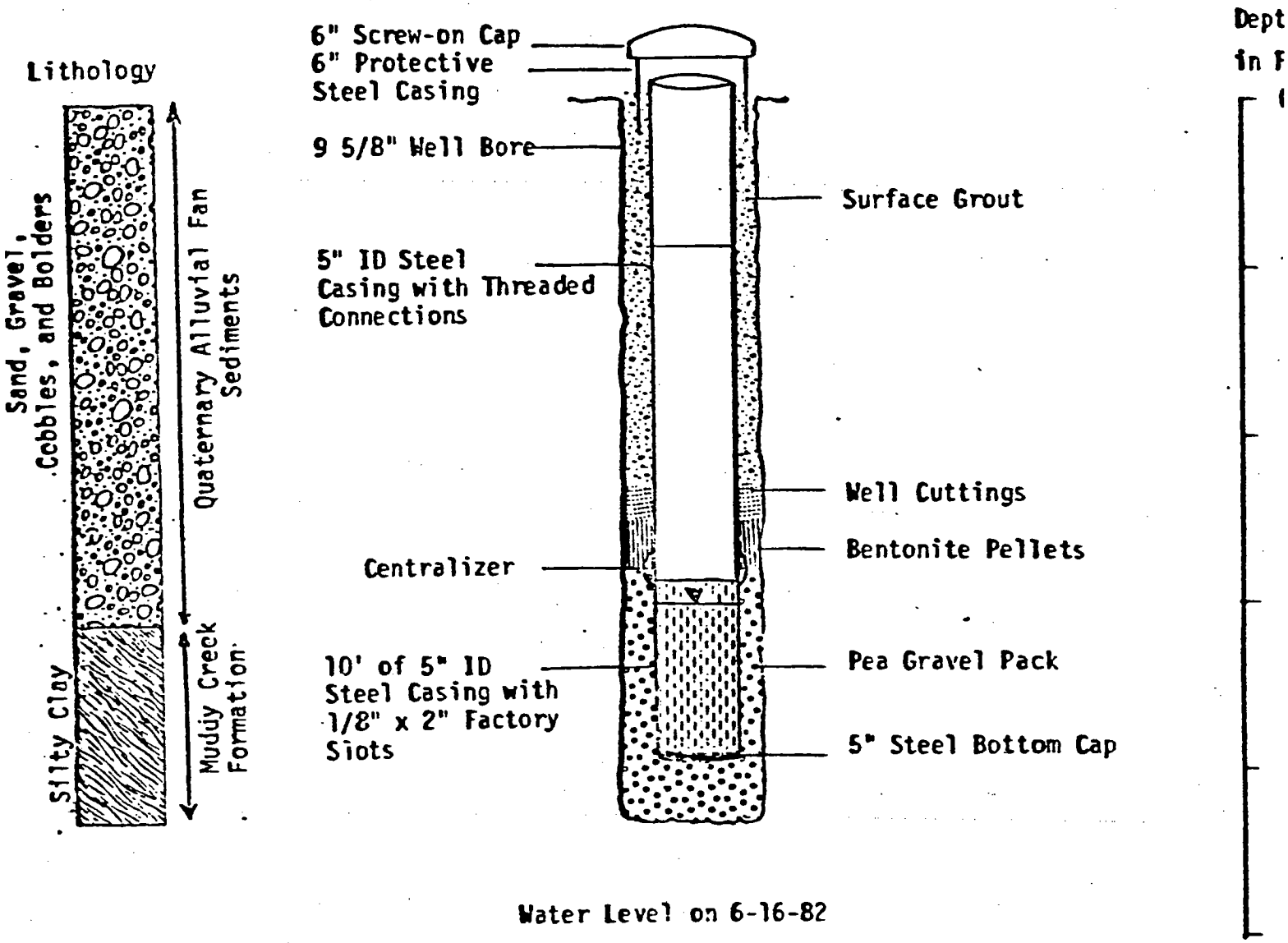


FIGURE 2: Generalized North-South Geological Cross Section Through The Kerr-McGee Henderson Facility.

FIGURE 3:
K-M Chemical Corporation
Henderson, Nevada Facility
Well No. M-5

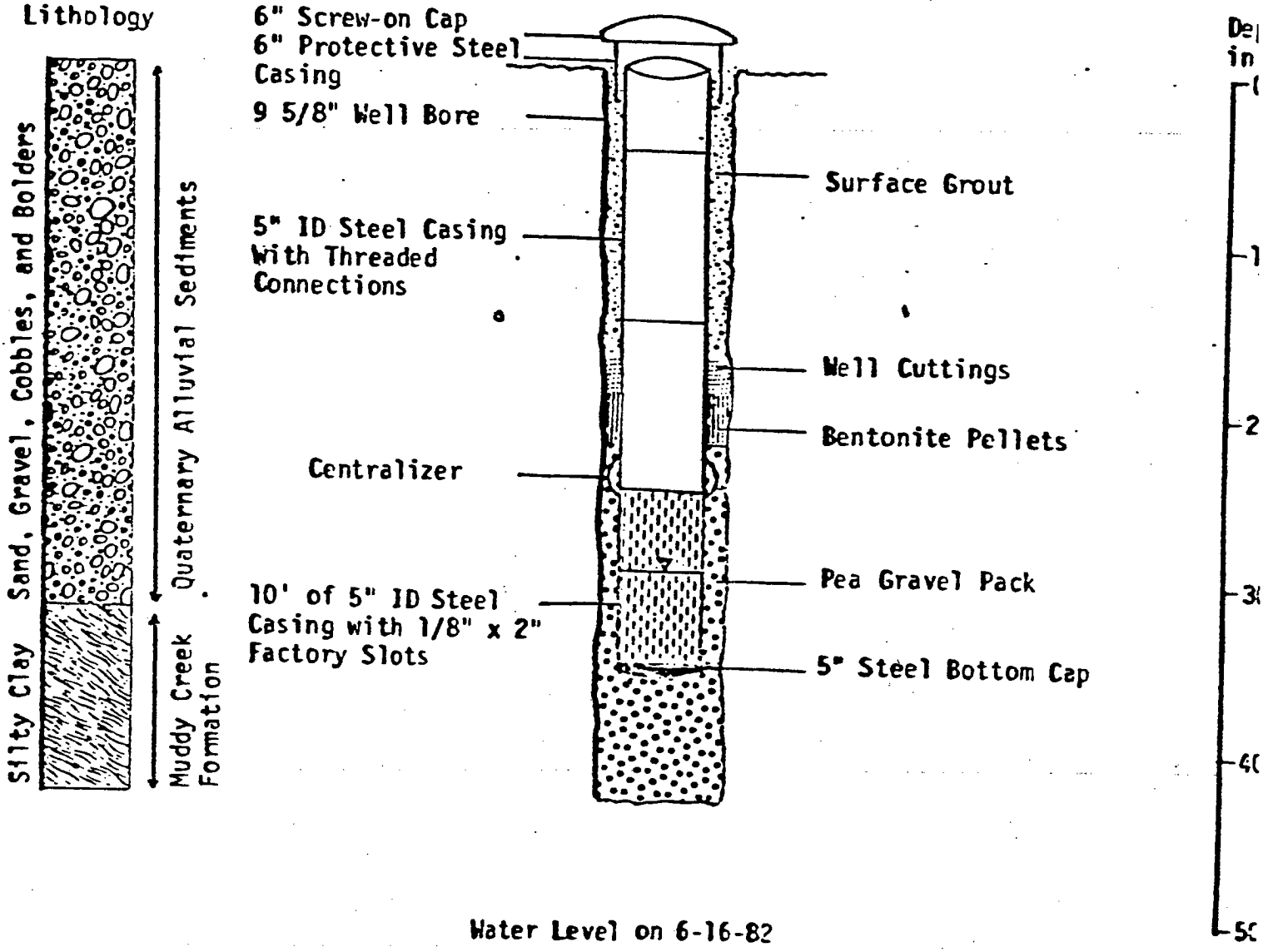


Water Level on 6-16-82

31' 4 3/8"

Measured from Top of Protective Casing

FIGURE 4:
K-M Chemical Corporation
Henderson, Nevada Facility
Well No. M-6

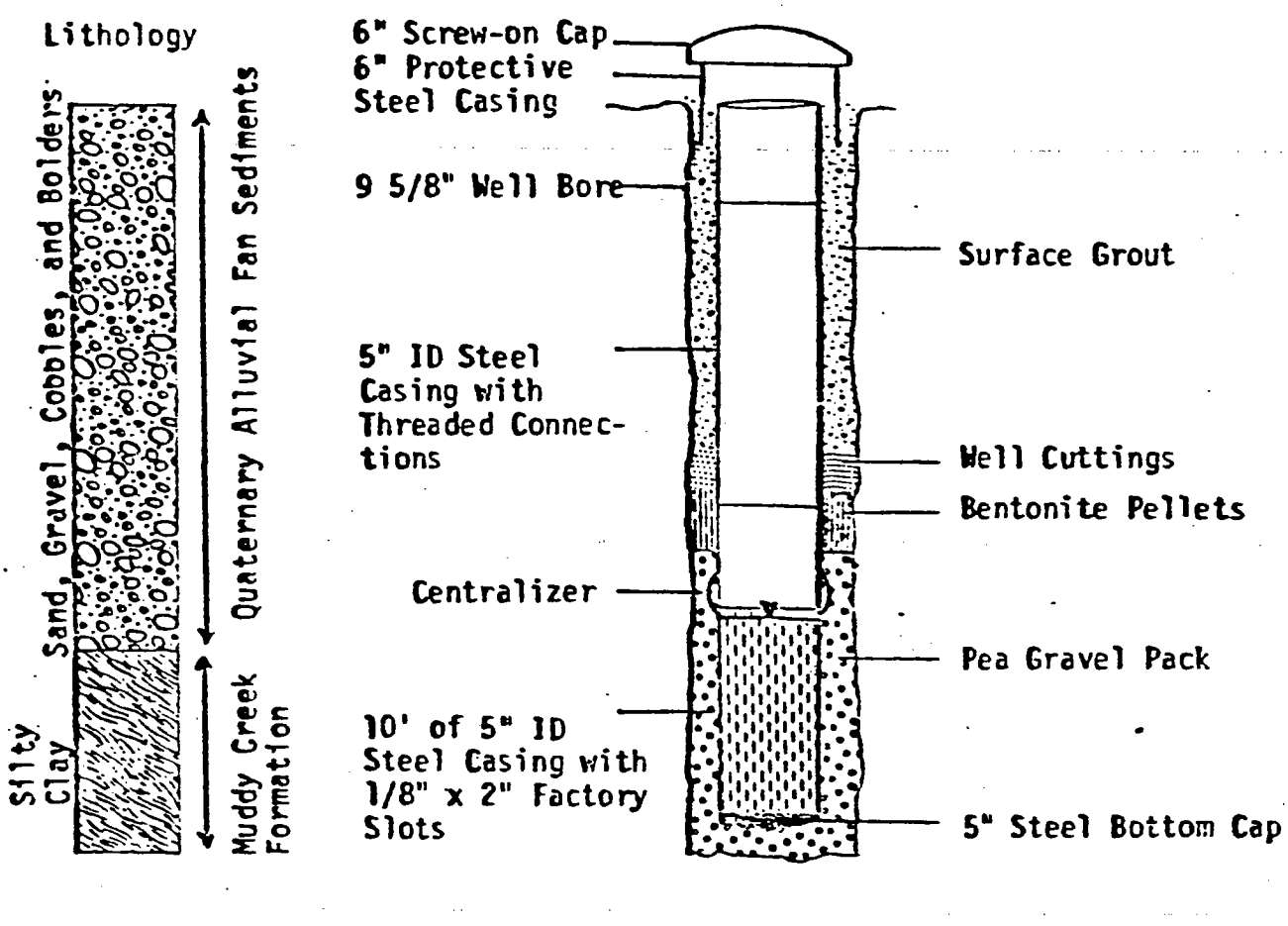


Water Level on 6-16-82

31' 4"

Measured from Top of Protective Casing

FIGURE 5:
K-M Chemical Corporation
Henderson, Nevada Facility
Well No. H-7



Water Level on 6-16-82

27' 11 3/4"

Measured from Top of Protective Casing

TABLE 1: Lithology Log for Henderson Well No. M-5

Depth in Feet	Lithology Description
0-12.0	Silty sandy gravel
12.0-15.0	Partially cemented sand and gravel
15.0-20.0	Cobbles
20.0-23.0	Silty sand and gravel
23.0-24.5	Gravel and sand with cobbles
24.5-25.5	White clay and gravel with gypsum and cobbles
25.5-28.0	Brown clayey silt with about 50% gypsum
28.0-31.0	Brown clayey silt with sand and gravel and white streaks
31.0-43.0	Brown clay with occasional thin caliche lenses

Top of Muddy Creek at 31 feet

TABLE 2: Lithology Log for Henderson Well No. K-6

Depth in Feet	Lithology Description
0-29.0	Silty gravel and sand; slightly cemented from 12' - 13'
29.0-32.0	Silty sand and gravel with gypsum
32.0-32.5	Brown silty clay
32.5-34.0	Silty sand and gravel
34.0-38.0	Brown silty clay
38.0-43.0	Brown clay with sand and gravel

Top of Muddy Creek at 32 feet

TABLE 3: Lithology Log for Henderson Well No. M-7

Depth in Feet	Lithology Description
0-15.0	Silty gravel and sand
15.0-18.0	Silty gravel and sand with gypsum
18.0-22.5	Silty gravel and sand with abundant gypsum; approximately 40% gypsum
22.5-28.0	Light brown silty clay with thin beds of caliche. Cemented from 27' - 27.5'
28.0-29.5	Clayey gravel (Not cemented)
29.5-37.0	Brown silty clay.

Top of Muddy Creek at 29.5'

TABLE 4: LITHOLOGY LOG FOR HENDERSON WELL NO. H-28

Description	Depth Below Land Surface (feet)
Sand, silty to clayey, grayish-brown very fine to very coarse (poorly sorted), and gravel, pebbles, cobbles and boulders, rounded to subangular; also with layers of caliche and caliche-cemented sand and gravel	0 - 44½
Clay, silty, to silt, clayey, light brown with traces of sand and gravel in matrix; also, with occasional thin layers of sand, reworked caliche, and caliche (Muddy Creek Formation)	44½ - 51

Data from Geraghty and Miller, Inc., October, 1980.

water-table configuration, and the vertical extent of water-bearing zones. The groundwater in the near-surface alluvial deposits flows north-northwest.

G. Groundwater Monitoring

Kerr-McGee Chemical Corporation has installed 8 RCRA monitoring wells around the hazardous-waste sites located at the Henderson Facility. Samples from the 4 wells serving the landfill site, M-5, M-6, M-7, and H-28, have been taken and analyzed for the RCRA drinking-water, water-quality-and-contamination-indication parameter over the past two years with background data being obtained during 1983. Chromium as a contaminant present in process operations and waste was added to the list of chemicals tested for during groundwater sampling.

The four RCRA wells at the landfill will continue to be sampled during closure/post-closure on a semi-annual basis in June and December with the results and the subsequent evaluation forwarded to the Nevada DEP within 30 days of receiving lab results. The groundwater quality parameters which will be checked are pH, specific conductance, TOC, TOH, chromium, chloride, sodium, sulfate, iron, manganese, and phenols.

Since chromium is the item of concern for this waste, a sample will be taken from each well monthly and analyzed from chromium only. Water levels of all wells will also be recorded monthly.

H. Special Requirements

1. Ignitable or Reactive Wastes [265.312]

The wastes are not reactive or ignitable and require no special treatment, stabilization or security provisions.

2. Incompatible Wastes [265.313]

All wastes in the landfill are fully compatible and have been in place for over 18 months.

3. Liquid Waste [265.314]

All waste was placed prior to January 26, 1983. All waste was solidified with native soil to eliminate any liquid that may have been present.

4. Containerized [265.315]

No containers, either empty, crushed or containing hazardous material, were placed in this landfill during its life.

IV. POST-CLOSURE CARE AND MAINTENANCE PLAN

1. Final Cover [265.310(b)(1)(4)]

a. The erosion-resistant cover will be inspected routinely on the first Wednesday of each month for visible evidence of surface deterioration by the Environmental Supervisor or his designated inspector. A written record will be kept of these inspections by the plant Environmental Supervisor.

b. Remedial maintenance will be taken within 5 working days to repair any observed defects. Records will be kept of this work by the Environmental Supervisor.

c. Special inspections will be made after each severe event, i.e., precipitation in excess of 0.5 inch in 24 hours, or high wind conditions equivalent to gale velocity during dry periods.

d. At least once a year (week of July 15), the elevation of the benchmark will be checked for subsidence and stability of the fill. The slope of the cover will be restored to 3 percent if any subsidence has changed the contour of the cover. The significance of any change in elevation will be assessed and the NDEP notified of any appropriate maintenance that is done.

e. At least once a year (week of July 15), and more often if inspection indicates the need, the erosion-resistant cap will be renewed and a slope of 3 percent maintained along its length.

f. Signs will be posted around the covered landfill to identify the perimeter, restrict access, and prevent unauthorized vehicular movement over the cap.

2. Groundwater Quality Monitoring

a. The groundwater-monitoring program around the landfill will continue for 30 years. Sampling, analysis, and reporting to NDEP will be done semi-annually or more frequently as directed by the NDEP. Groundwater quality parameters

will include pH, specific conductance, TOC, TOH, and Cr. Samples will be collected from monitor wells M-5, M-6, M-7, and H-28.

b. Permission to terminate this monitoring program may be requested from the NDEP when groundwater quality assessment data indicate no impact from the landfill for a period of 24 consecutive months.

c. To insure that the groundwater-monitoring system remains functional, monthly checks of each of the four wells will be made. They will be checked for water level and signs of silting, as well as any tampering of the well-closure cap. To prevent unauthorized personnel from removing the well cap, a lock will be installed with the key kept in the plant master key lock-box. If any signs are found that tampering has occurred with any well, a sample will be taken and analyzed. If the well is determined unserviceable, a new well will be installed to replace it and maintain the integrity of the monitoring system.

3. Facility Manager's Checklist for Post-Closure Care

a. First Wednesday of each month:

1) Inspect cap for evidence of visible deterioration.

2) Perform necessary maintenance.

3) Keep written records of inspection and maintenance.

4) Check well cap for tampering and well for siltation; then measure and record.

5) Sample wells M-5, M-6, M-7, and H-28 and analyze for chromium.

b. After heavy rainfall or windstorm event:

1) Inspect cap for evidence of deterioration.

2) Perform necessary maintenance.

3) Keep written records of inspection and maintnenance.

c. Week of July 15, annually:

1) Check elevation of benchmark.

2) Renew erosion-resistant cap and slope (more often as needed).

3) Keep written records of same.

d. Semi-annual groundwater monitoring and reporting:

1) Sample and analyze monitor wells around the landfill every December and June.

2) Assess data and report to NDEP within 30 days after receiving laboratory results.

4. Facility Contact

During closure activities and post-closure care, contact with the facility should be made as follows:

a. Facility Manager
Kerr-McGee Chemical Corporation
P. O. Box 55
Henderson, Nevada 89015
Phone (702) 565-8901

Rolfe B. Chase, Jr., is Facility Manager as of June 1, 1984.

b. Environmental Supervisor
Kerr-McGee Chemical Corporation
P. O. Box 55
Henderson, Nevada 89015
Phone (702) 565-8901

F. R. Stater is Environmental Supervisor as of June 1, 1984.

V. CERTIFICATION OF CLOSURE [265.115]

An independent professional engineer, registered in the State of Nevada, will be engaged to inspect the closure proceedings for compliance with the approved plan.

The PE will make inspection at each of the following stages of closure:

1. Prior to any closure activities to verify no additional waste has been added.

2. Upon completion of the application of the low permeability layer, verify coverage, depth, compaction, and slope of finished lift.

3. Upon completion of the installation of the protective membrane to insure seams are according to drawing and thickness meets specifications.

4. Upon final completion of top cover, insure the final slope of 3-5 percent is maintained and the drainage around the waste cell matches the engineering drawings as specified in this closure.

Certification of proper closure will be submitted by KMCC and the registered PE to the Director, NDEP, and the Regional Administrator, U. S. EPA, within 30 days after all work has been completed and inspected.

VI. PROPERTY RESTRICTIONS

1. Post-Closure Use [265.117]

The closed landfill will not be used in a manner that will disturb the integrity of the final cover unless KMCC demonstrates to the satisfaction of the Director, NDEP, that any contemplated use would not create a hazard to health or the environment.

Within the foreseeable future (year 2015), there is enough land within the existing property to satisfy all anticipated land use requirements without disturbing the landfill site.

2. Notice to Local Authorities [265.119]

Kerr-McGee will promptly notify the Clark County Recorder and the Director, NDEP, by providing within 90 days after closure a final plat showing the location and dimensions of the closed landfill. The benchmark set in the cover will be used for this identification. A registered land surveyor will prepare and certify this plat.

3. Notice in Property Deed [265.120]

KMCC, the property owner, will record with the Clark County Recorder of Deeds a notification on the deed to the facility property that will in perpetuity notify any potential or future purchaser that the land has been used for HW disposal and its use is restricted under 40 CFR 265.117(c).

VII. COST ESTIMATES

A. Cost Estimates for Closure [265.142]

Cost estimates for closure are shown in Table 5. The cost estimate for closing the landfill is based

TABLE 5 - CLOSURE COST ESTIMATE

The following cost estimate for installation of the landfill cap is based on the design specifications contained in Appendix IV:

1.	Low Permeability Layer		
	Material: 2,000 yd.^{3} clay x \$15/yd.^{3}	\$30,000	
	Installation: 2,000 yd.^{3} clay x \$ 3/yd.^{3}	6,000	
	Total		\$ 36,000
2.	Synthetic Membrane		
	Material: 30 mil HDPE 24,000 ft.^{2} x \$0.27	\$ 6,500	
	Installation: 30 mil HDPE 24,000 ft.^{2} x \$0.50	12,000	
	Total		\$ 18,500
3.	Protective Layer		
	Material: 450 yd.^{3} clay x \$15/yd.^{3}	\$ 6,750	
	Installation: 450 yd.^{3} clay x \$ 2/yd.^{3}	900	
	Total		\$ 7,650
4.	Final Cap - Drainage and Protective Layers		
	Material: 1,750 yd.^{3} native soil x \$10/yd.^{3}	\$17,500	
	Installation: 1,750 yd.^{3} native soil x \$ 2/yd.^{3}	3,500	
	Total		\$ 21,000
5.	Grading for Drainage		
	Total		\$ 10,000
6.	Miscellaneous Costs		
	Installation of BM:	\$ 1,500	
	PE Certification:	500	
	Administrative:	3,000	
	Total		\$ 5,000
	Total Closure Cost		\$ 98,150
	10% Contingency		9,800
			\$107,950

on the procedure proposed in this plan and on 1984 costs. These estimated costs will be escalated by the 1984 inflation factors if approval of this plan is delayed beyond December 31, 1984.

B. Cost Estimate for Post-Closure Care [265.144]

Post-closure cost estimates are given in Table 6. The cost for post-closure care is based on 1984 estimated costs for site mainntenance, sampling and analysis of groundwater-monitor wells, and reporting thereof.

Post-closure care for 30 years, beginning June, 1985, is forecasted. Annual revision of the post-closure cost estimates will be provided within 30 days of each anniversary date of final closure to reflect inflation and any changes that may occur in the plan. A copy of the annual revision to the post-closure plan will be kept at the Henderson Facility office.

VIII. FINANCIAL ASSURANCE

A. Financial Assurance for Closure [265.143]

Attached in Appendix V is the letter from the Chief Financial Officer of Kerr-McGee Corporation to demonstrate financial assurance of closure as specified in 40 CFR 265.143.

Also attached is a certificate of liability insurance for a HW facility provided by Harbor Insurance Company, Policy No. HI-167898.

B. Financial Assurance for Post-Closure Care and Groundwater Monitoring and Maintenance [265.145]

The same documents to meet the requirements of 265.143 apply to 265.145.

IX. CLOSURE TIME SCHEDULE

KMCC is prepared to begin closure within 7 days after notification of approval of the closure/post-closure plan by the NDEP.

The chronological listing and checkpoints for increments of progress are listed below. A bar chart, showing time versus activity, follows in Figure 6 to show simultaneous activities that may occur.

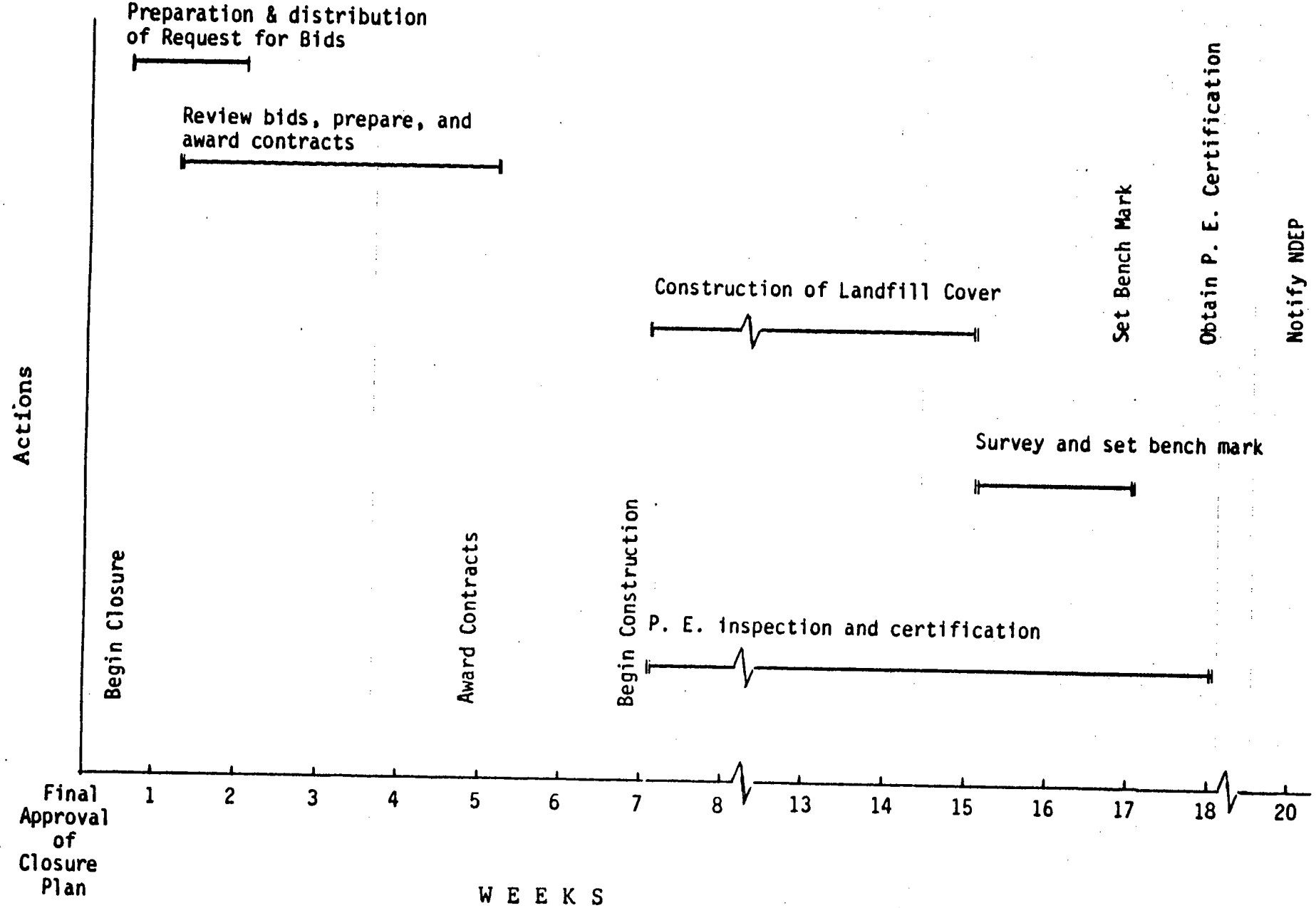
TABLE 6 - COST ESTIMATE FOR POST-CLOSURE CARE
[265.144]

1.	Inspections and Recordkeeping		
	a) One per week		52
	b) Special events (precipitation, high winds, etc.) Assume 10 = Total 62 62 x 1/2 hour = 31 hours - 31 x $15		$ 500
2.	Maintenance of Cover and Drainage Swales		
	Assume restoration of top cover and drainage swales once per year		$ 2,000
3.	Annual Subsidence Check		$ 1,000
4.	Groundwater Monitoring		
	a) Sampling and Analysis	$6,000	
	b) Maintenance	500	
	Total		$ 6,500
Total Post-Closure Costs/Year			$ 10,000
For 30 Years			$300,000

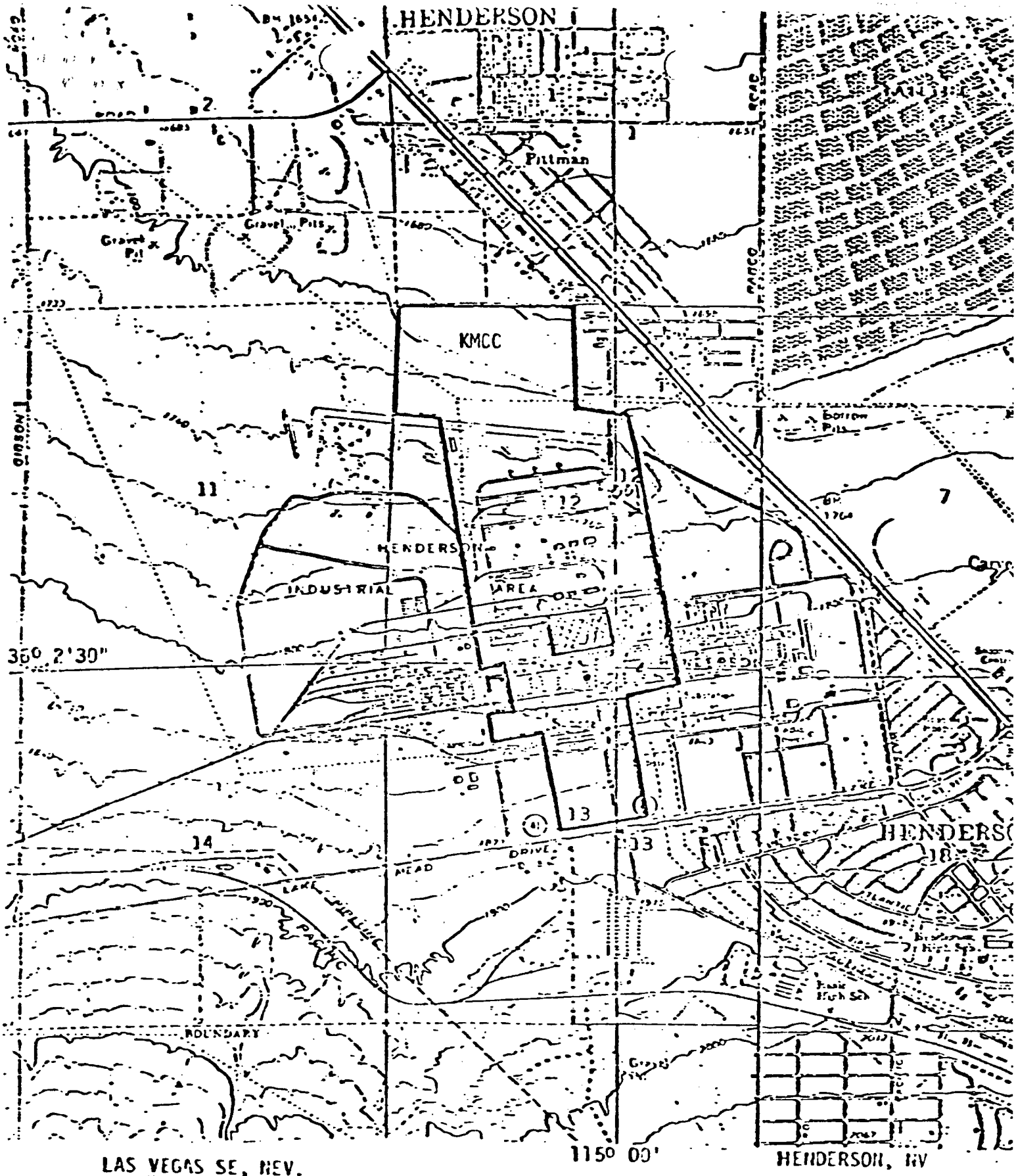
Time Frame	Action
0	1. Approval of Closure Plan
Within 1 week	2. Begin preparation of requests for bids for installation of cover, survey work, and PE services
Within 5 weeks	3. Award contracts
Within 7 weeks	4. Begin construction of landfill cover
Within 15 weeks	5. Completion of landfill cover
Within 17 weeks	6. Survey and set benchmark
Within 18 weeks	7. Obtain PE Certification
Within 20 weeks	8. Notify NDEP of completion

FIGURE 6:

LANDFILL CLOSURE TIME SCHEDULE



APPENDIX I

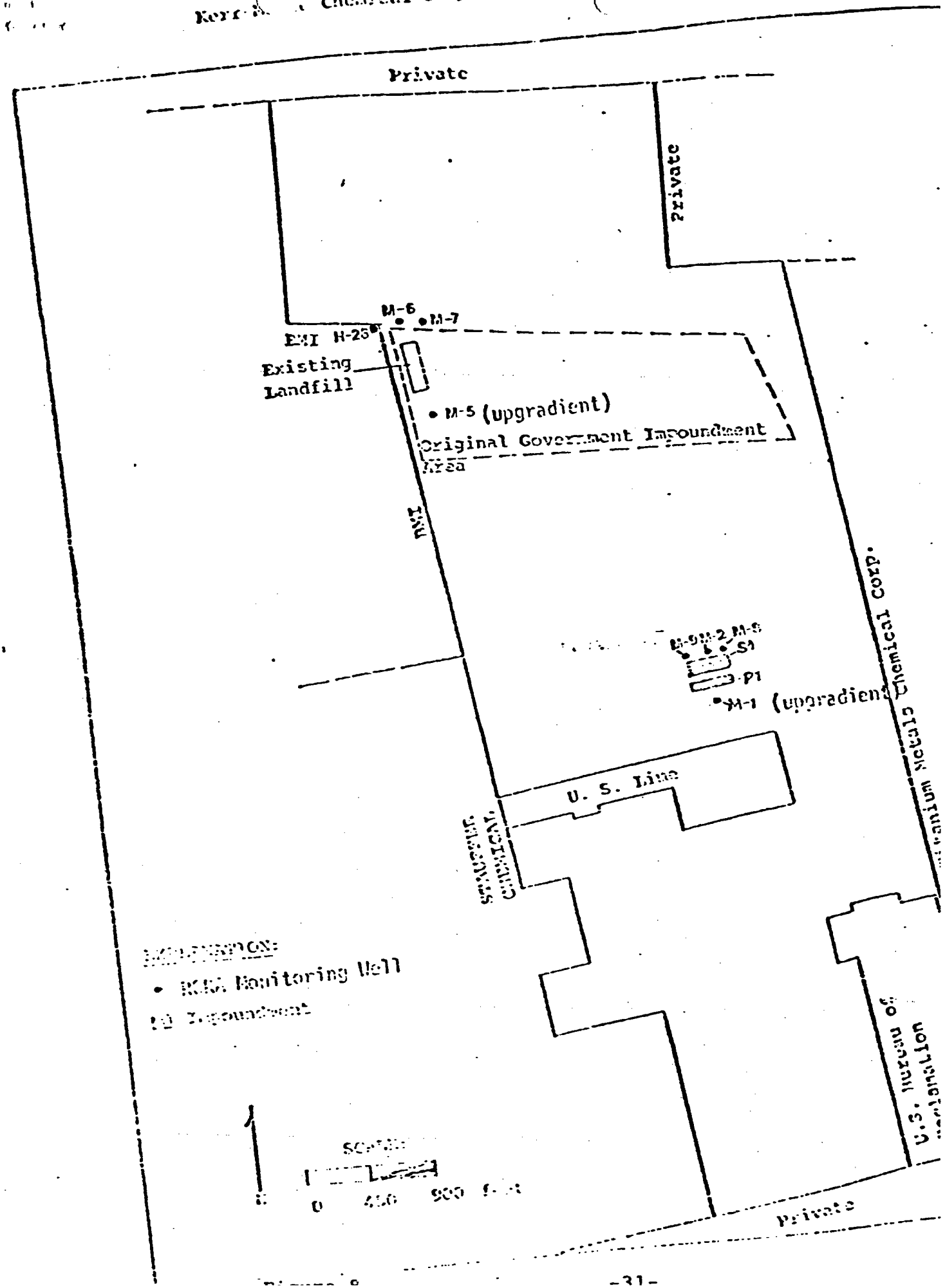


LOCATION MAP

Figure 7

LOCA[illegible] OF RCRA GROUND-WATER [illegible] Facility

Kerr-[illegible] Chemical Corporation's Rend[illegible]



APPENDIX II

October 16, 1985

P.S. Corbett
Manager-Operations
Kerr-McGee Chemical Corporation
P.O. Box 55
Henderson, NV 89105

Certified Mail #P22 1673027
Return Receipt Requested

Dear Mr. Corbett:

Pursuant to your request of October 11, 1985, the Division hereby grants a 1 week extension for certification of closure of the hazardous waste landfill. As such, certification must occur on or before October 23, 1985.

Should you have any questions concerning this matter, please contact me.

Sincerely,

Thomas J. Fronapfel

Thomas J. Fronapfel, P.E.
Environmental Engineer
Waste Management Section

TJF/pr

cc: Gary Lance

KERR-McGEE CHEMICAL CORPORATION
POST OFFICE BOX 55 • HENDERSON, NEVADA 89015

October 11, 1985

Certified Mail No. P 673 531 401

Mr. Tom Fronapfel
State of Nevada
Division of Environmental Protection
201 South Fall Street
Carson City, NV 89710

Dear Mr. Fronapfel:

As we discussed by phone on October 11, 1985, KMCC requests a one-week extension of the 180-day period for closure of the hazardous waste landfill at the Henderson facility. A delay in the final earthwork developed when the contractor's earthworking equipment failed.

The seven-day extension will establish the final date for closure certification as October 23, 1985. Please reply as to the acceptability of this request.

If you have any questions, please contact S. Crowley at (702) 565-8901, Ext. 234.

Sincerely,

P. S. Corbett
Manager - Operations

PSC:jc

KERR-McGEE CHEMICAL CORPORATION
POST OFFICE BOX 55 • HENDERSON, NEVADA 89015

September 6, 1985

Certified Mail No. P 455 591 971

Mr. Thomas J. Fronapfel, P.E.
Environmental Engineer
Waste Management Section
Division of Environmental Protection
Nevada Department of Conservation
and Natural Resources
201 South Fall Street
Carson City, NV 89710

Dear Mr. Fronapfel:

Kerr-McGee Chemical Corporation has completed activities for closure of the P-1 surface impoundments located at the Henderson facility. J. H. Kleinfelder and Associates provided a review of project activities and professional engineer's certification that the closure activities were in conformance with the "Hazardous Waste Closure/ Post-Closure Plan, Revision 1" dated September 28, 1984, as approved by the Division of Environmental Protection, Nevada Department of Conservation and Natural Resources on April 16, 1985. This consultant's certification is attached along with supporting documents.

We understand that upon NDEP acceptance of Kleinfelder's certification, closure of P-1 surface impoundment is completed and no further action is required on KMCC's part. If you have any questions, please contact S. Crowley at (702) 565-8901, Ext. 234.

Your written acceptance of this certification would be appreciated.

Sincerely,

R. B. Chase, Jr.
Plant Manager

RBC:jc
Attachments

J. H. KLEINFELDER & ASSOCIATES

GEOTECHNICAL CONSULTANTS • MATERIALS TESTING
LAND & WATER RESOURCES

5115 SOUTH INDUSTRIAL ROAD, SUITE 605

LAS VEGAS, NEVADA 89118

(702) 736-2936

September 4, 1985

Kerr-McGee Chemical Corporation
P.O. Box 55
Henderson, Nevada 89015

Attention: Ms. Susan M. Crowley

Subject: Closure Compliance
P-1 Surface Impoundment
Henderson Plant
Henderson, Nevada
Project No. L-1359-3

Gentlemen:

This letter presents a summary of the procedures used to close the P-1 Impoundment Pond and our conclusions on the adequacy of the closure operations.

We understand all of the wastes and the liners were removed from the P-1 Impoundment between July 25, 1985 and August 8, 1985. The removed materials were disposed of in a non-hazardous waste landfill located on-site. The exposed subgrade was drilled to a depth of 4½ feet at six locations as shown on the attached Plot Plan on August 9, 1985. Samples were obtained by our personnel at one foot increments in each of the borings. The samples were obtained using a 2.625 inch I.D. sampler driven by a 350 pound hammer with a free fall of 18 inches. The samples were double bagged in plastic and labeled immediately after they were obtained. The sampling equipment was washed with water prior to the next sample interval. The purpose of the sampling was to assess if waste material formerly held in the impoundment had leaked into the subsurface soils.

The soil samples obtained in the manner described above were relinquished by Mr. William Siegel of J.H. Kleinfelder and Associates to Ms. Marg Herndon of Desert Research Institute (DRI) in Las Vegas, Nevada on August 12, 1985. The samples were received by a representative of the D.R.I. laboratory in Sparks, Nevada on August 13, 1985. The chain-of-custody forms are attached. The samples were analyzed using the EP toxcity test method. The maximum chromium concentration permitted in 40 CFR 261.24 without considering

the material toxic is 5.0 ppm. No sample had a chromium content exceeding 0.41 ppm using the EP toxcity test procedure.

Based upon the field sampling procedures and the analytical laboratory test data, it is our opinion that the existing soil subgrade should not be considered a hazardous waste due to chromium content as defined 40 CFR 261.20 and 261.24. This conclusion assumes that chromium was the only hazardous substance impounded by the structure.

After review of the above information and our field observations, it is our opinion that the P-1 Impoundment has been closed in conformance with the intent of the "Hazardous Waste Closure/Post-Closure Plan, Revision 1" dated September 28, 1984. A copy of the closure plan is attached.

It is our pleasure to be of service. If you should have any questions, please call this office.

Respectfully submitted,

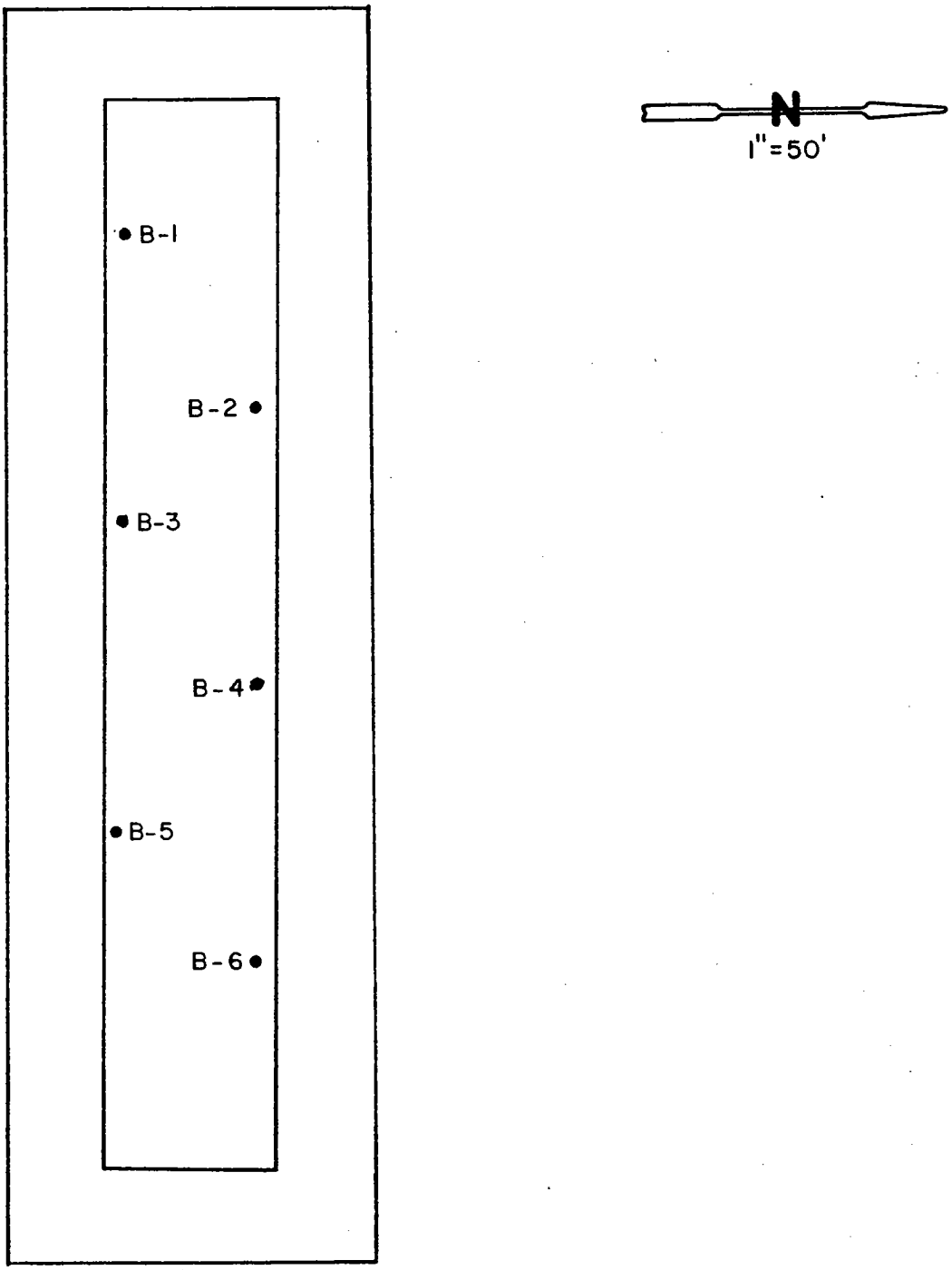
J.H. KLEINFELDER & ASSOCIATES

Paul A. Davis

Joseph M. Cibor
Manager

PAD:JMC:dj

Enclosures: Plot Plan
Chain-of-Custody forms
D.R.I. Analyses
Closure Plan



● B-2: Approximate Location of Exploratory Boring

J.H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

PROJECT NO. L-1359-3

PLOT PLAN
POND P-1

CHAIN OF CUSTODY RECORD

SAMPLERS: (Signature) Paul A. Davis (Paul A. Davis)

Phone: 702-736-2936

SHIP TO:
DESERT RESEARCH INST.
7010 DANDINI
SPARKS, NV 89431
ATTN: WRC LAB

ATTENTION:

Phone No.

SHIPPING INFORMATION

Shipper

Address

Date Shipped

Shipment Service

Airbill No.

Cooler No.

Relinquished by: (Signature) William Siegel	Received by: (Signature) Mary Hesnadon	Date/Time 8-12-85 11:24
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Receive for laboratory by*: (Signature) James C. Thurston	Date/Time 8-13-85 11:30

*Analysis laboratory should complete, "sample condition upon receipt", section below, sign and return top copy to J. H. KLEINFELDER & ASSOCIATES, 5115 South Industrial Road, Suite 605, Las Vegas, Nevada 89118

Sample Number	Site Identification	Date Sampled	Analysis Requested	Sample Condition Upon Receipt
0-1/2	B-1	8-9-85	Chromium	GOOD
1/2-1 1/2	B-1			
1 1/2-2 1/2	B-1			
2 1/2-3 1/2	B-1			
3 1/2-4 1/2	B-1			
0-1/2	B-2			
1/2-1 1/2	B-2			
1 1/2-2 1/2	B-2			
2 1/2-3 1/2	B-2			
3 1/2-4 1/2	B-2			
0-1/2	B-3			
1/2-1 1/2	B-3			
1 1/2-2 1/2	B-3			
2 1/2-3 1/2	B-3			
3 1/2-4 1/2	B-3			
0-1/2	B-4			
1/2-1 1/2	B-4			
1 1/2-2 1/2	B-4			
2 1/2-3 1/2	B-4			
3 1/2-4 1/2	B-4			

Form A-382 (Rev. 7/82)
White-Sampler Canary- J. H. KLEINFELDER & ASSOCIATES Pink-Lab Courtesy Copy

CHAIN OF CUSTODY RECORD

SAMPLERS: (Signature) Paul A. Davis (Paul A. Davis)

Phone: 702-736-2936

SHIP TO:

DESERT RESEARCH INST.
7010 DANDINI
SPARKS, NV

ATTENTION: WRC LAB

Phone No.

SHIPPING INFORMATION

Shipper

Address

Date Shipped

Shipment Service

Airbill No.

Cooler No.

Relinquished by: (Signature) William Siegel	Received by: (Signature) Mara Hernandez	Date/Time 8-12-85 11:24
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Receive for laboratory by*: (Signature) [signature]	Date/Time 8-13-85 11:20

*Analysis laboratory should complete, "sample condition upon receipt", section below, sign and return top copy to J. H. KLEINFELDER & ASSOCIATES, 5115 South Industrial Road, Suite 605, Las Vegas, Nevada 89118

Sample Number	Site Identification	Date Sampled	Analysis Requested	Sample Condition Upon Receipt
0-½	B-5	8-9-85	Chromium	GOOD
½-1½	B-5			
1½-2½	B-5			
2½-3½	B-5			
3½-4½	B-5			
0-½	B-6			
½-1½	B-6			
1½-2½	B-6			
2½-3½	B-6			
3½-4½	B-6			

Form A-382 (Rev. 7/82)
White-Sampler Canary- J. H. KLEINFELDER & ASSOCIATES Pink-Lab Courtesy Copy

WATER ANALYSIS LABORATORY — REPORT DATE: 22-AUG-85
DESERT RESEARCH INSTITUTE — FILE NAME: 9735KL.TBL

LAB # / DATE	SAMPLE POINT	CR MG/L
9735 / 9-AUG-85	B-1 :0 - .5'	0.11
9736 / 9-AUG-85	B-1 :.5 - 1.5'	<.10
9737 / 9-AUG-85	B-1 :1.5 - 2.5'	<.10
9738 / 9-AUG-85	B-1 :2.5 - 3.5'	<.10
9739 / 9-AUG-85	B-1 :3.5 - 4.5'	<.10
9740 / 9-AUG-85	B-2 :0 - .5'	0.41
9741 / 9-AUG-85	B-2 :.5 - 1.5'	0.10
9742 / 9-AUG-85	B-2 :1.5 - 2.5'	<.10
9743 / 9-AUG-85	B-2 :2.5 - 3.5'	<.10
9744 / 9-AUG-85	B-2 :3.5 - 4.5'	<.10
9745 / 9-AUG-85	B-3 :0 - .5'	0.27
9746 / 9-AUG-85	B-3 :.5 - 1.5'	<.10
9747 / 9-AUG-85	B-3 :1.5 - 2.5'	<.10
9748 / 9-AUG-85	B-3 :2.5 - 3.5'	<.10
9749 / 9-AUG-85	B-3 :3.5 - 4.5'	<.10

CHROMIUM ANALYSIS ON EP-TOX EXTRACTS

WATER ANALYSIS LABORATORY
DESERT RESEARCH INSTITUTE

REPORT DATE: 22-AUG-85
FILE NAME: 9735KL.TBL

LAB # / DATE	SAMPLE POINT	CR MG/L
9750 9-AUG-85	B-4 0 - .5'	< .10
9751 9-AUG-85	B-4 .5 - 1.5'	< .10
9752 9-AUG-85	B-4 1.5 - 2.5'	< .10
9753 9-AUG-85	B-4 2.5 - 3.5'	< .10
9754 9-AUG-85	B-4 3.5 - 4.5'	< .10
9755 9-AUG-85	B-5 0 - .5'	0.21
9756 9-AUG-85	B-5 .5 - 1.5'	< .10
9757 9-AUG-85	B-5 1.5 - 2.5'	< .10
9758 9-AUG-85	B-5 2.5 - 3.5'	< .10
9759 9-AUG-85	B-5 3.5 - 4.5'	< .10
9760 9-AUG-85	B-6 0 - .5'	0.25
9761 9-AUG-85	B-6 .5 - 1.5'	< .10
9762 9-AUG-85	B-6 1.5 - 2.5'	0.10
9763 9-AUG-85	B-6 2.5 - 3.5'	0.11
9764 9-AUG-85	B-6 3.5 - 4.5'	< .10

CHROMIUM ANALYSIS ON EP-TOX EXTRACTS