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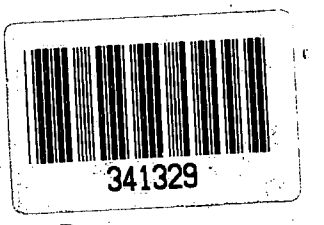
COTTONWOOD WEST INDUSTRIAL PARK PHASE I ENVIRONMENTAL SITE ASSESSMENT AND PRELIMINARY PHASE II ANALYSIS



Submitted by

Ogden Environmental and Energy Services Company, Inc.
Denver, Colorado 80237

to

LeisureTime Management Resources, Inc.
Lakewood, Colorado 80228

CONTRACT NO. LT-1-91-092

January 17, 1991

COTTONWOOD WEST INDUSTRIAL PARK

PHASE I ENVIRONMENTAL SITE ASSESSMENT AND

PRELIMINARY PHASE II ANALYSIS

ARVADA, COLORADO

Prepared for
LeisureTime Management Resources, Inc.
and Resolution Trust Corporation
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LTMR Contract LT-1-91-092

JANUARY 17, 1992

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1.0 INTRODUCTION

Ogden Environmental Energy Services Company (Ogden) has completed a Phase I Environmental Site Assessment (ESA) at the Cottonwood West Industrial Park (referred to herein as the "property" or "LTMR site." This ESA has been prepared for the exclusive use of LeisureTime Management Resources, Inc. (LTMR) and the Resolution Trust Corporation (RTC).

1.1 PURPOSE

The purpose of the Phase I ESA is to:

- identify the presence of a release or threat of a release of any hazardous substance affecting the property;
- determine the level of compliance with current selective environmental standards, laws, and regulations with respect to the property;
- provide support background for valuation of the property;
- establish baseline information for environmental liability for historical and comparative purposes;
- identify any hazardous substance that may have been utilized, stored, released, or disposed on the property; and
- identify the need for additional testing/monitoring to evaluate the scope, location, source, and nature of any releases, or threat of releases, of hazardous and toxic substances affecting the property or adjacent properties—both public and private.

1.2 GENERAL SITE INFORMATION

The site is located within the east one-half of Section 1, Township 3 South, Range 70 West of the 6th Prime Meridian, Jefferson County, State of Colorado. Specifically, the site is located near W. 68th Place and Joyce Street, Arvada, Colorado. The site consists of six parcels of land with five parcels being within the subdivision Cottonwood West Industrial Park Filing Number 1,

and the sixth parcel being directly south of the subdivision. Please refer to the 1986 Aerial Photograph Site Vicinity Map (1"=200') (Appendix B). The full property legal descriptions are included in Appendix C.

The property is bordered on the north by agricultural land with sparsely scattered single family homes, zoned A-1, City of Arvada. To the east of the property and directly adjacent to the site is Systems Engineering Associates, Inc., a vacant subdivided lot, and B-TEN SYSTEMS INC. Following the eastern boundary to the southern most point is The City of Arvada's Municipal Service Center/Public Works Department.

The Arvada Municipal Service Center houses the Police Department's impoundment yard, the Fleet Services Division, the Traffic and Water Departments, and the Engineering Department's Soil Lab. Adjacent to these facilities are open-air, temporary asphalt stockpiles. Directly east of the stockpiles is the Jefferson County School District's (JCSD's) Arvada Bus Terminal and maintenance yard. All of the land use to the east is zoned Planned Unit Development-Industrial (PUD-I), City of Arvada. Directly to the south of the property is the Croke Canal; south of the canal is a single-family home with a barn and silo surrounded by agricultural land. This land is zoned A-2 Jefferson County Zoning. Directly west of the site is the Croke Canal, and west of the canal is agricultural land with scattered single-family homes. This land is zoned A-2 and is within Jefferson County jurisdiction. The closest major intersection is to the southeast at 64th Avenue and Indiana Street.

The historical use of the site was researched in order to ascertain the probability of past waste disposal. Information researched included the following:

- Chain of Title
- Topographic Maps
- Historical Aerial Photographs (Appendices A and B)
- Geotechnical Site Evaluation; a 1982 Chen and Associates Soil and Foundation Investigation report, which was provided by LTMR is included in Appendix H.
- Soil Conservation Service Maps (Appendix E)
- Personal Interviews

In November 1985, Jefferson County recorded the Cottonwood West Industrial Park Filing 1, located in the City of Arvada. This 25.4-acre subdivision is the northern part of the site located north of Ralston Creek. There are also 13 acres (more or less) located south of the creek, which is also part of the LTMR site (see Figure 1, Appendix D). The subject property was annexed from Jefferson County by the City of Arvada in 1981 and 1982.

1.2.1 Chain of Title

The Chain of Title and deed research was conducted at the Jefferson County Court House in the Tax Assessors office and the County Clerk and Records office. Property ownership dating back to 1932 is listed below.

Date(s)	Ownership
Cottonwood West Industrial Park Filing 1 (Block 1, Block 2, Block 3, Block 4 Lot 1, Block 4 Lot 2)	
Present - March 18, 1988	Cottonwood West LTD.
March 18, 1988 - November 21, 1985	Cottonwood West Industrial Park Inc.
November 21, 1985 - July 20, 1981	Pulse Holding LTD.
July 20, 1981 - January 22, 1954	Earl N. & Ruth M. Murray
January 22, 1954 - November 29, 1945	Arthur H. Meisner
November 29, 1945 - September 19, 1932	Joseph H. Parish
Property South of Cottonwood West Industrial Park Filing 1	
Present - March 18, 1988	Cottonwood West LTD.
March 18, 1988 - November 2, 1981	Cottonwood West Industrial Park
November 2, 1981 - July 20, 1981	Pulse Holdings LTD.
July 20, 1981 - January 22, 1954	Earl N. & Ruth M. Murray
January 22, 1954 - November 29, 1945	Arthur H. Meisner
November 29, 1945 - May 28, 1932	Joseph H. Perish

No industrial or manufacturing interests have occupied the property in the specified time period. Prior to use as a landfill, the land was utilized for agricultural purposes. Although part of the site was planned for commercial development, no such activity was established. Other than the landfill site, the land remains in an agricultural state.

Presently, the subject site is vacant. The City of Arvada has zoned this property PUD-I. This zoning district allows for the construction of planned office/industrial parks.

The northern 25-acre portion of the site was subdivided in 1985 into five parcels: Block 1, Block 2, Block 3, Block 4-Lot 1, and Block 4-Lot 2. Streets and easements have been dedicated to the City of Arvada; but since no development has occurred, the streets have not been constructed.

The southern 13-acre portion of the site has not been subdivided. It is separated from the northern portion of the site by Ralston Creek.

1.2.2 Topographical Map Reference

United States Geological Survey (USGS) 7.5 minute (Golden Quadrangle) topographical maps were reviewed. The most recent quad edition is from a 1965 base with photo-revisions in 1980. The map shows the property to be relatively flat with a slight eastward tilt and lying geographically within the Ralston Creek drainage basin.

2.0 SITE INFORMATION HISTORICAL

2.1 AERIAL PHOTOGRAPHS

Historical aerial photographs were obtained from the City of Arvada Planning Department and the Jefferson County Mapping Department. The photographs examined were dated 1970 and 1986. In 1970, aerial photography revealed undeveloped land with possible agricultural uses north of Ralston Creek. The parcel south of Ralston Creek there is evidence of a landfill excavation with placement of a soil cap over the excavation. Aerial photography dated 1986 shows surface scrapes north of Ralston Creek where proposed roads in the Cottonwood Industrial Park were excavated. Today this parcel is covered by native grasses. The parcel south of Ralston Creek shows natural vegetation with a noticeably raised surface area. Commercial and industrial development is established along the eastern property line.

2.2 ENVIRONMENTAL EXTRACTS FROM PRIOR SOIL ANALYSIS

In 1982, a construction/development firm conducted a preliminary discovery process to determine the bearing capacity and structural suitability for bridge emplacement across Ralston Creek. A soil and foundation investigation report prepared by Chen and Associates Consulting Geotechnical Engineers confirmed the presence of a landfill south of Ralston Creek on a 13-acre tract. The Chen report revealed the presence of explosive levels of methane gas in three wells. This report is in reference to job no. 23,548 dated January 27, 1982, and is presented in Appendix H.

3.0 SPECIFIC SITE INFORMATION

The 25-acre tract north of Ralston Creek consists of hummocky surface conditions probably formed from the removal of topsoil where the proposed roadways were scrapped within the subdivision. Within this area, there is no indication of any environmental problems. South of Ralston Creek, the 13-acre subject site is a flat lying surface condition that has been artificially elevated approximately 5 to 10 ft above the surrounding landscape. This difference in relief is one indication of the presence of landfill material. This surface of fill area is partially unconsolidated and demonstrates signs of subsidence throughout.

According to soil surveys conducted by the USDA Soil Conservation Service, the predominant native soil type at and around the site consists of well-drained clayey soils that formed in material derived from mudstone and shale. The soil service map—located in Appendix E— is composed of an overlay of an aerial photograph that was taken from either 1978 or 1979 orthophotographs.

4.0 PERSONAL INTERVIEWS

On December 23, 1991, Ogden personnel interviewed people living and working in an area within a half-mile radius of the site.

The Arvada Municipal Service Center/Public Works Department borders the property on the southern quarter of the east side. Built in 1975, the Service Center houses several departments. In the past, spoils from Street and Water Department projects were stored on the western side of the property bordering the LTMR site. Presently, asphalt from old streets and roads is temporarily stored there and is later hauled away to be recycled. East of this location is the Police Department's impoundment yard. Southeast of the impoundment yard is the gas shed and two underground unleaded fuel tanks. Kevin Muenchow, fleet services coordinator for the Department, said that an additional two tanks were located there in the past. He directed Ogden to contact Callie Videtich, environmental analyst for the Water Quality and Environmental Services Department for the City of Arvada. Ms. Videtich confirmed that two underground storage tanks were pulled from the Municipal Service Center site on April 4, 1991, and were sent out as scrap iron. The tanks had been leaking. Ms. Videtich stated that the contamination plume from the tanks remains on their property extending 200 ft east toward the Indiana St. and 150 feet north towards JCSD. James McCarthy, Manager of the Arvada Water Quality and Environmental Services Department, concurred with the above information. Maps and documentation of the contamination will be available when the final report is released by the end of January 1992.

JCSD's Arvada Bus Terminal is located 675 ft east of the site and is bordered on the north by 68th Avenue. The terminal, built in 1976, is used for repair and maintenance of school busses. Two underground fuel tanks are located on the property. Patricia Cawfield, legal assistant to Bill Johnson, JCSD's Environmental Compliance Manager, stated that there is soil contamination heading in a north, northeast direction away from the LTMR site. As of November 11, 1991, eight monitoring wells were on the JCSD property, and the County was in the process of developing and implementing a corrective action plan for this contamination.

Bob Monzingo, a 19-year veteran of the Arvada Volunteer Fire Department, said he knew of no "Haz-Mat" responses, major fires, or floods on the LTMR site. His station is located one-half mile southeast of the site.

Jack Mathes, a two-year employee of B-TEN Systems, Inc., 6803 Joyce St., confirmed that dumping has occurred directly south of his building. He did not know the nature or extent of

this activity. This activity would probably occur at the Arvada Municipal Service Center stockpile area, since Ogden personnel did not observe recently dumped material directly on the LTMR site.

Kenneth P. Dixon is an employee of Systems Engineering Associates, Inc., which borders the site on the east and is north of the Arvada Municipal Service Center. During the 11 years that he has been at this location, he has noticed small-scale, farming-type operations in the field north of Ralston Creek. He has seen surveyors on the subject property many times. Mr. Dixon also said that he has noticed fire trucks at Glass Tech Solar, Inc. (GTSI), which is located directly east of his building, across Joyce Street. A few months ago, he saw a Haz-Mat Team removing something from the building. Several people working in the area have expressed concern with GTSI at 6800 Joyce Street. A sticker on the entrance door states that the facility is monitored by an MDA Scientific toxic gas detection system. Scott Brown, President of the now defunct GTSI, is the new owner of the building. He said the gas cylinders that were once stored in the building are gone. The contents of an underground acid tank north of the building had been neutralized, and the tank was removed January 13, 1992. In his opinion, the tank did not leak. Ogden was not able to determine the type of acid stored underground.

Ogden interviewed H.D. Adams on December 27, 1991. Mr. Adams has owned the property immediately south of the Croke Canal since 1972. He remembers the land south of Ralston Creek and north of the canal being farmed for hay and/or oats through the years 1972–1975. He estimates that the landfill, operated by Jefferson County, was closed in the late 1960s or early 1970s but before 1972. Since 1972, he can remember several junk items appearing along Ralston Creek. He recalls no major floods, industrial incidents, or unusual odors on the LTMR subject site.

On December 23, 1991, Ogden personnel interviewed Don Forbes, the owner of Lawn A Mat, a lawn service company. Mr. Forbes' property is across the Croke Canal west of the LTMR site. He has resided on this property since 1958. Tests performed on his well water at that time showed no problems. He knew of no unusual occurrences on the LTMR site. He responded to Ogden's questions about chemicals used in his lawn service company by saying that he had a tank with Trimeck Pesticide. This tank always remains on a truck for transportation to job sites. Ogden was not able to determine the depth of the producing aquifer or geologic formation from which Mr. Forbes gets his water.

Ruth Murray, owner of the LTMR site from 1954 to 1981, presently still owns some acreage across the Croke Canal south-southwest of the LTMR site. When she moved there 38 years ago, Jefferson County was operating the landfill with a guard on duty. She recalls that the landfill was

capped around 1971. Ms. Murray was told by the County that the property could be built upon in 10 years.

Sundstrand Fluid Handling is located southeast, diagonally from the LTMR site. John Randolf has been employed as Plant Engineer since the plant was constructed in 1976. The plant fabricates water pumps and recycles paint thinners and stoddard solvents that comprise its listed waste codes. The only tank on the facility is inside, containing water soluble coolant. The contents of the tank are periodically removed for appropriate disposal. According to Randolf, there is 17 ft of landfill buried in the northern 10 acres of Sundstrand's property. Not wanting to become involved in the waste-stream liability, Sundstrand has not done any testing of the area. Jefferson County has declared that Sundstrand was not involved with the landfill and any fill associated contamination in the area. Randolf has lived near the LTMR site area for over 30 years. Randolf further noted that he personally dumped trash at the site between the years of 1955 to 1967 when the site was a landfill.

Ogden personnel questioned Randolf about the three tanks listed in the Colorado Department of Health's 1989 Underground Storage Tank (UST) Inventory. Randolf confirmed that Sundstrand did have three USTs containing wastewater, waste oil, and petroleum. These three tanks were removed several years ago.

5.0 CURRENT SITE USE

The subject site presently is vacant. The City of Arvada has zoned this property PUD-I (Planned Unit Development-Industrial). This zoning district allows for the construction of planned office/industrial parks.

The northern 25-acre portion of the site was subdivided in 1985 into five parcels: Block 1, Block 2, Block 3, Block 4-Lot 1, and Block 4-Lot 2). Streets and easements have been dedicated to the City of Arvada; but because no development has occurred, the streets have not been constructed, although scars for prior earthwork is present.

The southern 13-acre portion of the site has not been subdivided. It is separated from the northern portion of the site by Ralston Creek and its floodplain restraints.

6.0 ENVIRONMENTAL REGULATION RESEARCH

6.1 FEDERAL AND STATE LISTINGS

CERCLIS (Comprehensive Environmental Response and Liability Information)
AERRCO (American Ecological Recycle Research Corporation)
T25 RTOW S23+26 (on Highway 72 West of Indiana)
Arvada
Operable Unit = 00
Completion date = 6/1/88

RCRA (Resource Conservation and Recovery Act) Master Facility List
Cobe Labs Inc.Contact: Gary Wilson
Date: 8/15/80Haz. Waste Codes: D001, F001, F005, V238
EPA ID# = COD000716555
Generator = 1

Sundstrand Fluid Handling Contact: John Randolf
Date: 3/11/87Haz. Waste Codes: D001, F001, F003, F005
EPA ID# = COD095153292
Generator = 2

Systems Engineering Associates, Inc. Contact: Jenene Francis-Novotny
Date: 2/2/87Haz. Waste Codes: D001, F003, F005
EPA ID# = COD981547391
Generator = 2

Glass Tech Solar Inc.Contact: Mike Rosencrans
Date: 8/12/88Haz. Waste Codes: D001, F001, F002, F003
EPA ID# = COD982648438
Generator = 2

SARA (Superfund Amendments and Reauthorization Act) TITLE III - Toxic Release Inventory

Cobe Laboratories
14401 W. 65th Way
Arvada, CO 80004
Elain Zummer (303) 231-4243
75-09-2 Dichloromethane
76-13-1 Freon 113
107-68-8 Mathylene BIS (Phenyl Isocyn)

NPDES (National Pollutant Discharge Elimination System) - none

Superfund Sites

Rocky Flats Plant
Golden, CO 80402

TSD (treatment, storage and disposal) List - RCRA facilities - nothing in zip code 80004

Underground Storage Tank (Inventory)

Colorado Highway Department; 1989, 2 tanks
65555 Indiana St.
Arvada, CO

Sundstrand - John Randolf; 1989, 3 tanks
14845 W. 64th Av.
Arvada, CO 80004

LUST - Leaking Underground Storage Tanks

Colorado Highway Department; notification date 01/05/91
6555 Indiana St.

Solid Waste Landfills

Landfill Name	Hazard Type	Water Type
Ralston Creek-72nd & Indiana	unknown	refuse
Arvada Shops-66th & Indiana	unknown	refuse

6.2 AGENCY INTERVIEWS

In an effort to discover any past misuse or environmentally relevant occurrences pertinent to the LTMR property, contact was made with the following individuals:

Steve Steigleder, Deputy Fire Marshall at Arvada Fire Station #6, has lived in Arvada for 29 years. He remembers the landfill—described in the Site Reconnaissance Section—as being the major landfill for Northern Jefferson County at that time. He recalls that general rubbish and trash from the community was deposited there. He also stated that all of the hazardous material responses to the area have been only to Glass Tech Solar, Inc. These responses have been to false alarms. There was an underground storage tank that has contained acid near the north side of the building. Scott Brown, the owner of the building states that the tank was removed January 13, 1992.

Colorado Department of Natural Resources; no reclamation permits have been issued for Section 1, T3S, R70W.

Sharon Pansey of the Oil and Gas Commission stated that there are no oil or gas wells within Section 1, T3-S, R7OW.

7.0 SITE RECONNAISSANCE

7.1 GENERAL DESCRIPTION

The 40-acre subject site is bisected in a west-to-east direction by Ralston Creek, which is a natural geomorphic surface drainage feature. The active stream channel averages about 5 ft wide, and the flood plain, including natural levies, ranges from 35 ft to 100 ft in width. Water depth was approximately 1 foot. The layout is clearly shown on the aerial photographs in Appendix B. Approximately 25 acres lie on the north side of the creek. Water was running through the property at the time of Ogden's investigation. The stream probably runs year-round and receives recharge from a combination of groundwater, surface runoff, and input from a mechanical canal meter gate at the east bank of the Croke Canal. Therefore, the flow volumes in the stream are highly variable over time. The flux in flow rates would certainly affect the concentration of contaminants that enter the stream from the adjacent buried refuse. These conditions must certainly affect the contaminant impact on the aquatic and wildlife environment of this wetland system. No fish were observed, but abundant algae is present adjacent to the subject property. A Jefferson County document, titled "Jefferson County Health Department, Methane Site Investigation, 1980," establishes the fact that the 13 acres south of the creek were a known landfill. The presence of methane from borehole punch surveys and landfill histories are presented in the above report.

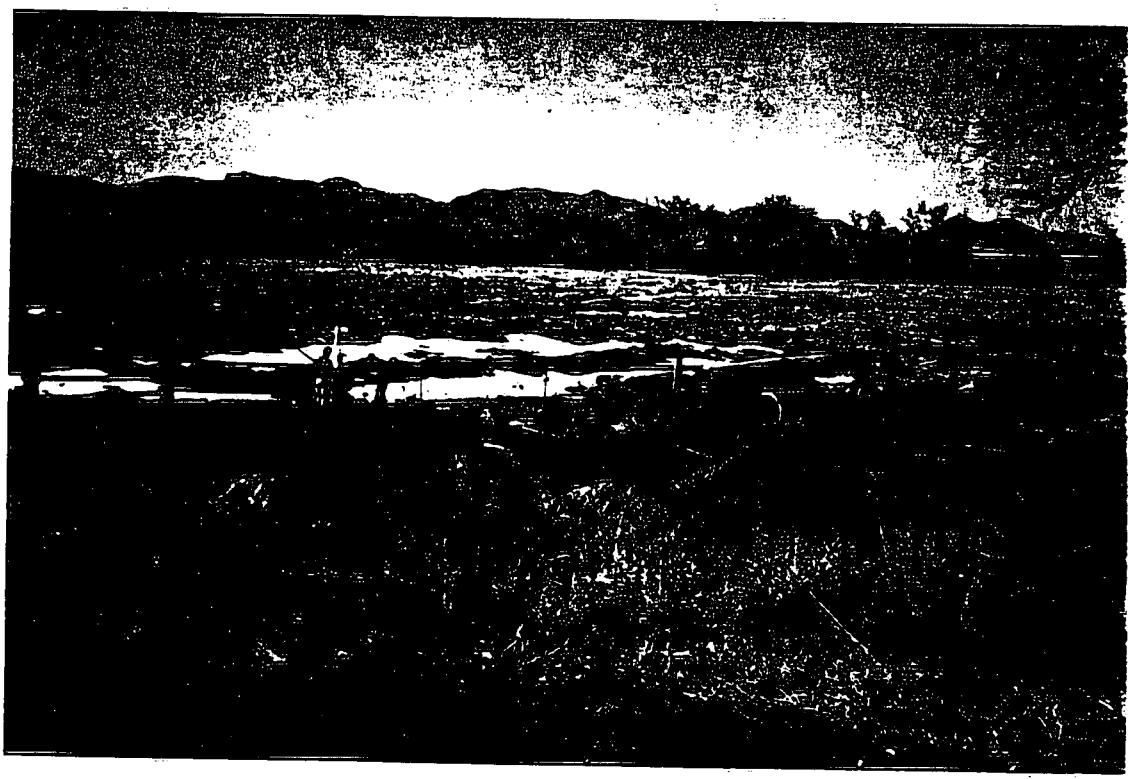
The 13 acres south of the creek contain an abandoned landfill. In January 1982, Chen and Associates Consulting Geotechnical Engineers conducted a "soil and foundation investigation" on behalf of KKBNA (supposedly a land development company). The Chen report is contained in Appendix H of this report. Nine boreholes were drilled. The purpose of this investigation was to determine the structural suitability of the earth to support a bridge across Ralston Creek that would connect the entire proposed commercial development. Three auger holes were drilled on the creek bank to evaluate the weight bearing capacity of the soils. Six additional auger test holes were drilled on the south side of the creek to determine the depth of trash fill. It was determined that the refuse extended vertically from the surface to a depth of 25 ft. The landfill on the subject property represents a portion of a much larger refuse area that borders the subject property on the east, south, and west sides. Refer to the aerial photographs in Appendix B for orientation.

Four of the holes drilled by Chen encountered methane. Since three of the holes reported explosive levels of gas, the area is considered to be a hazard. Two of the Chen-drilled holes are

View looking west. Arvada City Water pumphouse along side Ralston Creek spillway into Croke canal. Note frozen creek water on west side of canal.

Ice formation on Ralston Creek, west of Croke Canal. Stream is visually clean from here westward to Arvada Reservoir.

View southeasterly along the north western bank of the LTMR site; Croke Canal front and right, gate to Ralston Creek on left. Very high canal banks here.



Landfill Site panorama.

Surface water sample point adjacent to landfill. Note that the stream is unfrozen.

Trash in stream adjacent to landfill on right side of photo. "Water Bed"? Note stream is running. Not iced over.

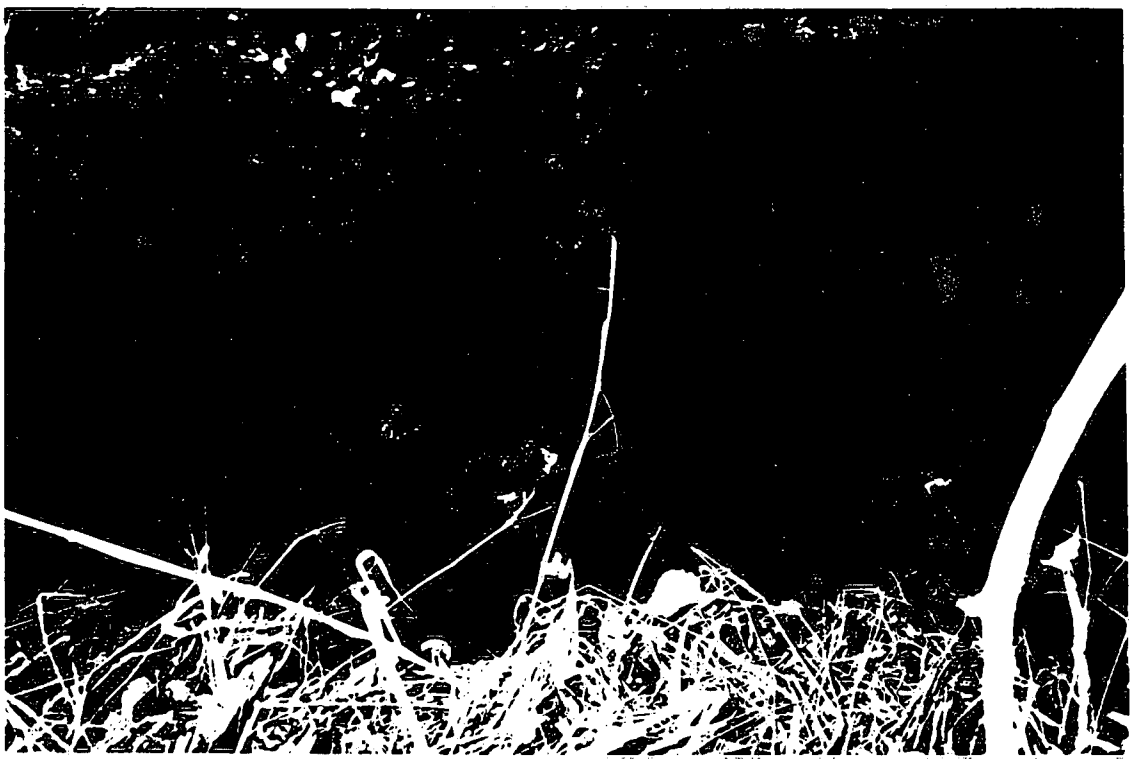
Ralston Creek adjacent to landfill. Note floating hydrocarbon (petroleum fluorescence) on each side of channel.

Ralston Creek adjacent to landfill. Polarizing lense on camera makes water transparent. Note orange scum and floating petroleum fluorescence next to bank.

Hole #1 with Mobile Drill Rig. Equipment operator for scale.

Pumping for groundwater sample.

Floating algae on main Ralston Creek channel with hydrocarbon sheen at each bank. Note water is not frozen.



Healthy green algae. Note: Petroleum sheen on water surface.

still identifiable at the surface. Both were cased with thin PVC and plugged with a grout; therefore, none were useful for bailing for groundwater sampling.

The Croke Canal meanders through the old landfill and comprises the south and western boundaries of the LTMR site. Water was actively flowing in December—during the time of our investigation. Water in the canal was not sampled for contaminants. There was no obvious visible pollution along the property boundary. However, it may be that the canal is receiving contaminants from the landfill materials. The nature and extent of any contamination was not determined since it is beyond the scope of the Phase I investigation.

7.2 MAGNETIC SURVEY

Ogden conducted a magnetic survey to determine the distribution of buried refuse that is present on the property. This survey was accomplished by physically walking a controlled grid shown on the aerial photograph in Appendix B. The equipment employed was a Fisher model TW6, which is capable of detection to a depth of 30 ft below surface. Such magnetic induction devices respond to most iron metals. The assumption that some metal objects would be distributed ubiquitously within the landfill proved to be correct. It was determined that no landfill refuse is present on the subject property north of Ralston Creek, which is basically raw agricultural land. However, the 13 acres south of the creek is completely covered by landfill material. Some local spots indicated high magnetic responses (anomalies) that may signify large metal objects (e.g., drums). Future Phase II intrusive activities will need to clear these anomalies.

At various places, refuse is exposed. In one instance, newspapers and magazines were found that date back to 1972. Personal interviews revealed that dumping activity took place well into the 1970s, although the Jefferson county records hinted that the dump was closed in the 1950s.

7.3 RADIOLOGICAL SURVEY

Since this landfill resides near the U.S. Department of Energy Rocky Flats Plant nuclear facility, Ogden elected to provide a cursory radiological survey as a courtesy to the client. No radiation materials were expected, but this particular survey was conducted to eliminate the possibility that lost or transient radiological materials might end up in this public dumping facility located so close to a known nuclear facility. A walkover survey was performed using a Ludlum model 19 Micro Rad Survey meter. Several background readings were taken both offsite and onsite, and the background level was 10 mR/hr gamma radiation, which is normal and acceptable.

The site was walked on a 20-foot grid with an approximate meter swing of 5 ft, thereby providing a 25% coverage survey. The maximum meter indication noted was 18 mR/hr, which is normal and acceptable as a natural soil background. These resultant readings are considered negative, thus confirming our assumption that no radiological sources are present on the landfill area.

7.4 pH SURVEY

The pH readings from the drive-tube and the baseline well water sample ranged from 6.32 to 7.90, respectively. Samples taken from within the landfill tend to be more acidic (Table 1). In addition, two pH readings were taken from Ralston Creek within the property boundary.

Table 1. Field parameter data

Well Hole	pH	Conductivity	PID	Explosiometer
1	7.36	923	NIL	NIL
2	7.59	1110	NIL	NIL
3	7.84	528	NIL	NIL
4	*	*	.005 ppm	NIL
5	See Note			
6	6.32	802	NIL	NIL
7	See Note			
8	7.90	403	NIL	NIL
Stream Sample (▸ on map)	5.56	503	*	*
Upstream Sample	7.61	420	*	*

*No sample taken.

Note: Wells 5 and 7 are nonexistent.

7.5 VISUAL OBSERVATIONS OF ENVIRONMENTAL IMPACTS

7.5.1 Upstream

None of the visual pollution was observed upstream, to the west side of Croke Canal. A visual survey was made upstream for the approximate distance of one-half mile, and this portion of the stream appeared unpolluted. However, it is appropriate to note that various parts of the upstream areas were frozen, and the ice could have hidden possible visual pollution effects in case some of the floating oils and/or orange-colored material has floated downstream from offsite of the Cottonwood Park property.

7.5.2 Adjacent

Ralston Creek appears to be receiving contamination directly from the landfill. Visual contamination is apparent on the surface of the stream and along the shoreline. Actual refuse is in the stream channel (see photographs), and an oil scum is floating on the surface. There is orange discoloration of the channel bottom materials and submerged algae. This discoloration is possibly caused by oxidizing and/or acidizing fluids that periodically emit from the landfill. The floating oils and probable corrosive fluids that caused the orange discoloration of the stream probably entered Ralston Creek from the exposed landfill refuse that border the flood plain next to the subject property. There is no indication that these potential pollutants migrated onto the property from upstream. There is abundant green algae present in the stream for this time of the year, and it is more prolific adjacent to the landfill. The active growth algae colonies are likely enhanced due to nutrients emitting from the landfill, such as phosphorous and nitrogen.

7.5.3 Downstream

The Ralston Creek flood plain is a public recreation facility in this area. There is a cement bicycle path that parallels the stream. The western limit of the paved bike path actually begins on the subject property and extends eastward. A downstream inspection also was made approximately one-quarter mile east of the property, and visible pollution is present.

It is a striking contrast that the upstream portion of Ralston Creek was frozen, in addition to being visually clear, and unfrozen adjacent to the subject landfill. Hydrocarbons, acids, and dissolved solids may provide an "antifreeze" effect that prevents the stream from freezing at the ambient temperatures, which existed during the time of our investigation. All stream pH readings were taken by hand-held equipment. Values recorded ranged from 5.56 to 7.11 adjacent to the landfill (refer to Table 1). Floating hydrocarbons could have a buffer effect,

and thus a broad range of pH measurements are explainable. Other variables that usually affect pH values are variable effluent sources and biologic activity.

7.6 DRIVE TUBE WELL INSTALLATIONS

Part of this environmental site assessment effort was to acquire groundwater and surface water samples from the property. The 1982 Chen drilling activity revealed explosive levels of methane emanating from the subsurface. Methane is a common component of landfills and originates from the decay of buried organic material in the refuse. Since it was thus established that methane is present, Ogden utilized a drive tube technique of installing monitoring wells. The drive tube system is very cost effective and somewhat safer to operate in a potentially explosive atmosphere.

Six drive tube wells were installed and left in place for future sampling opportunity. Well #8 was placed north of the creek as a baseline control. The 25 acres north of the creek are basically raw agricultural land, although some shallow surface scraping has scarred the land. The earth moving was obviously the beginning of a construction effort to develop the Cottonwood land parcel. The effect can be viewed on the aerial photos (Appendix B). No other industrial or commercial activity is apparent, and no landfill material is present, so it was felt that this portion of the property would suffice for baseline analytical control.

For safety considerations, in addition to methane detection, a portable explosimeter and a portable photoionization detector (PID) were utilized. Each drive tube installation was monitored. Surprisingly, negligible levels of methane were detected. Only hole #4 demonstrated one-half of one percent by volume, volatile gasses. Comparing the 10-year old Chen report, where explosive levels of gas were reported, our measurements are unexpectedly on the low side. Cold air temperatures could have had a suppression effect, or biologic reduction of land fill organics may have declined over time.

7.7 SAMPLING AND ANALYSIS

A total of six water samples were taken and analyzed for pH, volatile organics, and metals. One composite soil sample was taken for metal analysis. Note the aerial photographs in Appendix B for locations of wells and surface samples. All samples of water and soil were taken in accordance with standard EPA procedures. Laboratory reports for both the mobile/field gas chromatograph (GC) and the fixed-base GC/MS are located in Appendices I and F, respectively.

Water samples were collected to analyze for (VOA) volatile organics in two, 40-milliliter amber glass vials having a teflon-coated silicon septum. The vials contained no preservative and were filled in a manner to ensure that no headspace or bubbles were present. A total metals sample was also collected in a 1-liter polycarbonate, plastic container. The sample was preserved with 3 mL of nitric acid (NHO_3) in order to adjust the pH to less than 2. An oil and grease sample containing no preservative was collected in a 1-liter amber glass jar with a teflon-coated septum. All containers were filled using a direct immersion method.

Soil samples were taken from two areas. A VOA sample was collected from an area of darkly-stained soil near borehole #4 in a 2-oz glass jar having a teflon-coated lid insert. The soil was lightly compressed into the jar providing zero headspace. An identical suite of samples was collected from a location approximately 150 ft north and slightly west of the dark stain. Samples were collected from an embankment that was eroded to expose strata of fill materials. These two samples were composited and submitted to the laboratory for total lead and polychlorinated biphenyls (PCBs).

Samples collected and analyzed are as follows:

- Field GC—five groundwater and one surface water, non-acid preserved
- ATI Laboratories—one groundwater for VOA, non-acid preserved
- ATI Laboratories—one groundwater for total lead, acid preserved with nitric acid (HNO_3) to a pH of 2.0
- ATI Laboratories—one composite soil for PCBs and total lead
- ATI Laboratories—one soil for volatile organic analysis

7.7.1 Field GC

Six samples were taken and immediately analyzed in the field. A mobil GC was used to evaluate the samples for BTEX (benzene, toluene, ethylbenzene, xylenes). All field analyses data are located in Appendix I. Drive tube well numbers 1, 2, 3, 6, and 8 were analyzed, as well as one sample taken from Ralston Creek. Well number 8 (see aerial photo) was designated as the baseline control point for groundwater data comparisons within the subject property boundary.

None of the six samples analyzed in the field showed elevated levels from BTEX compounds.

7.7.2 Fixed Base Laboratory (ATI Laboratories, Inc.)

7.7.2.1 Water

One water sample was taken from borehole #6 in the center of the landfill, and one composite soil sample was taken directly from landfill cover.

The water was analyzed for volatile organics by EPA Method 8240, and nothing significant was noted.

The values in Appendix E are considered to be minimum and probably indicate sources of volatile organic materials buried in the landfill.

The water was also analyzed for total lead by EPA Method 239.1 and was found to contain an elevated level of lead that exceeds EPA drinking water standards.

7.7.2.2 Soil

One composite soil sample was collected and analyzed for PCBs by EPA Method 8080 and for volatile organics by EPA Method 8240. The sample was found to contain trichlorofluoromethane (freon) and also lead at elevated levels. The test for PCB was negative. The soil sample also contained elevated levels of volatile organics. Methylene chloride, acetone, 1,1,1-trichloroethane, tetrachloroethane, ethylbenzene, toluene, and total xylenes were all present.

7.7.2.3 Stream water

One surface water sample was taken from Ralston Creek to analyze for petroleum by EPA Modified Method 8015. The water was skimmed so as to collect as much floating product as possible. The compound was identified as diesel grade fuel oil (Appendix F). In addition, the laboratory also observed some late-eluting chromatographic peaks that indicate the presence of high molecular weight components, but these components could not be positively identified.

7.8 SAMPLING AND ANALYTICAL CAVEATS

The drive tube wells were placed at 12 to 15 ft total depth below surface and were generally terminated at "refusal point." This means that these small-bore wells were not able to penetrate a sufficient depth into the harder ground below soil development and trash fill. The Chen drilling

activity reported groundwater levels to be around 10 to 12 ft below ground surface. Therefore, we assumed that drive tubes would be placed below the water table.

At the beginning of the project while sampling with drive tubes, we anticipated obtaining adequate groundwater samples. Surprisingly, the pumping of water from the wells proved very difficult. It is common and expected that water tables fluctuate from season to season. We were able to obtain minimum samples from five of the six drive tube wells. Hard suction pumping can result in the loss of volatile organics from samples. Since the analytical results on samples taken from this site were low, it makes the outcome of nondetect or relatively low levels of VOAs suspect. For any future site characterization activity, a bailing method and/or submersible bladder pump is preferable. However, the December 1991 sampling activity raised questions about the water table and our ability to identify and/or characterize contaminants with such a cursory level of effort dictated by a Phase I Site Assessment approach.

In the landfill, there is very likely a perched water table. This could be caused by "clay lifts" within the landfill. The underlying permanent water table must certainly be affected by the level of the Croke Canal seasonally. The banks of the canal were not measured for this report, but the Croke Canal is unusually deep (estimated 30- to 35-foot banks) on the subject site. The water to feed Croke Canal is supplied from Clear Creek.

There is also the man made Ralston/Arvada Reservoir and associated water treatment plant approximately two miles upstream. This reservoir is used for limited public recreation and also as a culinary water supply locally.

In addition, there is a large pumping facility immediately adjacent to the LTMR site. This pumping station was built by the Army Corps of Engineers and is now operated by the City of Arvada. It is for the purpose of extracting water from Croke Canal and pumping it up hydrological gradient, into Ralston/Arvada Reservoir.

These man made and artificially operated water mechanisms most certainly have significant effects on groundwater elevations. Artificial controls, combined with natural seasonal meteoric events, will cause large fluctuations in groundwater dynamics, water table elevations, and vadose zone moisture contents.

8.0 CONCLUSIONS

Caution should be taken when excavating in, or adjacent to, landfill materials. Proper ventilation of excavations and/or buildings will be required. Any structures built on or immediately adjacent to the landfill will require special explosive gas controls. Also, roads, parking areas, underground utilities and other facilities may be subjected to differential compaction and corrosive environments.

No contaminants were identified in the portable field GC analytical results. However, only BTEX compounds were analyzed. However, the fixed-base laboratory results indicated the presence of elevated levels of lead in the borehole water sample and soil sample. Volatile organic compounds were also detected in the soil sample near borehole #4. These results indicate that a more thorough monitoring program should be implemented.

From the methane levels reported by Chen in 1982 and our observations of visual hydrocarbons in Ralston Creek, a curious situation arises. We feel that the permanent unconfined groundwater table may be deeper than the drive tube well method was able to penetrate. In addition, many pollutants have a specific gravity greater than one, therefore these heavy compounds would seek lower elevations in the ground water aquifer. The penetrations that we made were not likely to have been deep enough to sample "heavy" contaminants. Indeed, it is possible that the drive tube efforts intersected either perched "water," or even under-saturated vadose pods. It appears that the drive tubes, and/or previously drilled Chen auger holes, are not deep enough to effectively collect representative groundwater samples.

It is apparent at this time that the "nature and extent" of pollution emanating from the landfill is not determinable with the Preliminary Phase II level of effort. However, the recently collected information is valid and acceptable, to plan further evaluations in progress toward an actual "site characterization."

The vacant land adjoining the LTMR site west of Croke Canal has been designated for use as "Jefferson County Parks Open Area." The subject site may, at some time in the future, become useful for open area park type of utilization. This could require some level of clean-up if the Ralston Creek area is confirmed to be contaminated. A comprehensive Phase II site assessment would need to be developed and implemented to make this determination. As part of any Phase II assessment, the impact of surrounding activities needs to be assessed (i.e., commercial nursery, use of pesticides, etc.).

9.0 SUMMARY

The following are pertinent data derived from the Ogden Phase I environmental assessment:

- There is an inactive landfill on the LTMR site south of Ralston Creek.
- The 25 acres of the LTMR site north of Ralston Creek does not appear to have been impacted by human activities.
- The property that borders the south bank of Ralston Creek appears to be polluted by discharges from the landfill. Visible hydrocarbons are on the water surface.
- Groundwater samples from the landfill contain lead at concentrations of .0065 mg/L, which is above the EPA drinking water standard of .0050 mg/L.
- Soil samples from the landfill contain volatile organic compounds. Offending analytes are methylenechloride, acetone, tetrachloroethane, toluene, and total xylenes.
- A composite soil sample demonstrated an excessive concentration of lead in the amount of 54 mg/kg.

10.0 RECOMMENDATIONS

Based on the evaluation of prior data and data collected during the Preliminary Phase II site assessment, it is probable that contaminants are present on the site and that the potential for migration to offsite localities exists. Therefore, we would recommend the following activities to more clearly define the extent and nature of contamination on the LTMR site:

- Excavate spot locations of high magnetic response to determine if leaking drums are present.
- Design a statistically-based random soil sampling program.
- Design a statistically-based groundwater sampling program.
- Install deeper auger drilled monitoring wells at 30 to 50 ft depth.
- Case with large enough PVC for retrieving samples by bailing or the bladder pump method.
- Screen shallow groundwater monitoring wells in the landfill material and schedule sampling to be collected to allow for seasonal flux of contaminants.
- Determine perched water elevation.
- Selectively screen below landfill in permanent water table at low aquifer confining elevations to test for heavy compounds. Determining permanent water table and, if possible, the lower base confining depth.
- Schedule interval time sampling for surface water monitoring of Ralston Creek. Identify flora/fauna kill mechanisms.
- Landfill area should not be developed for commercial or residential construction.
- Monitor contempary methane presence.

11.0 REPORTING TO GOVERNMENT AGENCIES

Low levels of lead were identified in water and soil samples taken from the landfill area. The concentrations in the water did exceed EPA drinking water standards. Therefore, it is necessary to report the findings to the Colorado Department of Health (CDH) and also to the Jefferson County Health Department. Since Colorado is a "primary state," the CDH will report to the EPA, should it be deemed necessary.

One original report containing the lead in water concentration values should be sent to:

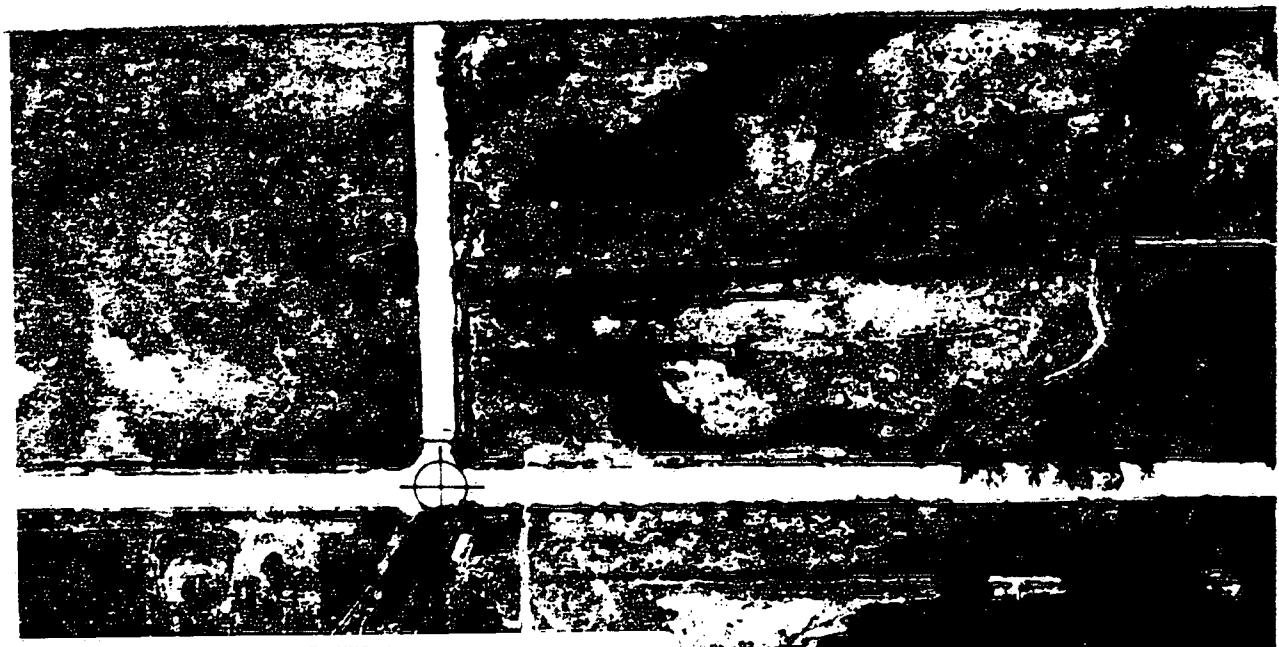
Mr. Glenn Mallory
Solid Waste Unit Leader
Colorado Department of Health
Hazardous Materials and Waste Management
4210 East 11th Avenue
Denver, Colorado 80220-3716

A carbon copy should also be sent to:

Mr. Cliff Myers
Environmental Health Division
Jefferson County Health Department
260 South Kipling
Lakewood, Colorado 80226

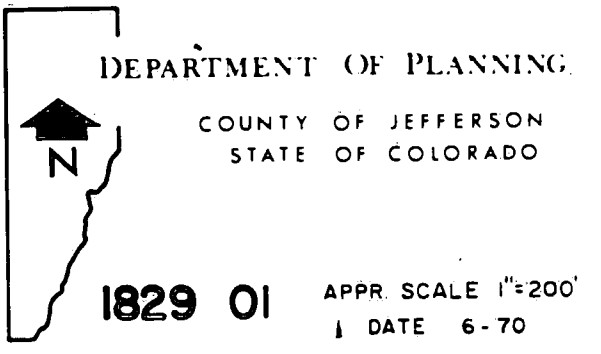
APPENDIX A

1970 AERIAL PHOTOGRAPH - SITE VICINITY MAP, PRECOMMERCIAL DEVELOPMENT



APPENDIX A

1970 Aerial Photograph
Site Vicinity Map
Precommercial Development



DEPARTMENT OF PLANNING

COUNTY OF JEFFERSON
STATE OF COLORADO

1829 01

APPR. SCALE 1"=200'
DATE 6-70

APPENDIX B

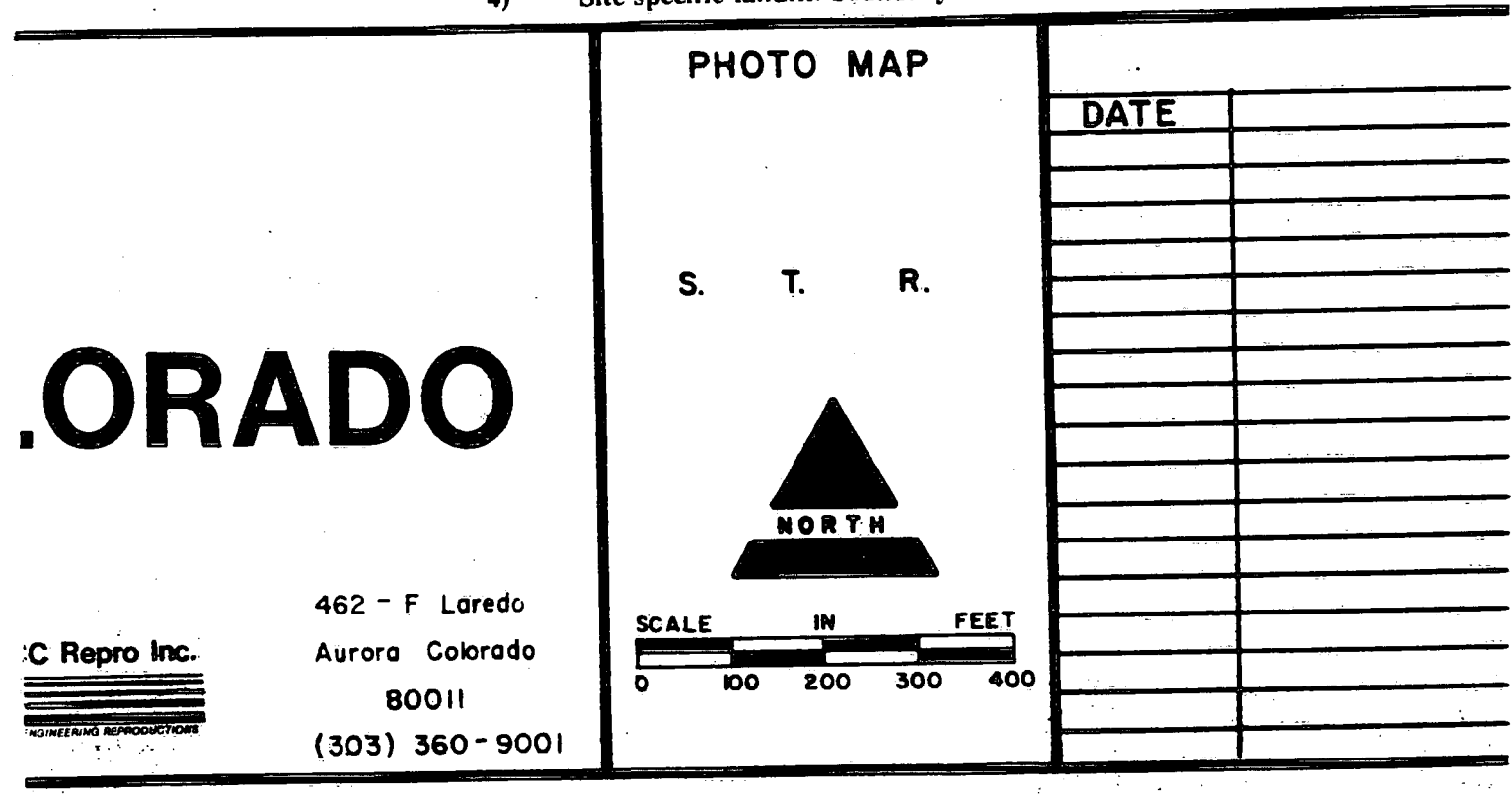
1986 AERIAL PHOTOGRAPH

1) Survey Traverse Grid for Magnetic Survey and Radiological Survey
2) Drive tube well locations
3) ▸ = water sample taken from Ralston Creek
4) Site specific landfill boundary-highlighted in yellow

APPENDIX B

1986 Aerial Photograph

1) Survey Traverse Grid For Magnetic Survey & Radiological Survey
2) Drive tube well locations
3) ▸ = water sample taken from Ralston Creek
4) Site specific landfill boundary



APPENDIX C

LEGAL DESCRIPTION AND ACCOMPANYING MAP

Recorded at ..... o'clock ..... M., ...
Reception No. .....

RECORDED IN
COUNTY OF JEFFERSON
STATE OF COLORADO
RECEPTION NO. 88040360
04/28/88 10:20 9.00

THIS DEED, Made this 18th day of March
19 88 , between

COTTONWOOD WEST INDUSTRIAL PARK INC.
a Colorado Corporation
of the City and County of DENVER and State of Colorado, of the first part, and

COTTONWOOD WEST LTD. ****
a Colorado limited partnership of the
County of DENVER and State of Colorado, of the second part;

WITNESSETH, That the said party of the first part, for and in consideration of the sum of TEN DOLLARS AND OTHER GOOD AND VALUABLE CONSIDERATION
Dollars,
to the said party of the first part, in hand paid by the said party of the second part, the receipt whereof is hereby confessed and acknowledged, has granted, bargained, sold and conveyed, and by these presents does grant, bargain, sell, convey and confirm unto the said party of the second part, its heirs and assigns forever, all the following described lot or parcel of land, situate, lying and being in the County of JEFFERSON and State of Colorado, to wit:

SEE EXHIBIT A ATTACHED HERETO FOR LEGAL DESCRIPTION
SEE EXHIBIT B ATTACHED HERETO FOR ADDITIONAL PROVISIONS

**** c/o Gibraltar Companies
Denver Corporate Center Tower III
7900 E. Union Avenue Suite 850
Denver, Co. 80237

also known as street and number vacant land

Together with all and singular the hereditaments and appurtenances thereunto belonging, or in anywise appertaining, and the reversion and reversions, remainder and remainders, rents, issues and profits thereof; and all the estate, right, title, interest, claim and demand whatsoever, of the said part of the first part, either in law or equity, of, in and to the above bargained premises, with the hereditaments and appurtenances; TO HAVE AND TO HOLD the said premises above bargained and described, with the appurtenances, unto
the said party of the second part, its heirs and assigns forever.

And the said part y of the first part, for itself its heirs, executors and administrators, does covenant, grant, bargain and agree to and with the said party of the second part, its heirs and assigns, the above bargained premises in the quiet and peaceable possession of said party of the second part, its heirs and assigns, against all and every person or persons lawfully claiming or to claim the whole or any part thereof, by, through or under the said party of the first part to WARRANT AND FOREVER DEFEND.

IN WITNESS WHEREOF, The said party of the first part has hereunto set its hand and seal the day and year first above written.

Signed, Sealed and Delivered In the presence of

..... [SEAL]
COTTONWOOD WEST INDUSTRIAL PARK INC. [SEAL]
..... [SEAL]
James Moilanen, Pres.

STATE OF COLORADO,
County of } ss.

The foregoing instrument was acknowledged before me this day of March
1988 by James Moilanen, President of Cottonwood West Industrial Park Inc., a Colorado corporation

My commission expires 8/11/92 . 19 . Witness my hand and official seal.

Notary Public

1616 16th St. Denver, 80202

16 SPECIAL WARRANTY DEED. —Bradford Publishing Co., 1821-48 Stout Street, Denver, Colorado (573-5011) 5-76

STATE DOCUMENTARY FEE
APR 28 1988

-4-4d-480116?-1

EXHIBIT A
TO SPECIAL WARRANTY DEED
DATED MARCH 18, 1988

2
2

Lot 7
Cottonwood Park in Ralston Valley

and

A portion of the East 1/2 of Section 1, Township 3 South, Range 70 West of the 6th P.M., more particularly described as follows: Beginning at the Northeast corner of the Northwest 1/4 of the Southeast 1/4 of said Section 1; thence South 00 degrees 03 minutes 01 seconds East along the Easterly line of said Northwest 1/4 of the Southeast 1/4, 463.77 feet to the Northerly right-of-way line of the Croke Canal; thence Northwesterly along said Northerly right-of-way line the following 8 courses: (1) thence North 82 degrees 50 minutes 54 seconds West, 150.11 feet to a point of curve; (2) thence along a curve to the right having a radius of 963.78 feet, a central angle of 11 degrees 23 minutes 39 seconds, 191.66 feet to a point of tangent; (3) thence North 71 degrees 27 minutes 15 seconds West along said tangent, 276.15 feet to a point of curve; (4) thence along a curve to the right having a radius of 208.06 feet, a central angle of 37 degrees 31 minutes 18 seconds, 136.26 feet to a point of tangent; (5) thence North 33 degrees 55 minutes 57 seconds West along said tangent, 557.70 feet to a point of curve; (6) thence along a curve to the right having a radius of 388.56 feet, a central angle of 39 degrees 23 minutes 06 seconds, 267.10 feet to a point of tangent; (7) thence North 05 degrees 27 minutes 09 seconds East along said tangent, 755.43 feet to a point of curve; (8) thence along a curve to the right having a radius of 565.00 feet, a central angle of 09 degrees 47 minutes 25 seconds, 96.54 feet to the Northerly line of the Southwest 1/4 of the Northeast 1/4 of said Section 1; thence South 89 degrees 27 minutes 29 seconds East along said Northerly line, 991.49 feet to the Northeast corner of said Southwest 1/4 of the Northeast 1/4; thence South 00 degrees 03 minutes 48 seconds West along the Easterly line of said Southwest 1/4 of the Northeast 1/4, 1320.46 feet to the point of beginning.

Also known as All of Blocks 1, 2, 3, and 4
Cottonwood West Industrial Park Filing No. 1,
All situate in the County of Jefferson,
State of Colorado

RECEPTION NO. 88040360

3

3

EXHIBIT B
TO SPECIAL WARRANTY DEED
DATED MARCH 18, 1988

By accepting this conveyance, second party hereby assumes and agrees to pay that certain obligation evidenced by that certain Promissory Note dated January 10, 1985 in the principal amount of $2,425,000.00 payable to Otero Savings and Loan Association, secured by that certain Deed of Trust recorded January 11, 1985 under Reception No. 85003626, Jefferson County, Colorado public records, as said Note and Deed of Trust have been subsequently modified. Second party's assumption and agreement to pay the foregoing obligation includes its assumption and ratification of the acts of certain third parties as evidenced by instruments recorded at Reception Numbers 85003627, 86006149, 86088951 and 86088952, even if those parties had no authority to complete or perform those acts.

RECEPTION NO. 88040360

DEDICATION:

NOW ALL MEN BY THESE PRESENTS: THAT THE UNDERSIGNED, BEING THE OWNERS OF A PARCEL OF LAND IN THE EAST 1/2 OF SECTION 1, TOWNSHIP 3 SOUTH, RANGE 70 WEST OF THE 6TH P.M., CITY OF ARVADA, COUNTY OF JEFFERSON, STATE OF COLORADO, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHEAST CORNER OF SAID SECTION 1; THENCE SOUTH 00°02'54" EAST, ALONG THE EAST LINE OF THE NORTHEAST 1/4 OF SAID SECTION 1, A DISTANCE OF 1323.58 FEET TO THE NORTHEAST CORNER OF THE SOUTHEAST 1/4 OF THE NORTHEAST 1/4 OF SAID SECTION 1; THENCE NORTH 89°39'54" WEST, ALONG THE NORTH LINE OF SAID SOUTHEAST 1/4 OF THE NORTHEAST 1/4 A DISTANCE OF 1322.17 FEET TO THE NORTHEAST CORNER OF THE SOUTHWEST 1/4 OF THE NORTHEAST 1/4 OF SAID SECTION 1, THE TRUE POINT OF BEGINNING; THENCE SOUTH 00°11'39" EAST, ALONG THE EAST LINE OF SAID SOUTHWEST 1/4 OF THE NORTHEAST 1/4, AND ALONG THE WEST LINE OF LOT 1, RESUBDIVISION OF LOTS 5 AND 6, COTTONWOOD PARK IN RALSTON VALLEY, A SUBDIVISION RECORDED IN THE OFFICE OF THE JEFFERSON COUNTY CLERK AND RECORDER UNDER RECEPTION NUMBER 79058658, A DISTANCE OF 313.56 FEET; THENCE NORTH 89°47'39" EAST, ALONG THE SOUTH LINE OF SAID LOT 1, A DISTANCE OF 250.22 FEET TO A POINT ON THE WEST RIGHT-OF-WAY LINE OF JOYCE STREET; THENCE ALONG THE WEST RIGHT-OF-WAY LINE OF JOYCE STREET THE FOLLOWING THREE (3) COURSES:

(1) SOUTH 29°55'40" WEST, A DISTANCE OF 68.23 FEET TO A POINT OF CURVE;
(2) ALONG THE ARC OF A CURVE TO THE LEFT WITH A RADIUS OF 125.13 FEET AND A CENTRAL ANGLE OF 29°26'36" A DISTANCE OF 64.30 FEET, THE LONG CHORD OF WHICH BEARS SOUTH 15°12'22" WEST, A DISTANCE OF 63.60, TO A POINT OF TANGENCY;
(3) SOUTH 00°29'04" WEST, A DISTANCE OF 201.41 FEET;

THENCE ALONG THE NORTH LINE OF LOT 18, COTTONWOOD PARK IN RALSTON VALLEY, A SUBDIVISION RECORDED IN THE OFFICE OF THE JEFFERSON COUNTY CLERK AND RECORDER IN BOOK 55 AT PAGE 11 THE FOLLOWING TWO (2) COURSES:

(1) SOUTH 71°50'32" WEST, A DISTANCE OF 150.35 FEET;
(2) NORTH 68°52'48" WEST, A DISTANCE OF 57.62 FEET TO A POINT ON THE EAST LINE OF THE SOUTHWEST 1/4 OF THE NORTHEAST 1/4 OF SAID SECTION 1;

THENCE SOUTH 00°11'39" EAST, ALONG THE EAST LINE OF SAID SOUTHWEST 1/4 OF THE NORTHEAST 1/4, AND ALONG THE WEST LINE OF SAID LOT 18, A DISTANCE OF 104.00 FEET; THENCE SOUTH 53°57'00" WEST, A DISTANCE OF 542.86 FEET; THENCE NORTH 80°49'37" WEST A DISTANCE OF 464.19 FEET; THENCE SOUTH 84°04'28" WEST, A DISTANCE OF 154.44 FEET TO A POINT ON THE EASTERLY RIGHT-OF-WAY LINE OF THE CROAK CANAL; THENCE ALONG THE EASTERLY RIGHT-OF-WAY LINE OF SAID CROAK CANAL THE FOLLOWING THREE (3) COURSES:

(1) ALONG THE ARC OF A NON-TANGENT CURVE TO THE RIGHT WITH A RADIUS OF 388.56 FEET AND A CENTRAL ANGLE OF 27°49'12" A DISTANCE OF 188.67 FEET, THE LONG CHORD OF WHICH BEARS NORTH 08°39'33" WEST, A DISTANCE OF 186.82 FEET TO A POINT OF TANGENCY;
(2) NORTH 05°15'03" EAST, A DISTANCE OF 755.43 FEET TO A POINT OF CURVE;
(3) ALONG THE ARC OF A CURVE TO THE RIGHT WITH A RADIUS OF 565.00 FEET AND A CENTRAL ANGLE OF 09°47'20" A DISTANCE OF 96.53 FEET, THE LONG CHORD OF WHICH BEARS NORTH 10°08'43" EAST, A DISTANCE OF 96.41 FEET TO A POINT ON THE NORTH LINE OF THE SOUTHWEST 1/4 OF THE NORTHEAST 1/4 OF SAID SECTION;

THENCE SOUTH 89°39'54" EAST, ALONG THE NORTH LINE OF SAID SOUTHWEST 1/4 OF THE NORTHEAST 1/4, A DISTANCE OF 990.20 FEET TO THE TRUE POINT OF BEGINNING. CONTAINING 25.486 ACRES.

HAVE LAID OUT, PLATTED, AND SUBDIVIDED THE ABOVE DESCRIBED LAND, UNDER THE NAME AND STYLE OF COTTONWOOD WEST INDUSTRIAL PARK FILING NO. 1, AND BY THESE PRESENTS DO DEDICATE TO THE CITY OF ARVADA IN FEE SIMPLE THE STREETS AND PUBLIC WAYS AS SHOWN ON THE PLATS, AND GRANTS TO THE PUBLIC UTILITIES, AND THE CITY OF ARVADA, THE RIGHT TO INSTALL, MAINTAIN, AND OPERATE MAINS, TRANSMISSION LINES, SERVICE LINES, AND APPURTENANCES, AS MAY BE NECESSARY TO PROVIDE SUCH UTILITY, CABLE TELEVISION, AND SANITARY SERVICES WITHIN THIS SUBDIVISION OR PROPERTY CONTIGUOUS THERETO, THROUGH, OVER, UNDER, AND ACROSS STREETS, UTILITY AND OTHER EASEMENTS, AND OTHER PUBLIC PLACES AS SHOWN ON THE PLAT.

COTTONWOOD WEST INDUSTRIAL PARK, INC., A COLORADO CORPORATION.

BY: Dennis M. Orr
PRESIDENT

ATTEST: D. Robert Clary
Assistant Secretary

SEAL

STATE OF COLORADO)
COUNTY OF) SS

THE FOREGOING INSTRUMENT WAS ACKNOWLEDGED BEFORE ME THIS 21st DAY OF October, A.D., 19 85, BY THE ABOVE PARTIES.

WITNESS MY HAND AND SEAL.
MY COMMISSION EXPIRES 7-26-89

NAME Julia A. Mabey
ADDRESS 828 So. Oneida
Denver, CO 80224

HOLDER OF DEED OF TRUST

EARL N. MURRAY

RUTH M. MURRAY

LEGAL DESCRIPTION

A PORTION OF THE EAST HALF OF SECTION 1, TOWNSHIP 3 SOUTH, RANGE 70 WEST OF THE SIXTH PRINCIPAL MERIDIAN, COUNTY OF JEFFERSON, STATE OF COLORADO, WHICH CONSIDERING THE EAST LINE OF THE SOUTHEAST 1/4 OF SAID SECTION 1 AS BEARING NORTH 00°02'49" WEST AND WITH ALL BEARINGS CONTAINED HEREIN RELATIVE THERETO IS MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHEAST CORNER OF THE NORTHEAST 1/4 OF THE SOUTHEAST 1/4 OF SAID SECTION 1; THENCE NORTH 89°32'02" WEST, ALONG THE NORTH LINE OF SAID NORTHEAST 1/4 OF THE SOUTHEAST 1/4, A DISTANCE OF 1318.84 FEET TO THE NORTHEAST CORNER OF THE NORTHWEST 1/4 OF THE SOUTHEAST 1/4 OF SAID SECTION 1, THE TRUE POINT OF BEGINNING; THENCE SOUTH 00°15'07" EAST, ALONG THE EAST LINE OF SAID NORTHWEST 1/4 OF THE SOUTHEAST 1/4, A DISTANCE OF 463.77 FEET TO A POINT ON THE NORTHERLY RIGHT-OF-WAY LINE OF THE CROKE CANAL; THENCE NORTHWESTERLY ALONG SAID NORTHERLY RIGHT-OF-WAY LINE THE FOLLOWING EIGHT (8) COURSES:

(1) NORTH 83°03'00" WEST, A DISTANCE OF 150.11 FEET TO A POINT OF CURVE;

(2) ALONG THE ARC OF A CURVE TO THE RIGHT WITH A RADIUS OF 963.78 FEET AND A CENTRAL ANGLE OF 11°23'39" A DISTANCE OF 191.66 FEET, THE LONG CHORD OF WHICH BEARS NORTH 77°21'10" WEST, A DISTANCE OF 191.35 FEET TO A POINT OF TANGENT;

(3) NORTH 71°39'21" WEST, A DISTANCE OF 276.15 FEET TO A POINT OF CURVE;

(4) ALONG THE ARC OF A CURVE TO THE RIGHT WITH A RADIUS OF 208.06 FEET AND A CENTRAL ANGLE OF 37°31'18" A DISTANCE OF 136.26 FEET, THE LONG CHORD OF WHICH BEARS NORTH 52°53'42" WEST, A DISTANCE OF 133.83 FEET TO A POINT OF TANGENT;

(5) NORTH 34°08'03" WEST, A DISTANCE OF 557.70 FEET TO A POINT OF CURVE;

(6) ALONG THE ARC OF A CURVE TO THE RIGHT WITH A RADIUS OF 388.56 FEET AND A CENTRAL ANGLE OF 39°23'06" A DISTANCE OF 267.10 FEET, THE LONG CHORD OF WHICH BEARS NORTH 14°26'30" WEST, A DISTANCE OF 261.87 FEET TO A POINT OF TANGENT;

(7) NORTH 05°15'03" EAST, A DISTANCE OF 755.43 FEET TO A POINT OF CURVE;

(8) ALONG THE ARC OF A CURVE TO THE RIGHT WITH A RADIUS OF 565.00 FEET AND A CENTRAL ANGLE OF 09°47'20" A DISTANCE OF 96.53, THE LONG CHORD OF WHICH BEARS NORTH 10°08'43" EAST, A DISTANCE OF 96.41 FEET TO A POINT ON THE NORTH LINE OF THE SOUTHWEST 1/4 OF THE NORTHEAST 1/4 OF SAID SECTION 1;

THENCE SOUTH 89°39'54" EAST ALONG SAID NORTH LINE, A DISTANCE OF 990.20 FEET TO THE NORTHEAST CORNER OF THE SOUTHWEST 1/4 OF THE NORTHEAST 1/4 OF SAID SECTION 1; THENCE SOUTH 00°11'39" EAST, ALONG THE EAST LINE OF SAID SOUTHWEST 1/4 OF THE NORTHEAST 1/4, A DISTANCE OF 313.56 FEET TO THE NORTHWEST CORNER OF LOT 7, COTTONWOOD PARK IN RALSTON VALLEY, RECORDED IN BOOK 55 AT PAGE 10 IN THE RECORDS OF JEFFERSON COUNTY; THENCE NORTH 89°47'39" EAST, ALONG THE NORTH LINE OF SAID LOT 7, A DISTANCE OF 250.22 FEET TO THE NORTHEAST CORNER OF SAID LOT 7; THENCE SOUTHERLY ALONG THE WESTERLY RIGHT-OF-WAY LINE OF JOYCE STREET THE FOLLOWING THREE (3) COURSES:

(1) SOUTH 29°55'41" WEST, A DISTANCE OF 68.23 FEET TO A POINT OF CURVE;

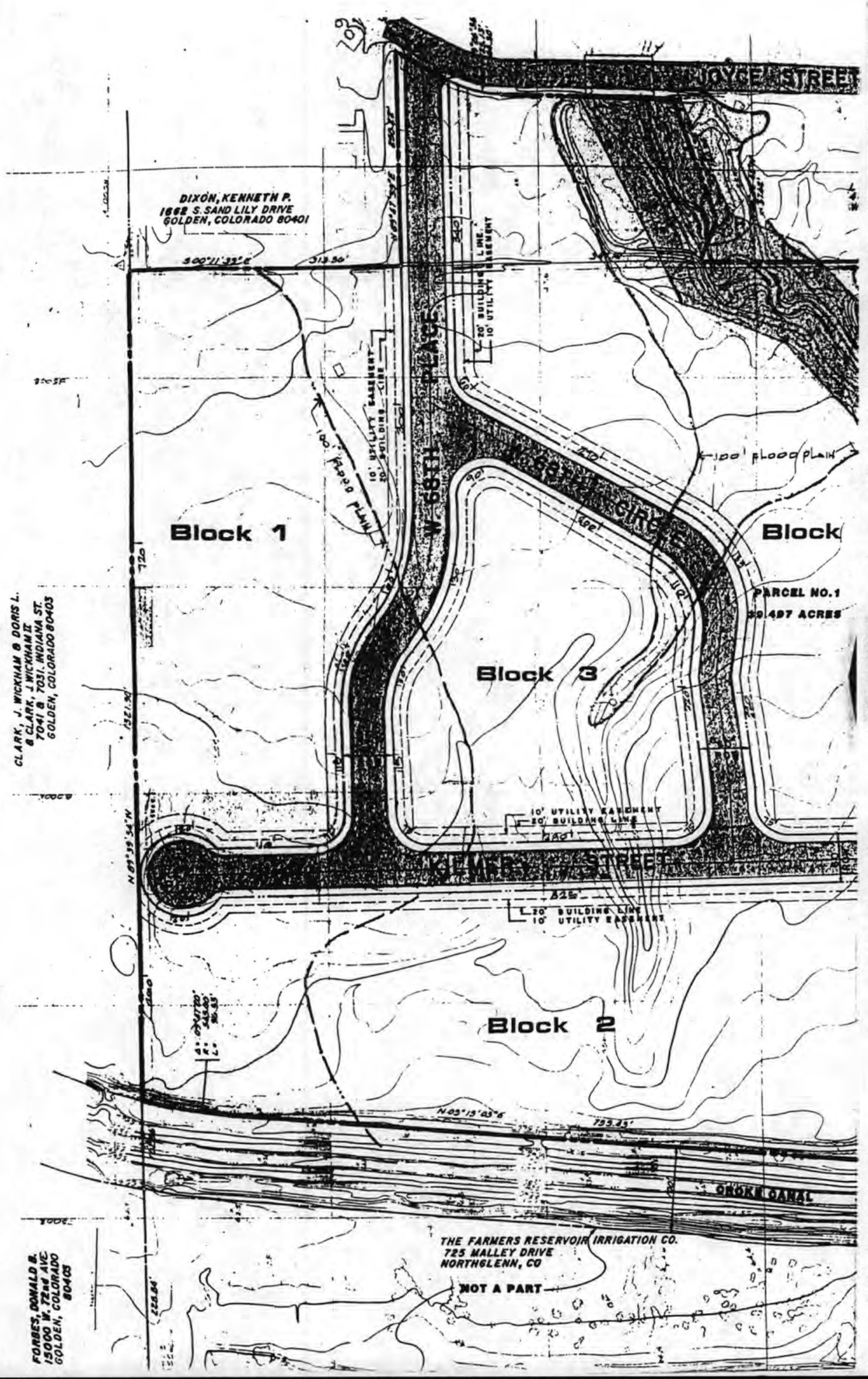
(2) ALONG THE ARC OF A CURVE TO THE LEFT WITH A RADIUS OF 125.00 FEET AND A CENTRAL ANGLE OF 29°26'36" A DISTANCE OF 64.30 FEET, THE LONG CHORD OF WHICH BEARS SOUTH 15°12'49" WEST, A DISTANCE OF 63.60 FEET TO A POINT OF TANGENT;

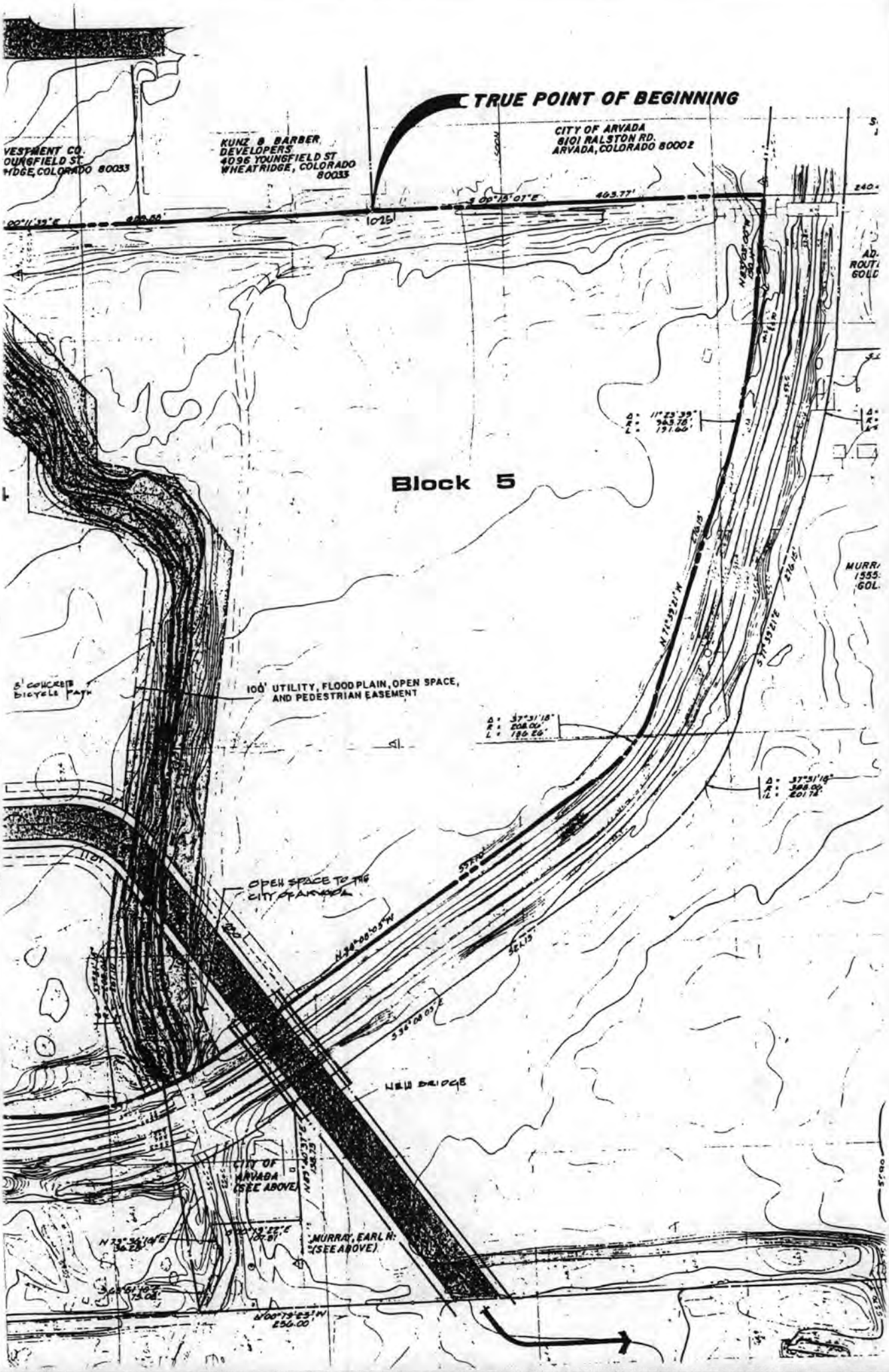
(3) SOUTH 00°29'04" WEST A DISTANCE OF 201.41 FEET; THENCE ALONG THE SOUTHERLY LINE OF SAID LOT 7 THE FOLLOWING TWO (2) COURSES:

(1) SOUTH 71°50'32" WEST, A DISTANCE OF 150.35 FEET;

(2) NORTH 68°52'48" WEST, A DISTANCE OF 57.62 FEET TO A POINT ON THE EAST LINE OF THE SOUTHWEST 1/4 OF THE NORTHEAST 1/4 OF SAID SECTION 1;

THENCE SOUTH 00°11'39" EAST ALONG SAID EAST LINE, A DISTANCE OF 659.88 FEET TO THE TRUE POINT OF BEGINNING. CONTAINING 39.497 ACRES.


JOYCE STREET
DIXON, KENNETH P.
1662 S. SAND LILY DRIVE
GOLDEN, COLORADO 80401
S00°11'33"E
313.50'
20' BUILDING LINE
10' UTILITY EASEMENT
W. 68TH PLACE
W. 68TH CIRCLE
100' FLOOD PLAIN
Block 1
Block
PARCEL NO.1
Block 3
CLARK, J. WICKHAM & DORIS L.
& CLARK, J. WICKHAM II
7041 & 7031 INDIANA ST.
GOLDEN, COLORADO 80403
10' UTILITY EASEMENT
20' BUILDING LINE
KIMBERLY STREET
20' BUILDING LINE
10' UTILITY EASEMENT
Block 2
CROKE CANAL
THE FARMERS RESERVOIR IRRIGATION CO.
725 MALLEY DRIVE
NORTHGLENN, CO
NOT A PART
FORBES, DONALD E.
15000 W. 72nd AVE
GOLDEN, COLORADO
80403


TRUE POINT OF BEGINNING
CITY OF ARVADA
8101 RALSTON RD.
ARVADA, COLORADO 80002
KUNZ & BARBER
DEVELOPERS
4096 YOUNGFIELD ST
WHEATRIDGE, COLORADO
80033
VESTMENT CO.
OUNGFIELD ST.
RIDGE, COLORADO 80033
S 00°13'07"E 463.77'
Block 5
5' CONCRETE BICYCLE PATH
100' UTILITY, FLOOD PLAIN, OPEN SPACE, AND PEDESTRIAN EASEMENT
OPEN SPACE TO THE CITY OF ARVADA
NEW BRIDGE
CITY OF ARVADA (SEE ABOVE)
MURRAY, EARL N. (SEE ABOVE)
N00°13'23"W 256.00'

APPENDIX D

JEFFERSON COUNTY QUARTER SECTION MAPS

1) 1986 Aerial Photograph - Site vicinity map with street and waterway labels.

2) Jefferson County Quarter Section 30-01 map

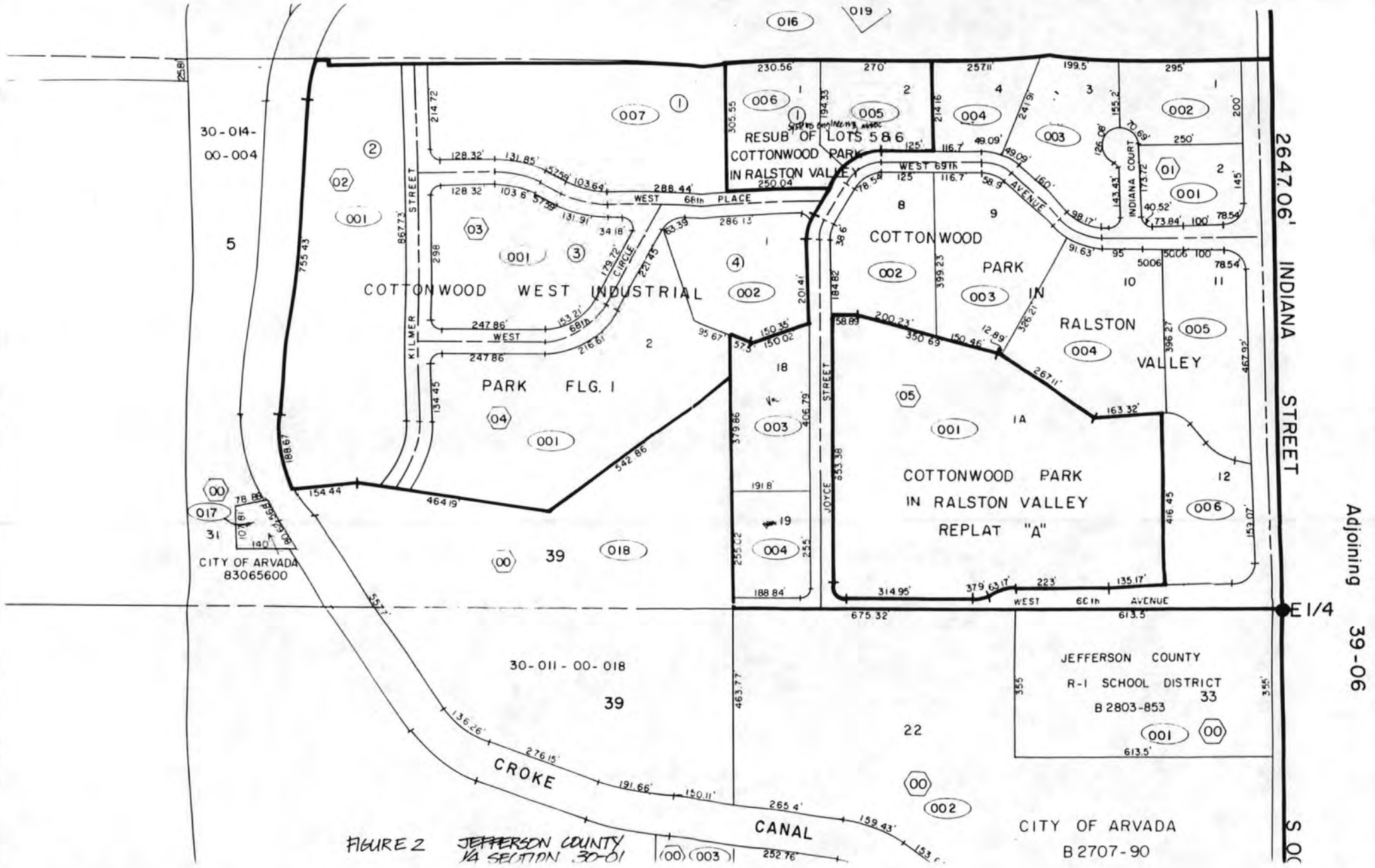


FIGURE 2 JEFFERSON COUNTY VA SECTION 30-01

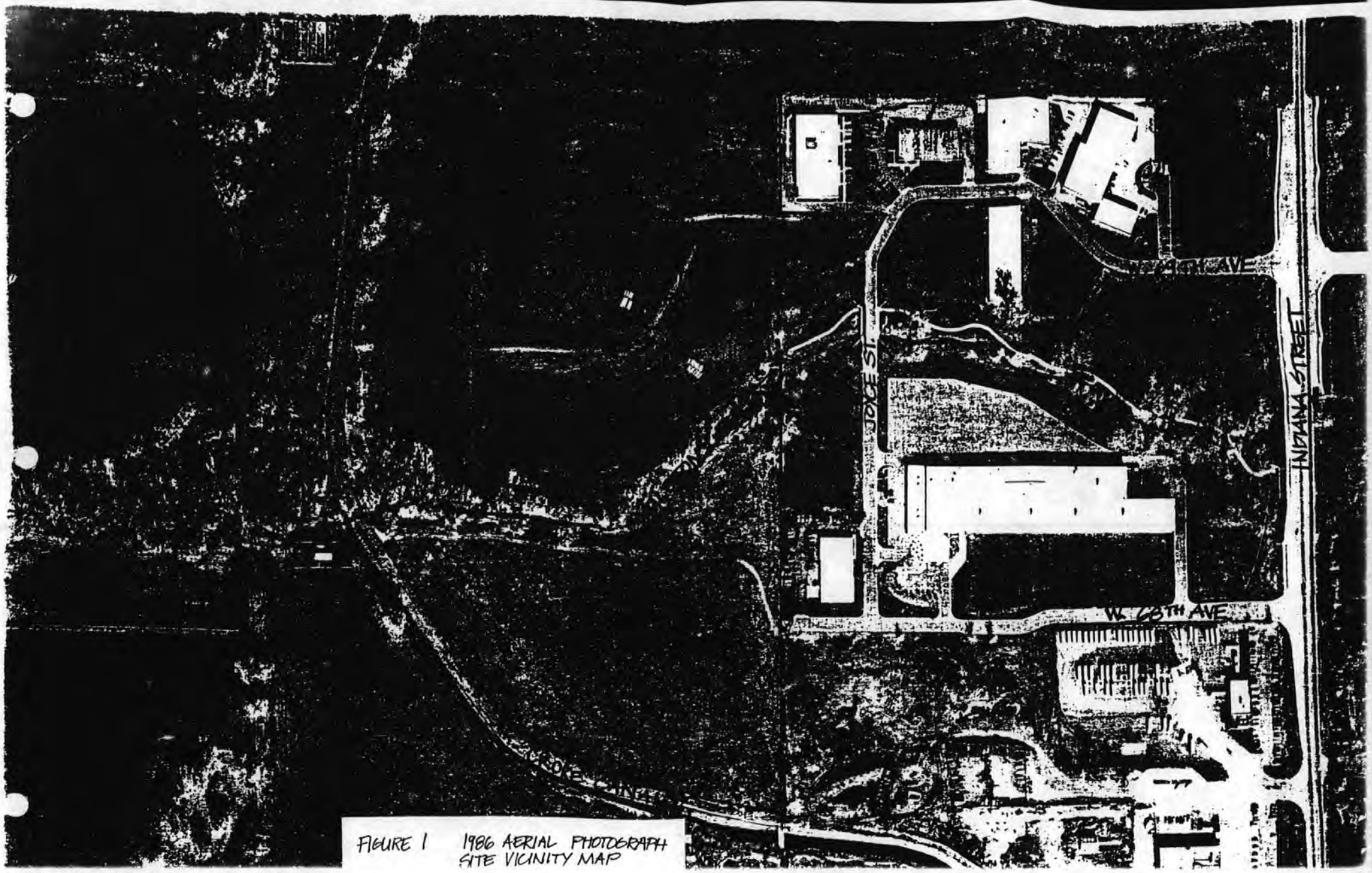
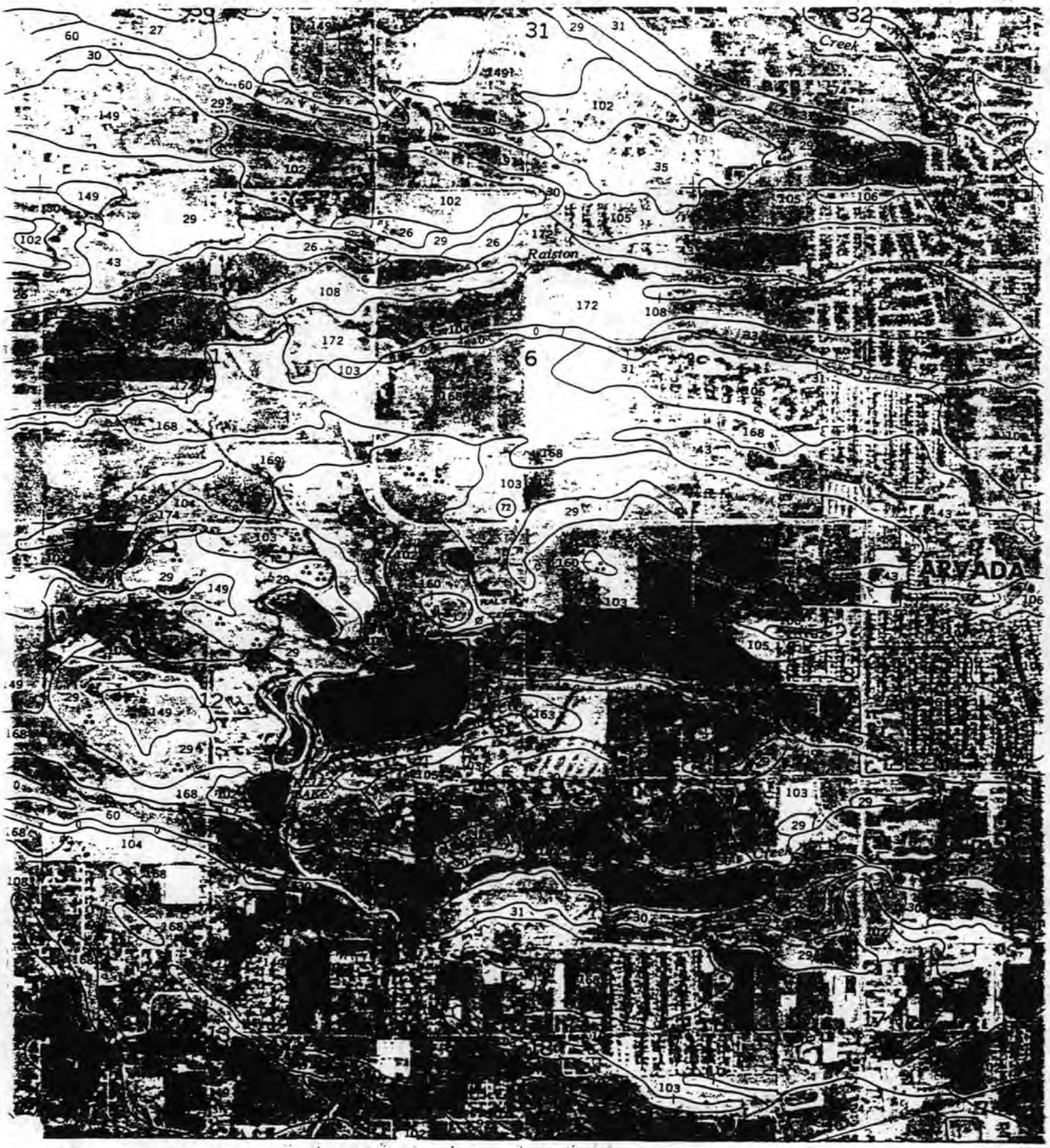


FIGURE 1 1986 AERIAL PHOTOGRAPH
SITE VICINITY MAP

APPENDIX E

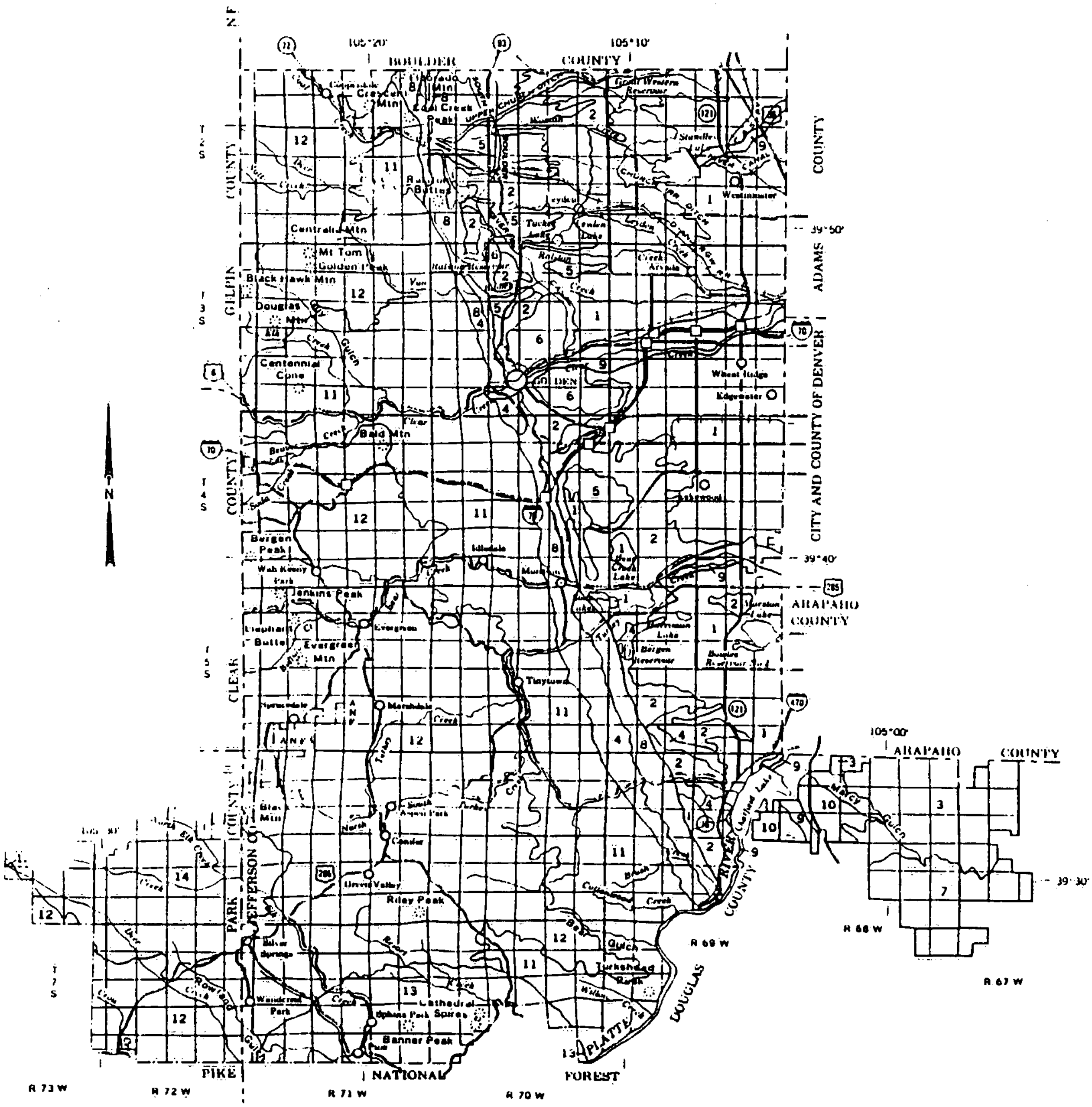
U.S.D.A. SOIL CONSERVATION SERVICE MAPS

1) Soil Survey Map and Legend
2) General Soil Map


Raiston
ARVADA
Creek
Creek

SOIL LEGEND

SYMBOL	NAME
1	Alda loam, 0 to 2 percent slopes
2	Alda-Niwot complex, 0 to 2 percent slopes
3	Allens Park Variant-Ratake-Rock outcrop complex, 30 to 50 percent slopes
4	Argiustolls, loamy, 15 to 30 percent slopes
5	Argiustolls-Rock outcrop complex, 15 to 60 percent slopes
6	Arvada clay loam, 0 to 2 percent slopes
7	Ascalon sandy loam, 5 to 9 percent slopes
8	Ascalon sandy loam, 9 to 15 percent slopes
9	Baller-Rock outcrop complex, 15 to 50 percent slopes
10	Baller Variant-Lavina-Rock outcrop complex, 5 to 15 percent slopes
11	Baller Variant-Lavina-Rock outcrop complex, 15 to 30 percent slopes
12	Blakeland loamy sand, 0 to 9 percent slopes
13	Blakeland loamy sand, 9 to 15 percent slopes
14	Breece sandy loam, 9 to 25 percent slopes
15	Bresser sandy loam, 0 to 5 percent slopes
16	Bresser gravelly sandy loam, 9 to 25 percent slopes
17	Critchell gravelly sandy loam, 0 to 3 percent slopes
18	Critchell gravelly sandy loam, 3 to 9 percent slopes
19	Critchell gravelly sandy loam, 9 to 15 percent slopes
20	Critchell stony sandy loam, 0 to 5 percent slopes
21	Cryofluvents, 0 to 5 percent slopes
22	Cumulic Cryoborolls, loamy, 0 to 5 percent slopes
23	Curecanti very stony sandy loam, 15 to 50 percent slopes
24	Daconio Variant gravelly clay loam, 0 to 3 percent slopes
25	Denver clay loam, 0 to 2 percent slopes
26	Denver clay loam, 2 to 5 percent slopes
27	Denver clay loam, 5 to 9 percent slopes
28	Denver cobbly clay loam, 5 to 9 percent slopes
29	Denver-Kutch clay loams, 5 to 9 percent slopes
30	Denver-Kutch clay loams, 9 to 15 percent slopes
31	Denver-Kutch-Midway clay loams, 9 to 25 percent slopes
32	Denver-Kutch-Urban land complex, 5 to 9 percent slopes
33	Denver-Kutch-Urban land complex, 9 to 15 percent slopes
34	Denver-Urban land complex, 0 to 2 percent slopes
35	Denver-Urban land complex, 2 to 5 percent slopes
36	Denver-Urban land complex, 5 to 9 percent slopes
37	Earcree gravelly sandy loam, 9 to 15 percent slopes
38	Earcree Variant very gravelly sandy loam, 3 to 9 percent slopes
39	Earcree Variant very gravelly sandy loam, 9 to 15 percent slopes
40	Earcree Variant-Venable complex, 0 to 15 percent slopes
41	Englewood clay loam, 0 to 2 percent slopes
42	Englewood clay loam, 2 to 5 percent slopes
43	Englewood clay loam, wet, 0 to 3 percent slopes
44	Englewood-Urban land complex, 0 to 2 percent slopes
45	Flatirons very cobbly sandy loam, 0 to 3 percent slopes
46	Flatirons very stony sandy loam, 0 to 5 percent slopes
47	Flatirons very stony sandy loam, 5 to 9 percent slopes
48	Flatirons very stony sandy loam, 9 to 15 percent slopes
49	Flatirons very stony sandy loam, 15 to 30 percent slopes
50	Fluvaquents, sandy, 0 to 2 percent slopes
51	Fondis loam, 0 to 3 percent slopes
52	Garber Variant very gravelly sandy loam, 5 to 9 percent slopes
53	Garber Variant very gravelly sandy loam, 9 to 15 percent slopes
54	Grimstone stony sandy loam, 9 to 15 percent slopes
55	Grimstone-Hiwan-Rock outcrop complex, 30 to 60 percent slopes
56	Grimstone-Peeler-Rock outcrop complex, 15 to 30 percent slopes
57	Grimstone-Peeler-Rock outcrop complex, 30 to 50 percent slopes
58	Hargreave sandy loam, 3 to 9 percent slopes
59	Hargreave-Bernal sandy loams, 9 to 15 percent slopes
60	Haverson loam, 0 to 3 percent slopes
61	Haverson loam, 3 to 9 percent slopes
62	Heldt clay, 3 to 9 percent slopes
63	Heldt clay, 9 to 15 percent slopes
64	Herdman-Sprucedale-Rock outcrop complex, 9 to 15 percent slopes
65	Herdman-Sprucedale-Rock outcrop complex, 15 to 30 percent slopes
66	Kittredge-Earcree complex, 3 to 9 percent slopes
67	Kittredge-Earcree complex, 9 to 20 percent slopes
68	Kittredge-Venable complex, 0 to 15 percent slopes
69	Laporte Variant complex, 15 to 60 percent slopes
70	Lavate sandy loam, 3 to 9 percent slopes
71	Lavate sandy loam, 9 to 15 percent slopes
72	Lavate-Bernal-Rock outcrop complex, 15 to 30 percent slopes
73	Lavina loam, very rocky, 0 to 5 percent slopes
74	Lebsack clay loam, saline, 0 to 2 percent slopes
75	Legault-Hiwan stony loamy sands, 5 to 15 percent slopes
76	Legault-Hiwan stony loamy sands, 15 to 30 percent slopes
77	Legault-Hiwan-Rock outcrop complex, 30 to 50 percent slopes
78	Legault-Tolvar-Rock outcrop complex, 50 to 70 percent slopes
79	Leyden-Nunn-Rooney complex, 9 to 30 percent slopes
80	Leyden-Primen-Standley cobbly clay loams, 15 to 50 percent slopes
81	Leyden-Primen-Standley extremely stony clay loams, 30 to 70 percent slopes
82	Leyden-Standley-Primen cobbly clay loams, 9 to 15 percent slopes
83	Leyden-Standley-Primen very cobbly clay loams, 30 to 60 percent slopes
84	Lininger-Ratake complex, 5 to 15 percent slopes
85	Lininger-Ratake complex, 15 to 30 percent slopes
86	Lininger-Trag sandy loams, 3 to 9 percent slopes
87	Lininger-Trag sandy loams, 9 to 20 percent slopes
88	Loveland clay loam, 0 to 1 percent slopes
89	Loveland Variant gravelly sandy loam, 0 to 2 percent slopes
90	Manzano fine sandy loam, 0 to 2 percent slopes
91	Manzanola clay loam, 0 to 5 percent slopes
92	Manzanola clay loam, 5 to 9 percent slopes
93	Manzanola clay loam, 9 to 15 percent slopes
94	Manzanola clay loam, 15 to 25 percent percent slopes
95	Manzanola cobbly clay loam, 15 to 25 percent slopes
96	Manzanola-Renohill-Stoneham complex, 9 to 15 percent slopes
97	McClave clay loam, 0 to 3 percent slopes
98	Midway clay loam, 9 to 30 percent slopes
99	Midway stony clay loam, 15 to 40 percent slopes
100	Nederland very cobbly sandy loam, 15 to 50 percent slopes
101	Nederland Variant very cobbly sandy loam, 30 to 50 percent slopes
102	Nunn clay loam, 0 to 2 percent slopes
103	Nunn clay loam, 2 to 5 percent slopes
104	Nunn clay loam, 5 to 9 percent slopes
105	Nunn-Urban land complex, 0 to 2 percent slopes
106	Nunn-Urban land complex, 2 to 5 percent slopes
107	Nunn-Urban land complex, 5 to 9 percent slopes
108	Nunn Variant-Urban land complex, 0 to 3 percent slopes
109	Paymaster sandy loam, 0 to 3 percent slopes
110	Pits, clayey
111	Pits, gravel
112	Platner loam, 3 to 5 percent slopes
113	Platner-Urban land complex, 0 to 3 percent slopes
114	Raleigh very gravelly sandy loam, 9 to 15 percent slopes
115	Raleigh very gravelly sandy loam, 15 to 30 percent slopes
116	Raleigh very gravelly sandy loam, 30 to 50 percent slopes
117	Raleigh very gravelly sandy loam, 2 to 9 percent south slopes
118	Raleigh very gravelly sandy loam, 9 to 15 percent south slopes
119	Raleigh very gravelly sandy loam, 15 to 30 percent south slopes
120	Raleigh stony sandy loam, 30 to 50 percent south slopes
121	Raleigh-Rock outcrop complex, 50 to 70 percent slopes
122	Ratake-Cathedral very stony sandy loams, 25 to 60 percent slopes
123	Ratake-Cathedral-Rock outcrop complex, 25 to 60 percent slopes
124	Ratake-Cathedral-Rock outcrop complex, 25 to 60 percent north slopes
125	Ratake-Lininger stony sandy loams, 30 to 60 percent slopes
126	Razor-Heldt clay loams, 9 to 25 percent slopes
127	Razor-Heldt-Midway cobbly clay loams, 15 to 30 percent slopes
128	Rednun clay loam, 0 to 3 percent slopes
129	Rednun clay loam, 3 to 9 percent slopes
130	Rednun clay loam, 9 to 15 percent slopes
131	Rednun-Chapin Variant clay loams, 9 to 15 percent slopes
132	Renohill loam, 5 to 9 percent slopes
133	Renohill-Manzanola clay loams, 9 to 15 percent slopes
134	Renohill-Midway complex, 9 to 15 percent slopes
135	Resort-Sohinx very gravelly sandy loams, 9 to 15 percent slopes
136	Resort-Sohinx very gravelly sandy loams, 15 to 30 percent slopes
137	Resort-Sohinx very gravelly sandy loams, 30 to 50 percent slopes
138	Rock outcrop, igneous and metamorphic
139	Rock outcrop, sedimentary
140	Rock outcrop-Cathedral-Ratake complex, 50 to 100 percent slopes
141	Rogert-Herdman-Rock outcrop complex, 30 to 70 percent slopes
142	Rooney very cobbly sandy loam, 15 to 50 percent slopes
143	Rooney-Primen-Leyden complex, 15 to 50 percent slopes
144	Rooney-Rock outcrop complex, 50 to 70 percent slopes
145	Rosane sandy loam, 0 to 3 percent slopes
146	Rosane-Venable fine sandy loams, 0 to 3 percent slopes
147	Sohinx-Resort-Rock outcrop complex, 50 to 70 percent slopes
148	Standley-Leyden-Primen very stony clay loams, 15 to 30 percent slopes
149	Standley-Nunn gravelly clay loams, 0 to 5 percent slopes
150	Tolvar very gravelly loamy sand, 15 to 30 percent slopes
151	Torrifluvents, very gravelly, 0 to 3 percent slopes
152	Trag sandy loam, 3 to 9 percent slopes
153	Trag sandy loam, 9 to 25 percent slopes
154	Troutdale gravelly sandy loam, 3 to 9 percent slopes
155	Troutdale-Kittredge sandy loams, 5 to 15 percent slopes
156	Troutdale-Rogert-Kittredge complex, 15 to 30 percent slopes
157	Troutdale-Sprucedale gravelly sandy loams, 3 to 15 percent slopes
158	Truckton sandy loam, 0 to 3 percent slopes
159	Truckton sandy loam, 3 to 9 percent slopes
160	Ulm clay loam, 5 to 9 percent slopes
161	Ulm-Urban land complex, 0 to 3 percent slopes
162	Ulm-Urban land complex, 3 to 5 percent slopes
163	Ulm-Urban land complex, 5 to 9 percent slopes
164	Ulm-Urban land complex, 9 to 18 percent slopes
165	Ustic Torriorthents, loamy, 15 to 50 percent slopes
166	Ustic Torriorthents, clayey, 0 to 50 percent slopes
167	Ustorthents, cool-Rock outcrop complex, 15 to 50 percent slopes
168	Valmont clay loam, 0 to 3 percent slopes
169	Veldkamp-Nederland very cobbly sandy loams, 0 to 3 percent slopes
170	Venable loam, 0 to 3 percent slopes
171	Venable loam, 3 to 9 percent slopes
172	Wann fine sandy loam, 0 to 2 percent slopes
173	Willowman cobbly sandy loam, 0 to 5 percent slopes
174	Willowman-Leyden cobbly loams, 9 to 30 percent slopes
175	Yoder Variant gravelly sandy loam, 9 to 30 percent slopes
176	Yoder Variant-Midway complex, 15 to 60 percent slopes



SOIL ASSOCIATIONS

DOMINANTLY WELL DRAINED, CLAYEY AND LOAMY SOILS ON HIGH TERRACES, HILL SLOPES, AND FANS

1 [illegible]

2 [illegible]

3 [illegible]

4 [illegible]

DOMINANTLY WELL DRAINED [illegible] AND GRAVELLY SOILS ON FANS, TERRACES, HILL SLOPES AND STABLE SUMMITS

5 [illegible]

DOMINANTLY WELL DRAINED STONY [illegible] CLAYEY SOILS ON MESA TOPS, STABLE SUMMITS AND HILL SLOPES

6 [illegible]

7 [illegible]

DOMINANTLY WELL DRAINED STONY AND LOAMY SOILS ON HOGBACKS AND HILL SLOPES

8 [illegible]

DOMINANTLY SOMEWHAT EXCESSIVELY DRAINED AND SOMEWHAT POORLY DRAINED LOAMY, VERY GRAVELLY AND SANDY SOILS ON FLOOD PLAINS AND LOW TERRACES

9 [illegible]

DOMINANTLY SOMEWHAT EXCESSIVELY DRAINED AND WELL DRAINED SANDY AND LOAMY SOILS ON HIGH TERRACES AND HILL SLOPES

10 [illegible]

DOMINANTLY WELL DRAINED STONY, GRAVELLY, LOAMY AND SANDY SOILS ON MOUNTAIN SIDE SLOPES AND STABLE SUMMITS AND IN DRAINAGEWAYS

11 [illegible]

12 [illegible]

13 [illegible]

14 [illegible]

[illegible]

[illegible]

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GENERAL SOIL MAP

GOLDEN AREA COLORADO PARTS OF DENVER, DOUGLAS, JEFFERSON AND PARK COUNTIES.

Scale 1:253,440

0 1 2 3 4 Miles

4 Miles = 1"

APPENDIX F

LABORATORY RESULTS
ATI (ANALYTICAL TECHNOLOGIES, INC.)

Analytical Technologies, Inc. 225 Commerce Drive Fort Collins, Colorado 80524 (303) 490-1511

Message

Dave,

Here are your results.

Steve F.

To Dave Runyon Company EREE

Fax No. 843-6215 Date 1-14-92

From Steven Fry Number of pages including this sheet 21

If you do not receive all the pages please call us back as soon as possible.

Analytical Technologies, Inc. 225 Commerce Drive Fort Collins, Colorado 80524 (303) 490-1511

January 14, 1992

Mr. Dave Runyon
ERCE
Stanford Place 3, Suite 415
4582 South Ulster Street Parkway
Denver, CO 80237

RE: ATI Workorder: 91-12-190
Client Project Name: Cottonwood ESA

Dear Mr. Runyon:

Two soil samples and two water samples were received from ERCE on December 27, 1991. The samples were scheduled for the following analyses: Volatile Organics, PCB's, and Total Lead. Results for these analyses are contained in the following report.

Please note that the Volatile Organic surrogate recoveries for sample "001" were outside the method required limits. This sample was re-analyzed and the surrogates once again did not meet the required recovery limits. This is probably due to the matrix of the sample, i.e., the sample resembled activated carbon.

Thank you for your confidence in Analytical Technologies, Inc. Should you have any questions, please call.

Sincerely yours,

Steven Fry, Ph.D.
Project Manager

SF/kci

Enclosures

Analytical Technologies, Inc.

QUALITY ASSURANCE DATA REVIEW

The data contained in the following report has been reviewed and approved by the appropriate supervisory personnel listed below:

Alex Blanche, GC/GCMS Supervisor

CERTIFICATION

Analytical Technologies Inc. certifies that the analyses reported herein are true, complete and correct within the limits of the method employed.

Analytical Technologies, Inc.

QUALITY ASSURANCE
DATA REVIEW

The data contained in the following report has been reviewed and approved by the appropriate supervisory personnel listed below:

Tom Austin, Jr.
GC/HPLC/Fuels Supervisor

CERTIFICATION

Analytical Technologies, Inc. certifies that the analyses reported herein are true, complete and correct within the limits of the method employed.

VOLATILE ORGANICS DATA SHEET

Method 8240

Client Sample ID:
Reagent Blank

Lab Name: Analytical Technologies Inc.
Client Name: ERCE
Client Project ID: Cottonwood ESA
Sample Matrix: Soil

Lab Sample ID: 91-12-190-RB
Date Collected: N/A
Date Analyzed: 01/09/92
Dilution Factor: 1

COMPOUND NAME	Concentration ug/kg
Chloromethane	< 10
Bromomethane	< 10
Vinyl chloride	< 10
Chloroethane	< 10
Methylene chloride	< 5
Acetone	< 10
Carbon disulfide	< 5
1,1-Dichloroethene	< 5
1,1-Dichloroethane	< 5
1,2-Dichloroethene (Total)	< 5
Chloroform	< 5
1,2-Dichloroethane	< 5
2-Butanone	< 10
1,1,1-Trichloroethane	< 5
Carbon tetrachloride	< 5
Vinyl Acetate	< 10
Bromodichloromethane	< 5
1,2-Dichloropropane	< 5
cis-1,3-Dichloropropene	< 5
Trichloroethene	< 5
Dibromochloromethane	< 5
1,1,2-Trichloroethane	< 5
Benzene	< 5
trans-1,3-Dichloropropene	< 5
Bromoform	< 5
2-Hexanone	< 10
4-Methyl-2-pentanone	< 10
Tetrachloroethene	< 5
1,1,2,2-Tetrachloroethane	< 5
Toluene	< 5
Chlorobenzene	< 5
Ethylbenzene	< 5
Styrene	< 5
Total Xylenes	< 5

Surrogate Recoveries:	% Rec	% Rec Limits
1,2-Dichloroethane-d4	87	70-121
Toluene-d8	104	81-117
Bromofluorobenzene	102	74-121

VOLATILE ORGANICS DATA SHEET

Method 8240

Client Sample ID: 001

Lab Name: Analytical Technologies Inc. Lab Sample ID: 91-12-190-01
Client Name: ERCE Date Collected: 12/26/91
Client Project ID: Cottonwood ESA Date Analyzed: 01/09/92
Sample Matrix: Soil Dilution Factor: 1

COMPOUND NAME	Concentration (ug/kg)		
Chloromethane	<	10	
Bromomethane	<	10	
Vinyl chloride	<	10	
Chloroethane	<	10	
Methylene chloride		120	
Acetone		68	
Carbon disulfide	<	5	
1,1-Dichloroethene		2	J
1,1-Dichloroethane	<	5	
1,2-Dichloroethene (Total)		4	J
Chloroform		3	J
1,2-Dichloroethane	<	5	
2-Butanone	<	10	
1,1,1-Trichloroethane		12	
Carbon tetrachloride	<	5	
Vinyl Acetate	<	10	
Bromodichloromethane	<	5	
1,2-Dichloropropane	<	5	
cis-1,3-Dichloropropene	<	5	
Trichloroethene		4	J
Dibromochloromethane	<	5	
1,1,2-Trichloroethane	<	5	
Benzene		4	J
trans-1,3-Dichloropropene	<	5	
Bromoform	<	5	
2-Hexanone	<	10	
4-Methyl-2-pentanone	<	10	
Tetrachloroethene		23	
1,1,2,2-Tetrachloroethane	<	5	
Toluene		24	
Chlorobenzene		4	J
Ethylbenzene		7	
Styrene	<	5	
Total Xylenes		43	

Surrogate Recoveries:	% Rec	% Rec Limits
1,2-Dichloroethane-d4	93	70-121
Toluene-d8	72 *	81-117
Bromofluorobenzene	122 *	74-121

* Outside control limits.

J = compound detected below practical quantitation limit.

VOLATILE ORGANICS DATA SHEET

Tentatively Identified Compounds

Client Sample ID:

001

Laboratory Name: Analytical Technologies, Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Lab Sample ID: 91-12-190-01

Date Collected: 12/26/91

Date Analyzed: 01/09/92

Dilution Factor: 1

Matrix: Soil

Concentration units: ug/kg

COMPOUND NAME	RT	Concentration	Q
Trichlorofluoromethane		120 J	

J = estimated value

VOLATILE ORGANICS DATA SHEET

Method 8240

Client Sample ID:
Reagent Blank

Lab Name: Analytical Technologies Inc.
Client Name: ERCE
Client Project ID: Cottonwood ESA
Sample Matrix: Water

Lab Sample ID: 91-12-190-RB
Date Collected: N/A
Date Analyzed: 01/09/92
Dilution Factor: 1

COMPOUND NAME	Concentration ug/L	
Chloromethane	<	10
Bromomethane	<	10
Vinyl chloride	<	10
Chloroethane	<	10
Methylene chloride	<	5
Acetone	<	10
Carbon disulfide	<	5
1,1-Dichloroethene	<	5
1,1-Dichloroethane	<	5
1,2-Dichloroethene (Total)	<	5
Chloroform	<	5
1,2-Dichloroethane	<	5
2-Butanone	<	10
1,1,1-Trichloroethane	<	5
Carbon tetrachloride	<	5
Vinyl Acetate	<	10
Bromodichloromethane	<	5
1,2-Dichloropropane	<	5
cis-1,3-Dichloropropene	<	5
Trichloroethene	<	5
Dibromochloromethane	<	5
1,1,2-Trichloroethane	<	5
Benzene	<	5
trans-1,3-Dichloropropene	<	5
Bromoform	<	5
2-Hexanone	<	10
4-Methyl-2-pentanone	<	10
Tetrachloroethene	<	5
1,1,2,2-Tetrachloroethane	<	5
Toluene	<	5
Chlorobenzene	<	5
Ethylbenzene	<	5
Styrene	<	5
Total Xylenes	<	5

Surrogate Recoveries:	% Rec	% Rec Limits
1,2-Dichloroethane-d4	87	76-116
Toluene-d8	104	88-110
Bromofluorobenzene	102	86-115

VOLATILE ORGANICS DATA SHEET

Method 8240

Client Sample ID: 004

Lab Name: Analytical Technologies Inc.
Client Name: ERCE
Client Project ID: Cottonwood ESA
Sample Matrix: Water

Lab Sample ID: 91-12-190-03
Date Collected: 12/26/91
Date Analyzed: 01/09/92
Dilution Factor: 1

COMPOUND NAME	Concentration (ug/L)	
Chloromethane	<	10
Bromomethane	<	10
Vinyl chloride	<	10
Chloroethane	<	10
Methylene chloride	<	5
Acetone	<	10
Carbon disulfide	<	5
1,1-Dichloroethene	<	5
1,1-Dichloroethane	<	5
1,2-Dichloroethene (Total)	<	5
Chloroform	<	5
1,2-Dichloroethane	<	5
2-Butanone	<	10
1,1,1-Trichloroethane	<	5
Carbon tetrachloride	<	5
Vinyl Acetate	<	10
Bromodichloromethane	<	5
1,2-Dichloropropane	<	5
cis-1,3-Dichloropropene	<	5
Trichloroethene	<	5
Dibromochloromethane	<	5
1,1,2-Trichloroethane	<	5
Benzene	<	5
trans-1,3-Dichloropropene	<	5
Bromoform	<	5
2-Hexanone	<	10
4-Methyl-2-pentanone	<	10
Tetrachloroethene	<	5
1,1,2,2-Tetrachloroethane	<	5
Toluene	<	5
Chlorobenzene	<	5
Ethylbenzene	<	5
Styrene	<	5
Total Xylenes	<	5

Surrogate Recoveries:	% Rec	% Rec Limits
1,2-Dichloroethane-d4	87	76-116
Toluene-d8	102	88-110
Bromofluorobenzene	101	86-115

Tentatively Identified Compounds

Client Sample ID:

004

Laboratory Name: Analytical Technologies, Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Lab Sample ID: 91-12-190-03

Date Collected: 12/26/91

Date Analyzed: 01/09/92

Dilution Factor: 1 1

Matrix: Water

Concentration units: ug/L

COMPOUND NAME	RT	Concentration	Q
Methyl-t-butyl ether		10 J	

J = estimated value

VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
Method 8240

Lab Name: Analytical Technologies, Inc.

Client Name: ERCE

Sample Matrix: Water

Client Sample ID: In House

Lab Sample ID: 20199905/AZ

Date Analyzed: 01/09/92

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	MS Concentration (ug/L)	MS % REC
1,1-Dichloroethene	50	<	5	57	114
Trichloroethene	50	<	5	43	86
Benzene	50	<	5	39	78
Toluene	50	<	5	51	102
Chlorobenzene	50	<	5	50	100

Compound	Spike Added (ug/L)	MSD Concentration (ug/L)	MSD % REC	% RPD
1,1-Dichloroethene	50	58	116	2
Trichloroethene	50	44	88	2
Benzene	50	41	82	5
Toluene	50	49	98	4
Chlorobenzene	50	51	102	2

QUALITY CONTROL LIMITS

Compound	Water		Soil	
	%REC	RPD	% Rec	RPD
1,1-Dichloroethene	61 - 145	14	59 - 172	22
Trichloroethene	71 - 120	14	62 - 137	24
Benzene	76 - 127	11	60 - 133	21
Toluene	76 - 125	13	59 - 139	21
Chlorobenzene	75 - 130	13	66 - 142	21

PCB ANALYSIS DATA SHEET
Method 8080

Lab Name: Analytical Technologies Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Lab Sample ID: 91-12-190-RBS

Sample Matrix: Sodium Sulfate

Sample Weight: 30 g

GPC Cleanup: N

Client Sample ID: Reagent Blank

Date Collected: N/A

Date Extracted: 12/30/91

Date Analyzed: 01/03/92

Extract Volume: 10 mL

Dilution Factor: 1

Compound	Conc (mg/kg)
PCB 1016	< 0.03
PCB 1221	< 0.03
PCB 1232	< 0.03
PCB 1242	< 0.03
PCB 1248	< 0.03
PCB 1254	< 0.03
PCB 1260	< 0.03

SURROGATE RECOVERY

Compound	% Recovery
Tetrachloro-m-xylene	86

PCB ANALYSIS DATA SHEET
Method 8080

Lab Name: Analytical Technologies Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Lab Sample ID: 91-12-190-02A

Sample Matrix: Soil

Sample Weight: 30 g

GPC Cleanup: N

Client Sample ID: 002

Date Collected: 12/26/91

Date Extracted: 12/30/91

Date Analyzed: 01/03/92

Extract Volume: 10 mL

Dilution Factor: 1

Compound	Conc (mg/kg)
PCB 1016	< 0.03
PCB 1221	< 0.03
PCB 1232	< 0.03
PCB 1242	< 0.03
PCB 1248	< 0.03
PCB 1254	< 0.03
PCB 1260	< 0.03

SURROGATE RECOVERY

Compound	% Recovery
Tetrachloro-m-xylene	98

PCB MATRIX SPIKE RESULTS
Method 8080

Client Sample ID: In House

Lab Name: Analytical Technologies, Inc.

Client Name: ERCE

Lab Sample ID: 91-12-114-01A

Sample Matrix: Soil

Date Analyzed: 12/19/91

GC Column: DB-1701

Compound	Spike Added (mg/kg)	Sample Concentration (mg/kg)	MS Concentration (mg/kg)	MS Percent Recovery
PCB 1260	0.50	< 0.3	0.597	119

Compound	Spike Added (mg/kg)	MSD Concentration (mg/kg)	MSD Percent Recovery	RPD
PCB 1260	0.50	0.607	121	2

PCB ON-GOING PRECISION AND RECOVERY
Method 8080

Lab Name: Analytical Technologies, Inc. Lab Sample ID: 91-12-190-OPR

Client Name: ERCE Date Analyzed: 01/03/92

Sample Matrix: Soil GC Column: DB-608

Compound	Spike Added (mg/kg)	OPR Concentration (mg/kg)	OPR Percent Recovery
PCB 1260	0.50	0.590	118

Compound	Spike Added (mg/kg)	OPRD Concentration (mg/kg)	OPRD Percent Recovery	RPD
PCB 1260	0.50	0.657	131	11

Analytical Technologies, Inc.

QUALITY ASSURANCE DATA REVIEW

The data contained in the following report has been reviewed and approved by the appropriate supervisory personnel listed below:

Steve Workman

Steve Workman, GC/HPLC/Inorganics Supervisor

CERTIFICATION

Analytical Technologies Inc. certifies that the analyses reported herein are true, complete and correct within the limits of the method employed.

TOTAL LEAD ANALYSIS DATA SHEET

Laboratory Name: Analytical Technologies, Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Workorder Number: 91-12-190

Date Collected: 12/26/91

Prep Date: 01/02/92

Date Analyzed: 01/03/92

Sample Matrix: Soil

Client ID.	ATI ID.	Lead Conc. (mg/kg)
Reagent Blank	91-12-190-RB	< 5
002	91-12-190-02	56

TOTAL LEAD ANALYSIS DATA SHEET

Laboratory Name: Analytical Technologies, Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Workorder Number: 91-12-190

Date Collected: 12/26/91

Prep Date: 01/02/92

Date Analyzed: 01/02/92

Sample Matrix: Water

Client ID.	ATI ID.	Lead Conc. (mg/L)
Reagent Blank	91-12-190-RB	< 0.003
005	91-12-190-04	0.065

TOTAL LEAD MATRIX SPIKE

Client Sample ID: In House

Laboratory Name: Analytical Technologies, Inc.

Client Name: ERCE

Prep Date: 01/02/92

Lab Sample ID: 9659A/FL

Date Analyzed: 01/03/92

Sample Matrix: Soil

Compound	Spike Added (mg/kg)	Sample Concentration (mg/kg)	MS Concentration (mg/kg)	MS Percent Recovery
Lead	50	< 5	54	108

TOTAL LEAD MATRIX SPIKE

Client Sample ID: In House

Laboratory Name: Analytical Technologies, Inc.

Client Name: ERCE

Prep Date: 01/02/92

Lab Sample ID: 9600B-1/FL

Date Analyzed: 01/02/92

Sample Matrix: Water

Compound	Spike Added (mg/L)	Sample Concentration (mg/L)	MS Concentration (mg/L)	MS Percent Recovery
Lead	0.80	< 0.003	0.80	100

12-17-91

CONTRACTOR ERCE SAMPLERS Ron C. Holm, Will Glasgow PROJECT • COTTONWOOD ESA

SITE CONTACT/PHONE DAVE RUNYON 843-6210 LAB/LOCATION ATI - FORT COLLINS

C-O-C NUMBER 0001

~~EG&G ROCKY FLATS~~ RCRA, CHAIN OF CUSTODY

ERCE (DENVER)
DENVER TECH CENTER
STANFORD PLACE #3 STE 415 Denver Co

	DATE/TIME		SAMPLE NUMBER	LOCATION	CONTAINER TYPE	NUMBER OF CONTAINERS	MEDIA SOIL(S) WATER (W)	FILTERED-F POT DISS-P	TURN AROUND RUSH -R	OUT OF SPEC REPORTS	PRESERVATIVE: COOLED TO 4 C	HCl	NAOH	HNO3	H2SO4	BOTTLE CODES: VOA	OIL+GREASE	PCB's + METALS	TOTAL METALS
01	12-26-91	1330	001	LANDFILL	2 oz GLASS	1	S				Y					X			
02		1335	002	LANDFILL	2 oz GLASS	2	S				Y							X	
*		1420	003	Ralston Creek	2 oz Glass	1	W				Y						X		
03		1500	004	Hole #6	40 ml Amber	2	W				Y					X			
04		1505	005	Hole #6	1 Liter	1	W				Y				X				X

Ron 12-26-91

E 12-26-91

RELINQUISHED BY	DATE/TIME		RECEIVED BY	DATE/TIME	
Ron C. Holm	12-27-91	0919	Debi Burdick	12/27/91	9:15 am

REMARKS

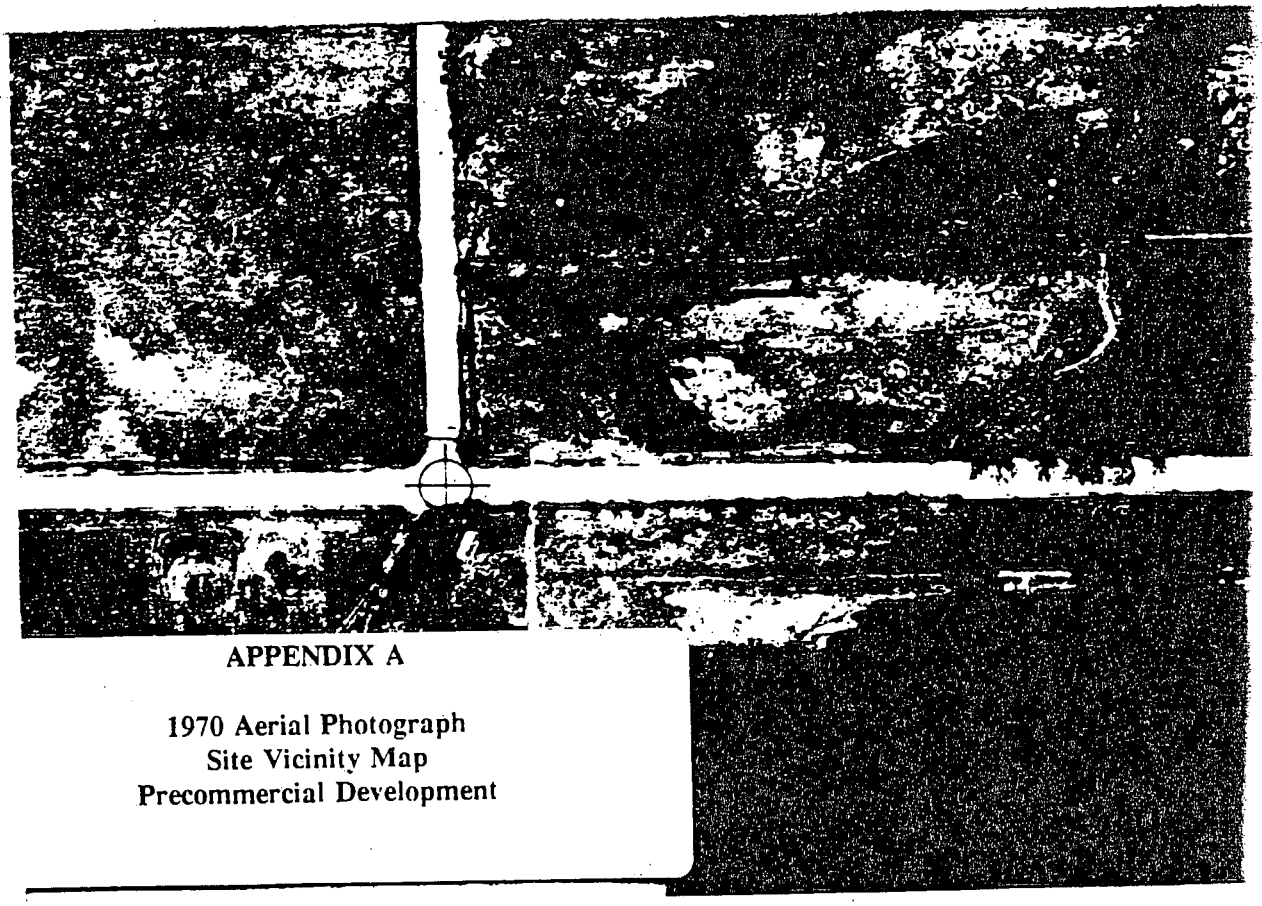
SHIPMENT METHOD personal delivery by Ron.

LABORATORY USE ONLY	Y	N
PCKG RECD/CUSTODY SEALS INTACT	✓	
SAMPLE LABELS/COCs AGREE	✓	
TEMPERATURE WITHIN SPECIFICATION ____C		
CORRECTED COPY ATTACHED		
PROBLEMS OR DISCREPANCIES		

* HOLD SAMPLE - DO NOT RUN. NOT ENOUGH SAMPLE. RON WILL GET BACK TO US 12/27/91 & ?

APPENDIX A

1970 AERIAL PHOTOGRAPH - SITE VICINITY MAP, PRECOMMERCIAL DEVELOPMENT



APPENDIX A

1970 Aerial Photograph
Site Vicinity Map
Precommercial Development

DEPARTMENT OF PLANNING

COUNTY OF JEFFERSON
STATE OF COLORADO

1829 01

APPR. SCALE 1"=200'
DATE 6-70

APPENDIX B

1986 AERIAL PHOTOGRAPH

1) Survey Traverse Grid for Magnetic Survey and Radiological Survey
2) Drive tube well locations
3) ▸ = water sample taken from Ralston Creek
4) Site specific landfill boundary-highlighted in yellow

APPENDIX B

1986 Aerial Photograph

1) Survey Traverse Grid For Magnetic Survey & Radiological Survey
2) Drive tube well locations
3) ▸ = water sample taken from Ralston Creek
4) Site specific landfill boundary

PHOTO MAP

S. T. R.

.ORADO

NORTH

SCALE IN FEET

0 100 200 300 400

DATE

C Repro Inc.
ENGINEERING REPRODUCTIONS
462 - F Laredo
Aurora Colorado
80011
(303) 360-9001

APPENDIX C

LEGAL DESCRIPTION AND ACCOMPANYING MAP

Recorded at .... o'clock ..... M., ...

Reception No. ....

RECORDED IN
COUNTY OF JEFFERSON
STATE OF COLORADO
RECEPTION NO. 88040360
04/28/88 10:20 9.00

THIS DEED, Made this 18th day of March, 19 88, between

COTTONWOOD WEST INDUSTRIAL PARK INC.
a Colorado Corporation
of the City and County of DENVER and State of Colorado, of the first part, and

COTTONWOOD WEST LTD. ****
a Colorado limited partnership of the County of DENVER and State of Colorado, of the second part;

WITNESSETH, That the said party of the first part, for and in consideration of the sum of TEN DOLLARS AND OTHER GOOD AND VALUABLE CONSIDERATION Dollars, to the said party of the first part, in hand paid by the said party of the second part, the receipt whereof is hereby confessed and acknowledged, has granted, bargained, sold and conveyed, and by these presents does grant, bargain, sell, convey and confirm unto the said party of the second part, its heirs and assigns forever, all the following described lot or parcel of land, situate, lying and being in the County of JEFFERSON and State of Colorado, to wit:

SEE EXHIBIT A ATTACHED HERETO FOR LEGAL DESCRIPTION
SEE EXHIBIT B ATTACHED HERETO FOR ADDITIONAL PROVISIONS

**** c/o Gibraltar Companies
Denver Corporate Center Tower III
7900 E. Union Avenue Suite 850
Denver, Co. 80237

also known as street and number vacant land

Together with all and singular the hereditaments and appurtenances thereunto belonging, or in anywise appertaining, and the reversion and reversions, remainder and remainders, rents, issues and profits thereof; and all the estate, right, title, interest, claim and demand whatsoever, of the said part of the first part, either in law or equity, of, in and to the above bargained premises, with the hereditaments and appurtenances; TO HAVE AND TO HOLD the said premises above bargained and described, with the appurtenances, unto the said party of the second part, its heirs and assigns forever.

And the said party of the first part, for it self its heirs, executors and administrators, does covenant, grant, bargain and agree to and with the said party of the second part, its heirs and assigns, the above bargained premises in the quiet and peaceable possession of said party of the second part, its heirs and assigns, against all and every person or persons lawfully claiming or to claim the whole or any part thereof, by, through or under the said party of the first part to WARRANT AND FOREVER DEFEND.

IN WITNESS WHEREOF, The said party of the first part has hereunto set its hand and seal the day and year first above written.

Signed, Sealed and Delivered in the presence of

.... [SEAL]
COTTONWOOD WEST INDUSTRIAL PARK INC. [SEAL]
[signature] [SEAL]
James Moilanen, Pres.

STATE OF COLORADO, } ss.
County of

The foregoing instrument was acknowledged before me this day of March 19 88, by James Moilanen, President of Cottonwood West Industrial Park Inc., a Colorado corporation

My Commission expires 6/11/[illegible], 19 . Witness my hand and official seal.

[signature]
Notary Public
[illegible] Denver 80202

NOTARY PUBLIC STATE OF COLORADO

STATE DOCUMENTARY FEE
APR 28 1988
no doc fee collected
no doc fee

1-3

No. 16 SPECIAL WARRANTY DEED. —Bradford Publishing Co., 1824-46 Stout Street, Denver, Colorado (573-5011) 6-76

-JV-4P-8801167-1

EXHIBIT A
TO SPECIAL WARRANTY DEED
DATED MARCH 18, 1988

2
2

Lot 7
Cottonwood Park in Ralston Valley

and

A portion of the East 1/2 of Section 1, Township 3 South, Range 70 West of the 6th P.M., more particularly described as follows: Beginning at the Northeast corner of the Northwest 1/4 of the Southeast 1/4 of said Section 1; thence South 00 degrees 03 minutes 01 seconds East along the Easterly line of said Northwest 1/4 of the Southeast 1/4, 463.77 feet to the Northerly right-of-way line of the Croke Canal; thence Northwesterly along said Northerly right-of-way line the following 8 courses: (1) thence North 82 degrees 50 minutes 54 seconds West, 150.11 feet to a point of curve; (2) thence along a curve to the right having a radius of 963.78 feet, a central angle of 11 degrees 23 minutes 39 seconds, 191.66 feet to a point of tangent; (3) thence North 71 degrees 27 minutes 15 seconds West along said tangent, 276.15 feet to a point of curve; (4) thence along a curve to the right having a radius of 208.06 feet, a central angle of 37 degrees 31 minutes 18 seconds, 136.26 feet to a point of tangent; (5) thence North 33 degrees 55 minutes 57 seconds West along said tangent, 557.70 feet to a point of curve; (6) thence along a curve to the right having a radius of 388.56 feet, a central angle of 39 degrees 23 minutes 06 seconds, 267.10 feet to a point of tangent; (7) thence North 05 degrees 27 minutes 09 seconds East along said tangent, 755.43 feet to a point of curve; (8) thence along a curve to the right having a radius of 565.00 feet, a central angle of 09 degrees 47 minutes 25 seconds, 96.54 feet to the Northerly line of the Southwest 1/4 of the Northeast 1/4 of said Section 1; thence South 89 degrees 27 minutes 29 seconds East along said Northerly line, 991.49 feet to the Northeast corner of said Southwest 1/4 of the Northeast 1/4; thence South 00 degrees 03 minutes 48 seconds West along the Easterly line of said Southwest 1/4 of the Northeast 1/4, 1320.46 feet to the point of beginning.

Also known as All of Blocks 1, 2, 3, and 4
Cottonwood West Industrial Park Filing No. 1,
All situate in the County of Jefferson,
State of Colorado

RECEPTION NO. 88040360

3

3

EXHIBIT B
TO SPECIAL WARRANTY DEED
DATED MARCH 18, 1988

By accepting this conveyance, second party hereby assumes and agrees to pay that certain obligation evidenced by that certain Promissory Note dated January 10, 1985 in the principal amount of $2,425,000.00 payable to Otero Savings and Loan Association, secured by that certain Deed of Trust recorded January 11, 1985 under Reception No. 85003626, Jefferson County, Colorado public records, as said Note and Deed of Trust have been subsequently modified. Second party's assumption and agreement to pay the foregoing obligation includes its assumption and ratification of the acts of certain third parties as evidenced by instruments recorded at Reception Numbers 85003627, 86006149, 86088951 and 86088952, even if those parties had no authority to complete or perform those acts.

RECEPTION NO. 88040360

DEDICATION

:OW ALL MEN BY THESE PRESENTS: THAT THE UNDERSIGNED, BEING THE OWNERS OF A PARCEL OF LAND IN ,HE EAST 1/2 OF SECTION 1, TOWNSHIP 3 SOUTH, RANGE 70 WEST OF THE 6TH P.M., CITY OF ARVAOA, COUNTY OF JEFFERSON, STATE OF COLORADO, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHEAST CORNER OF SAID SECTION 1; THENCE SOUTH 00°02'54" EAST, ALONG THE EAST LINE OF THE NORTHEAST 1/4 OF SAID SECTION 1, A DISTANCE OF 1323.58 FEET TO THE NORTHEAST CORNER OF THE SOUTHEAST 1/4 OF THE NORTHEAST 1/4 OF SAID SECTION 1; THENCE NORTH 89°39'54" WEST, ALONG THE NORTH LINE OF SAID SOUTHEAST 1/4 OF THE NORTHEAST 1/4 A DISTANCE OF 1322.17 FEET TO THE NORTHEAST CORNER OF THE SOUTHWEST 1/4 OF THE NORTHEAST 1/4 OF SAID SECTION 1, THE TRUE POINT OF BEGINNING; THENCE SOUTH 00°11'39" EAST, ALONG THE EAST LINE OF SAID SOUTHWEST 1/4 OF THE NORTHEAST 1/4, AND ALONG THE WEST LINE OF LOT 1, RESUBDIVISION OF LOTS 5 AND 6, COTTONWOOD PARK IN RALSTON VALLEY, A SUBDIVISION RECORDED IN THE OFFICE OF THE JEFFERSON COUNTY CLERK AND RECORDER UNDER RECEPTION NUMBER 79058658, A DISTANCE OF 313.56 FEET; THENCE NORTH 89°47'39" EAST, ALONG THE SOUTH LINE OF SAID LOT 1, A DISTANCE OF 250.22 FEET TO A POINT ON THE WEST RIGHT-OF-WAY LINE OF JOYCE STREET; THENCE ALONG THE WEST RIGHT-OF-WAY LINE OF JOYCE STREET THE FOLLOWING THREE (3) COURSES:

(1) SOUTH 29°55'40" WEST, A DISTANCE OF 68.23 FEET TO A POINT OF CURVE;
(2) ALONG THE ARC OF A CURVE TO THE LEFT WITH A RADIUS OF 125.13 FEET AND A CENTRAL ANGLE OF 29°26'36" A DISTANCE OF 64.30 FEET, THE LONG CHORD OF WHICH BEARS SOUTH 15°12'22" WEST, A DISTANCE OF 63.60, TO A POINT OF TANGENCY;
(3) SOUTH 00°29'04" WEST, A DISTANCE OF 201.41 FEET;

THENCE ALONG THE NORTH LINE OF LOT 18, COTTONWOOD PARK IN RALSTON VALLEY, A SUBDIVISION RECORDED IN THE OFFICE OF THE JEFFERSON COUNTY CLERK AND RECORDER IN BOOK 55 AT PAGE 11 THE FOLLOWING TWO (2) COURSES:

(1) SOUTH 71°50'32" WEST, A DISTANCE OF 150.35 FEET;
(2) NORTH 68°52'48" WEST, A DISTANCE OF 57.62 FEET TO A POINT ON THE EAST LINE OF THE SOUTHWEST 1/4 OF THE NORTHEAST 1/4 OF SAID SECTION 1;

...ENCE SOUTH 00°11'39" EAST, ALONG THE EAST LINE OF SAID SOUTHWEST 1/4 OF THE NORTHEAST 1/4, AND ALONG THE WEST LINE OF SAID LOT 18, A DISTANCE OF 104.00 FEET; THENCE SOUTH 53°57'00" WEST, A DISTANCE OF 542.86 FEET; THENCE NORTH 80°49'37" WEST A DISTANCE OF 464.19 FEET; THENCE SOUTH 84°04'28" WEST, A DISTANCE OF 154.44 FEET TO A POINT ON THE EASTERLY RIGHT-OF-WAY LINE OF THE CROAK CANAL; THENCE ALONG THE EASTERLY RIGHT-OF-WAY LINE OF SAID CROAK CANAL THE FOLLOWING THREE (3) COURSES:

(1) ALONG THE ARC OF A NON-TANGENT CURVE TO THE RIGHT WITH A RADIUS OF 388.56 FEET AND A CENTRAL ANGLE OF 27°49'12" A DISTANCE OF 188.67 FEET, THE LONG CHORD OF WHICH BEARS NORTH 08°39'33" WEST, A DISTANCE OF 186.82 FEET TO A POINT OF TANGENCY;
(2) NORTH 05°15'03" EAST, A DISTANCE OF 755.43 FEET TO A POINT OF CURVE;
(3) ALONG THE ARC OF A CURVE TO THE RIGHT WITH A RADIUS OF 565.00 FEET AND A CENTRAL ANGLE OF 09°47'20" A DISTANCE OF 96.53 FEET, THE LONG CHORD OF WHICH BEARS NORTH 10°08'43" EAST, A DISTANCE OF 96.41 FEET TO A POINT ON THE NORTH LINE OF THE SOUTHWEST 1/4 OF THE NORTHEAST 1/4 OF SAID SECTION;

THENCE SOUTH 89°39'54" EAST, ALONG THE NORTH LINE OF SAID SOUTHWEST 1/4 OF THE NORTHEAST 1/4, A DISTANCE OF 990.20 FEET TO THE TRUE POINT OF BEGINNING. CONTAINING 25.486 ACRES.

HAVE LAID OUT, PLATTED, AND SUBDIVIDED THE ABOVE DESCRIBED LAND, UNDER THE NAME AND STYLE OF COTTONWOOD WEST INDUSTRIAL PARK FILING NO. 1, AND BY THESE PRESENTS DO DEDICATE TO THE CITY OF ARVADA IN FEE SIMPLE THE STREETS AND PUBLIC WAYS AS SHOWN ON THE PLATS, AND GRANTS TO THE PUBLIC UTILITIES, AND THE CITY OF ARVADA, THE RIGHT TO INSTALL, MAINTAIN, AND OPERATE MAINS, TRANSMISSION LINES, SERVICE LINES, AND APPURTENANCES, AS MAY BE NECESSARY TO PROVIDE SUCH UTILITY, CABLE TELEVISION, AND SANITARY SERVICES WITHIN THIS SUBDIVISION OR PROPERTY CONTIGU-OUS THERETO, THROUGH, OVER, UNDER, AND ACROSS STREETS, UTILITY AND OTHER EASEMENTS, AND ER PUBLIC PLACES AS SHOWN ON THE PLAT.

COTTONWOOD WEST INDUSTRIAL PARK, INC., A COLORADO CORPORATION.

BY: Dennis M. Dow
PRESIDENT

ATTEST: D. Robert Clary
Assistant Secretary

SEAL

STATE OF COLORADO)
COUNTY OF) SS

THE FOREGOING INSTRUMENT WAS ACKNOWLEDGED BEFORE ME THIS 21st DAY OF October, A.D., 19 85, BY THE ABOVE PARTIES.

WITNESS MY HAND AND SEAL.
MY COMMISSION EXPIRES 7-26-89

NAME Julia A. Mabey
ADDRESS 828 So. Oneida
Denver, CO 80224

HOLDER OF DEED OF TRUST

EARL N. MURRAY

RUTH M. MURRAY

LEGAL DESCRIPTION

A PORTION OF THE EAST HALF OF SECTION 1, TOWNSHIP 3 SOUTH, RANGE 70 WEST OF THE SIXTH PRINCIPAL MERIDIAN, COUNTY OF JEFFERSON, STATE OF COLORADO, WHICH CONSIDERING THE EAST LINE OF THE SOUTHEAST 1/4 OF SAID SECTION 1 AS BEARING NORTH 00°02'49" WEST AND WITH ALL BEARINGS CONTAINED HEREIN RELATIVE THERETO IS MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHEAST CORNER OF THE NORTHEAST 1/4 OF THE SOUTHEAST 1/4 OF SAID SECTION 1; THENCE NORTH 89°32'02" WEST, ALONG THE NORTH LINE OF SAID NORTHEAST 1/4 OF THE SOUTHEAST 1/4, A DISTANCE OF 1318.84 FEET TO THE NORTHEAST CORNER OF THE NORTHWEST 1/4 OF THE SOUTHEAST 1/4 OF SAID SECTION 1, THE TRUE POINT OF BEGINNING; THENCE SOUTH 00°15'07" EAST, ALONG THE EAST LINE OF SAID NORTHWEST 1/4 OF THE SOUTHEAST 1/4, A DISTANCE OF 463.77 FEET TO A POINT ON THE NORTHERLY RIGHT-OF-WAY LINE OF THE CROKE CANAL; THENCE NORTHWESTERLY ALONG SAID NORTHERLY RIGHT-OF-WAY LINE THE FOLLOWING EIGHT (8) COURSES:

(1) NORTH 83°03'00" WEST, A DISTANCE OF 150.11 FEET TO A POINT OF CURVE;

(2) ALONG THE ARC OF A CURVE TO THE RIGHT WITH A RADIUS OF 963.78 FEET AND A CENTRAL ANGLE OF 11°23'39", A DISTANCE OF 191.66 FEET, THE LONG CHORD OF WHICH BEARS NORTH 77°21'10" WEST, A DISTANCE OF 191.35 FEET TO A POINT OF TANGENT;

(3) NORTH 71°39'21" WEST, A DISTANCE OF 276.15 FEET TO A POINT OF CURVE;

(4) ALONG THE ARC OF A CURVE TO THE RIGHT WITH A RADIUS OF 208.06 FEET AND A CENTRAL ANGLE OF 37°31'18" A DISTANCE OF 136.26 FEET, THE LONG CHORD OF WHICH BEARS NORTH 52°53'42" WEST, A DISTANCE OF 133.83 FEET TO A POINT OF TANGENT;

(5) NORTH 34°08'03" WEST, A DISTANCE OF 557.70 FEET TO A POINT OF CURVE;

(6) ALONG THE ARC OF A CURVE TO THE RIGHT WITH A RADIUS OF 388.56 FEET AND A CENTRAL ANGLE OF 39°23'06" A DISTANCE OF 267.10 FEET, THE LONG CHORD OF WHICH BEARS NORTH 14°26'30" WEST, A DISTANCE OF 261.87 FEET TO A POINT OF TANGENT;

(7) NORTH 05°15'03" EAST, A DISTANCE OF 755.43 FEET TO A POINT OF CURVE;

(8) ALONG THE ARC OF A CURVE TO THE RIGHT WITH A RADIUS OF 565.00 FEET AND A CENTRAL ANGLE OF 09°47'20" A DISTANCE OF 96.53, THE LONG CHORD OF WHICH BEARS NORTH 10°08'43" EAST, A DISTANCE OF 96.41 FEET TO A POINT ON THE NORTH LINE OF THE SOUTHWEST 1/4 OF THE NORTHEAST 1/4 OF SAID SECTION 1;

THENCE SOUTH 89°39'54" EAST ALONG SAID NORTH LINE, A DISTANCE OF 990.20 FEET TO THE NORTHEAST CORNER OF THE SOUTHWEST 1/4 OF THE NORTHEAST 1/4 OF SAID SECTION 1; THENCE SOUTH 00°11'39" EAST, ALONG THE EAST LINE OF SAID SOUTHWEST 1/4 OF THE NORTHEAST 1/4, A DISTANCE OF 313.56 FEET TO THE NORTHWEST CORNER OF LOT 7, COTTONWOOD PARK IN RALSTON VALLEY, RECORDED IN BOOK 55 AT PAGE 10 IN THE RECORDS OF JEFFERSON COUNTY; THENCE NORTH 89°47'39" EAST, ALONG THE NORTH LINE OF SAID LOT 7, A DISTANCE OF 250.22 FEET TO THE NORTHEAST CORNER OF SAID LOT 7; THENCE SOUTHERLY ALONG THE WESTERLY RIGHT-OF-WAY LINE OF JOYCE STREET THE FOLLOWING THREE (3) COURSES:

(1) SOUTH 29°55'41" WEST, A DISTANCE OF 68.23 FEET TO A POINT OF CURVE;

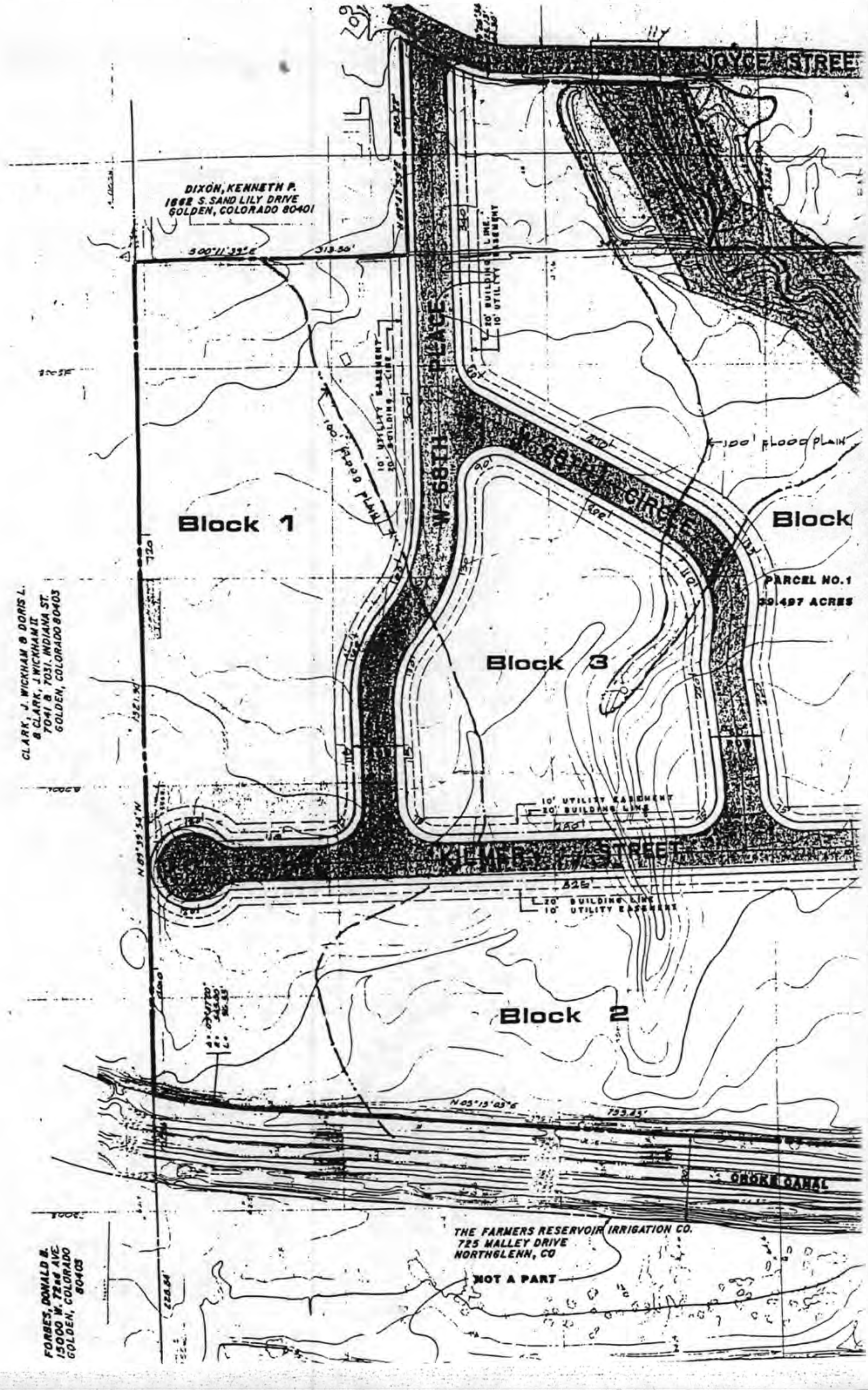
(2) ALONG THE ARC OF A CURVE TO THE LEFT WITH A RADIUS OF 125.00 FEET AND A CENTRAL ANGLE OF 29°26'36" A DISTANCE OF 64.30 FEET, THE LONG CHORD OF WHICH BEARS SOUTH 15°12'49" WEST, A DISTANCE OF 63.60 FEET TO A POINT OF TANGENT;

(3) SOUTH 00°29'04" WEST A DISTANCE OF 201.41 FEET; THENCE ALONG THE SOUTHERLY LINE OF SAID LOT 7 THE FOLLOWING TWO (2) COURSES:

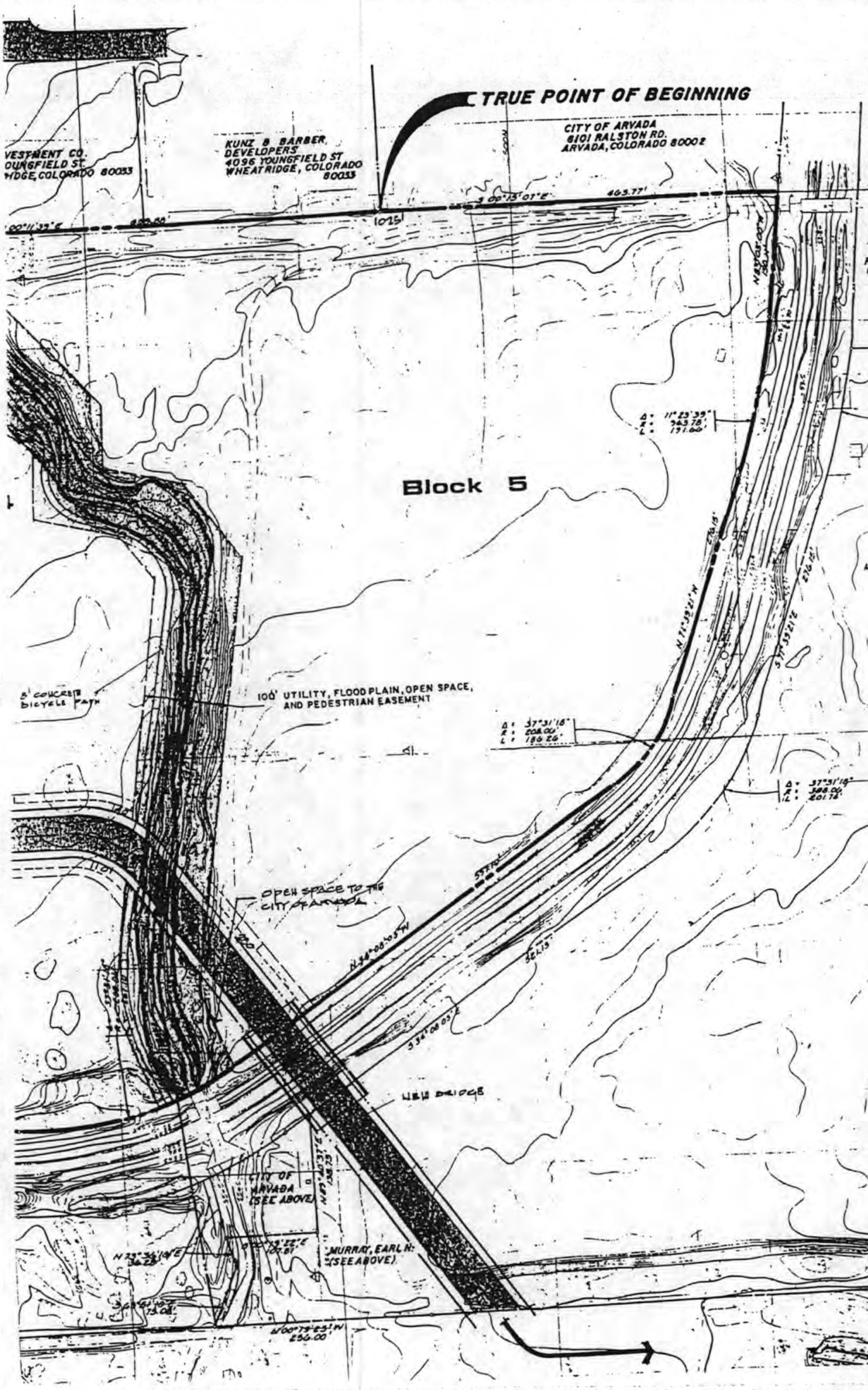
(1) SOUTH 71°50'32" WEST, A DISTANCE OF 150.35 FEET;

(2) NORTH 60°52'48" WEST, A DISTANCE OF 57.62 FEET TO A POINT ON THE EAST LINE OF THE SOUTHWEST 1/4 OF THE NORTHEAST 1/4 OF SAID SECTION 1;

THENCE SOUTH 00°11'39" EAST ALONG SAID EAST LINE, A DISTANCE OF 659.88 FEET TO THE TRUE POINT OF BEGINNING. CONTAINING 39.497 ACRES.



DIXON, KENNETH P.
1662 S. SAND LILY DRIVE
GOLDEN, COLORADO 80401
JOYCE STREET
W. 68TH PLACE
W. 68TH CIRCLE
Block 1
Block 3
Block 2
Block
PARCEL NO. 1
39.497 ACRES
100' FLOOD PLAIN
10' UTILITY EASEMENT
20' BUILDING LINE
KEMPER STREET
CLARK, J. WICKHAM & DORIS L.
& CLARK, J. WICKHAM II
7041 & 7031 INDIANA ST.
GOLDEN, COLORADO 80403
CROKE CANAL
THE FARMERS RESERVOIR IRRIGATION CO.
725 MALLEY DRIVE
NORTHGLENN, CO
NOT A PART
FORBES, DONALD B.
15000 W. 72nd AVE
GOLDEN, COLORADO
80403


TRUE POINT OF BEGINNING
KUNZ & BARBER DEVELOPERS
4096 YOUNGFIELD ST
WHEATRIDGE, COLORADO 80033
CITY OF ARVADA
8101 RALSTON RD.
ARVADA, COLORADO 80002
Block 5
100' UTILITY, FLOOD PLAIN, OPEN SPACE, AND PEDESTRIAN EASEMENT
OPEN SPACE TO THE CITY OF ARVADA
NEW BRIDGE
CITY OF ARVADA (SEE ABOVE)
MURRAY, EARL H. (SEE ABOVE)

APPENDIX D

JEFFERSON COUNTY QUARTER SECTION MAPS

1) 1986 Aerial Photograph - Site vicinity map with street and waterway labels.

2) Jefferson County Quarter Section 30-01 map

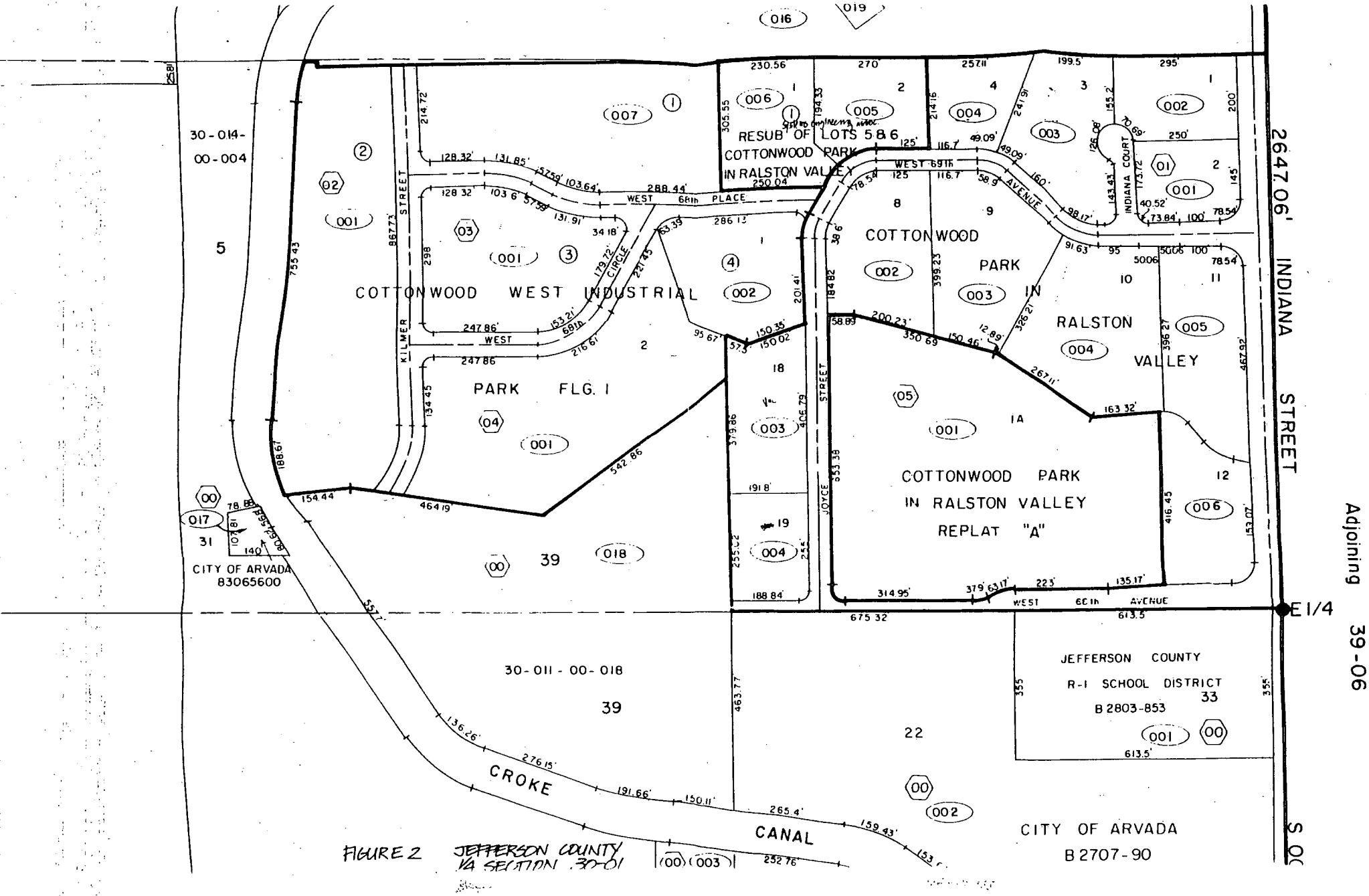


FIGURE 2 JEFFERSON COUNTY VA SECTION 30-01

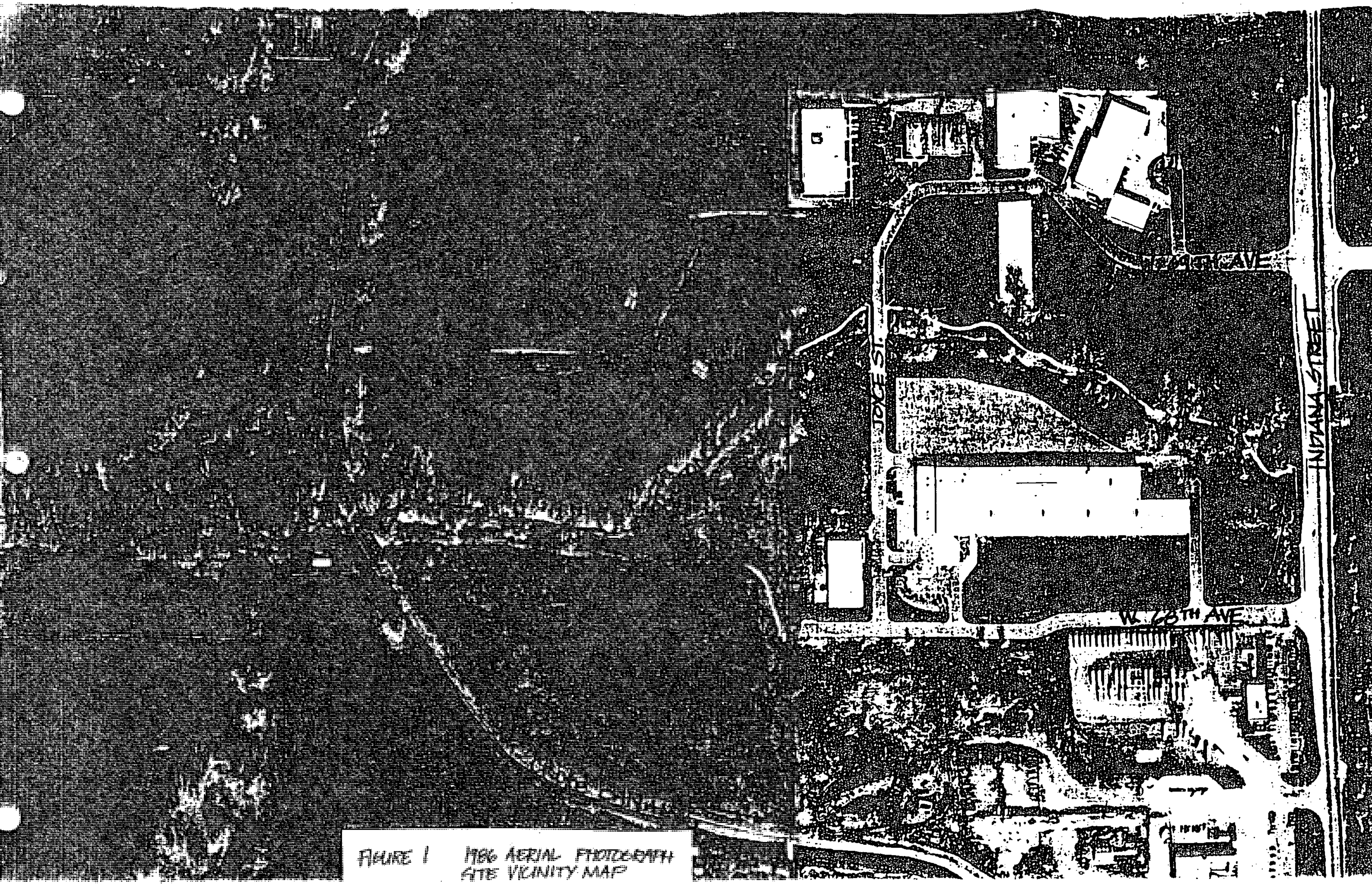


FIGURE 1 1986 AERIAL PHOTOGRAPH
SITE VICINITY MAP

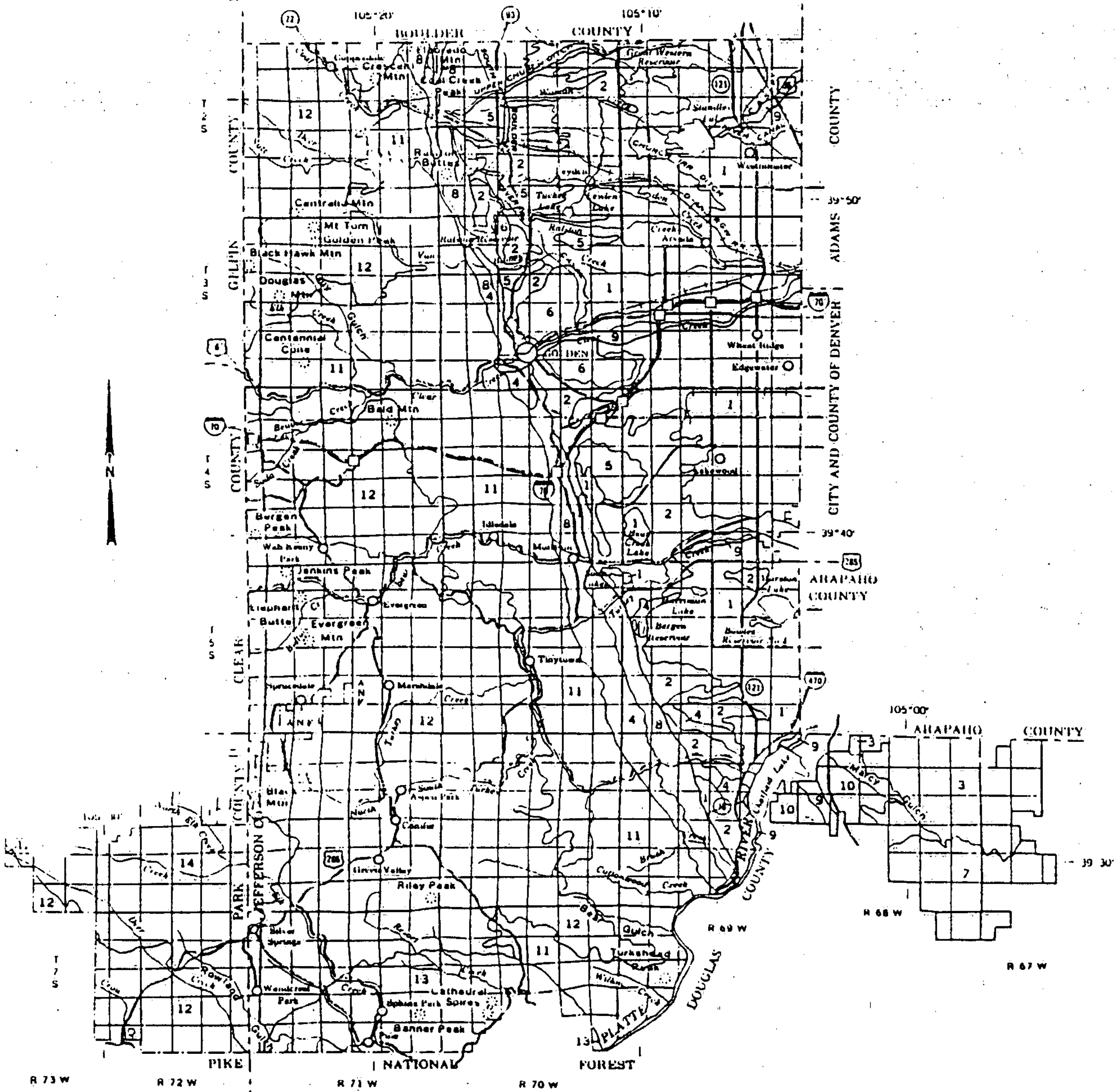
APPENDIX E

U.S.D.A. SOIL CONSERVATION SERVICE MAPS

1) Soil Survey Map and Legend
2) General Soil Map

SOIL LEGEND

SYMBOL	NAME
1	Alda loam, 0 to 2 percent slopes
2	Alda-Niwot complex, 0 to 2 percent slopes
3	Allens Park Variant-Ratake-Rock outcrop complex, 30 to 50 percent slopes
4	Argiustolls, loamy, 15 to 30 percent slopes
5	Argiustolls-Rock outcrop complex, 15 to 60 percent slopes
6	Arvada clay loam, 0 to 2 percent slopes
7	Ascalon sandy loam, 5 to 9 percent slopes
8	Ascalon sandy loam, 9 to 15 percent slopes
9	Baller-Rock outcrop complex, 15 to 50 percent slopes
10	Baller Variant-Lavina-Rock outcrop complex, 5 to 15 percent slopes
11	Baller Variant-Lavina-Rock outcrop complex, 15 to 30 percent slopes
12	Blakeland loamy sand, 0 to 9 percent slopes
13	Blakeland loamy sand, 9 to 15 percent slopes
14	Breece sandy loam, 9 to 25 percent slopes
15	Bresser sandy loam, 0 to 5 percent slopes
16	Bresser gravelly sandy loam, 9 to 25 percent slopes
17	Critchell gravelly sandy loam, 0 to 3 percent slopes
18	Critchell gravelly sandy loam, 3 to 9 percent slopes
19	Critchell gravelly sandy loam, 9 to 15 percent slopes
20	Critchell stony sandy loam, 0 to 5 percent slopes
21	Cryofluvents, 0 to 5 percent slopes
22	Cumulic Cryoborolls, loamy, 0 to 5 percent slopes
23	Curecanti very stony sandy loam, 15 to 50 percent slopes
24	Dacono Variant gravelly clay loam, 0 to 3 percent slopes
25	Denver clay loam, 0 to 2 percent slopes
26	Denver clay loam, 2 to 5 percent slopes
27	Denver clay loam, 5 to 9 percent slopes
28	Denver cobbly clay loam, 5 to 9 percent slopes
29	Denver-Kutch clay loams, 5 to 9 percent slopes
30	Denver-Kutch clay loams, 9 to 15 percent slopes
31	Denver-Kutch-Midway clay loams, 9 to 25 percent slopes
32	Denver-Kutch-Urban land complex, 5 to 9 percent slopes
33	Denver-Kutch-Urban land complex, 9 to 15 percent slopes
34	Denver-Urban land complex, 0 to 2 percent slopes
35	Denver-Urban land complex, 2 to 5 percent slopes
36	Denver-Urban land complex, 5 to 9 percent slopes
37	Earcree gravelly sandy loam, 9 to 15 percent slopes
38	Earcree Variant very gravelly sandy loam, 3 to 9 percent slopes
39	Earcree Variant very gravelly sandy loam, 9 to 15 percent slopes
40	Earcree Variant-Venable complex, 0 to 15 percent slopes
41	Englewood clay loam, 0 to 2 percent slopes
42	Englewood clay loam, 2 to 5 percent slopes
43	Englewood clay loam, wet, 0 to 3 percent slopes
44	Englewood-Urban land complex, 0 to 2 percent slopes
45	Flatirons very cobbly sandy loam, 0 to 3 percent slopes
46	Flatirons very stony sandy loam, 0 to 5 percent slopes
47	Flatirons very stony sandy loam, 5 to 9 percent slopes
48	Flatirons very stony sandy loam, 9 to 15 percent slopes
49	Flatirons very stony sandy loam, 15 to 30 percent slopes
50	Fluvaquents, sandy, 0 to 2 percent slopes
51	Fondis loam, 0 to 3 percent slopes
52	Garber Variant very gravelly sandy loam, 5 to 9 percent slopes
53	Garber Variant very gravelly sandy loam, 9 to 15 percent slopes
54	Grimstone stony sandy loam, 9 to 15 percent slopes
55	Grimstone-Hiwan-Rock outcrop complex, 30 to 60 percent slopes
56	Grimstone-Peeler-Rock outcrop complex, 15 to 30 percent slopes
57	Grimstone-Peeler-Rock outcrop complex, 30 to 50 percent slopes
58	Hargreave sandy loam, 3 to 9 percent slopes
59	Hargreave-Bernal sandy loams, 9 to 15 percent slopes
60	Haverson loam, 0 to 3 percent slopes
61	Haverson loam, 3 to 9 percent slopes
62	Heldt clay, 3 to 9 percent slopes
63	Heldt clay, 9 to 15 percent slopes
64	Herdman-Sorucedale-Rock outcrop complex, 9 to 15 percent slopes
65	Herdman-Sorucedale-Rock outcrop complex, 15 to 30 percent slopes
66	Kittredge-Earcree complex, 3 to 9 percent slopes
67	Kittredge-Earcree complex, 9 to 20 percent slopes
68	Kittredge-Venable complex, 0 to 15 percent slopes
69	Laporte Variant complex, 15 to 60 percent slopes
70	Lavate sandy loam, 3 to 9 percent slopes
71	Lavate sandy loam, 9 to 15 percent slopes
72	Lavate-Bernal-Rock outcrop complex, 15 to 30 percent slopes
73	Lavina loam, very rocky, 0 to 5 percent slopes
74	Lebsack clay loam, saline, 0 to 2 percent slopes
75	Legault-Hiwan stony loamy sands, 5 to 15 percent slopes
76	Legault-Hiwan stony loamy sands, 15 to 30 percent slopes
77	Legault-Hiwan-Rock outcrop complex, 30 to 50 percent slopes
78	Legault-Tolvar-Rock outcrop complex, 50 to 70 percent slopes
79	Leyden-Nunn-Rooney complex, 9 to 30 percent slopes
80	Leyden-Primen-Standley cobbly clay loams, 15 to 50 percent slopes
81	Leyden-Primen-Standley extremely stony clay loams, 30 to 70 percent slopes
82	Leyden-Standley-Primen cobbly clay loams, 9 to 15 percent slopes
83	Leyden-Standley-Primen very cobbly clay loams, 30 to 60 percent slopes
84	Lininger-Ratake complex, 5 to 15 percent slopes
85	Lininger-Ratake complex, 15 to 30 percent slopes
86	Lininger-Trag sandy loams, 3 to 9 percent slopes
87	Lininger-Trag sandy loams, 9 to 20 percent slopes
88	Loveland clay loam, 0 to 1 percent slopes
89	Loveland Variant gravelly sandy loam, 0 to 2 percent slopes
90	Manzano fine sandy loam, 0 to 2 percent slopes
91	Manzanola clay loam, 0 to 5 percent slopes
92	Manzanola clay loam, 5 to 9 percent slopes
93	Manzanola clay loam, 9 to 15 percent slopes
94	Manzanola clay loam, 15 to 25 percent percent slopes
95	Manzanola cobbly clay loam, 15 to 25 percent slopes
96	Manzanola-Renohill-Stoneham complex, 9 to 15 percent slopes
97	McClave clay loam, 0 to 3 percent slopes
98	Midway clay loam, 9 to 30 percent slopes
99	Midway stony clay loam, 15 to 40 percent slopes
100	Nederland very cobbly sandy loam, 15 to 50 percent slopes
101	Nederland Variant very cobbly sandy loam, 30 to 50 percent slopes
102	Nunn clay loam, 0 to 2 percent slopes
103	Nunn clay loam, 2 to 5 percent slopes
104	Nunn clay loam, 5 to 9 percent slopes
105	Nunn-Urban land complex, 0 to 2 percent slopes
106	Nunn-Urban land complex, 2 to 5 percent slopes
107	Nunn-Urban land complex, 5 to 9 percent slopes
108	Nunn Variant-Urban land complex, 0 to 3 percent slopes
109	Paymaster sandy loam, 0 to 3 percent slopes
110	Pits, clevey
111	Pits, gravel
112	Platner loam, 3 to 5 percent slopes
113	Platner-Urban land complex, 0 to 3 percent slopes
114	Raleigh very gravelly sandy loam, 9 to 15 percent slopes
115	Raleigh very gravelly sandy loam, 15 to 30 percent slopes
116	Raleigh very gravelly sandy loam, 30 to 50 percent slopes
117	Raleigh very gravelly sandy loam, 2 to 9 percent south slopes
118	Raleigh very gravelly sandy loam, 9 to 15 percent south slopes
119	Raleigh very gravelly sandy loam, 15 to 30 percent south slopes
120	Raleigh stony sandy loam, 30 to 50 percent south slopes
121	Raleigh-Rock outcrop complex, 50 to 70 percent slopes
122	Ratake-Cathedral very stony sandy loams, 25 to 60 percent slopes
123	Ratake-Cathedral-Rock outcrop complex, 25 to 60 percent slopes
124	Ratake-Cathedral-Rock outcrop complex, 25 to 60 percent north slopes
125	Ratake-Lininger stony sandy loams, 30 to 60 percent slopes
126	Razor-Heldt clay loams, 9 to 25 percent slopes
127	Razor-Heldt-Midway cobbly clay loams, 15 to 30 percent slopes
128	Rednun clay loam, 0 to 3 percent slopes
129	Rednun clay loam, 3 to 9 percent slopes
130	Rednun clay loam, 9 to 15 percent slopes
131	Rednun-Chaney Variant clay loams, 9 to 15 percent slopes
132	Renohill loam, 5 to 9 percent slopes
133	Renohill-Manzanola clay loams, 9 to 15 percent slopes
134	Renohill-Midway complex, 9 to 15 percent slopes
135	Resort-Sohinx very gravelly sandy loams, 9 to 15 percent slopes
136	Resort-Sohinx very gravelly sandy loams, 15 to 30 percent slopes
137	Resort-Sohinx very gravelly sandy loams, 30 to 50 percent slopes
138	Rock outcrop, igneous and metamorphic
139	Rock outcrop, sedimentary
140	Rock outcrop-Cathedral-Ratake complex, 50 to 100 percent slopes
141	Rogert-Heroman-Rock outcrop complex, 30 to 70 percent slopes
142	Rooney very cobbly sandy loam, 15 to 50 percent slopes
143	Rooney-Primen-Leyden complex, 15 to 50 percent slopes
144	Rooney-Rock outcrop complex, 50 to 70 percent slopes
145	Rosane sandy loam, 0 to 3 percent slopes
146	Rosane-Venable fine sandy loams, 0 to 3 percent slopes
147	Sohinx-Resort-Rock outcrop complex, 50 to 70 percent slopes
148	Standley-Leyden-Primen very stony clay loams, 15 to 30 percent slopes
149	Standley-Nunn gravelly clay loams, 0 to 5 percent slopes
150	Tolvar very gravelly loamy sand, 15 to 30 percent slopes
151	Torrifluvents, very gravelly, 0 to 3 percent slopes
152	Trag sandy loam, 3 to 9 percent slopes
153	Trag sandy loam, 9 to 25 percent slopes
154	Troutdale gravelly sandy loam, 3 to 9 percent slopes
155	Troutdale-Kittredge sandy loams, 5 to 15 percent slopes
156	Troutdale-Rogert-Kittredge complex, 15 to 30 percent slopes
157	Troutdale-Sorucedale gravelly sandy loams, 3 to 15 percent slopes
158	Truckton sandy loam, 0 to 3 percent slopes
159	Truckton sandy loam, 3 to 9 percent slopes
160	Ulm clay loam, 5 to 9 percent slopes
161	Ulm-Urban land complex, 0 to 3 percent slopes
162	Ulm-Urban land complex, 3 to 5 percent slopes
163	Ulm-Urban land complex, 5 to 9 percent slopes
164	Ulm-Urban land complex, 9 to 18 percent slopes
165	Ustic Torriorthents, loamy, 15 to 50 percent slopes
166	Ustic Torriorthents, clayey, 0 to 50 percent slopes
167	Ustorthents, cool-Rock outcrop complex, 15 to 50 percent slopes
168	Valmont clay loam, 0 to 3 percent slopes
169	Veldkamp-Nederland very cobbly sandy loams, 0 to 3 percent slopes
170	Venable loam, 0 to 3 percent slopes
171	Venable loam, 3 to 9 percent slopes
172	Wann fine sandy loam, 0 to 2 percent slopes
173	Willowman cobbly sandy loam, 0 to 5 percent slopes
174	Willowman-Leyden cobbly loams, 9 to 30 percent slopes
175	Yoder Variant gravelly sandy loam, 9 to 30 percent slopes
176	Yoder Variant-Midway complex, 15 to 60 percent slopes



SOIL ASSOCIATIONS

DOMINANTLY WELL DRAINED CLAYEY AND LOAMY SOILS ON HIGH TERRACES, HILL SLOPES AND FANS

1 — [illegible]

2 — [illegible]

3 — [illegible]

4 — [illegible]

DOMINANTLY WELL DRAINED LOAMY AND GRAVELLY SOILS ON FANS, TERRACES, HILL SLOPES AND STABLE SUMMITS

5 — [illegible]

DOMINANTLY WELL DRAINED STONY LOAMY OR CLAYEY SOILS ON MESA TOPS, STABLE SUMMITS AND HILL SLOPES

6 — [illegible]

7 — [illegible]

DOMINANTLY WELL DRAINED STONY AND LOAMY SOILS ON HOGBACKS AND HILL SLOPES

8 — [illegible]

DOMINANTLY SOMEWHAT EXCESSIVELY DRAINED AND SOMEWHAT POORLY DRAINED LOAMY, VERY GRAVELLY AND SANDY SOILS ON FLOOD PLAINS AND LOW TERRACES

9 — [illegible]

DOMINANTLY SOMEWHAT EXCESSIVELY DRAINED AND WELL DRAINED SANDY AND LOAMY SOILS ON HIGH TERRACES AND HILL SLOPES

10 — [illegible]

DOMINANTLY WELL DRAINED STONY, GRAVELLY, LOAMY AND SANDY SOILS ON MOUNTAIN SIDE SLOPES AND STABLE SUMMITS AND IN DRAINAGEWAYS

11 — [illegible]

12 — [illegible]

13 — [illegible]

14 — [illegible]

* [illegible]

[illegible]

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GENERAL SOIL MAP

GOLDEN AREA COLORADO
PARTS OF
DENVER, DOUGLAS, JEFFERSON AND PARK COUNTIES.

Scale 1:253,440

1 0 1 2 3 4 Miles

4 Miles = 1"

APPENDIX F

LABORATORY RESULTS
ATI (ANALYTICAL TECHNOLOGIES, INC.)

Analytical Technologies, Inc. 225 Commerce Drive Fort Collins, Colorado 80524 (303) 490-1511

Message

Dave,

Here are your results.

Steve F.

To Dave Runyon Company EREE

Fax No. 843-6215 Date 1-14-92

From Steven Fry Number of pages including this sheet 21

If you do not receive all the pages please call us back as soon as possible.

Analytical Technologies, Inc. 225 Commerce Drive Fort Collins, Colorado 80524 (303) 490-1511

January 14, 1992

Mr. Dave Runyon
ERCE
Stanford Place 3, Suite 415
4582 South Ulster Street Parkway
Denver, CO 80237

RE: ATI Workorder: 91-12-190
Client Project Name: Cottonwood ESA

Dear Mr. Runyon:

Two soil samples and two water samples were received from ERCE on December 27, 1991. The samples were scheduled for the following analyses: Volatile Organics, PCB's, and Total Lead. Results for these analyses are contained in the following report.

Please note that the Volatile Organic surrogate recoveries for sample "001" were outside the method required limits. This sample was re-analyzed and the surrogates once again did not meet the required recovery limits. This is probably due to the matrix of the sample, i.e., the sample resembled activated carbon.

Thank you for your confidence in Analytical Technologies, Inc. Should you have any questions, please call.

Sincerely yours,

Steven Fry, Ph.D.
Project Manager

SF/kci

Enclosures

Analytical Technologies, Inc.

QUALITY ASSURANCE
DATA REVIEW

The data contained in the following report has been reviewed and approved by the appropriate supervisory personnel listed below:

Alex Blanche, GC/GCMS Supervisor

CERTIFICATION

Analytical Technologies Inc. certifies that the analyses reported herein are true, complete and correct within the limits of the method employed.

Analytical Technologies, Inc.

QUALITY ASSURANCE
DATA REVIEW

The data contained in the following report has been reviewed and approved by the appropriate supervisory personnel listed below:

Tom Austin, Jr.
GC/HPLC/Fuels Supervisor

CERTIFICATION

Analytical Technologies, Inc. certifies that the analyses reported herein are true, complete and correct within the limits of the method employed.

VOLATILE ORGANICS DATA SHEET

Method 8240

Client Sample ID:
Reagent Blank

Lab Name: Analytical Technologies Inc.
Client Name: ERCE
Client Project ID: Cottonwood ESA
Sample Matrix: Soil

Lab Sample ID: 91-12-190-RB
Date Collected: N/A
Date Analyzed: 01/09/92
Dilution Factor: 1

COMPOUND NAME	Concentration ug/kg	
Chloromethane	<	10
Bromomethane	<	10
Vinyl chloride	<	10
Chloroethane	<	10
Methylene chloride	<	5
Acetone	<	10
Carbon disulfide	<	5
1,1-Dichloroethene	<	5
1,1-Dichloroethane	<	5
1,2-Dichloroethene (Total)	<	5
Chloroform	<	5
1,2-Dichloroethane	<	5
2-Butanone	<	10
1,1,1-Trichloroethane	<	5
Carbon tetrachloride	<	5
Vinyl Acetate	<	10
Bromodichloromethane	<	5
1,2-Dichloropropane	<	5
cis-1,3-Dichloropropene	<	5
Trichloroethene	<	5
Dibromochloromethane	<	5
1,1,2-Trichloroethane	<	5
Benzene	<	5
trans-1,3-Dichloropropene	<	5
Bromoform	<	5
2-Hexanone	<	10
4-Methyl-2-pentanone	<	10
Tetrachloroethene	<	5
1,1,2,2-Tetrachloroethane	<	5
Toluene	<	5
Chlorobenzene	<	5
Ethylbenzene	<	5
Styrene	<	5
Total Xylenes	<	5

Surrogate Recoveries:	% Rec	% Rec Limits
1,2-Dichloroethane-d4	87	70-121
Toluene-d8	104	81-117
Bromofluorobenzene	102	74-121

VOLATILE ORGANICS DATA SHEET

Method 8240

Client Sample ID: 001

Lab Name: Analytical Technologies Inc. Lab Sample ID: 91-12-190-01
Client Name: ERCE Date Collected: 12/26/91
Client Project ID: Cottonwood ESA Date Analyzed: 01/09/92
Sample Matrix: Soil Dilution Factor: 1

COMPOUND NAME	Concentration (ug/kg)		
Chloromethane	<	10	
Bromomethane	<	10	
Vinyl chloride	<	10	
Chloroethane	<	10	
Methylene chloride		120	
Acetone		68	
Carbon disulfide	<	5	
1,1-Dichloroethene		2	J
1,1-Dichloroethane	<	5	
1,2-Dichloroethene (Total)		4	J
Chloroform		3	J
1,2-Dichloroethane	<	5	
2-Butanone	<	10	
1,1,1-Trichloroethane		12	
Carbon tetrachloride	<	5	
Vinyl Acetate	<	10	
Bromodichloromethane	<	5	
1,2-Dichloropropane	<	5	
cis-1,3-Dichloropropene	<	5	
Trichloroethene		4	J
Dibromochloromethane	<	5	
1,1,2-Trichloroethane	<	5	
Benzene		4	J
trans-1,3-Dichloropropene	<	5	
Bromoform	<	5	
2-Hexanone	<	10	
4-Methyl-2-pentanone	<	10	
Tetrachloroethene		23	
1,1,2,2-Tetrachloroethane	<	5	
Toluene		24	
Chlorobenzene		4	J
Ethylbenzene		7	
Styrene	<	5	
Total Xylenes		43	

Surrogate Recoveries:	% Rec	% Rec Limits
1,2-Dichloroethane-d4	93	70-121
Toluene-d8	72 *	81-117
Bromofluorobenzene	122 *	74-121

* Outside control limits.

J = compound detected below practical quantitation limit.

VOLATILE ORGANICS DATA SHEET

Tentatively Identified Compounds

Client Sample ID:

001

Laboratory Name: Analytical Technologies, Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Lab Sample ID: 91-12-190-01

Date Collected: 12/26/91

Date Analyzed: 01/09/92

Dilution Factor: 1

Matrix: Soil

Concentration units: ug/kg

COMPOUND NAME	RT	Concentration	Q
Trichlorofluoromethane		120 J	

J = estimated value

VOLATILE ORGANICS DATA SHEET

Method 8240

Client Sample ID:
Reagent Blank

Lab Name: Analytical Technologies Inc.
Client Name: ERCE
Client Project ID: Cottonwood ESA
Sample Matrix: Water

Lab Sample ID: 91-12-190-RB
Date Collected: N/A
Date Analyzed: 01/09/92
Dilution Factor: 1

COMPOUND NAME	Concentration ug/L	
Chloromethane	<	10
Bromomethane	<	10
Vinyl chloride	<	10
Chloroethane	<	10
Methylene chloride	<	5
Acetone	<	10
Carbon disulfide	<	5
1,1-Dichloroethene	<	5
1,1-Dichloroethane	<	5
1,2-Dichloroethene (Total)	<	5
Chloroform	<	5
1,2-Dichloroethane	<	5
2-Butanone	<	10
1,1,1-Trichloroethane	<	5
Carbon tetrachloride	<	5
Vinyl Acetate	<	10
Bromodichloromethane	<	5
1,2-Dichloropropane	<	5
cis-1,3-Dichloropropene	<	5
Trichloroethene	<	5
Dibromochloromethane	<	5
1,1,2-Trichloroethane	<	5
Benzene	<	5
trans-1,3-Dichloropropene	<	5
Bromoform	<	5
2-Hexanone	<	10
4-Methyl-2-pentanone	<	10
Tetrachloroethene	<	5
1,1,2,2-Tetrachloroethane	<	5
Toluene	<	5
Chlorobenzene	<	5
Ethylbenzene	<	5
Styrene	<	5
Total Xylenes	<	5

Surrogate Recoveries:	% Rec	% Rec Limits
1,2-Dichloroethane-d4	87	76-116
Toluene-d8	104	88-110
Bromofluorobenzene	102	86-115

VOLATILE ORGANICS DATA SHEET

Method 8240

Client Sample ID: 004

Lab Name: Analytical Technologies Inc. Lab Sample ID: 91-12-190-03
Client Name: ERCE Date Collected: 12/26/91
Client Project ID: Cottonwood ESA Date Analyzed: 01/09/92
Sample Matrix: Water Dilution Factor: 1

COMPOUND NAME	Concentration (ug/L)		
Chloromethane	<	10	
Bromomethane	<	10	
Vinyl chloride	<	10	
Chloroethane	<	10	
Methylene chloride	<	5	
Acetone	<	10	
Carbon disulfide	<	5	
1,1-Dichloroethene	<	5	
1,1-Dichloroethane	<	5	
1,2-Dichloroethene (Total)	<	5	
Chloroform	<	5	
1,2-Dichloroethane	<	5	
2-Butanone	<	10	
1,1,1-Trichloroethane	<	5	
Carbon tetrachloride	<	5	
Vinyl Acetate	<	10	
Bromodichloromethane	<	5	
1,2-Dichloropropane	<	5	
cis-1,3-Dichloropropene	<	5	
Trichloroethene	<	5	
Dibromochloromethane	<	5	
1,1,2-Trichloroethane	<	5	
Benzene	<	5	
trans-1,3-Dichloropropene	<	5	
Bromoform	<	5	
2-Hexanone	<	10	
4-Methyl-2-pentanone	<	10	
Tetrachloroethene	<	5	
1,1,2,2-Tetrachloroethane	<	5	
Toluene	<	5	
Chlorobenzene	<	5	
Ethylbenzene	<	5	
Styrene	<	5	
Total Xylenes	<	5	
Surrogate Recoveries:	**%**	**Rec**	**% Rec Limits**
1,2-Dichloroethane-d4		87	76-116
Toluene-d8		102	88-110
Bromofluorobenzene		101	86-115

Tentatively Identified Compounds

Client Sample ID:

004

Laboratory Name: Analytical Technologies, Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Lab Sample ID: 91-12-190-03

Date Collected: 12/26/91

Date Analyzed: 01/09/92

Dilution Factor: 1 1

Matrix: Water

Concentration units: ug/L

COMPOUND NAME	RT	Concentration	Q
Methyl-t-butyl ether		10 J	

J = estimated value

VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY
Method 8240

Lab Name: Analytical Technologies, Inc.

Client Sample ID: In House

Client Name: ERCE

Lab Sample ID: 20199905/AZ

Sample Matrix: Water

Date Analyzed: 01/09/92

Compound	Spike Added (ug/L)	Sample Concentration (ug/L)	MS Concentration (ug/L)	MS % REC
1,1-Dichloroethene	50	< 5	57	114
Trichloroethene	50	< 5	43	86
Benzene	50	< 5	39	78
Toluene	50	< 5	51	102
Chlorobenzene	50	< 5	50	100

Compound	Spike Added (ug/L)	MSD Concentration (ug/L)	MSD % REC	% RPD
1,1-Dichloroethene	50	58	116	2
Trichloroethene	50	44	88	2
Benzene	50	41	82	5
Toluene	50	49	98	4
Chlorobenzene	50	51	102	2

QUALITY CONTROL LIMITS

Compound	Water		Soil	
	%REC	RPD	% Rec	RPD
1,1-Dichloroethene	61 - 145	14	59 - 172	22
Trichloroethene	71 - 120	14	62 - 137	24
Benzene	76 - 127	11	60 - 133	21
Toluene	76 - 125	13	59 - 139	21
Chlorobenzene	75 - 130	13	66 - 142	21

PCB ANALYSIS DATA SHEET
Method 8080

Lab Name: Analytical Technologies Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Lab Sample ID: 91-12-190-RBS

Sample Matrix: Sodium Sulfate

Sample Weight: 30 g

GPC Cleanup: N

Client Sample ID: Reagent Blank

Date Collected: N/A

Date Extracted: 12/30/91

Date Analyzed: 01/03/92

Extract Volume: 10 mL

Dilution Factor: 1

Compound	Conc (mg/kg)
PCB 1016	< 0.03
PCB 1221	< 0.03
PCB 1232	< 0.03
PCB 1242	< 0.03
PCB 1248	< 0.03
PCB 1254	< 0.03
PCB 1260	< 0.03

SURROGATE RECOVERY

Compound	% Recovery
Tetrachloro-m-xylene	86

PCB ANALYSIS DATA SHEET
Method 8080

Lab Name: Analytical Technologies Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Lab Sample ID: 91-12-190-02A

Sample Matrix: Soil

Sample Weight: 30 g

GPC Cleanup: N

Client Sample ID: 002

Date Collected: 12/26/91

Date Extracted: 12/30/91

Date Analyzed: 01/03/92

Extract Volume: 10 mL

Dilution Factor: 1

Compound	Conc (mg/kg)
PCB 1016	< 0.03
PCB 1221	< 0.03
PCB 1232	< 0.03
PCB 1242	< 0.03
PCB 1248	< 0.03
PCB 1254	< 0.03
PCB 1260	< 0.03

SURROGATE RECOVERY

Compound	% Recovery
Tetrachloro-m-xylene	98

PCB MATRIX SPIKE RESULTS
Method 8080

Client Sample ID: In House

Lab Name: Analytical Technologies, Inc.

Client Name: ERCE

Lab Sample ID: 91-12-114-01A

Date Analyzed: 12/19/91

Sample Matrix: Soil

GC Column: DB-1701

Compound	Spike Added (mg/kg)	Sample Concentration (mg/kg)	MS Concentration (mg/kg)	MS Percent Recovery
PCB 1260	0.50	< 0.3	0.597	119

Compound	Spike Added (mg/kg)	MSD Concentration (mg/kg)	MSD Percent Recovery	RPD
PCB 1260	0.50	0.607	121	2

PCB ON-GOING PRECISION AND RECOVERY
Method 8080

Lab Name: Analytical Technologies, Inc.

Lab Sample ID: 91-12-190-OPR

Client Name: ERCE

Date Analyzed: 01/03/92

Sample Matrix: Soil

GC Column: DB-608

Compound	Spike Added (mg/kg)	OPR Concentration (mg/kg)	OPR Percent Recovery
PCB 1260	0.50	0.590	118

Compound	Spike Added (mg/kg)	OPRD Concentration (mg/kg)	OPRD Percent Recovery	RPD
PCB 1260	0.50	0.657	131	11

Analytical Technologies, Inc.

QUALITY ASSURANCE
DATA REVIEW

The data contained in the following report has been reviewed and approved by the appropriate supervisory personnel listed below:

Steve Workman

Steve Workman, GC/HPLC/Inorganics Supervisor

CERTIFICATION

Analytical Technologies Inc. certifies that the analyses reported herein are true, complete and correct within the limits of the method employed.

TOTAL LEAD ANALYSIS DATA SHEET

Laboratory Name: Analytical Technologies, Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Workorder Number: 91-12-190

Date Collected: 12/26/91

Prep Date: 01/02/92

Date Analyzed: 01/03/92

Sample Matrix: Soil

Client ID.	ATI ID.	Lead Conc. (mg/kg)
Reagent Blank	91-12-190-RB	< 5
002	91-12-190-02	56

TOTAL LEAD ANALYSIS DATA SHEET

Laboratory Name: Analytical Technologies, Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Workorder Number: 91-12-190

Date Collected: 12/26/91

Prep Date: 01/02/92

Date Analyzed: 01/02/92

Sample Matrix: Water

Client ID.	ATI ID.	Lead Conc. (mg/L)
Reagent Blank	91-12-190-RB	< 0.003
005	91-12-190-04	0.065

TOTAL LEAD MATRIX SPIKE

Client Sample ID: In House

Laboratory Name: Analytical Technologies, Inc.

Client Name: ERCE

Prep Date: 01/02/92

Lab Sample ID: 9659A/FL

Date Analyzed: 01/03/92

Sample Matrix: Soil

Compound	Spike Added (mg/kg)	Sample Concentration (mg/kg)	MS Concentration (mg/kg)	MS Percent Recovery
Lead	50	< 5	54	108

TOTAL LEAD MATRIX SPIKE

Client Sample ID: In House

Laboratory Name: Analytical Technologies, Inc.

Client Name: ERCE

Lab Sample ID: 9600B-1/FL

Sample Matrix: Water

Prep Date: 01/02/92

Date Analyzed: 01/02/92

Compound	Spike Added (mg/L)	Sample Concentration (mg/L)	MS Concentration (mg/L)	MS Percent Recovery
Lead	0.80	< 0.003	0.80	100

11-12-170

CON...ACTOR ERCE SAMPLERS Ron C. Holm, Will Glasgow PROJECT # COTR00101 ESA

SITE CONTACT/PHONE DAVE RUNYON 843-6210 LAB/LOCATION ATI - FORT COLLINS

C-O-C NUMBER 0001

~~ERCE ROCKY FLATS~~ RCRA, CHAIN OF CUSTODY

ERCE (DENVER)
DENVER TECH CENTER
STANFORD PLACE #3 STE 415 Denver Co

	DATE/TIME		SAMPLE NUMBER	LOCATION	CONTAINER TYPE	NUMBER OF CONTAINERS	MEDIA SOIL(S) WATER (W)	FILTERED-F POT DISS-P	TURN AROUND RUSH -R	OUT OF SPEC REPORTS	PRESERVATIVE: COOLED TO 4C	HCl	NaOH	HNO3	H2SO4	BOTTLE CODES: VOA	OIL+GREASE	RCRA + METALS	TOTAL METALS
01	12-26-91	1330	001	LANDFILL	2oz GLASS	1	S				Y					X			
02		1335	002	LANDFILL	2oz GLASS	2	S				Y						X	X	
*		1420	003	Walnut Creek	2oz GLASS	1	W				Y					X			
03		1500	004	Hole #6	40ml Vials	2	W				Y					X			
04		1505	005	Hole #6	Liter	1	W				Y			X				X	

Pour 12-26-91

Pour 12-26-91

RELINQUISHED BY	DATE/TIME		RECEIVED BY	DATE/TIME	
Ron C. Holm	11-27-91	0919	Debi Busdick	12/27/91	9:15 am

LABORATORY USE ONLY	Y	N
PCKG RECD/CUSTODY SEALS INTACT	✓	
SAMPLE LABELS/COCs AGREE	✓	
TEMPERATURE WITHIN SPECIFICATION ____C		
CORRECTED COPY ATTACHED		
PROBLEMS OR DISCREPANCIES		

REMARKS

SHIPMENT METHOD personal delivery by Ron.

* HOLD SAMPLE - DO NOT RUN. NOT ENOUGH SAMPLE. RON WILL GET BACK TO US 12/27/91 & [illegible] ANOTHER SAMPLING (TOTAL METALS FOR SOIL & WATER SAMPLES)

AnalyticalTechnologies, Inc. 225 Commerce Drive Fort Collins, Colorado 80524 (303) 490-1511

January 3, 1992

Mr. Dave Runyon
ERCE
Stanford Place 3, Suite 415
4582 South Ulster Street Parkway
Denver, CO 80237

RE: ATI Workorder: 91-12-195
Client Project Name: Cottonwood ESA

Dear Mr. Runyon:

One water sample was received from ERCE on December 27, 1991. The sample was scheduled for Total Extractable Petroleum Hydrocarbons analysis. Results for this analysis are contained in the following report.

Thank you for your confidence in Analytical Technologies, Inc. Should you have any questions, please call.

Sincerely yours,

Penny Brogan-Paley for

Steven Fry, Ph.D.
Project Manager

SF/jw

Enclosures

Analytical Technologies, Inc.

QUALITY ASSURANCE
DATA REVIEW

The data contained in the following report has been reviewed and approved by the appropriate supervisory personnel listed below:

Eddy Hammerquist

Eddy Hammerquist, Fuels Supervisor

CERTIFICATION

Analytical Technologies, Inc. certifies that the analyses reported herein are true, complete and correct within the limits of the method employed.

TOTAL EXTRACTABLE PETROLEUM HYDROCARBONS
Modified Method 8015

Lab Name: Analytical Technologies, Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

ATI Workorder Number: 91-12-195

Date Collected: 12/27/91

Date Extracted: 12/31/91

Date Analyzed: 12/31/91

Sample Matrix: Water

Client Sample ID	Lab Sample ID	Dilution Factor	Conc. TEPH (mg/L)
Reagent Blank	91-12-195-RB	1	< 1
006	91-12-195-01	1	2

Note: Sample 006 contains high molecular weight components which could not be quantified by TPH-D analytical conditions.

TOTAL EXTRACTABLE PETROLEUM HYDROCARBONS
MATRIX SPIKE RESULTS
Modified Method 8015

Lab Name: Analytical Technologies, Inc.

Client Name: ERCE

Client Sample ID: 008

Lab Sample ID: 91-12-195-01

Sample Matrix: Water

Date Analyzed: 12/31/91

GC Column: DB-5

Compound	Spike Added (mg/L)	Sample Concentration (mg/L)	MS Concentration (mg/L)	MS Percent Recovery
TEPH	10	2	10	80

Compound	Spike Added (mg/L)	MSD Concentration (mg/L)	MSD Percent Recovery	Matrix Spike RPD
TEPH	10	9.8	78	2

CONTRA ERCE - DENVER SAMPLERS Ron C. Holm PROJECT COTTONWOOD E

SITE CONTACT/PHONE DAVE RUNYON 843-6210 LAB/LOCATION ATI - FT. COLLINS

C-O-C NUMBER 0002

~~CO&G ROCKY FLATS~~ RCH, CHAIN OF CUSTODY

ERCE - STANFORD PL. 3 SUITE 415
4582 So. Ulster St. Pkwy
DENVER, CO 80237

	DATE/TIME		SAMPLE NUMBER	LOCATION	CONTAINER TYPE	NUMBER OF CONTAINERS	MEDIA SOIL(S) WATER (W)	FILTERED-F POT DISS-P	TURN AROUND RUSH-R	OUT OF SPEC REPORTS	PRESERVATIVE: COOLED TO 4 C	HCl	NAOH	HNO3	H2SO4	BOTTLE CODES
01	12/27/91	1605	006	Ralston Cr.	1L glass amb	1	W				Y					A1

9-12-195

POR 12-27-91

RELINQUISHED BY	DATE/TIME		RECEIVED BY	DATE/TIME	
Ron C. Holm	12/27/91	0750	Derek Fullerton	12/28/91	8:50

REMARKS WILL CALL MONDAY WITH ANALYSIS.

SHIPMENT METHOD

LABORATORY USE ONLY	Y	N
PCKG RECD/CUSTODY SEALS INTACT		
SAMPLE LABELS/COCs AGREE		
TEMPERATURE WITHIN SPECIFICATION ____C		
CORRECTED COPY ATTACHED		
PROBLEMS OR DISCREPANCIES		

APPENDIX G

DATA VALIDATION SUMMARY OF LABORATORY RESULTS

Date: 01\15\92
Client: D. Runyon (Ogden)
Reviewer: T. Perrin

Data Validation Summary

Samples and Analyses

Client Sample ID	Lab Sample ID	Analysis	Matrix
001	91-12-190-01	Volatiles	SOIL
004	91-12-190-03	Volatiles	WATER
002	91-12-190-02A	PCBs	SOIL
002	91-12-190-02	Total Lead	SOIL
005	91-12-190-04	Total Lead	WATER

Volatile Organics:

1. Overall Assessment:
Only result summaries were provided so compound identification could not be confirmed from raw instrument results nor could the calculations be verified. No data for instrument tuning or calibration was provided.
Data is acceptable with qualifications as noted below.

2. Holding times:
Per W. Glasgow the sample for volatile water analysis was not preserved with acid. The holding time for volatile analysis of an unpreserved water sample is 7 days. The sample was analyzed at 14 days after collection, therefore analytes were qualified "UJ" in sample 004. Since there are no guidelines for soils the soil sample was not qualified.

3. Surrogate Recoveries:
Surrogate compounds were added to the samples as a measure of purging efficiency. Surrogate recoveries were acceptable for both reagent blanks and sample 004. Recovery for surrogate toluene-d8 was low and bromofluorobenzene high for soil sample 001. All detects were qualified as estimated "J" and all quantitation limits as estimated "UJ" in sample 001 for this QC exceedance. In the case narrative the lab attributed the non-compliant surrogate recoveries to a matrix effect because on reanalysis the surrogate performance did not improve.

4. Reagent Blank:
A reagent blank was analyzed to evaluate possible laboratory-introduced contamination. No target analytes were reported in the reagent blanks. A TIC result page was not provided for the reagent blanks. Whether this is an omission by the lab or whether no TICs were detected in the reagent blanks is unknown. One tentatively identified compound (TIC) was reported in each sample. Trichlorofluoromethane (freon) is a common laboratory contaminant and therefore may not be a true sample constituent in analysis 001.

5. Matrix Spike/Matrix Spike Duplicate:
An associated matrix spike/matrix spike duplicate was performed on a water sample although not on the Ogden water sample. % Recoveries and RPDs were acceptable.

PCBs:

1. Overall Assessment:
No PCBs were reported in the sample. Only result summaries were provided so compound identification could not be confirmed from raw instrument results nor could the calculations be verified. No qualification of data was required.

2. Holding times:
Holding times were acceptable.

3. Surrogate Recoveries:
A surrogate compound was added to the sample before extraction as a measure of the extraction efficiency. The surrogate recoveries at 86 and 98% are considered acceptable for the reagent blank and sample 002 respectively.

4. Reagent Blank:
A reagent blank was analyzed to evaluated possible laboratory-introduced contamination. No target analytes were reported in the method blank.

5. Matrix Spike/Matrix Spike Duplicate:
A matrix spike/matrix spike duplicate was performed on a soil sample although not on the Ogden soil sample. The MS/MSD was analyzed 11 days before sample 002 was extracted so is not really indicative of extraction conditions for sample 002. % Recoveries and RPDs were acceptable. No qualifications were required.

Total Lead:

1. Overall Assessment:
Raw data was not provided for review; therefore, sample results and QC data were reviewed based on information presented in the respective summary forms. Sample results were acceptable without qualifications.

2. Holding Times:
The soil and water sample were analyzed within the water holding time of six months. The water sample was preserved with HNO_3.

3. Blanks:
Blank data presented on the Total Lead analysis data sheet was acceptable.

4. Matrix Spike:
An acceptable Matrix Spike percent recovery (%R) of 108% and 100% were recorded on the Total Lead Matrix Spike sheet for the soil and water samples respectively.

VOLATILE ORGANICS DATA SHEET

Method 8240

Client Sample ID: 001

Lab Name: Analytical Technologies Inc.
Client Name: ERCE
Client Project ID: Cottonwood ESA
Sample Matrix: Soil

Lab Sample ID: 91-12-190-01
Date Collected: 12/26/91
Date Analyzed: 01/09/92
Dilution Factor: 1

COMPOUND NAME	Concentration (ug/kg)		Raw Qual	Qual Code	Val Code
Chloromethane	< 10		UJ	S	VV
Bromomethane	< 10				
Vinyl chloride	< 10				
Chloroethane	< 10				
Methylene chloride	120		J		
Acetone	68		J		
Carbon disulfide	< 5		UJ		
1,1-Dichloroethene	2	J	J		
1,1-Dichloroethane	< 5		UJ		
1,2-Dichloroethene (Total)	4	J	J		
Chloroform	3	J	J		
1,2-Dichloroethane	< 5		UJ		
2-Butanone	< 10		UJ		
1,1,1-Trichloroethane	12		J		
Carbon tetrachloride	< 5		UJ		
Vinyl Acetate	< 10				
Bromodichloromethane	< 5				
1,2-Dichloropropane	< 5				
cis-1,3-Dichloropropene	< 5				
Trichloroethene	4	J	J		
Dibromochloromethane	< 5		UJ		
1,1,2-Trichloroethane	< 5		UJ		
Benzene	4	J	J		
trans-1,3-Dichloropropene	< 5		UJ		
Bromoform	< 5				
2-Hexanone	< 10				
4-Methyl-2-pentanone	< 10				
Tetrachloroethene	23		J		
1,1,2,2-Tetrachloroethane	< 5		UJ		
Toluene	24		J		
Chlorobenzene	4	J	J		
Ethylbenzene	7		J		
Styrene	< 5		UJ		
Total Xylenes	43		J		

Surrogate Recoveries:	% Rec	% Rec Limits
1,2-Dichloroethane-d4	93	70-121
Toluene-d8	72 *	81-117
Bromofluorobenzene	122 *	74-121

* Outside control limits.

J = compound detected below practical quantitation limit.

OGDEN VALIDATED

VOLATILE ORGANICS DATA SHEET

Tentatively Identified Compounds

Client Sample ID:

001

Laboratory Name: Analytical Technologies, Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Lab Sample ID: 91-12-190-01

Date Collected: 12/26/91

Date Analyzed: 01/09/92

Dilution Factor: 1

Matrix: Soil

Concentration units: ug/kg

COMPOUND NAME	RT	Concentration	Q	Raw Qual	Qual Code	Val Code
Trichlorofluoromethane		120 J		NJ		W

J = estimated value

OGDEN VALIDATED

VOLATILE ORGANICS DATA SHEET

Method 8240

Client Sample ID: 004

Lab Name: Analytical Technologies Inc.
Client Name: ERCE
Client Project ID: Cottonwood ESA
Sample Matrix: Water

Lab Sample ID: 91-12-190-03
Date Collected: 12/26/91
Date Analyzed: 01/09/92
Dilution Factor: 1

COMPOUND NAME	Concentration (ug/L)	Rev Qual	Qual Code	Val Code
Chloromethane	< 10	UJ	H	VV
Bromomethane	< 10			
Vinyl chloride	< 10			
Chloroethane	< 10			
Methylene chloride	< 5			
Acetone	< 10			
Carbon disulfide	< 5			
1,1-Dichloroethene	< 5			
1,1-Dichloroethane	< 5			
1,2-Dichloroethene (Total)	< 5			
Chloroform	< 5			
1,2-Dichloroethane	< 5			
2-Butanone	< 10			
1,1,1-Trichloroethane	< 5			
Carbon tetrachloride	< 5			
Vinyl Acetate	< 10			
Bromodichloromethane	< 5			
1,2-Dichloropropane	< 5			
cis-1,3-Dichloropropene	< 5			
Trichloroethene	< 5			
Dibromochloromethane	< 5			
1,1,2-Trichloroethane	< 5			
Benzene	< 5			
trans-1,3-Dichloropropene	< 5			
Bromoform	< 5			
2-Hexanone	< 10			
4-Methyl-2-pentanone	< 10			
Tetrachloroethene	< 5			
1,1,2,2-Tetrachloroethane	< 5			
Toluene	< 5			
Chlorobenzene	< 5			
Ethylbenzene	< 5			
Styrene	< 5			
Total Xylenes	< 5			

Surrogate Recoveries:	% Rec	% Rec Limits
1,2-Dichloroethane-d4	87	76-116
Toluene-d8	102	88-110
Bromofluorobenzene	101	86-115

OGDEN VALIDATED

Tentatively Identified Compounds

Client Sample ID:

004

Laboratory Name: Analytical Technologies, Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Lab Sample ID: 91-12-190-03

Date Collected: 12/26/91

Date Analyzed: 01/09/92

Dilution Factor: 1 1

Matrix: Water

Concentration units: ug/L

COMPOUND NAME	RT	Concentration	Q	Lab Qual	Qual Code	Val Code
Methyl-t-butyl ether		10 J		NJ		VV

J = estimated value

OGDEN VALIDATED

PCB ANALYSIS DATA SHEET
Method 8080

Lab Name: Analytical Technologies Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Lab Sample ID: 91-12-190-02A

Sample Matrix: Soil

Sample Weight: 30 g

GPC Cleanup: N

Client Sample ID: 002

Date Collected: 12/26/91

Date Extracted: 12/30/91

Date Analyzed: 01/03/92

Extract Volume: 10 mL

Dilution Factor: 1

Compound	Conc (mg/kg)	Rev Qual	Qual Code	Val Code
PCB 1016	< 0.03	U		VV
PCB 1221	< 0.03			
PCB 1232	< 0.03			
PCB 1242	< 0.03			
PCB 1248	< 0.03			
PCB 1254	< 0.03			
PCB 1260	< 0.03			

SURROGATE RECOVERY

Compound	% Recovery
Tetrachloro-m-xylene	98

OGDEN VALIDATED

TOTAL LEAD ANALYSIS DATA SHEET

Laboratory Name: Analytical Technologies, Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Workorder Number: 91-12-190

Date Collected: 12/26/91

Prep Date: 01/02/92

Date Analyzed: 01/02/92

Sample Matrix: Water

Client ID.	ATI ID.	Lead Conc. (mg/L)	Reason Qual	Qual Code	Val Code
Reagent Blank	91-12-190-RB	< 0.003			
005	91-12-190-04	0.065			V V

OGDEN VALIDATED

TOTAL LEAD ANALYSIS DATA SHEET

Laboratory Name: Analytical Technologies, Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Workorder Number: 91-12-190

Date Collected: 12/26/91

Prep Date: 01/02/92

Date Analyzed: 01/03/92

Sample Matrix: Soil

Client ID.	ATI ID.	Lead Conc. (mg/kg)	Raw Qual	Qual Code	Val Code
Reagent Blank	91-12-190-RB	< 5			
002	91-12-190-02	56			VV

OGDEN VALIDATED

Qualifier Codes for Organics

1)	Holding times were exceeded:	H
2)	Tuning (BFB or DFTPP) was non-compliant:	M
3)	Calibration:	
	a) RRF was <0.05:	R
	b) %RSD or %D was outside of QC limits:	C
4)	Blanks:	
	a) Presumed contamination from method blank:	B
	b) Presumed contamination from trip blank:	T
	c) Presumed contamination from field blank:	F
5)	Surrogate recovery was outside of QC limits:	S
6)	MS/MSD recovery was poor or RPD high:	Q
7)	Field duplicates showed poor agreement:	E
8)	IS Performance was unsatisfactory:	I
9)	Compound ID:	
	a) False positive (reported compound was not present):	+
	b) False Negative (compound was present but not reported):	-
10)	Reported result or other information was incorrect:	$
11)	TIC identity or reported retention time has been changed:	?
12)	Original analyses, dilutions, reanalyses or duplicate data that should not be used because another more technically sound analysis is available:	D
13)	Instrument performance for pesticides was poor:	P
14)	Unusual problems with the data that have been described in the Data Summary in a specific section. For example, *11 indicates that an unusual problem has been described in section 11 of the Data Summary:	*#

Reviewer Codes

U The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

J The analyte was positively identified in the sample, but the associated numerical value may not be an accurate representation of the amount actually present in the environmental sample. Values are of limited use.

R The data are unusable (presence or absence cannot be determined). Resampling and/or reanalysis is necessary for verification.

N Presumptive evidence of the presence of the material.

NJ Presumptive evidence of the presence of the material at an estimated quantity.

UJ The material was analyzed for but was not detected. The sample quantitation limit is an estimated quantity.

Validation Codes

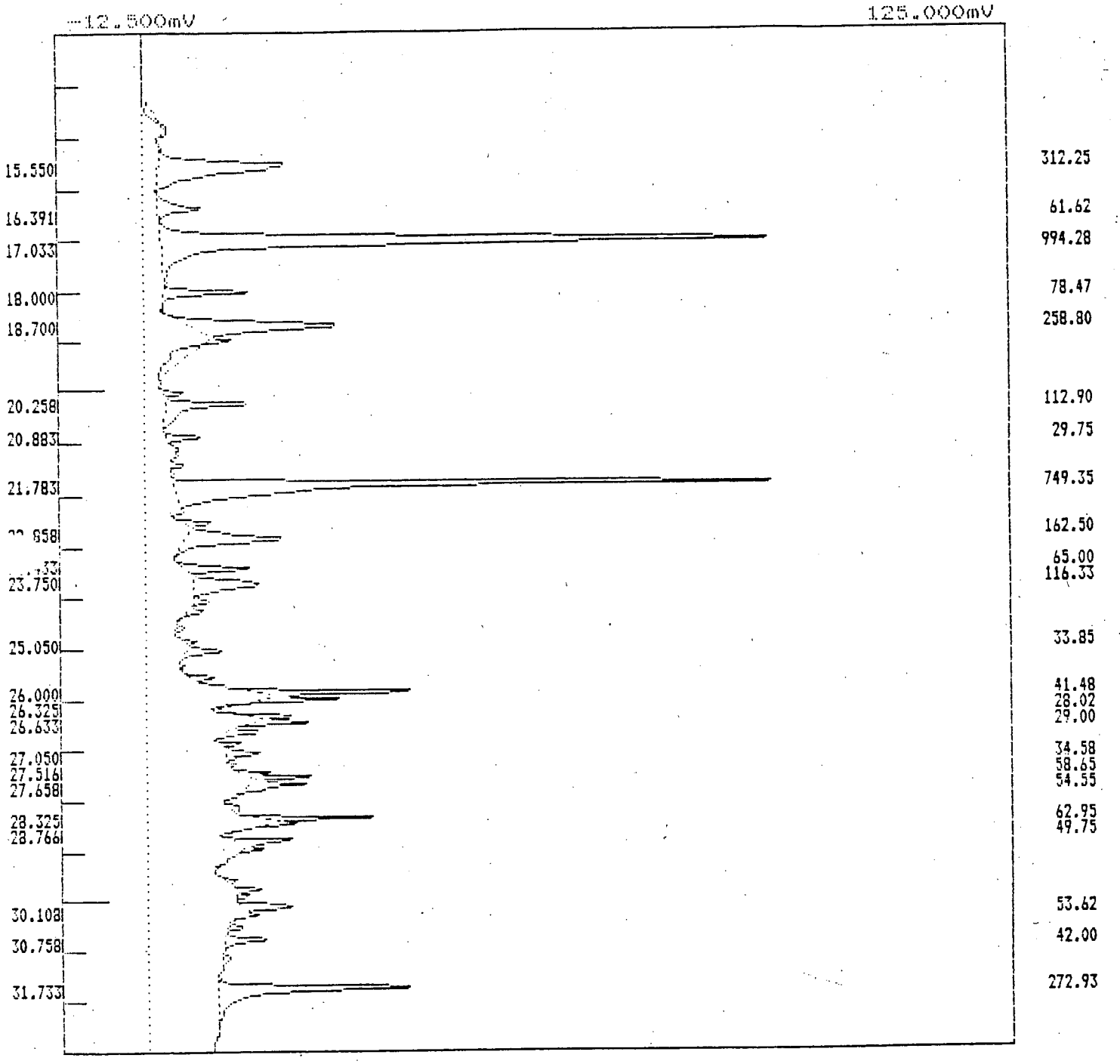
Validation Code	Definition	Usability
VV	Validated Valid	Usable data
VI	Validated Invalid	Unusable for any purpose.
UN	Unvalidated	All data which has not been validated e.g. trip blanks

APPENDIX H

CHEN AND ASSOCIATES CONSULTING GEOTECHNICAL ENGINEERS

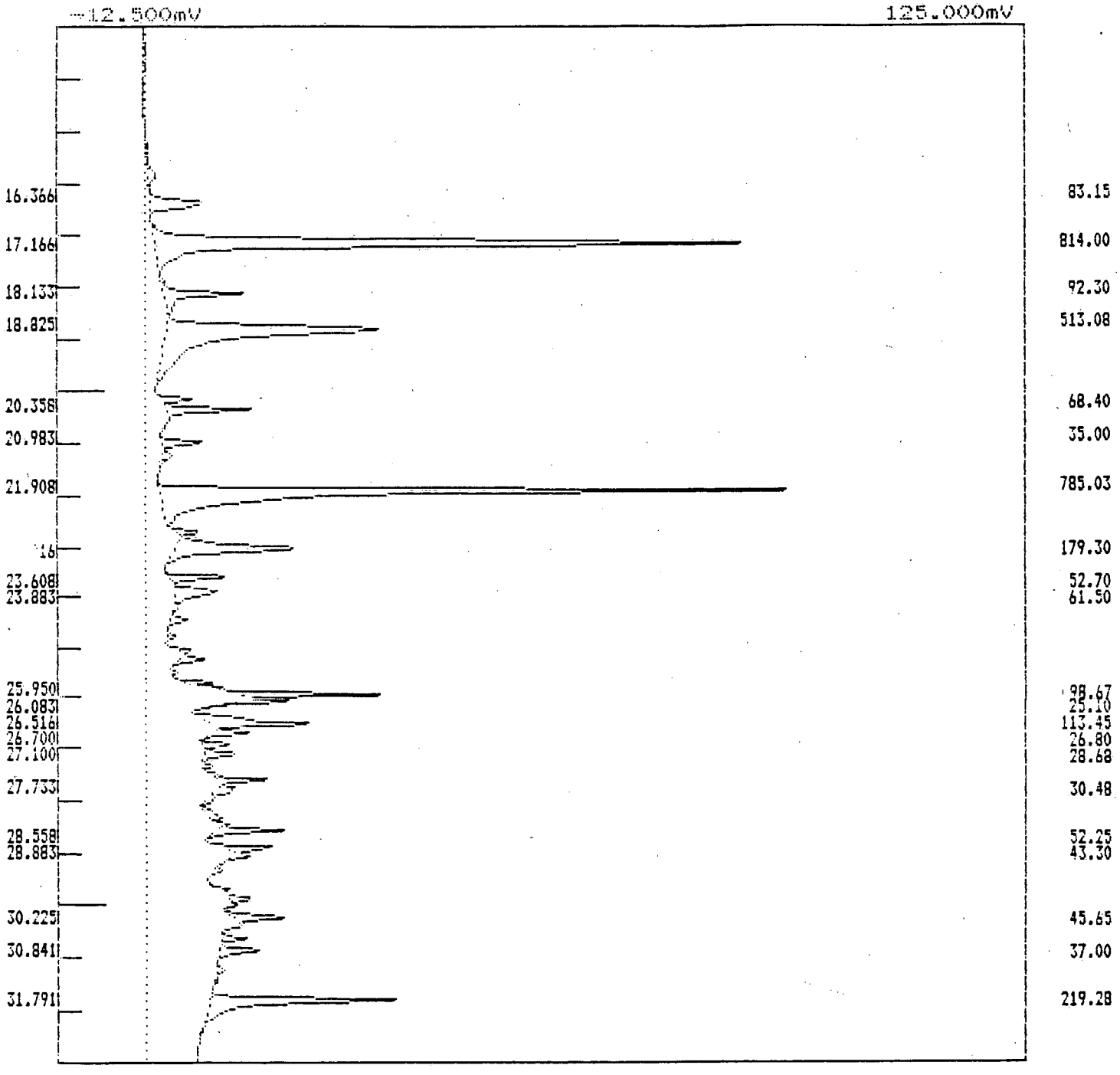
"Soil & Foundation Investigation Proposed Bridge Across Ralston Creek Cottonwood Subdivision"

Control file : 8020.CON
Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 6 CH 1 PID
Conditions : BH02 WS01, 5ML PURGE COLLECTED @ 1330 @ 15'
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225C6.CHR
Temperature : 8020.TEM
Components : 8020C.CPT
Date : 12/26/1991
Time : 14:43:34



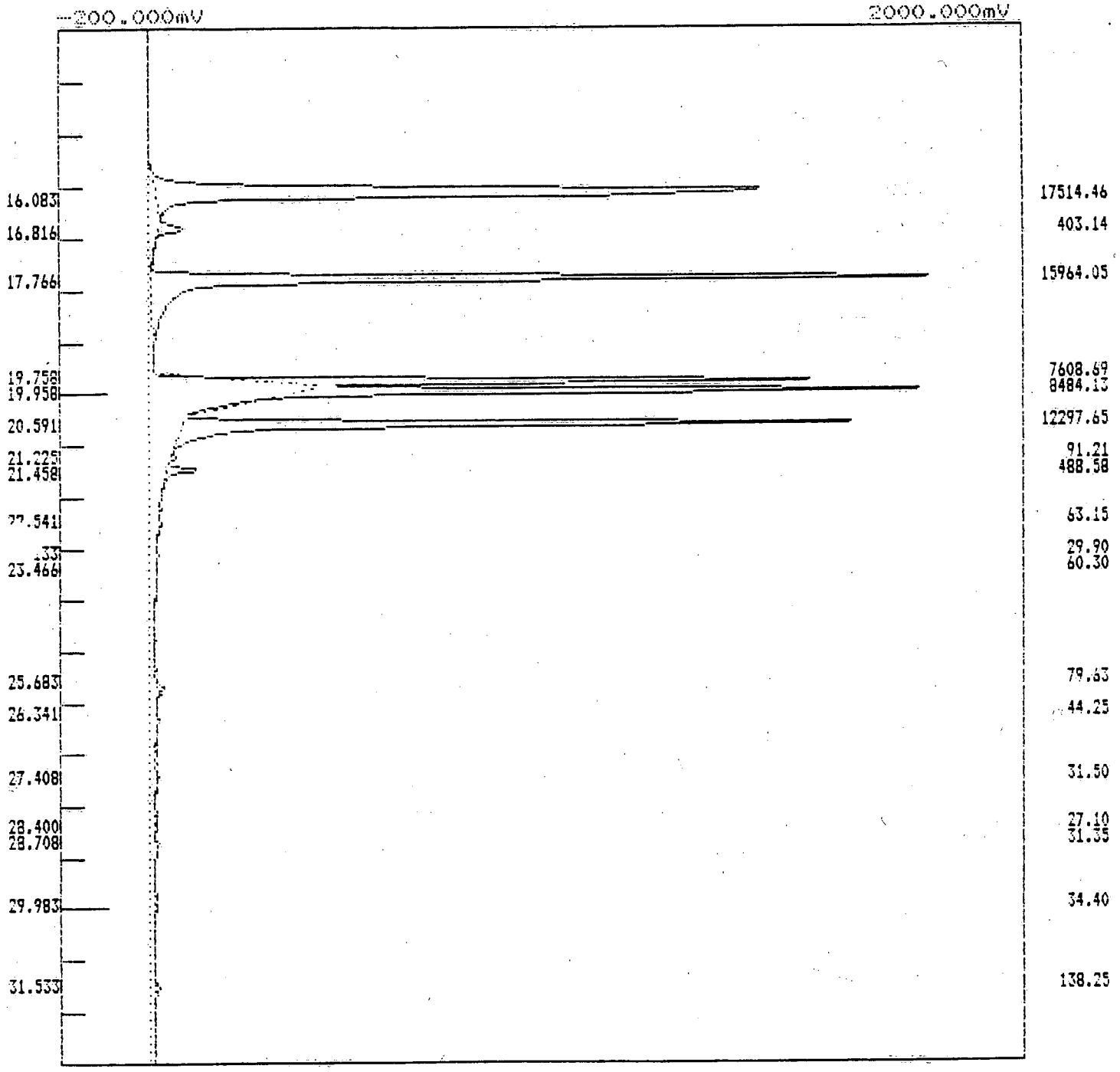
Component	Number	Retention	Area	External	Internal	Units
[illegible]ene	1	16.391	61.62	N/A	N/A	NG
[illegible]oluene surr	2	17.033	994.28	887.86	150.0000	NG
Toluene	3	18.000	78.47	N/A	N/A	NG
m/p-Xylene	4	20.258	112.90	N/A	N/A	NG
o-Xylene	7	20.883	29.75	N/A	N/A	NG
BFB - surr	8	21.783	749.35	279.53	150.0000	NG
			2026.38	224.01	296.0000	

Control File : 8020.CON
Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 6 CH 1 PID
Conditions : 5ML DI H2O BLANK (250NG SURR'S)
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225C4.CHR
Temperature : 8020.TEM
Components : 8020CD23.CPT
Date : 12/26/1991
Time : 11:29:45



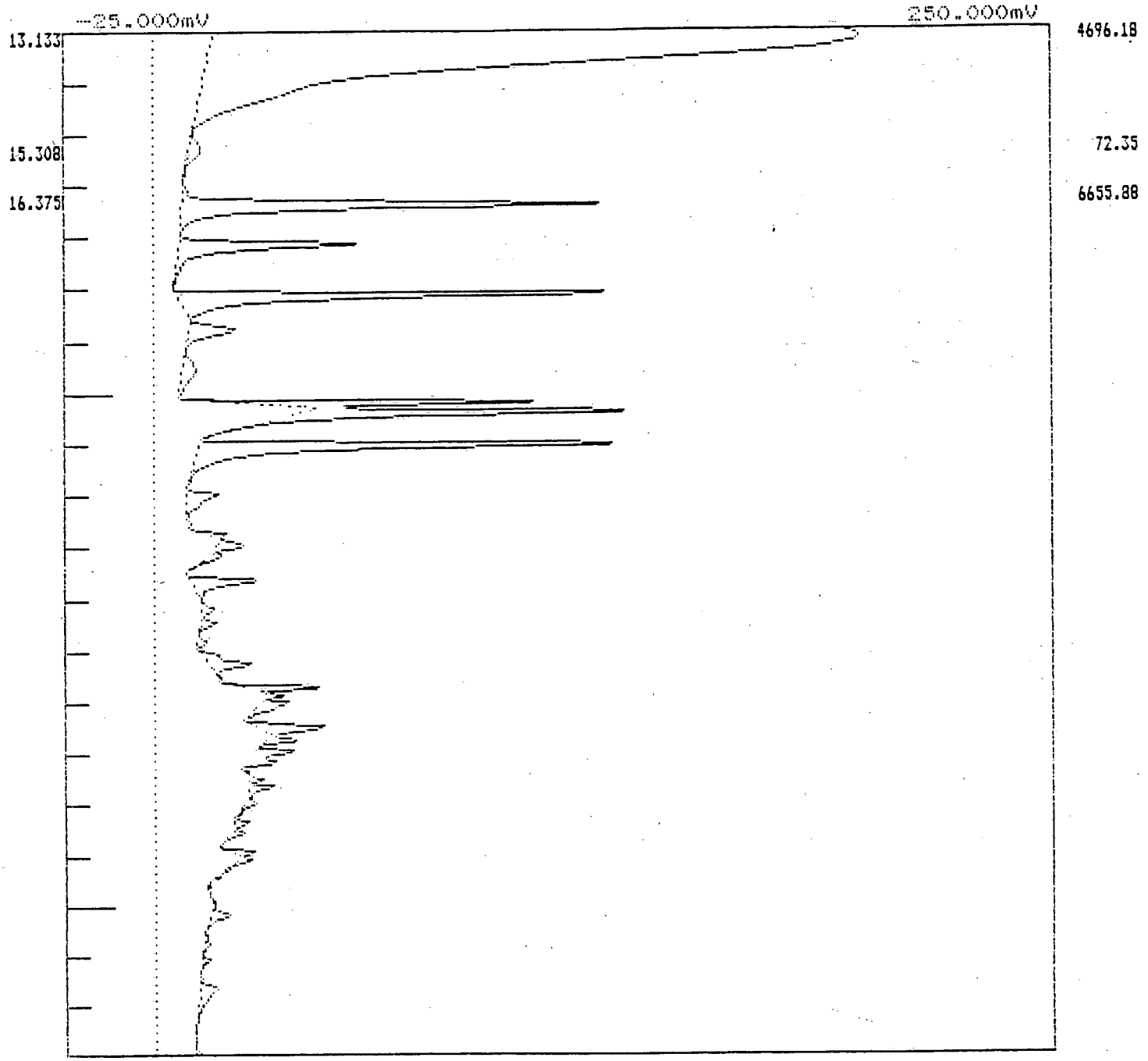
Component	Number	Retention	Area	External	Internal	Units
[illegible]zene	1	16.366	83.15	N/A	N/A	NG
[illegible]oluene surr	2	17.166	814.00	734.82	150.0000	NG
Toluene	3	18.133	92.30	N/A	N/A	NG
m/p-Xylene	6	20.358	68.40	N/A	N/A	NG
o-Xylene	7	20.983	35.00	N/A	N/A	NG
BFB - surr	8	21.908	785.03	291.92	150.0000	NG
6			1877.88	67.79	296.0000	

Control file : 8020.CON
Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 6 CH 1 PID
Conditions : 5000NG BTEX CALIB STD (250NG SURR'S)
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225C3.CHR
Temperature : 8020.TEM
Components : 8020CD23.CPT
Date : 12/26/1991
Time : 10:50:50



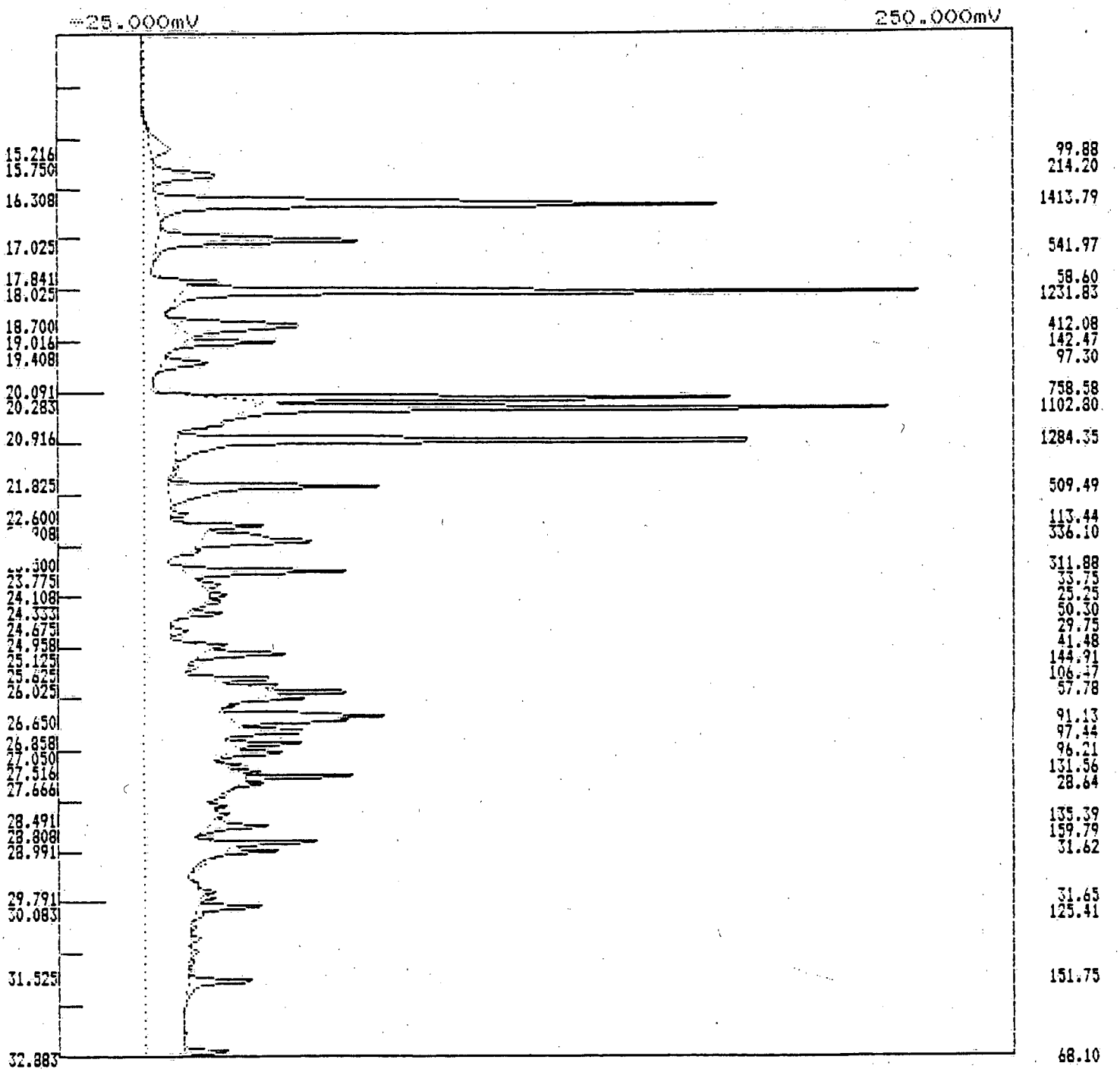
Component	Number	Retention	Area	External	Internal	Units
T ene	1	16.083	17514.46	5001.31	1943.2584	NG
FB Toluene surr	2	16.816	403.14	386.05	150.0000	NG
Toluene	3	17.766	15964.05	5001.31	1943.2552	NG
Ethylbenzene	5	19.758	7608.69	4999.09	3967.3364	NG
m/p-Xylene	6	19.958	8484.13	5002.66	3970.1669	NG
o-Xylene	7	20.591	12297.65	4998.99	3967.2535	NG
BFB - surr	8	21.225	91.21	51.07	150.0000	NG
BFB - surr	8	21.458	488.58	189.01	150.0000	NG

Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 6 CH 2 FID
Conditions : 250NG BTEX CALIB STD
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225D1.CHR
Temperature : 8020.TEM
Components : 8020TPGH.CPT
Date : 12/26/1991
Time : 07:07:01



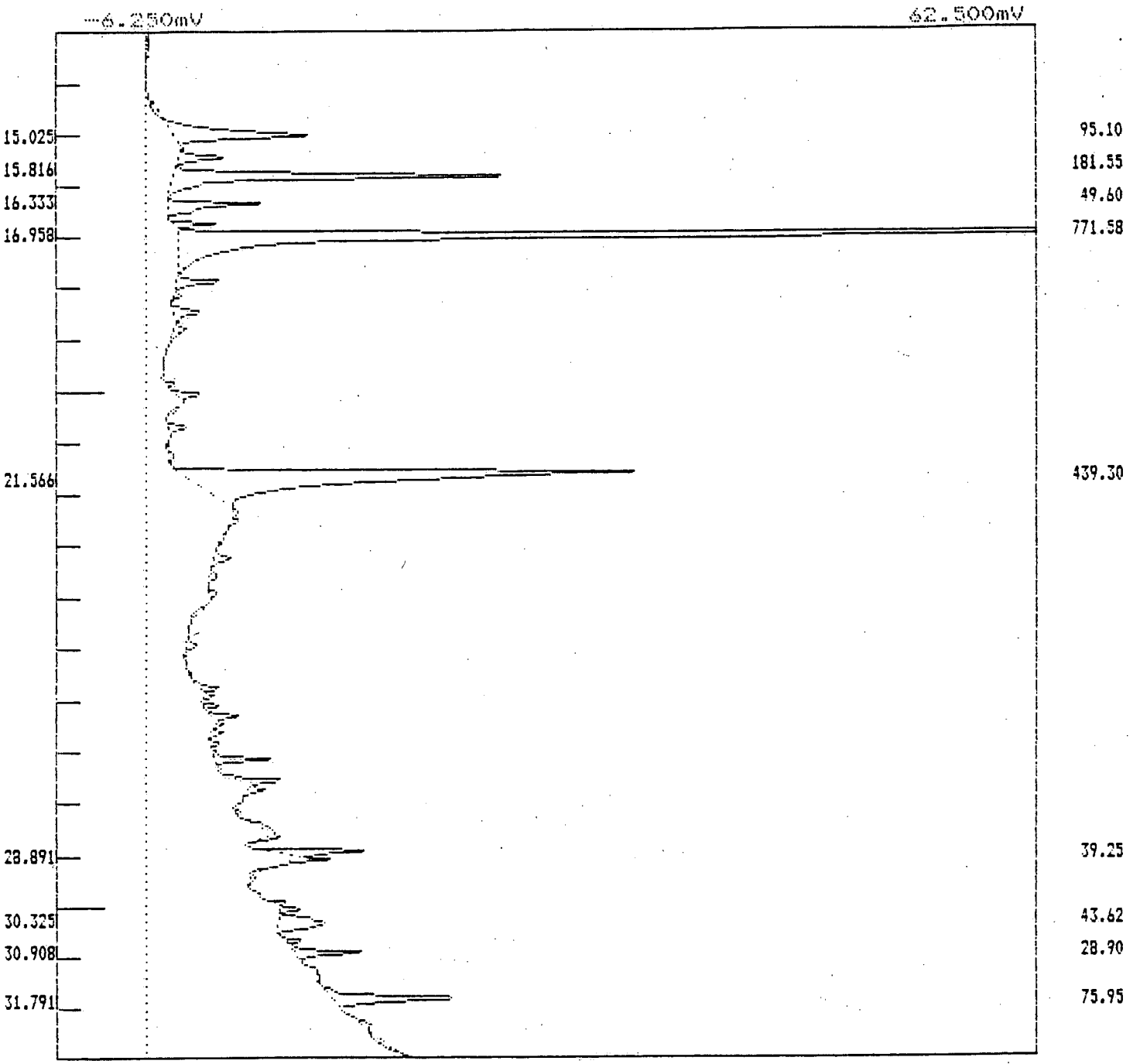
Component	Number	Retention	Area	External	Internal	Units
TOTL PRGBL H-C	1	16.375	6655.88	N/A	N/A	
1			6655.88	N/A	N/A	

Control file : 8020.CON
Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 6 CH 1 PID
Conditions : 250NG BTEX CALIB STD
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225C1.CHR
Temperature : 8020.TEM
Components : 8020CD23.CPT
Date : 12/26/1991
Time : 07:07:01



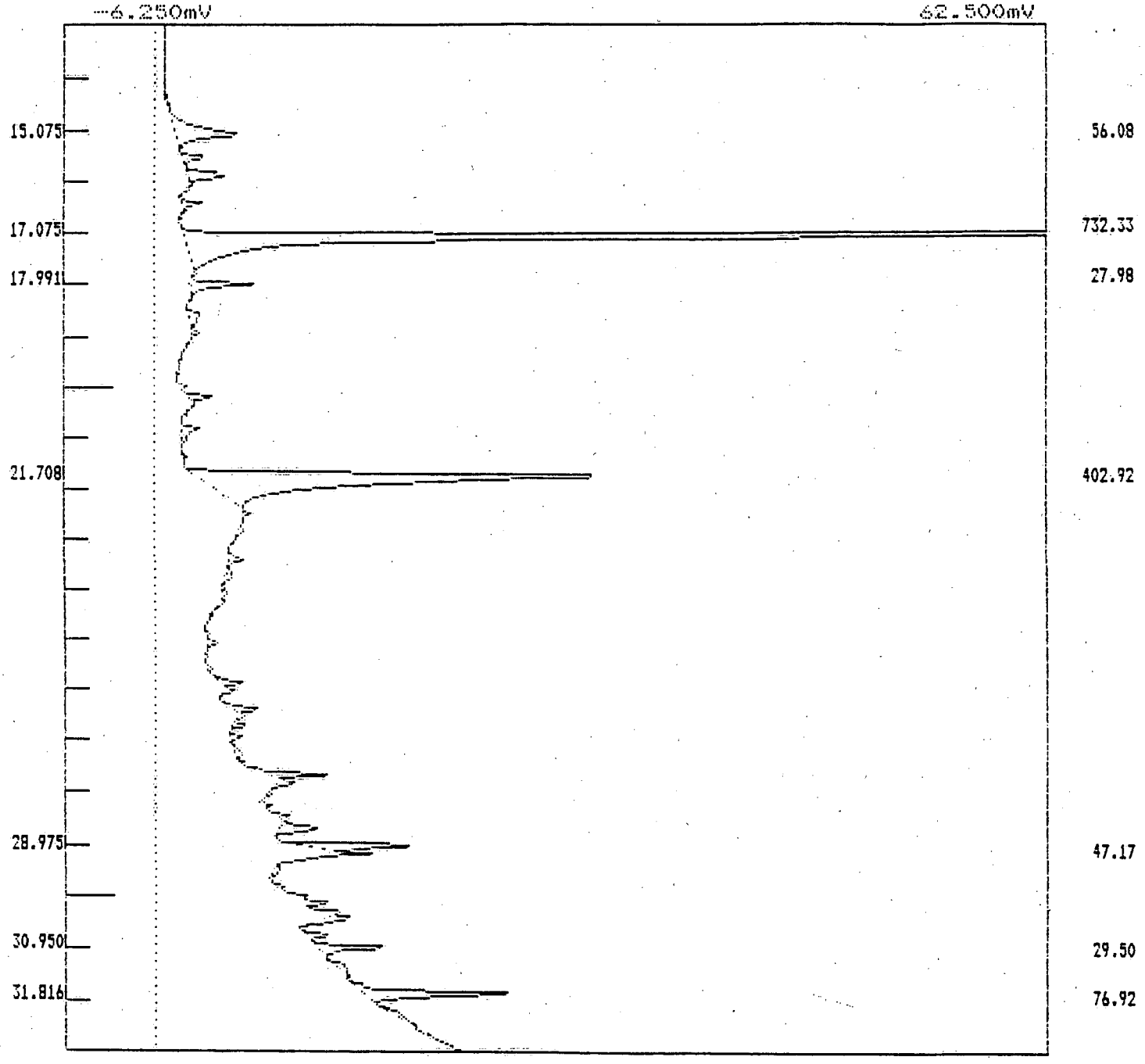
Component	Number	Retention	Area	External	Internal	Units
B ene	1	16.308	1413.79	251.12	74.7528	NG
FB foluene surr	2	17.025	541.97	503.90	150.0000	NG
Toluene	3	17.841	58.60	N/A	N/A	NG
Toluene	3	18.025	1231.83	250.59	74.5956	NG
Ethylbenzene	5	20.091	758.58	249.01	190.3119	NG
m/p-Xylene	6	20.283	1102.80	251.80	192.4420	NG
o-Xylene	7	20.916	1284.35	251.87	192.4984	NG
BFB - surr	8	21.825	509.49	196.27	150.0000	NG

Control file : 8020.CON
Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 5 CH 1 PID
Conditions : BH06 WS01 5ML PURGE COLLECTED @ 1453 @ 18'
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225A6.CHR
Temperature : 8020.TEM
Components : 8020A.CPT
Date : 12/26/1991
Time : 15:19:45



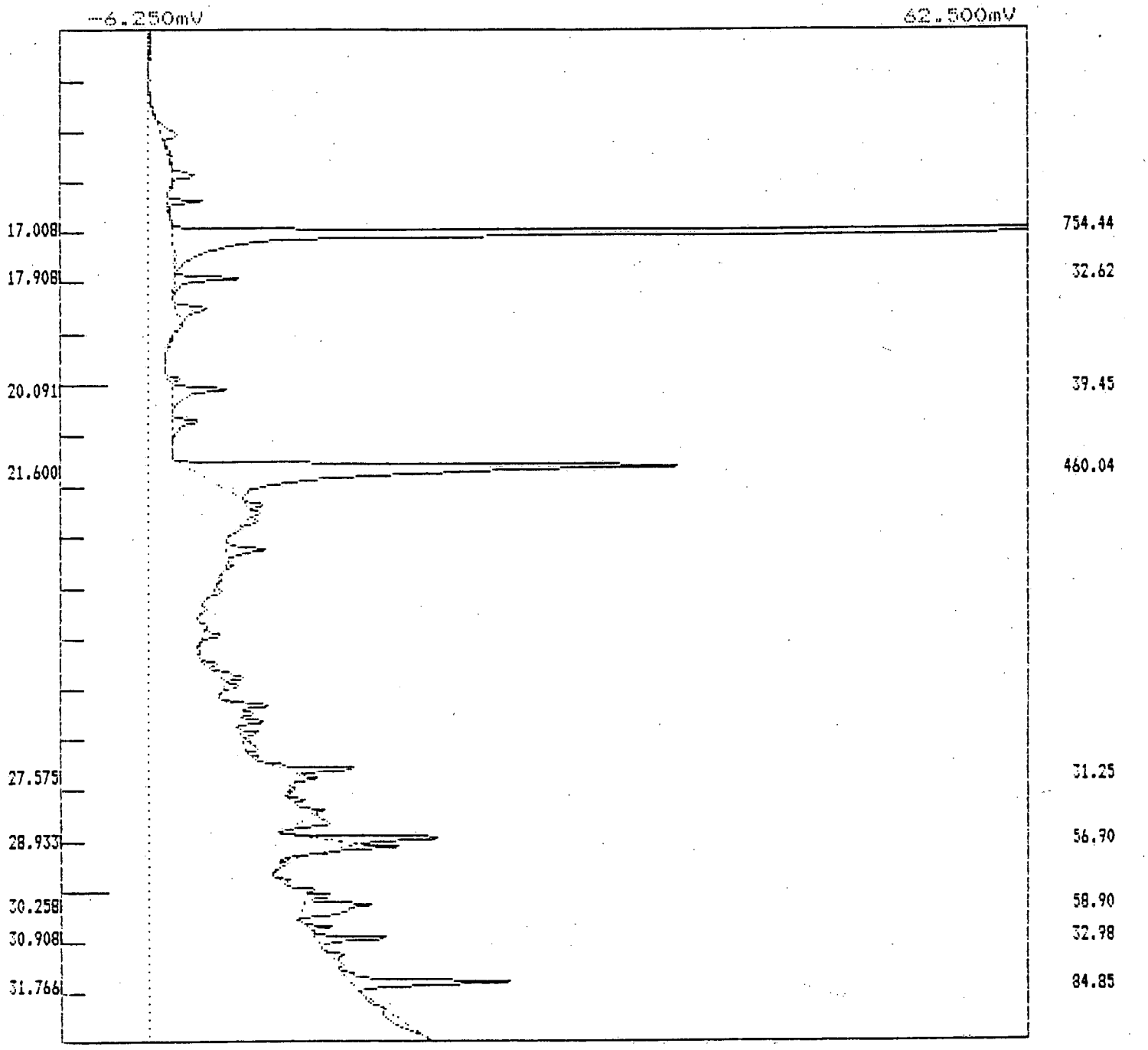
Component	Number	Retention	Area	External	Internal	Units
Benzene	1	16.333	49.60	6.53	1.6474	NG
F3-Toluene surr	2	16.958	771.58	594.23	150.0000	NG
I - surr	8	21.566	439.30	148.56	150.0000	NG
3			1260.48	749.32	301.6474	

Control file : 8020.CON
Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 5 CH 1 PID
Conditions : BH03 WS01 5ML PURGE COLLECTED @ 1352 @ 18'
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225A5.CHR
Temperature : 8020.TEM
Components : 8020A.CPT
Date : 12/26/1991
Time : 14:21:11



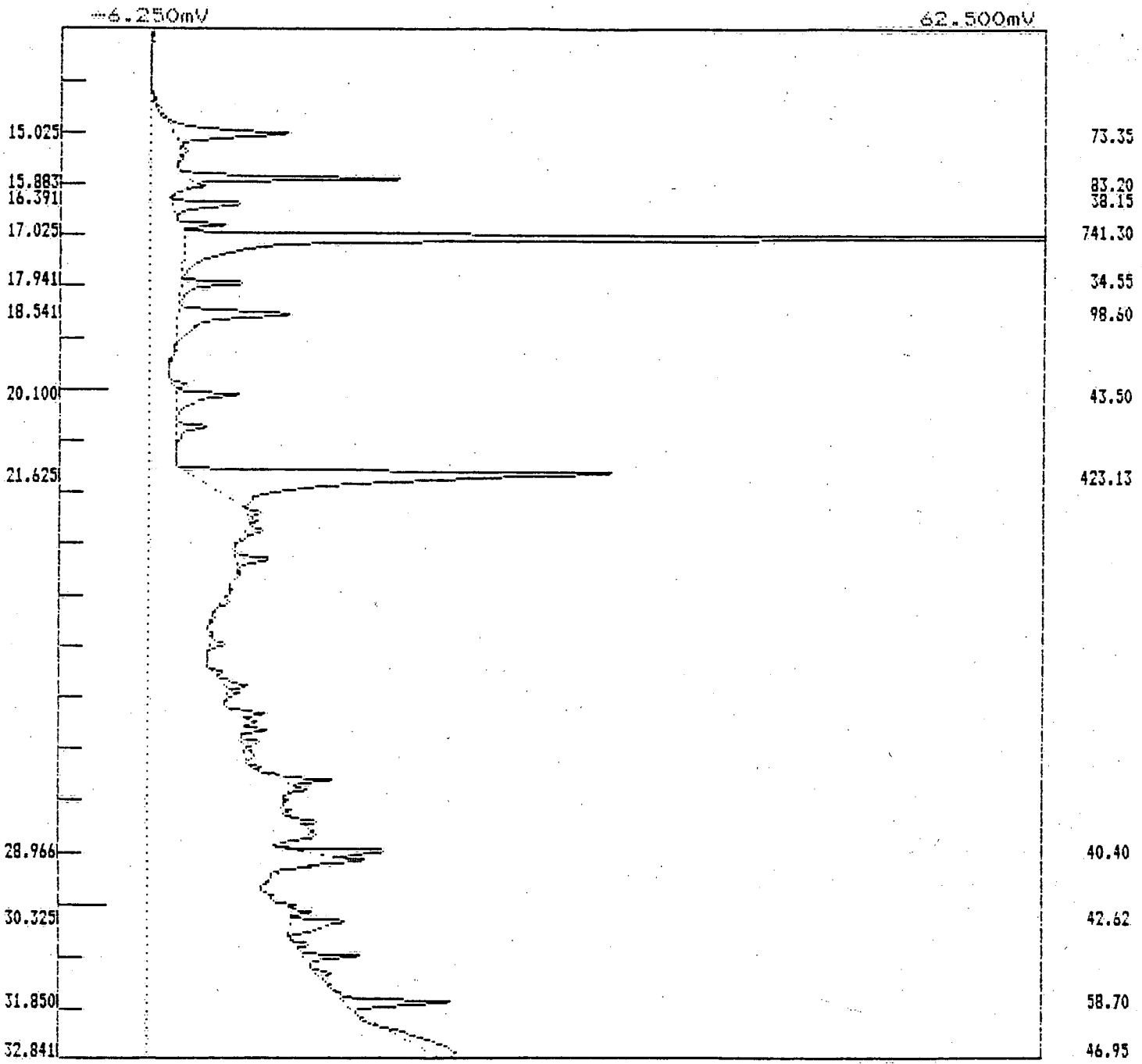
Component	Number	Retention	Area	External	Internal	Units
F3-Toluene surr	2	17.075	732.33	566.76	150.0000	NG
Toluene	3	17.991	27.98	3.68	0.9742	NG
F3 - surr	8	21.708	402.92	141.17	150.0000	NG
3			1163.23	711.61	300.9742	

Control file : 8020.CON
Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 5 CH 1 PID
Conditions : RALSTON CRK WS01 5ML PURGE COLLT'D @1325@SURF.
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225A4.CHR
Temperature : 8020.TEM
Components : 8020A.CPT
Date : 12/26/1991
Time : 13:33:35



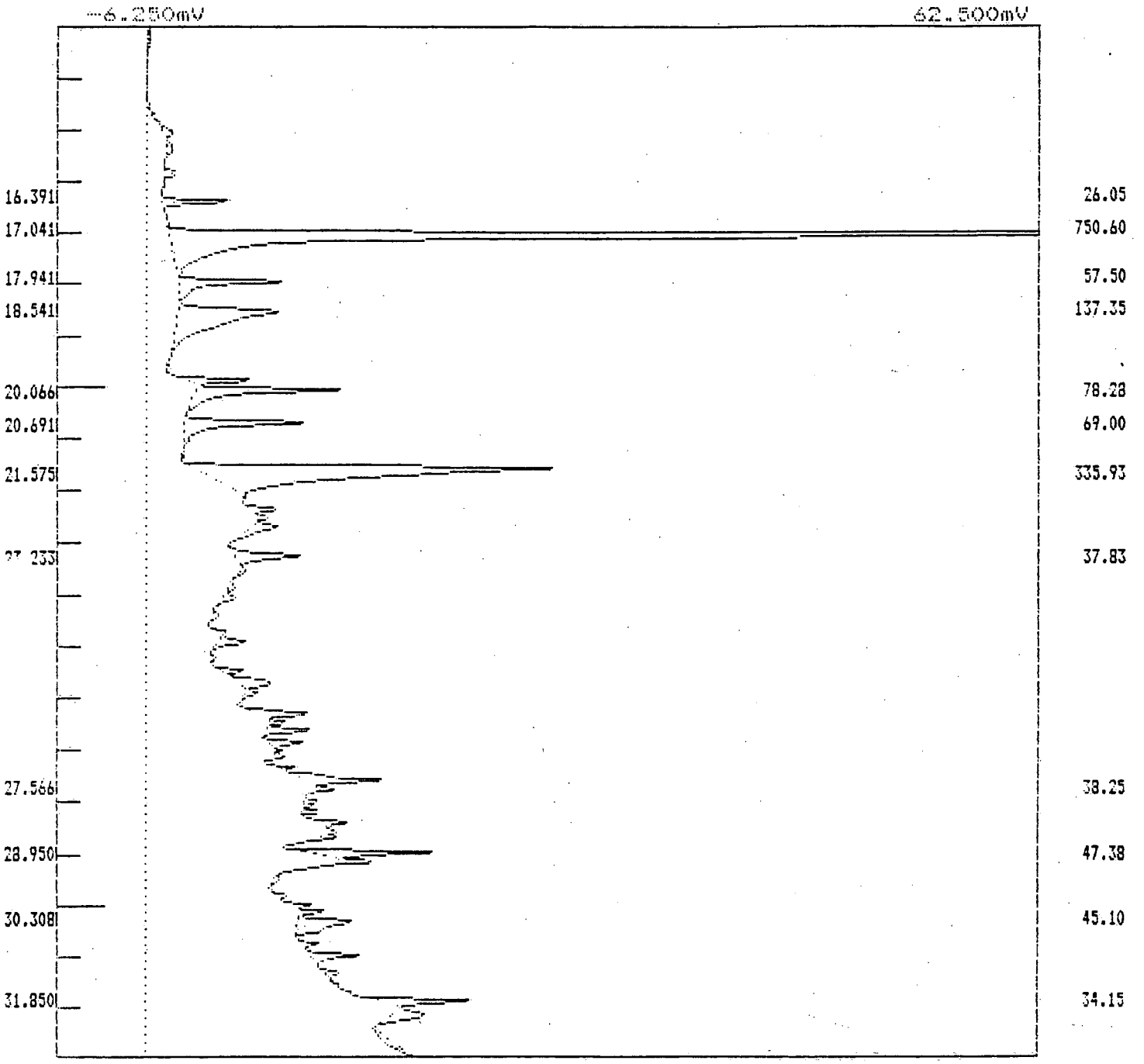
Component	Number	Retention	Area	External	Internal	Units
F3-Toluene surr	2	17.008	754.44	582.24	150.0000	NG
Toluene	3	17.908	32.62	4.29	1.1059	NG
m -Xylene	6	20.091	39.45	10.60	10.4128	NG
t - surr	8	21.600	460.04	152.77	150.0000	NG
4			1286.55	749.90	311.5188	

Control file : 8020.CON
Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 5 CH 1 PID
Conditions : BH01 WS01 5ML PURGE COLLECTED @ 1057 @ 12'
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225A3.CHR
Temperature : 8020.TEM
Components : 8020A.CPT
Date : 12/26/1991
Time : 11:11:45



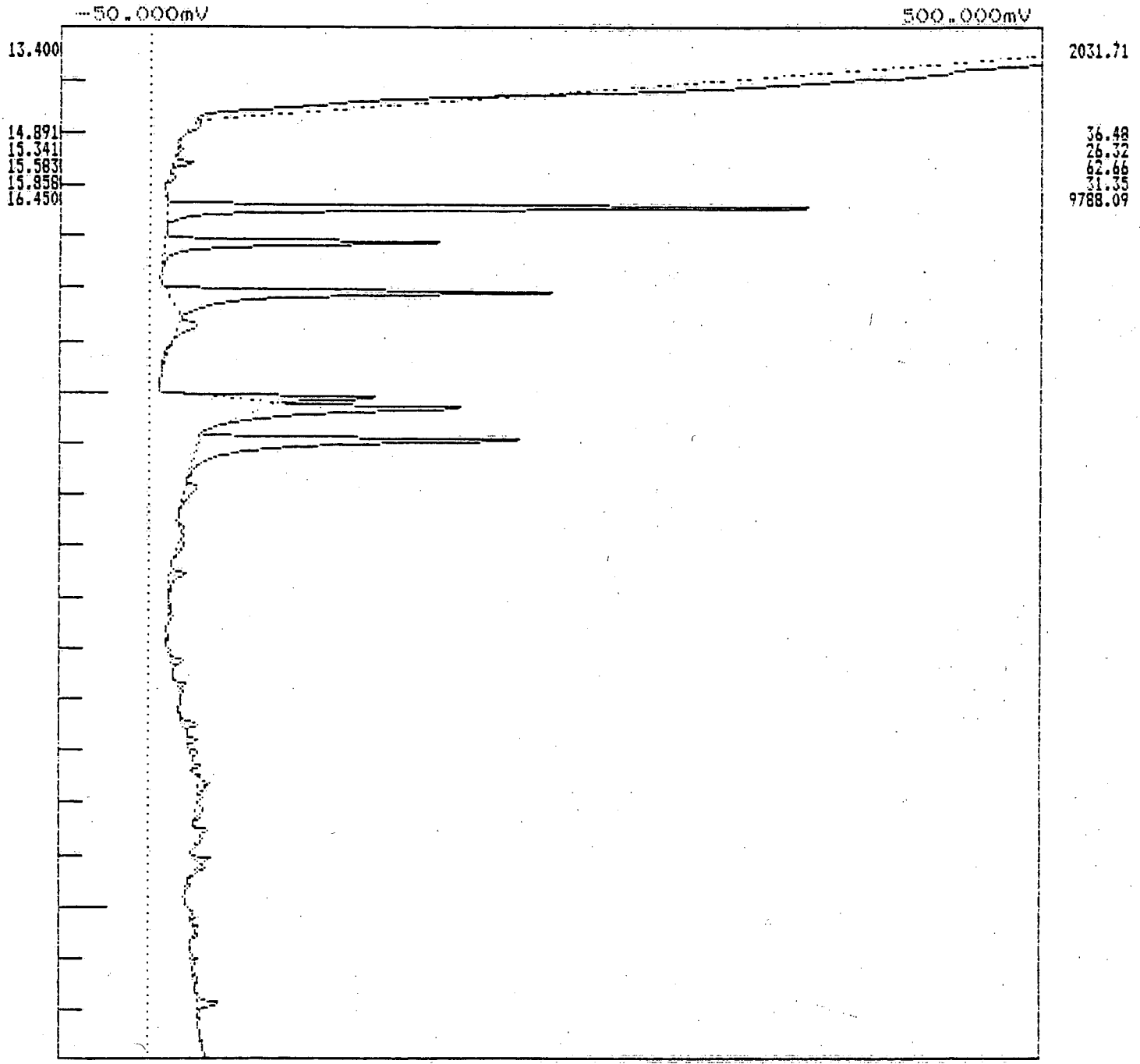
Component	Number	Retention	Area	External	Internal	Units
Benzene	1	16.391	38.15	5.02	1.3140	NG
F3-Toluene surr	2	17.025	741.30	573.04	150.0000	NG
T ene	3	17.941	34.55	4.55	1.1900	NG
m, -Xylene	6	20.100	43.50	11.69	12.0738	NG
BFB - surr	8	21.625	423.13	145.28	150.0000	NG
5			1280.63	739.58	314.5778	

Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 5 CH 1 PID
Conditions : 5 ML DI H2O BLANK (250NG SURR'S)
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225A2.CHR
Temperature : 8020.TEM
Components : 8020A.CPT
Date : 12/26/1991
Time : 09:26:18



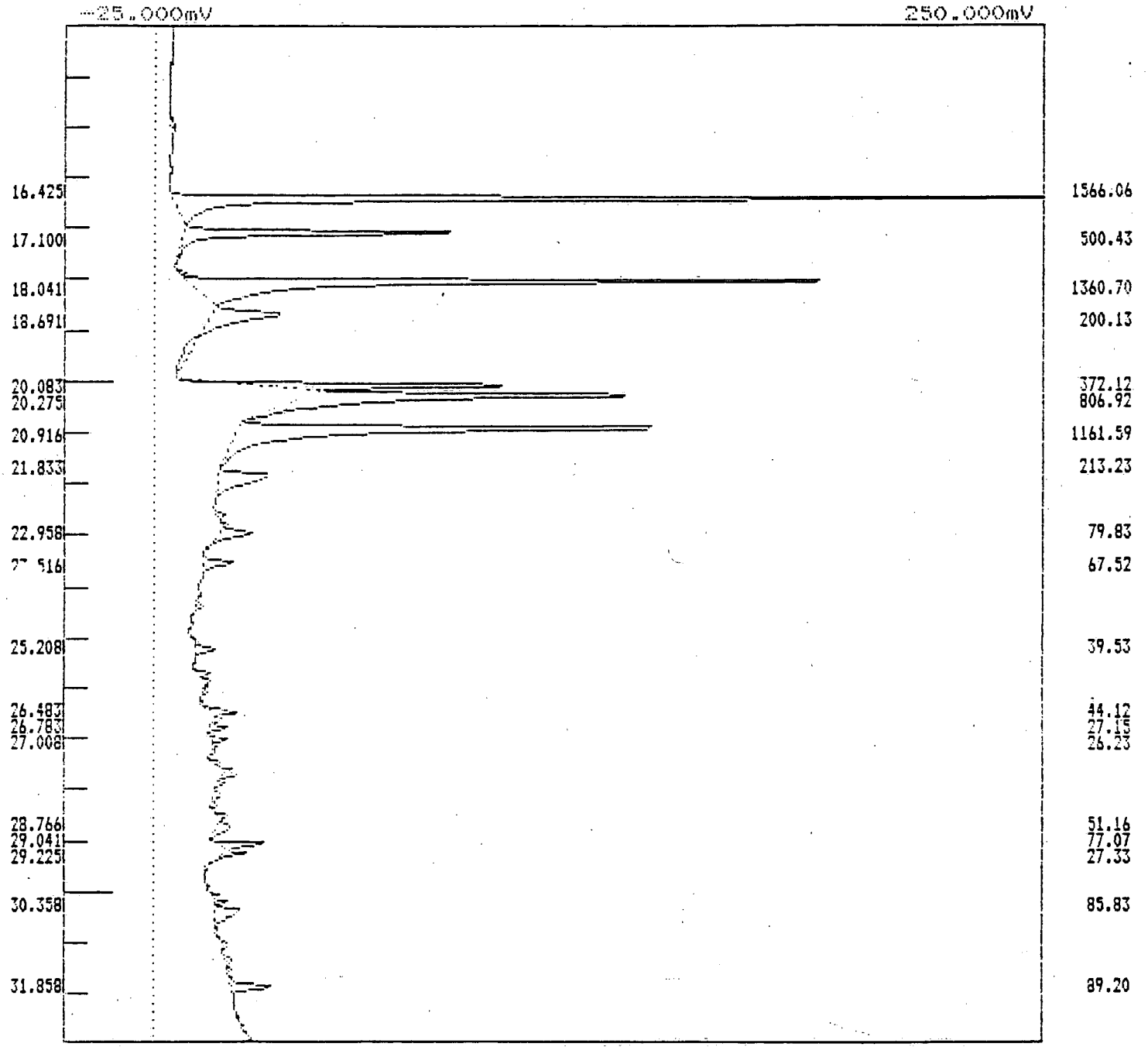
Component	Number	Retention	Area	External	Internal	Units
Benzene	1	16.391	26.05	3.43	0.8672	NG
FB-Toluene surr	2	17.041	750.60	579.54	150.0000	NG
Toluene	3	17.941	57.50	7.57	1.9582	NG
p -Xylene	6	20.066	78.28	21.04	24.7398	NG
o -Xylene	7	20.691	69.00	13.27	15.6013	NG
BFB - surr	8	21.575	335.93	127.58	150.0000	NG
6			1317.35	752.43	343.1865	

Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 5 CH 2 FID
Conditions : 250NG BTEX CALIB STD
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225B1.CHR
Temperature : 8020.TEM
Components : 8020TPGH.CPT
Date : 12/26/1991
Time : 07:06:29



Component	Number	Retention	Area	External	Internal	Units
TOTL PRGBL H-C	1	16.450	9788.09	N/A	N/A	
1			9788.09	N/A	N/A	

Description : INSTRUMENT 5 CH 1 PID
Conditions : 250NG BTEX CALIB STD
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225A1.CHR
Temperature : 8020.TEM
Components : 8020A.CPT
Date : 12/26/1991
Time : 07:06:29



Component	Number	Retention	Area	External	Internal	Units
Benzene	1	16.425	1566.06	206.06	76.4270	NG
FB-Toluene surr	2	17.100	500.43	404.42	150.0000	NG
Toluene	3	18.041	1360.70	179.04	66.4053	NG
Ethylbenzene	5	20.083	372.12	186.06	271.8159	NG
m -Xylene	6	20.275	806.92	216.91	316.8863	NG
o -Xylene	7	20.916	1161.59	223.38	326.3371	NG
BFB - surr	8	21.833	213.23	102.68	150.0000	NG
7			5981.06	1518.56	1357.8717	

Client: ERCE
Chromatographer: Adam P. Macdonald
Analysis Date: December 26, 1991
Analysis: SW-846 Method 8015/8020
Location: 69th & Indiana Arvada, CO
Sample Number: BH06 WS01

Analyte	Concentration	
Benzene	<5	ug/L
Toluene	<5	ug/L
Ethylbenzene	<5	ug/L
Total Xylenes	<5	ug/L
Total Volatile Hydrocarbons	<2	mg/L

Client: ERCE
Chromatographer: Adam P. Macdonald
Analysis Date: December 26, 1991
Analysis: SW-846 Method 8015/8020
Location: 69th & Indiana Arvada, CO
Sample Number: RALSTON CRK WS01

Analyte	Concentration	
Benzene	<5	ug/L
Toluene	<5	ug/L
Ethylbenzene	<5	ug/L
Total Xylenes	<5	ug/L
Total Volatile Hydrocarbons	<2	mg/L

chen and associates
CONSULTING GEOTECHNICAL ENGINEERS
96 SOUTH ZUNI STREET • DENVER, COLORADO 80223 • 303/744-7105

SOIL & FOUNDATION INVESTIGATION
PROPOSED BRIDGE ACROSS RALSTON CREEK
COTTONWOOD SUBDIVISION
JEFFERSON COUNTY, COLORADO

Prepared for:

KKBNA
7456 W. 5th Avenue
Denver CO 80226

Attn: Mr. Gary Thomas

Job No. 23,548

January 27, 1982

TABLE OF CONTENTS

PURPOSE AND SCOPE OF STUDY

This report presents the results of a soil and foundation investigation for a bridge across Ralston Creek in Cottonwood Subdivision, Jefferson County, Colorado. The project site is shown on Fig. 1.

This report has been prepared to summarize the data obtained and to present our conclusions and recommendations based on the conditions encountered. Design parameters and a discussion of geotechnical engineering considerations related to construction of the proposed facility are included.

PROPOSED CONSTRUCTION

An 80 foot long single-span structure is proposed for the site. The structure will be approximately 44 feet wide and include two 15 foot lanes and two 5 foot sidewalks with parapets. The type of construction had not been finalized at the time of our investigation. For purposes of this report, the foundation loads were assumed to range between 100 and 300 kips per abutment.

If loadings or conditions are significantly different from those described above, we should be notified to re-evaluate the recommendations contained in this report.

SITE CONDITIONS

The bridge site is located in the Cottonwood Subdivision on Kilmer Street. The structure will provide access across Ralston Creek. At the time of our investigation, the creek was approximately 4 feet wide

with flowing water about 6 inches deep. The north bank is nearly vertical with an overall depth of approximately 12 feet. The south bank is on a 1:1 slope with an intermediate bench.

The site was vacant at the time of our investigation. The vegetation consists of native grasses, weeds and deciduous trees along Ralston Creek.

Croke Canal is approximately 300 feet west of the proposed ditch site and runs perpendicular to Ralston Creek. The flow in the canal is approximately 15 feet wide with the water level at approximately elevation 60. A gate controls the flow from the canal into the creek. At the time of our investigation, the gate was closed. It appears that water seeps from the canal into the creek.

SUBSURFACE CONDITIONS

To evaluate the subsurface conditions at the bridge site, 3 test holes were drilled at the approximate locations shown on Fig. 1. Six additional test holes were drilled in the subdivision south of Ralston Creek to determine the extent and depth of trash fill.

In general, the subsoils at the site were highly variable. They consisted of 20 to 25 feet of trash fill, organic silt, clay, sand and gravel overlying bedrock. Trash fill varied in depth from 8 to 16 feet across the entire area south of Ralston Creek. This is an old landfill which consists of approximately 3 feet of sandy clay overlying various metal, plastic, wood, paper, glass and organic material. The exact lateral and vertical extent of the fill was not determined as a result of this investigation.

A 2.5 to 3 foot layer of organic silt was encountered in Test Holes 1, 7 and 9 below the trash fill. The clay is sandy and medium stiff and the sand is clayey and medium dense. The gravel and sand layer varied in thickness from 7 to 13 feet. This material is poorly graded and dense to very dense with scattered cobbles.

Claystone bedrock underlies the overburden soils. The claystone consists of a 1.5 to 2.5 foot weathered mantel overlying sandy and hard to very hard claystone. Field penetration tests and unconfined compression tests indicate that the bedrock is capable of supporting moderate foundation loads without undergoing significant settlements. Results of laboratory tests are shown on Figs 4 and 5 and summarized on Table I.

Free water was encountered at depths of 10.5 to 14 feet below the ground surface at the time of drilling and when measured 4 to 8 days after drilling, see Figs. 2 and 3.

Ground intersect landfill

EXISTING LANDFILL

Landfill debris consisting of mixtures of wood, paper, glass, plastic and metal was encountered in all of the test holes drilled south of Ralston Creek. This area and two areas to the south have been identified by the Jefferson County Health Department as known landfills. The approximate locations of these fills, results of bar hole punch gas surveys and landfill histories, are presented in a report prepared by the department.[1]

1. Jefferson County Health Department, Methane Site Investigation, 1980.

Combustible gas measurements were taken during our investigation to determine if combustible gases were present in the landfill. The measurements were obtained with an MSA Model 53 gas scope. This instrument allows the measurement of the percent by volume of combustible gas in air and the percent lower explosive limit (LEL). The measurements obtained indicated 85% to 100% of the LEL and 3% to 28% combustible gases. The readings are summarized below:

Hole No.	% LEL	% Gas
4	100	10
5	85	3
6	100	28
9	100	13

Based on these readings, it appears that combustible gas is being generated within this landfill in quantities sufficient to be considered a hazard. The combustible range of methane gas is between 5% and 15% by volume in air. Concentrations above this range are too rich to burn. However, gas migration or exposure to the atmosphere will result in dilution of the gas and result in a flammable condition.

Care should be taken when excavating within or adjacent to the landfill mass. Venting of excavations will be required. Any structures built over the landfill will require special methane gas controls. There are 2 basic approaches to controlling the migration of methane into structures. These include barriers separating the proposed structure from the landfill and ventilation systems. Access roads, parking areas, underground utilities and other facilities constructed on landfill materials will be subjectd to large differential movements and a corrosive environment. The owner should

be aware of the high risk of distress associated with construction on landfills.

FOUNDATION RECOMMENDATIONS

Based on the subsurface conditions encountered at the site and the proposed construction, we recommend that the bridge be supported on drilled piers founded in the underlying unweathered bedrock. The following design and construction details should be observed for a drilled pier foundation system:

(1) Piers should be designed for a maximum end bearing pressure of 40,000 psf and a skin friction of 4,000 psf for the portion of the pier in unweathered bedrock. Piers should be designed for a minimum dead load pressure of 15,000 psf based on end area only. Uplift on the piers can be resisted by utilizing 50% of the skin friction value plus the weight of the pier.

(2) Piers should penetrate at least three pier diameters into the competent bedrock. A minimum penetration of 5 feet into the bedrock is recommended.

(3) Piers should be designed to resist lateral loads assuming a modulus of horizontal subgrade reaction in the clay of 40 tcf, a constant of horizontal subgrade reaction in the granular soils of 60 tcf and a modulus of horizontal subgrade reaction of 200 tcf in the bedrock. Resistance to lateral loads should be neglected in the trash fill and all materials above estimated scour depth.

(4) The minimum spacing requirements between caissons on the site should be 3 diameters from center to center. At this spacing, no

reduction in axial or horizontal soil modulus values is required. Piers grouped less than 3 diameters center to center should be studied on an individual basis to determine the appropriate reduction in both lateral and axial capacity.

(5) A minimum pier diameter of 24 inches is recommended to facilitate proper cleaning and observation of the pier hole.

(6) Concrete utilized in the piers should be a fluid mix with sufficient slump so that concrete will fill the void between reinforcing steel and the pier hole.

(7) Rock penetration in all pier holes should be roughened artificially to assist the development of peripheral shear between the pier and the bedrock. The roughening should be installed with a grooving tool in a pattern approved by the soil engineer.

The specifications should allow the soil engineer to eliminate the requirements for pier roughening if it appears the roughening procedure is not beneficial. This could occur if the pier hole is sufficiently roughened by the drilling process or if the presence of water results in a degradation of the pier hole during the roughening procedure.

(8) Based on the results of our field exploration, laboratory testing and experience with similiar, properly constructed caisson foundations, we estimate that pier settlement will be low. Generally, we estimate that settlement for a 24 to 36 inch diameter pier will be approximately 3/4 to 1 inch when designed with the criteria presented herein. The settlement of closely

spaced piers will be larger and should be studied on an individual basis.

(9) Pier holes should be properly cleaned prior to the placement of concrete.

(10) The presence of water and the nature of overburden strata encountered at the site indicates that the use of casing will be required to reduce water infiltration into the pier holes. If water cannot be removed prior to placement of concrete, the tremie method should be used after the hole has been well cleaned. In no case should concrete be placed in more than 3 inches of water.

(11) Gravel and cobbles were encountered during drilling of our test holes. These conditions will complicate the drilling process and may reduce the effectiveness or prevent seating of the casing in the upper bedrock surface. The drilling contractor should be made aware of this information and should be prepared for these conditions during the pier installation.

(12) Adequate construction equipment should be used to drill the piers to the required penetration and seat the casing into the bedrock materials. If shallow refusal is encountered in the bedrock our office should be notified to evaluate the conditions and establish that true refusal has been met with adequate equipment.

(13) A representative of the soil engineer should observe the pier drilling operations.

FOUNDATION ALTERNATES

Based on the subsurface conditions encountered, the proposed bridge may be supported on high-capacity driven piles or spread footings.

Driven Pile Alternate: The following design and construction details should be closely followed for a driven pile foundation system.

(1) The maximum allowable pile capacity should not exceed a service stress of 12,000 psi.

(2) The pile type should consist of heavy steel H-pile with tip reinforcement.

(3) The piles should penetration a minimum of 3 feet into unweathered bedrock.

(4) The piles should be designed to resist lateral loads using a modulus of subgrade reaction of 40 tcf, a constant of horizontal subgrade reaction in the clay of 60 tcf and a modulus of horizontal subgrade reaction of 200 tcf in the bedrock. Resistance to lateral loads should be neglected in the trash fill material and all material above the estimated scour depths.

(5) All piers should be advanced to virtual refusal. Virtual refusal is defined as 20 blows per inch with an approved pile hammer.

(6) The rated energy output of the hammer should be between 1800 and 2,000 foot-pounds per square inch of pile cross-sectional area.

(7) The hammer should be operating at the manufacturers recommended stroke when virtual refusal is measured.

(8) Due to the dense to very dense sand and gravel strata at the site, difficult driving conditions should be anticipated. These

conditions could adversely affect the structural integrity of the piles and also result in variable penetration into subsurface materials. Consequently, predrilling may be required to advance piles through the sand and gravel overburden materials.

(9) A representative of the soil engineer should observe the pile driving operations.

Spread Footing Alternate: The structure may be founded on spread footings placed on the dense to very dense sand and gravel strata. The following design and construction details should be observed for spread footing foundation system.

(1) Footings placed on undisturbed sand and gravel strata may be designed for a maximum allowable soil bearing pressure of 6,000 psf.

(2) Spread footings placed on granular soils should have a minimum footing dimension of not less than 36 inches.

(3) Footings should be provided with adequate scour protection above their bearing elevation.

(4) The lateral resistance of spread footing foundations placed on the undisturbed sand and gravel strata at the site will be a combination of the passive earth pressure against the side of the footing and the sliding resistance of the footing on the foundation materials. Sliding friction at the bottom of the footings can be taken as 0.4 times the vertical dead load. Passive pressure against the sides of the footings can be

calculated using an equivalent fluid pressure of 200 psf per foot of depth.

(5) Based on experience, we estimate that total settlement for footings designed and constructed as discussed in this section will be approximately 3/4 inch.

(6) The proposed footing elevations appear to be near or slightly above ground water level. Therefore, it may be necessary to dewater some footing excavations during construction. Dewatering should not be conducted by pumping from inside the footing excavations. This may decrease the supporting capacity of the soils.

(7) A representative of the soil engineer should observe all footing excavations prior to concrete placement in order to evaluate the supporting capacity of foundation materials.

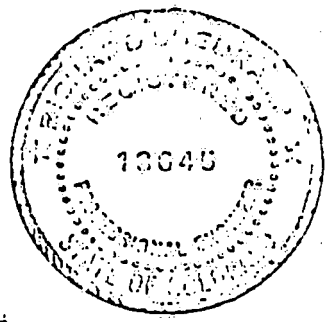
ABUTMENT AND WINGWALL BACKFILL

Backfill within 6 feet of the abutments and wingwalls should be Class 1 structural backfill in accordance with Colorado Standard Specifications for Road and Bridge Construction and should be compacted to a density of not less than 95% as determined in accordance with ASTM D698. Design lateral loads on wingwalls and abutments should be based on equivalent fluid pressure of 40 psf per foot.

LIMITATIONS

This report has been prepared in accordance with generally accepted soil and foundation engineering practices in this area for

use by the client for design purposes. The conclusions and recommendations submitted in this report are based upon the data obtained from the exploratory holes drilled at the locations indicated on the exploratory hole plan. The nature and extent of variations between the exploratory holes may not become evident until excavation is performed. If during construction, soil, rock and ground water conditions appear to be different from those described herein, this office should be advised at once so that re-evaluation of the recommendations may be made. We recommend on-site observation of excavations and foundation bearing strata by a soil engineer.



CHEN AND ASSOCIATES, INC.

By _____
Richard J. Suedkamp, P.E.

Reviewed By _____
David M. Jubenville, P.E.

RJS:fs

CONCLUSIONS

(1) The proposed structure should be founded on piers drilled into bedrock and designed for maximum end bearing pressure of 40,000 psf, a skin friction of 4,000 psf and a minimum dead load pressure of 15,000 psf, with design and construction details as outlined.

(2) Alternate foundation systems consisting of steel H-piles and designed for a maximum stress of 12,000 psi with tip reinforcement or spread footings placed on the lower sand and gravel strata and designed for a maximum bearing pressure of 6,000 psf may be used.

(3) Trash fill varying in depth from 8 to 16 feet was encountered across the site south of Ralston Creek. This landfill material is generating sufficient quantities of combustible methane gas to be hazardous.

Fill, man-made, sandy clay.

Trash fill, man-made, clay, metal, plastic, wood, paper organic materials.

Organic silt, slightly sandy, slightly clayey, stiff, moist to v moist, black.

Clay (CL), sandy, medium to stiff, moist to very moist, red to brown, occasionaly gravel.

Gravel, silty to sandy, poorly graded, medium dense to very dens wet, brown, scattered cobbles.

Weathered Claystone, sandy, firm to medium hard, moist, rust to

Claystone, sandy, very hard, moist, gray.

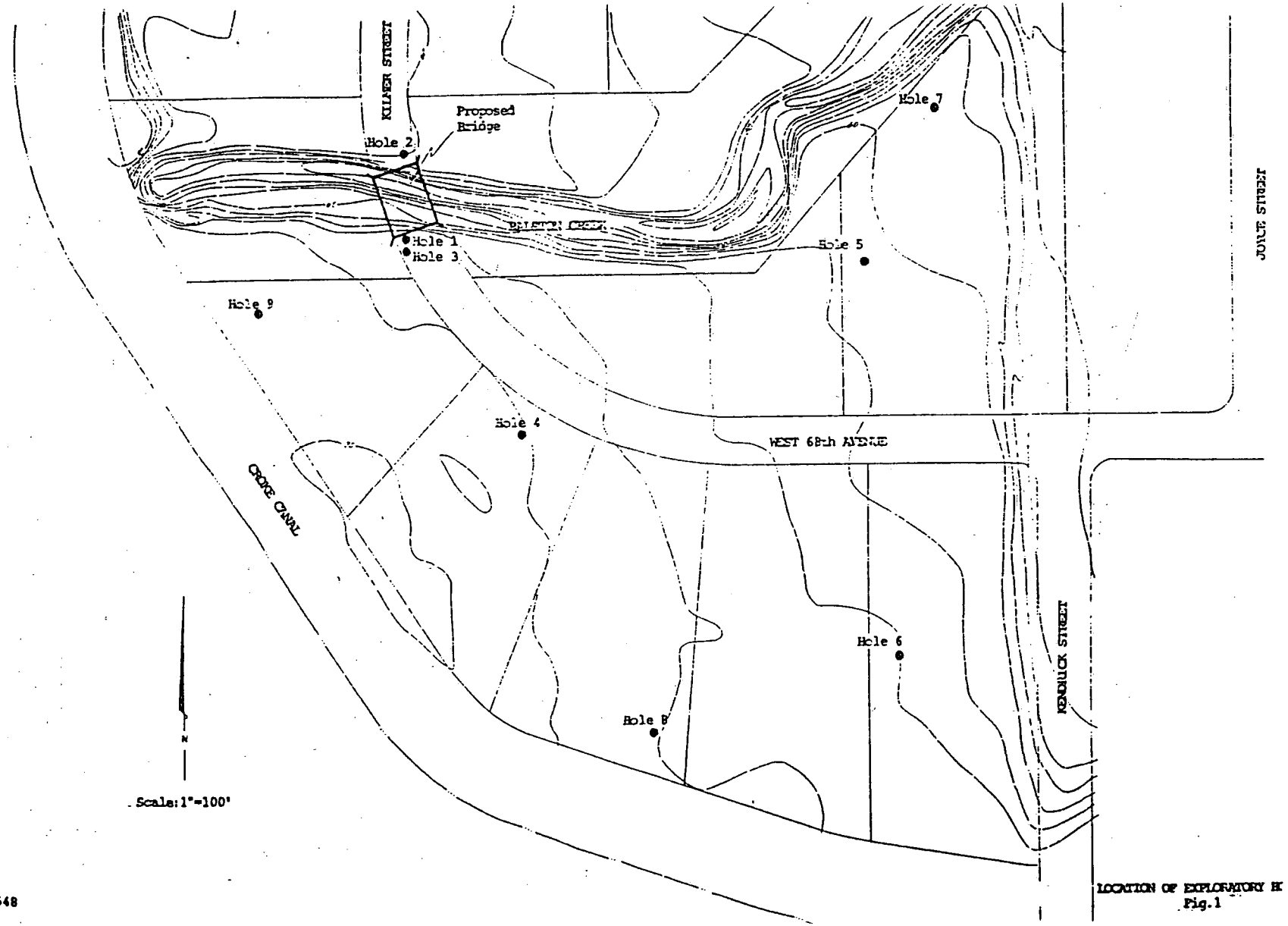
Undisturbed drive sample. The symbol 15/12 indicates that 15 blc a 140 pound hammer falling 30 inches were required to drive the 12 inches.

Standard Split Spoon Sample.

Indicates P.V.C. pipe installed to depth shown.

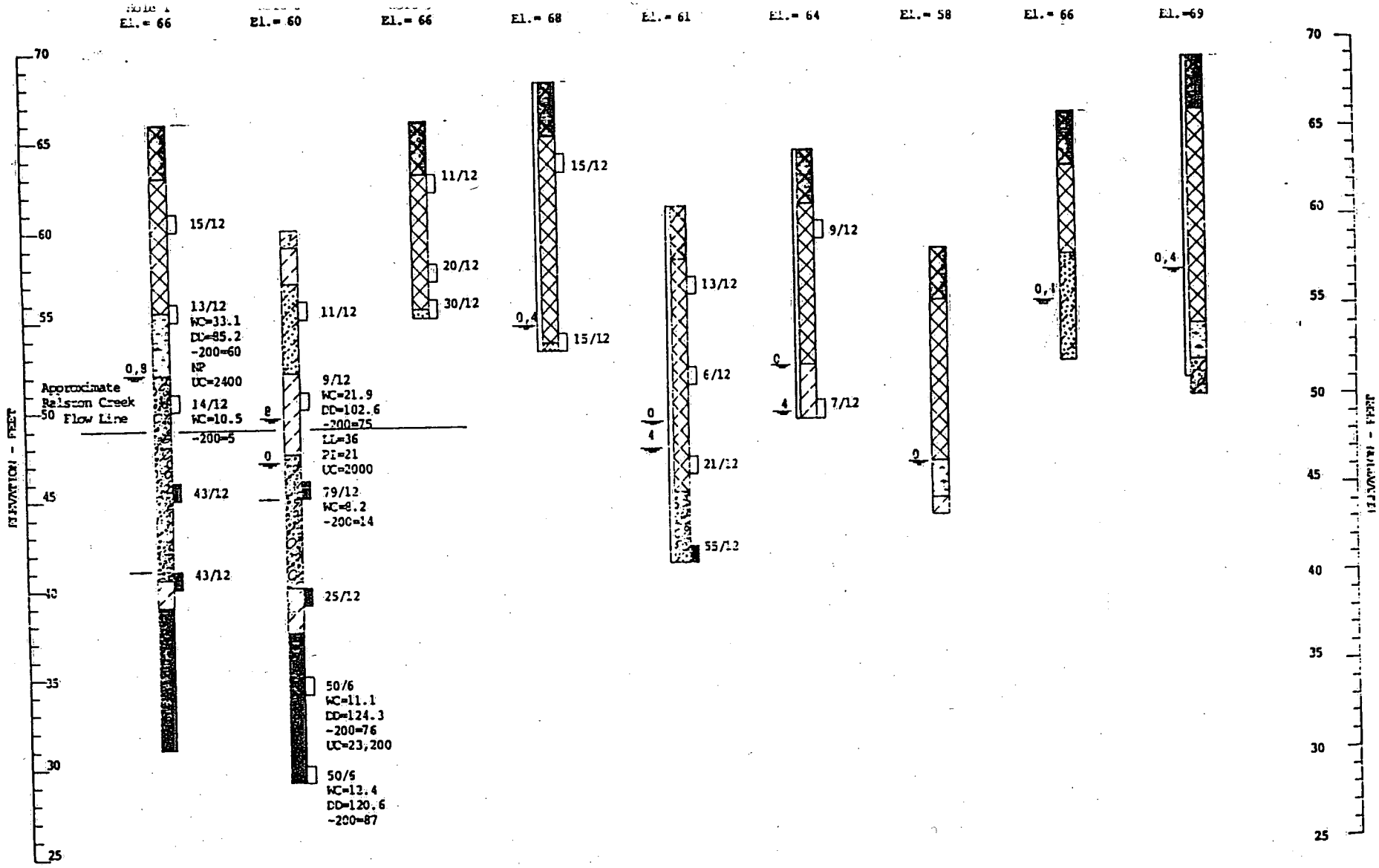
Indicates depth to free water.

Depth at which hole caved.



23,548

LOCATION OF EXPLORATORY H
Fig.1



LOGS OF EXPLORATORY HOLES
Fig. 2

23.54R

Fill, man-made, sandy clay.

Trash fill, man-made, clay, metal, plastic, wood, paper organic materials.

Organic silt, slightly sandy, slightly clayey, stiff, moist to very moist, black.

Clay (CL), sandy, medium to stiff, moist to very moist, red to brown, occasionaly gravel.

Gravel, silty to sandy, poorly graded, medium dense to very dense, wet, brown, scattered cobbles.

Weathered Claystone, sandy, firm to medium hard, moist, rust to brown

Claystone, sandy, very hard, moist, grey.

Undisturbed drive sample. The symbol 15/12 indicates that 15 blows of a 140 pound hammer falling 30 inches were required to drive the sampler 12 inches.

Standard Split Spoon Sample.

Indicates P.V.C. pipe installed to depth shown.

Indicates depth to free water.

Depth at which hole caved.

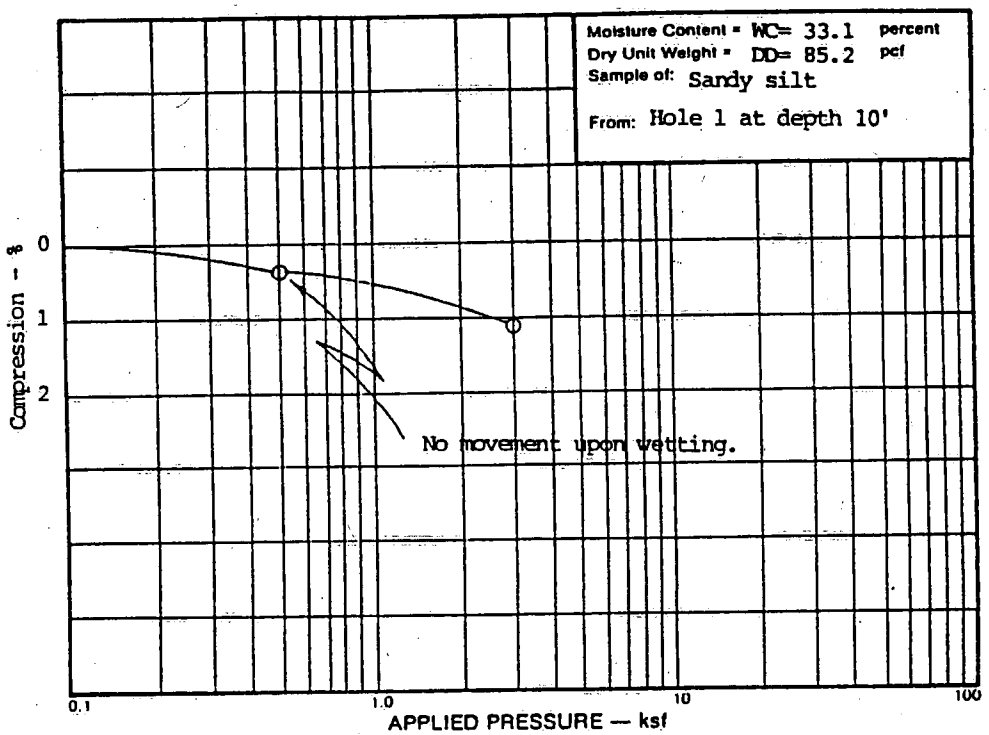
NOTES:

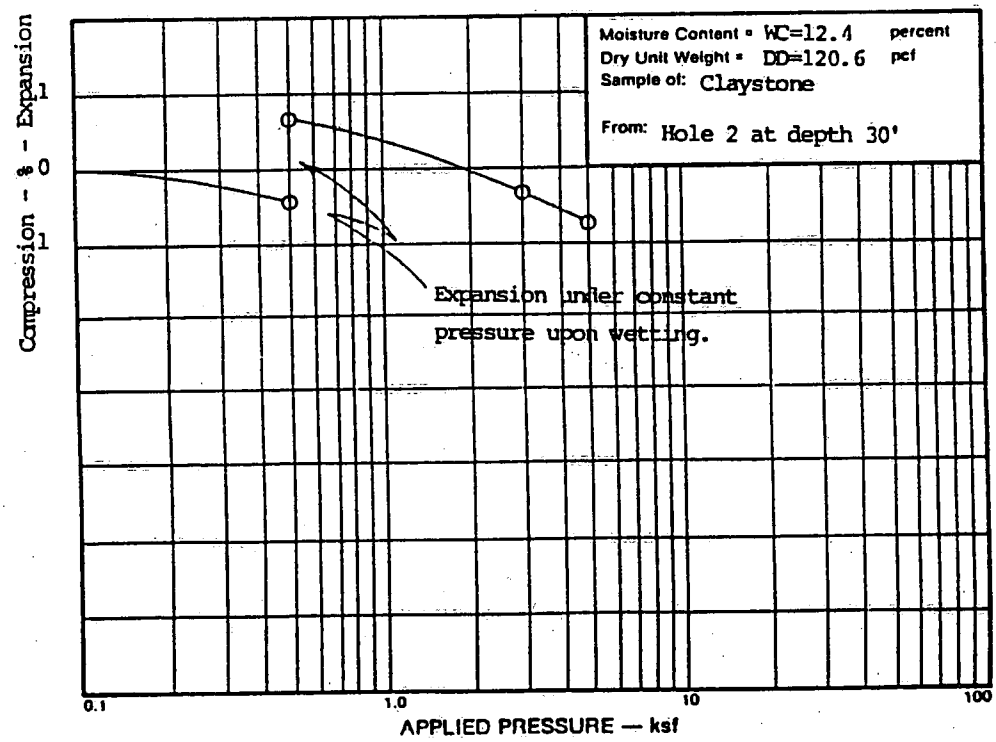
1. Test holes were drilled on January 11 and 18, 1982 with a 6-inch diameter continuous flight hollow stem and 4-inch diameter continuous flight power auger.
2. Location of test holes are approximate and were determined by pacing from existing Croke Channel.
3. Elevations of test hole were determined by interpolation between contours on the plan provided.
4. The locations and elevations of test holes should be considered accurate only to the degree implied by the method used.
5. The stratification lines shown on the test hole logs represent the approximate boundary between soil types and the transition may be gradual.
6. Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. These data have been reviewed and interpretations made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rain fall, temperature, and other factors at the time measurements were made.
7. WC = Water Content (%);
   DD = Dry Density (pcf);
   -200 = Percent Passing No. 200 Sieve;
   LL = Liquid Limit (%);
   PI = Plasticity Index (%);
   NP = Non Plastic;
   UC = Unconfined Compressive Strength (psf).

LEGEND AND NOTES
Fig. 3

CA-1-79

chen and associates, inc.





23,548

SWELL-CONSOLIDATION TEST RESULTS

Fig. 4

CHEN AND ASSOCIATES

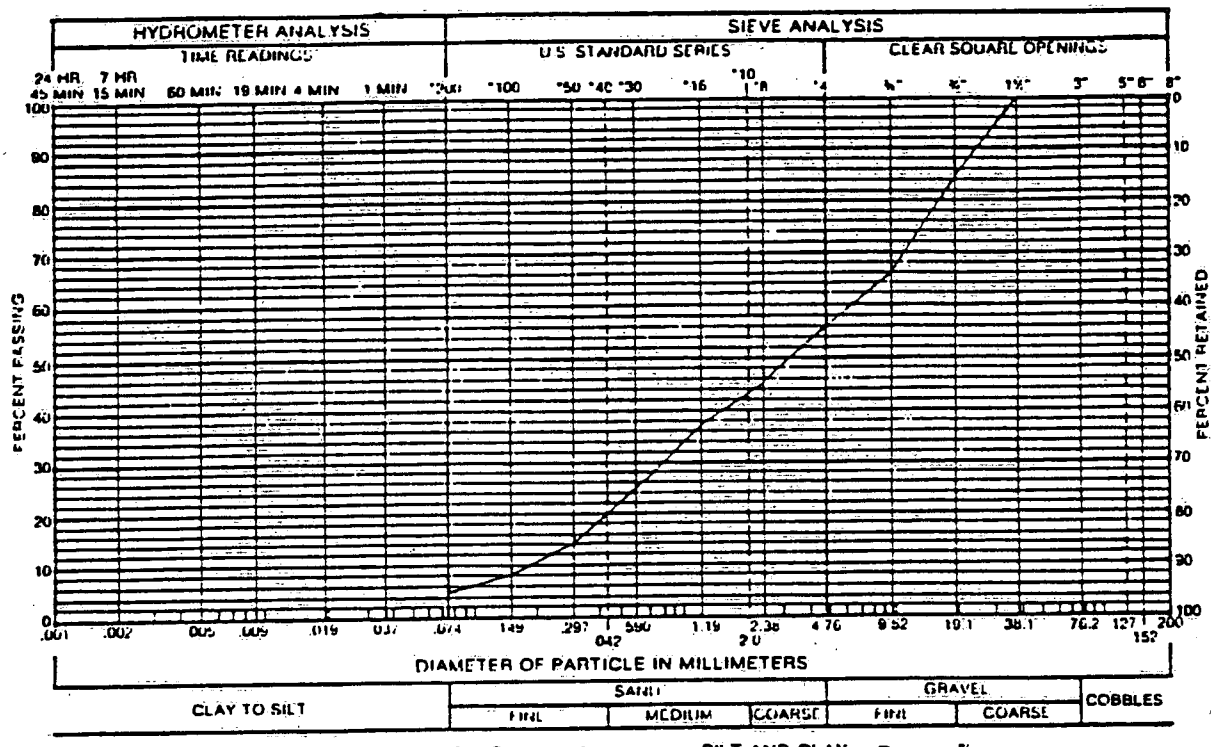
TABLE I

SUMMARY OF LABORATORY TEST RESULTS

Job No. 23,548
Page 1 of 1

SAMPLE LOCATION		NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (PCF)	GRADATION		PERCENT PASSING NO. 200 SIEVE	ATTERBERG LIMITS		UNCONFINED COMPRESSIVE STRENGTH (PSF)		SOIL OR BEDROCK TYPE
HOLE	DEPTH (FEET)			GRAVEL (%)	SAND (%)		LIQUID LIMIT (%)	PLASTICITY INDEX (%)			
1	10	33.1	85.2			60		NP	2400		Sandy silt
	15	10.5	—	44	51	5					Silty sand and gravel.
2	9	21.9	102.6			75	36	21	2000		Sandy clay
	14	8.2	—	50	36	14					Clayey sand and gravel
	25	11.1	124.3			76			23200		Claystone
	30	12.4	120.6			87					Claystone

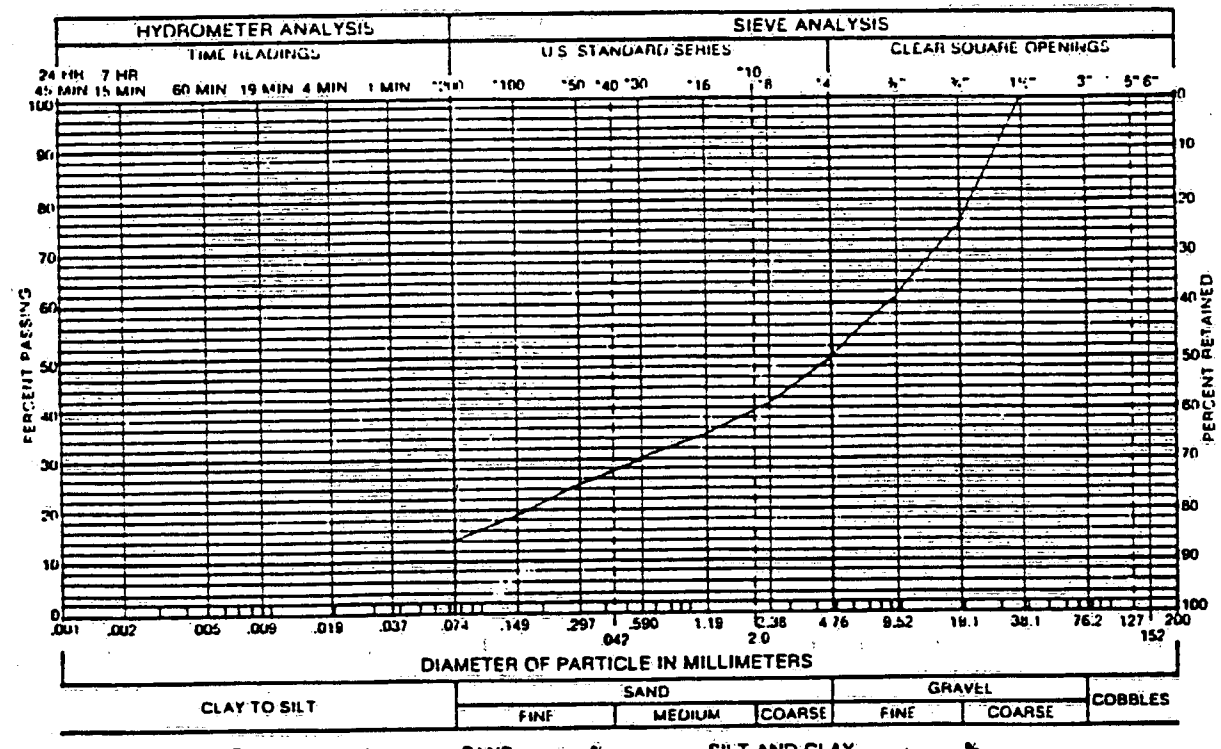
chen and associates, inc.



GRAVEL 44 % SAND 51 % SILT AND CLAY 5 %

LIQUID LIMIT % PLASTICITY INDEX %

SAMPLE OF Silty sand and gravel FROM Hole 1 at depth 15'



GRAVEL 50 % SAND 36 % SILT AND CLAY 14 %

LIQUID LIMIT % PLASTICITY INDEX %

SAMPLE OF Clayey sand and gravel FROM Hole 2 at depth 14'

APPENDIX I

FIELD GC (GAS CHROMATOGRAPH) DATA

GEO
CORPORATION

ERCE
Stanford Place 3, Suite 415
4582 South Ulster St Pkwy
Denver, CO 80237
Attention: Mr. Dave Runyon

Mr. Runyon:

Here are the analytical results for the project done on site at 69th and Indiana in Arvada, Colorado. There were 6 water samples collected, and subsamples were taken from all of these and analyzed.

The instrumentation was calibrated for the SW-846 Method 8020 suite of analytes and unleaded gasoline by Method 8015. Of these, the benzene, toluene, ethylbenzene, and xylene subset (BTEX), and the total volatile hydrocarbons (TVH) are reported.

The PQL for the BTEX analytes is 5 ug/L and for the total volatile hydrocarbons it is 2 mg/L.

The sample analysis for boring #8 was lost due to generator failure. Notation in the analysis log book showed sample run (BH08 WS01) to be clean.

If there are any questions concerning the data or the analysis, please feel free to call.

Cordially,

Adam P. Macdonald

Adam P. Macdonald
Geochemist
GEO Environmental
(303) 279-4655

Client: ERCE
Chromatographer: Adam P. Macdonald
Analysis Date: December 26, 1991
Analysis: SW-846 Method 8015/8020
Location: 69th & Indiana Arvada, CO
Sample Number: BH01 WS01

Analyte	Concentration	
Benzene	<5	ug/L
Toluene	<5	ug/L
Ethylbenzene	<5	ug/L
Total Xylenes	<5	ug/L
Total Volatile Hydrocarbons	<2	mg/L

Client: ERCE
Chromatographer: Adam P. Macdonald
Analysis Date: December 26, 1991
Analysis: SW-846 Method 8015/8020
Location: 69th & Indiana Arvada, CO
Sample Number: BH02 WS01

Analyte	Concentration	
Benzene	<5	ug/L
Toluene	<5	ug/L
Ethylbenzene	<5	ug/L
Total Xylenes	<5	ug/L
Total Volatile Hydrocarbons	<2	mg/L

Client: ERCE
Chromatographer: Adam P. Macdonald
Analysis Date: December 26, 1991
Analysis: SW-846 Method 8015/8020
Location: 69th & Indiana Arvada, CO
Sample Number: BH03 WS01

Analyte	Concentration	
Benzene	<5	ug/L
Toluene	<5	ug/L
Ethylbenzene	<5	ug/L
Total Xylenes	<5	ug/L
Total Volatile Hydrocarbons	<2	mg/L

AnalyticalTechnologies, Inc. 225 Commerce Drive Fort Collins, Colorado 80524 (303) 490-1511

January 3, 1992

Mr. Dave Runyon
ERCE
Stanford Place 3, Suite 415
4582 South Ulster Street Parkway
Denver, CO 80237

RE: ATI Workorder: 91-12-195
Client Project Name: Cottonwood ESA

Dear Mr. Runyon:

One water sample was received from ERCE on December 27, 1991. The sample was scheduled for Total Extractable Petroleum Hydrocarbons analysis. Results for this analysis are contained in the following report.

Thank you for your confidence in Analytical Technologies, Inc. Should you have any questions, please call.

Sincerely yours,

Penny Brogan-Daly for

Steven Fry, Ph.D.
Project Manager

SF/jw

Enclosures

Analytical Technologies, Inc.

QUALITY ASSURANCE
DATA REVIEW

The data contained in the following report has been reviewed and approved by the appropriate supervisory personnel listed below:

Eddy Hammerquist

Eddy Hammerquist, Fuels Supervisor

CERTIFICATION

Analytical Technologies, Inc. certifies that the analyses reported herein are true, complete and correct within the limits of the method employed.

TOTAL EXTRACTABLE PETROLEUM HYDROCARBONS
Modified Method 8015

Lab Name: Analytical Technologies, Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

ATI Workorder Number: 91-12-195

Date Collected: 12/27/91

Date Extracted: 12/31/91

Date Analyzed: 12/31/91

Sample Matrix: Water

Client Sample ID	Lab Sample ID	Dilution Factor	Conc. TEPH (mg/L)
Reagent Blank	91-12-195-RB	1	< 1
006	91-12-195-01	1	2

Note: Sample 006 contains high molecular weight components which could not be quantified by TPH-D analytical conditions.

TOTAL EXTRACTABLE PETROLEUM HYDROCARBONS
MATRIX SPIKE RESULTS
Modified Method 8015

Lab Name: Analytical Technologies, Inc.

Client Name: ERCE

Lab Sample ID: 91-12-195-01

Sample Matrix: Water

Client Sample ID: 006

Date Analyzed: 12/31/91

GC Column: DB-5

Compound	Spike Added (mg/L)	Sample Concentration (mg/L)	MS Concentration (mg/L)	MS Percent Recovery
TEPH	10	2	10	80

Compound	Spike Added (mg/L)	MSD Concentration (mg/L)	MSD Percent Recovery	Matrix Spike RPD
TEPH	10	9.8	78	2

CONTRA ERCE - DENVER SAMPLERS Ron C. Holm PROJECT COTTONWOOD E

SITE CONTACT/PHONE DAVE RUNYON 843-6210 LAB/LOCATION ATI - FT. COLLINS

C-O-C NUMBER 0002

~~EG&G ROCKY FLATS~~ RCH, CHAIN OF CUSTODY

ERCE - STANFORD PL. 3 SUITE 415
4582 So. Ulster St. Pkwy
DENVER, CO 80237

	DATE/TIME	SAMPLE NUMBER	LOCATION	CONTAINER TYPE	NUMBER OF CONTAINERS	MEDIA SOIL(S) WATER (W)	FILTERED-F POT DISS-P	TURN AROUND RUSH-R	OUT OF SPEC REPORTS	PRESERVATIVE: COOLED TO 4C	HCl	NaOH	HNO3	H2SO4	BOTTLE CODES
01	12/27/91 1605	006	Ralston Cr.	1 L glass Amb	1	W				Y					45

91-12-195

RCH 12-27-91

RELINQUISHED BY	DATE/TIME	RECEIVED BY	DATE/TIME
Ron C Holm	12/27/91 1615	Derek Fullerton	12/28/91 8:50

REMARKS WILL CALL MONDAY WITH ANALYSIS.

SHIPMENT METHOD

LABORATORY USE ONLY	Y	N
PCKG RECD/CUSTODY SEALS INTACT		
SAMPLE LABELS/COCs AGREE		
TEMPERATURE WITHIN SPECIFICATION ____C		
CORRECTED COPY ATTACHED		
PROBLEMS OR DISCREPANCIES		

APPENDIX G

DATA VALIDATION SUMMARY OF LABORATORY RESULTS

Date: 01\15\92
Client: D. Runyon (Ogden)
Reviewer: T. Perrin

Data Validation Summary

Samples and Analyses

Client Sample ID	Lab Sample ID	Analysis	Matrix
001	91-12-190-01	Volatiles	SOIL
004	91-12-190-03	Volatiles	WATER
002	91-12-190-02A	PCBs	SOIL
002	91-12-190-02	Total Lead	SOIL
005	91-12-190-04	Total Lead	WATER

Volatile Organics:

1. Overall Assessment:
Only result summaries were provided so compound identification could not be confirmed from raw instrument results nor could the calculations be verified. No data for instrument tuning or calibration was provided.
Data is acceptable with qualifications as noted below.

2. Holding times:
Per W. Glasgow the sample for volatile water analysis was not preserved with acid. The holding time for volatile analysis of an unpreserved water sample is 7 days. The sample was analyzed at 14 days after collection, therefore analytes were qualified "UJ" in sample 004. Since there are no guidelines for soils the soil sample was not qualified.

3. Surrogate Recoveries:
Surrogate compounds were added to the samples as a measure of purging efficiency. Surrogate recoveries were acceptable for both reagent blanks and sample 004. Recovery for surrogate toluene-d8 was low and bromofluorobenzene high for soil sample 001. All detects were qualified as estimated "J" and all quantitation limits as estimated "UJ" in sample 001 for this QC exceedance. In the case narrative the lab attributed the non-compliant surrogate recoveries to a matrix effect because on reanalysis the surrogate performance did not improve.

4. Reagent Blank:
A reagent blank was analyzed to evaluate possible laboratory-introduced contamination. No target analytes were reported in the reagent blanks. A TIC result page was not provided for the reagent blanks. Whether this is an omission by the lab or whether no TICs were detected in the reagent blanks is unknown. One tentatively identified compound (TIC) was reported in each sample. Trichlorofluoromethane (freon) is a common laboratory contaminant and therefore may not be a true sample constituent in analysis 001.

5. Matrix Spike/Matrix Spike Duplicate:
An associated matrix spike/matrix spike duplicate was performed on a water sample although not on the Ogden water sample. % Recoveries and RPDs were acceptable.

PCBs:

1. Overall Assessment:
No PCBs were reported in the sample. Only result summaries were provided so compound identification could not be confirmed from raw instrument results nor could the calculations be verified. No qualification of data was required.

2. Holding times:
Holding times were acceptable.

3. Surrogate Recoveries:
A surrogate compound was added to the sample before extraction as a measure of the extraction efficiency. The surrogate recoveries at 86 and 98% are considered acceptable for the reagent blank and sample 002 respectively.

4. Reagent Blank:
A reagent blank was analyzed to evaluated possible laboratory-introduced contamination. No target analytes were reported in the method blank.

5. Matrix Spike/Matrix Spike Duplicate:
A matrix spike/matrix spike duplicate was performed on a soil sample although not on the Ogden soil sample. The MS/MSD was analyzed 11 days before sample 002 was extracted so is not really indicative of extraction conditions for sample 002. % Recoveries and RPDs were acceptable. No qualifications were required.

Total Lead:

1. Overall Assessment:
Raw data was not provided for review; therefore, sample results and QC data were reviewed based on information presented in the respective summary forms. Sample results were acceptable without qualifications.

2. Holding Times:
The soil and water sample were analyzed within the water holding time of six months. The water sample was preserved with HNO_3.

3. Blanks:
Blank data presented on the Total Lead analysis data sheet was acceptable.

4. Matrix Spike:
An acceptable Matrix Spike percent recovery (%R) of 108% and 100% were recorded on the Total Lead Matrix Spike sheet for the soil and water samples respectively.

VOLATILE ORGANICS DATA SHEET

Method 8240

Client Sample ID: 001

Lab Name: Analytical Technologies Inc.
Client Name: ERCE
Client Project ID: Cottonwood ESA
Sample Matrix: Soil

Lab Sample ID: 91-12-190-01
Date Collected: 12/26/91
Date Analyzed: 01/09/92
Dilution Factor: 1

COMPOUND NAME	Concentration (ug/kg)		Lab Qual	Qual Code	Val Code
Chloromethane	< 10		U	S	VV
Bromomethane	< 10		U		
Vinyl chloride	< 10		U		
Chloroethane	< 10		U		
Methylene chloride	120		J		
Acetone	68		J		
Carbon disulfide	< 5		U		
1,1-Dichloroethene	2	J	J		
1,1-Dichloroethane	< 5		U		
1,2-Dichloroethene (Total)	4	J	J		
Chloroform	3	J	J		
1,2-Dichloroethane	< 5		U		
2-Butanone	< 10		U		
1,1,1-Trichloroethane	12		J		
Carbon tetrachloride	< 5		U		
Vinyl Acetate	< 10		U		
Bromodichloromethane	< 5		U		
1,2-Dichloropropane	< 5		U		
cis-1,3-Dichloropropene	< 5		U		
Trichloroethene	4	J	J		
Dibromochloromethane	< 5		U		
1,1,2-Trichloroethane	< 5		U		
Benzene	4	J	J		
trans-1,3-Dichloropropene	< 5		U		
Bromoform	< 5		U		
2-Hexanone	< 10		U		
4-Methyl-2-pentanone	< 10		U		
Tetrachloroethene	23		J		
1,1,2,2-Tetrachloroethane	< 5		U		
Toluene	24		J		
Chlorobenzene	4	J	J		
Ethylbenzene	7		J		
Styrene	< 5		U		
Total Xylenes	43		J		

Surrogate Recoveries:	% Rec	% Rec Limits
1,2-Dichloroethane-d4	93	70-121
Toluene-d8	72 *	81-117
Bromofluorobenzene	122 *	74-121

* Outside control limits.

J = compound detected below practical quantitation limit.

OGDEN VALIDATED

VOLATILE ORGANICS DATA SHEET

Tentatively Identified Compounds

Client Sample ID:

001

Laboratory Name: Analytical Technologies, Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Lab Sample ID: 91-12-190-01

Date Collected: 12/26/91

Date Analyzed: 01/09/92

Dilution Factor: 1

Matrix: Soil

Concentration units: ug/kg

COMPOUND NAME	RT	Concentration	Q	Raw Qual	Qual Code	Val Code
Trichlorofluoromethane		120 J		NJ		W

J = estimated value

OGDEN VALIDATED

VOLATILE ORGANICS DATA SHEET

Method 8240

Client Sample ID: 004

Lab Name: Analytical Technologies Inc.
Client Name: ERCE
Client Project ID: Cottonwood ESA
Sample Matrix: Water

Lab Sample ID: 91-12-190-03
Date Collected: 12/26/91
Date Analyzed: 01/09/92
Dilution Factor: 1

COMPOUND NAME	Concentration (ug/L)		Rev Qual	Qual Code	Val Code
Chloromethane	<	10	UJ	H	VV
Bromomethane	<	10			
Vinyl chloride	<	10			
Chloroethane	<	10			
Methylene chloride	<	5			
Acetone	<	10			
Carbon disulfide	<	5			
1,1-Dichloroethene	<	5			
1,1-Dichloroethane	<	5			
1,2-Dichloroethene (Total)	<	5			
Chloroform	<	5			
1,2-Dichloroethane	<	5			
2-Butanone	<	10			
1,1,1-Trichloroethane	<	5			
Carbon tetrachloride	<	5			
Vinyl Acetate	<	10			
Bromodichloromethane	<	5			
1,2-Dichloropropane	<	5			
cis-1,3-Dichloropropene	<	5			
Trichloroethene	<	5			
Dibromochloromethane	<	5			
1,1,2-Trichloroethane	<	5			
Benzene	<	5			
trans-1,3-Dichloropropene	<	5			
Bromoform	<	5			
2-Hexanone	<	10			
4-Methyl-2-pentanone	<	10			
Tetrachloroethene	<	5			
1,1,2,2-Tetrachloroethane	<	5			
Toluene	<	5			
Chlorobenzene	<	5			
Ethylbenzene	<	5			
Styrene	<	5			
Total Xylenes	<	5			

Surrogate Recoveries:	% Rec	% Rec Limits
1,2-Dichloroethane-d4	87	76-116
Toluene-d8	102	88-110
Bromofluorobenzene	101	86-115

OGDEN VALIDATED

Tentatively Identified Compounds

Client Sample ID

004

Laboratory Name: Analytical Technologies, Inc. Date Collected: 12/26/91

Client Name: ERCE Date Analyzed: 01/09/92

Client Project ID: Cottonwood ESA Dilution Factor: 1 1

Lab Sample ID: 91-12-190-03 Matrix: Water

Concentration units: ug/L

COMPOUND NAME	RT	Concentration	Q	Lab Qual	Qual Code	Val Code
Methyl-t-butyl ether		10 J		NJ		VV

J = estimated value

OGDEN VALIDATED

PCB ANALYSIS DATA SHEET
Method 8080

Lab Name: Analytical Technologies Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Lab Sample ID: 91-12-190-02A

Sample Matrix: Soil

Sample Weight: 30 g

GPC Cleanup: N

Client Sample ID: 002

Date Collected: 12/26/91

Date Extracted: 12/30/91

Date Analyzed: 01/03/92

Extract Volume: 10 mL

Dilution Factor: 1

Compound	Conc (mg/kg)	Rev Qual	Qual Code	Val Code
PCB 1016	< 0.03	U		VV
PCB 1221	< 0.03			
PCB 1232	< 0.03			
PCB 1242	< 0.03			
PCB 1248	< 0.03			
PCB 1254	< 0.03			
PCB 1260	< 0.03			

SURROGATE RECOVERY

Compound	% Recovery
Tetrachloro-m-xylene	98

OGDEN VALIDATED

TOTAL LEAD ANALYSIS DATA SHEET

Laboratory Name: Analytical Technologies, Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Workorder Number: 91-12-190

Date Collected: 12/26/91

Prep Date: 01/02/92

Date Analyzed: 01/02/92

Sample Matrix: Water

Client ID.	ATI ID.	Lead Conc. (mg/L)	Raw Qual	Qual Code	Val Code
Reagent Blank	91-12-190-RB	< 0.003			
005	91-12-190-04	0.065			V V

OGDEN VALIDATED

TOTAL LEAD ANALYSIS DATA SHEET

Laboratory Name: Analytical Technologies, Inc.

Client Name: ERCE

Client Project ID: Cottonwood ESA

Workorder Number: 91-12-190

Date Collected: 12/26/91

Prep Date: 01/02/92

Date Analyzed: 01/03/92

Sample Matrix: Soil

Client ID.	ATI ID.	Lead Conc. (mg/kg)	Raw Qual	Qual Code	Val Code
Reagent Blank	91-12-190-RB	< 5			
002	91-12-190-02	56			VV

OGDEN VALIDATED

Qualifier Codes for Organics

1)	Holding times were exceeded:	H
2)	Tuning (BFB or DFTPP) was non-compliant:	M
3)	Calibration:	
	a) RRF was <0.05:	R
	b) %RSD or %D was outside of QC limits:	C
4)	Blanks:	
	a) Presumed contamination from method blank:	B
	b) Presumed contamination from trip blank:	T
	c) Presumed contamination from field blank:	F
5)	Surrogate recovery was outside of QC limits:	S
6)	MS/MSD recovery was poor or RPD high:	Q
7)	Field duplicates showed poor agreement:	E
8)	IS Performance was unsatisfactory:	I
9)	Compound ID:	
	a) False positive (reported compound was not present):	+
	b) False Negative (compound was present but not reported):	-
10)	Reported result or other information was incorrect:	$
11)	TIC identity or reported retention time has been changed:	?
12)	Original analyses, dilutions, reanalyses or duplicate data that should not be used because another more technically sound analysis is available:	D
13)	Instrument performance for pesticides was poor:	P
14)	Unusual problems with the data that have been described in the Data Summary in a specific section. For example, *11 indicates that an unusual problem has been described in section 11 of the Data Summary:	*#

Reviewer Codes

U The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

J The analyte was positively identified in the sample, but the associated numerical value may not be an accurate representation of the amount actually present in the environmental sample. Values are of limited use.

R The data are unusable (presence or absence cannot be determined). Resampling and/or reanalysis is necessary for verification.

N Presumptive evidence of the presence of the material.

NJ Presumptive evidence of the presence of the material at an estimated quantity.

UJ The material was analyzed for but was not detected. The sample quantitation limit is an estimated quantity.

Validation Codes

Validation Code	Definition	Usability
VV	Validated Valid	Usable data
VI	Validated Invalid	Unusable for any purpose.
UN	Unvalidated	All data which has not been validated e.g. trip blanks

APPENDIX H

CHEN AND ASSOCIATES CONSULTING GEOTECHNICAL ENGINEERS

"Soil & Foundation Investigation Proposed Bridge Across Ralston Creek Cottonwood Subdivision"

chen and associates
CONSULTING GEOTECHNICAL ENGINEERS
86 SOUTH ZUNI STREET • DENVER, COLORADO 80223 • 303/744-7105

SOIL & FOUNDATION INVESTIGATION
PROPOSED BRIDGE ACROSS RALSTON CREEK
COTTONWOOD SUBDIVISION
JEFFERSON COUNTY, COLORADO

Prepared for:

KKBNA
7456 W. 5th Avenue
Denver CO 80226

Attn: Mr. Gary Thomas

Job No. 23,548

January 27, 1982

TABLE OF CONTENTS

PURPOSE AND SCOPE OF STUDY

This report presents the results of a soil and foundation investigation for a bridge across Ralston Creek in Cottonwood Subdivision, Jefferson County, Colorado. The project site is shown on Fig. 1.

This report has been prepared to summarize the data obtained and to present our conclusions and recommendations based on the conditions encountered. Design parameters and a discussion of geotechnical engineering considerations related to construction of the proposed facility are included.

PROPOSED CONSTRUCTION

An 80 foot long single-span structure is proposed for the site. The structure will be approximately 44 feet wide and include two 15 foot lanes and two 5 foot sidewalks with parapets. The type of construction had not been finalized at the time of our investigation. For purposes of this report, the foundation loads were assumed to range between 100 and 300 kips per abutment.

If loadings or conditions are significantly different from those described above, we should be notified to re-evaluate the recommendations contained in this report.

SITE CONDITIONS

The bridge site is located in the Cottonwood Subdivision on Kilmer Street. The structure will provide access across Ralston Creek. At the time of our investigation, the creek was approximately 4 feet wide

with flowing water about 6 inches deep. The north bank is nearly vertical with an overall depth of approximately 12 feet. The south bank is on a 1:1 slope with an intermediate bench.

The site was vacant at the time of our investigation. The vegetation consists of native grasses, weeds and deciduous trees along Ralston Creek.

Croke Canal is approximately 300 feet west of the proposed ditch site and runs perpendicular to Ralston Creek. The flow in the canal is approximately 15 feet wide with the water level at approximately elevation 60. A gate controls the flow from the canal into the creek. At the time of our investigation, the gate was closed. It appears that water seeps from the canal into the creek.

SUBSURFACE CONDITIONS

To evaluate the subsurface conditions at the bridge site, 3 test holes were drilled at the approximate locations shown on Fig. 1. Six additional test holes were drilled in the subdivision south of Ralston Creek to determine the extent and depth of trash fill.

In general, the subsoils at the site were highly variable. They consisted of 20 to 25 feet of trash fill, organic silt, clay, sand and gravel overlying bedrock. Trash fill varied in depth from 8 to 16 feet across the entire area south of Ralston Creek. This is an old landfill which consists of approximately 3 feet of sandy clay overlying various metal, plastic, wood, paper, glass and organic material. The exact lateral and vertical extent of the fill was not determined as a result of this investigation.

A 2.5 to 3 foot layer of organic silt was encountered in Test Holes 1, 7 and 9 below the trash fill. The clay is sandy and medium stiff and the sand is clayey and medium dense. The gravel and sand layer varied in thickness from 7 to 13 feet. This material is poorly graded and dense to very dense with scattered cobbles.

Claystone bedrock underlies the overburden soils. The claystone consists of a 1.5 to 2.5 foot weathered mantel overlying sandy and hard to very hard claystone. Field penetration tests and unconfined compression tests indicate that the bedrock is capable of supporting moderate foundation loads without undergoing significant settlements. Results of laboratory tests are shown on Figs 4 and 5 and summarized on Table I.

Free water was encountered at depths of 10.5 to 14 feet below the ground surface at the time of drilling and when measured 4 to 8 days after drilling, see Figs. 2 and 3.

Ground wt. intersect landfill

EXISTING LANDFILL

Landfill debris consisting of mixtures of wood, paper, glass, plastic and metal was encountered in all of the test holes drilled south of Ralston Creek. This area and two areas to the south have been identified by the Jefferson County Health Department as known landfills. The approximate locations of these fills, results of bar hole punch gas surveys and landfill histories, are presented in a report prepared by the department.[1]

1. Jefferson County Health Department, Methane Site Investigation, 1980.

Combustible gas measurements were taken during our investigation to determine if combustible gases were present in the landfill. The measurements were obtained with an MSA Model 53 gas scope. This instrument allows the measurement of the percent by volume of combustible gas in air and the percent lower explosive limit (LEL). The measurements obtained indicated 85% to 100% of the LEL and 3% to 28% combustible gases. The readings are summarized below:

Hole No.	% LEL	% Gas
4	100	10
5	85	3
6	100	28
9	100	13

Based on these readings, it appears that combustible gas is being generated within this landfill in quantities sufficient to be considered a hazard. The combustible range of methane gas is between 5% and 15% by volume in air. Concentrations above this range are too rich to burn. However, gas migration or exposure to the atmosphere will result in dilution of the gas and result in a flammable condition.

Care should be taken when excavating within or adjacent to the landfill mass. Venting of excavations will be required. Any structures built over the landfill will require special methane gas controls. There are 2 basic approaches to controlling the migration of methane into structures. These include barriers separating the proposed structure from the landfill and ventilation systems. Access roads, parking areas, underground utilities and other facilities constructed on landfill materials will be subjectd to large differential movements and a corrosive environment. The owner should

be aware of the high risk of distress associated with construction on landfills.

FOUNDATION RECOMMENDATIONS

Based on the subsurface conditions encountered at the site and the proposed construction, we recommend that the bridge be supported on drilled piers founded in the underlying unweathered bedrock. The following design and construction details should be observed for a drilled pier foundation system:

(1) Piers should be designed for a maximum end bearing pressure of 40,000 psf and a skin friction of 4,000 psf for the portion of the pier in unweathered bedrock. Piers should be designed for a minimum dead load pressure of 15,000 psf based on end area only. Uplift on the piers can be resisted by utilizing 50% of the skin friction value plus the weight of the pier.

(2) Piers should penetrate at least three pier diameters into the competent bedrock. A minimum penetration of 5 feet into the bedrock is recommended.

(3) Piers should be designed to resist lateral loads assuming a modulus of horizontal subgrade reaction in the clay of 40 tcf, a constant of horizontal subgrade reaction in the granular soils of 60 tcf and a modulus of horizontal subgrade reaction of 200 tcf in the bedrock. Resistance to lateral loads should be neglected in the trash fill and all materials above estimated scour depth.

(4) The minimum spacing requirements between caissons on the site should be 3 diameters from center to center. At this spacing, no

reduction in axial or horizontal soil modulus values is required. Piers grouped less than 3 diameters center to center should be studied on an individual basis to determine the appropriate reduction in both lateral and axial capacity.

(5) A minimum pier diameter of 24 inches is recommended to facilitate proper cleaning and observation of the pier hole.

(6) Concrete utilized in the piers should be a fluid mix with sufficient slump so that concrete will fill the void between reinforcing steel and the pier hole.

(7) Rock penetration in all pier holes should be roughened artificially to assist the development of peripheral shear between the pier and the bedrock. The roughening should be installed with a grooving tool in a pattern approved by the soil engineer.

The specifications should allow the soil engineer to eliminate the requirements for pier roughening if it appears the roughening procedure is not beneficial. This could occur if the pier hole is sufficiently roughened by the drilling process or if the presence of water results in a degradation of the pier hole during the roughening procedure.

(8) Based on the results of our field exploration, laboratory testing and experience with similiar, properly constructed caisson foundations, we estimate that pier settlement will be low. Generally, we estimate that settlement for a 24 to 36 inch diameter pier will be approximately 3/4 to 1 inch when designed with the criteria presented herein. The settlement of closely

spaced piers will be larger and should be studied on an individual basis.

(9) Pier holes should be properly cleaned prior to the placement of concrete.

(10) The presence of water and the nature of overburden strata encountered at the site indicates that the use of casing will be required to reduce water infiltration into the pier holes. If water cannot be removed prior to placement of concrete, the tremie method should be used after the hole has been well cleaned. In no case should concrete be placed in more than 3 inches of water.

(11) Gravel and cobbles were encountered during drilling of our test holes. These conditions will complicate the drilling process and may reduce the effectiveness or prevent seating of the casing in the upper bedrock surface. The drilling contractor should be made aware of this information and should be prepared for these conditions during the pier installation.

(12) Adequate construction equipment should be used to drill the piers to the required penetration and seat the casing into the bedrock materials. If shallow refusal is encountered in the bedrock our office should be notified to evaluate the conditions and establish that true refusal has been met with adequate equipment.

(13) A representative of the soil engineer should observe the pier drilling operations.

FOUNDATION ALTERNATES

Based on the subsurface conditions encountered, the proposed bridge may be supported on high-capacity driven piles or spread footings.

Driven Pile Alternate: The following design and construction details should be closely followed for a driven pile foundation system.

(1) The maximum allowable pile capacity should not exceed a service stress of 12,000 psi.

(2) The pile type should consist of heavy steel H-pile with tip reinforcement.

(3) The piles should penetration a minimum of 3 feet into unweathered bedrock.

(4) The piles should be designed to resist lateral loads using a modulus of subgrade reaction of 40 tcf, a constant of horizontal subgrade reaction in the clay of 60 tcf and a modulus of horizontal subgrade reaction of 200 tcf in the bedrock. Resistance to lateral loads should be neglected in the trash fill material and all material above the estimated scour depths.

(5) All piers should be advanced to virtual refusal. Virtual refusal is defined as 20 blows per inch with an approved pile hammer.

(6) The rated energy output of the hammer should be between 1800 and 2,000 foot-pounds per square inch of pile cross-sectional area.

(7) The hammer should be operating at the manufacturers recommended stroke when virtual refusal is measured.

(8) Due to the dense to very dense sand and gravel strata at the site, difficult driving conditions should be anticipated. These

conditions could adversely affect the structural integrity of the piles and also result in variable penetration into subsurface materials. Consequently, predrilling may be required to advance piles through the sand and gravel overburden materials.

(9) A representative of the soil engineer should observe the pile driving operations.

Spread Footing Alternate: The structure may be founded on spread footings placed on the dense to very dense sand and gravel strata. The following design and construction details should be observed for spread footing foundation system.

(1) Footings placed on undisturbed sand and gravel strata may be designed for a maximum allowable soil bearing pressure of 6,000 psf.

(2) Spread footings placed on granular soils should have a minimum footing dimension of not less than 36 inches.

(3) Footings should be provided with adequate scour protection above their bearing elevation.

(4) The lateral resistance of spread footing foundations placed on the undisturbed sand and gravel strata at the site will be a combination of the passive earth pressure against the side of the footing and the sliding resistance of the footing on the foundation materials. Sliding friction at the bottom of the footings can be taken as 0.4 times the vertical dead load. Passive pressure against the sides of the footings can be

calculated using an equivalent fluid pressure of 200 psf per foot of depth.

(5) Based on experience, we estimate that total settlement for footings designed and constructed as discussed in this section will be approximately 3/4 inch.

(6) The proposed footing elevations appear to be near or slightly above ground water level. Therefore, it may be necessary to dewater some footing excavations during construction. Dewatering should not be conducted by pumping from inside the footing excavations. This may decrease the supporting capacity of the soils.

(7) A representative of the soil engineer should observe all footing excavations prior to concrete placement in order to evaluate the supporting capacity of foundation materials.

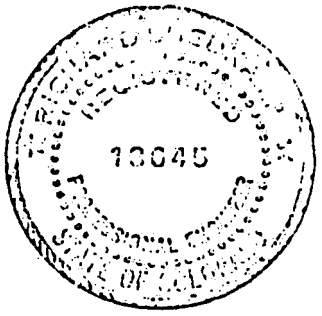
ABUTMENT AND WINGWALL BACKFILL

Backfill within 6 feet of the abutments and wingwalls should be Class 1 structural backfill in accordance with Colorado Standard Specifications for Road and Bridge Construction and should be compacted to a density of not less than 95% as determined in accordance with ASTM D698. Design lateral loads on wingwalls and abutments should be based on equivalent fluid pressure of 40 psf per foot.

LIMITATIONS

This report has been prepared in accordance with generally accepted soil and foundation engineering practices in this area for

use by the client for design purposes. The conclusions and recommendations submitted in this report are based upon the data obtained from the exploratory holes drilled at the locations indicated on the exploratory hole plan. The nature and extent of variations between the exploratory holes may not become evident until excavation is performed. If during construction, soil, rock and ground water conditions appear to be different from those described herein, this office should be advised at once so that re-evaluation of the recommendations may be made. We recommend on-site observation of excavations and foundation bearing strata by a soil engineer.



CHEN AND ASSOCIATES, INC.

By _____
Richard J. Suedkamp, P.E.

Reviewed By _____
David M. Jubenville, P.E.

RJS:fs

CONCLUSIONS

(1) The proposed structure should be founded on piers drilled into bedrock and designed for maximum end bearing pressure of 40,000 psf, a skin friction of 4,000 psf and a minimum dead load pressure of 15,000 psf, with design and construction details as outlined.

(2) Alternate foundation systems consisting of steel H-piles and designed for a maximum stress of 12,000 psi with tip reinforcement or spread footings placed on the lower sand and gravel strata and designed for a maximum bearing pressure of 6,000 psf may be used.

(3) Trash fill varying in depth from 8 to 16 feet was encountered across the site south of Ralston Creek. This landfill material is generating sufficient quantities of combustible methane gas to be hazardous.

LEGEND:

Fill, man-made, sandy clay.

Trash fill, man-made, clay, metal, plastic, wood, paper organic materials.

Organic silt, slightly sandy, slightly clayey, stiff, moist to ver moist, black.

Clay (CL), sandy, medium to stiff, moist to very moist, red to brown, occasionaly gravel.

Gravel, silty to sandy, poorly graded, medium dense to very dense, wet, brown, scattered cobbles.

Weathered Claystone, sandy, firm to medium hard, moist, rust to br

Claystone, sandy, very hard, moist, gray.

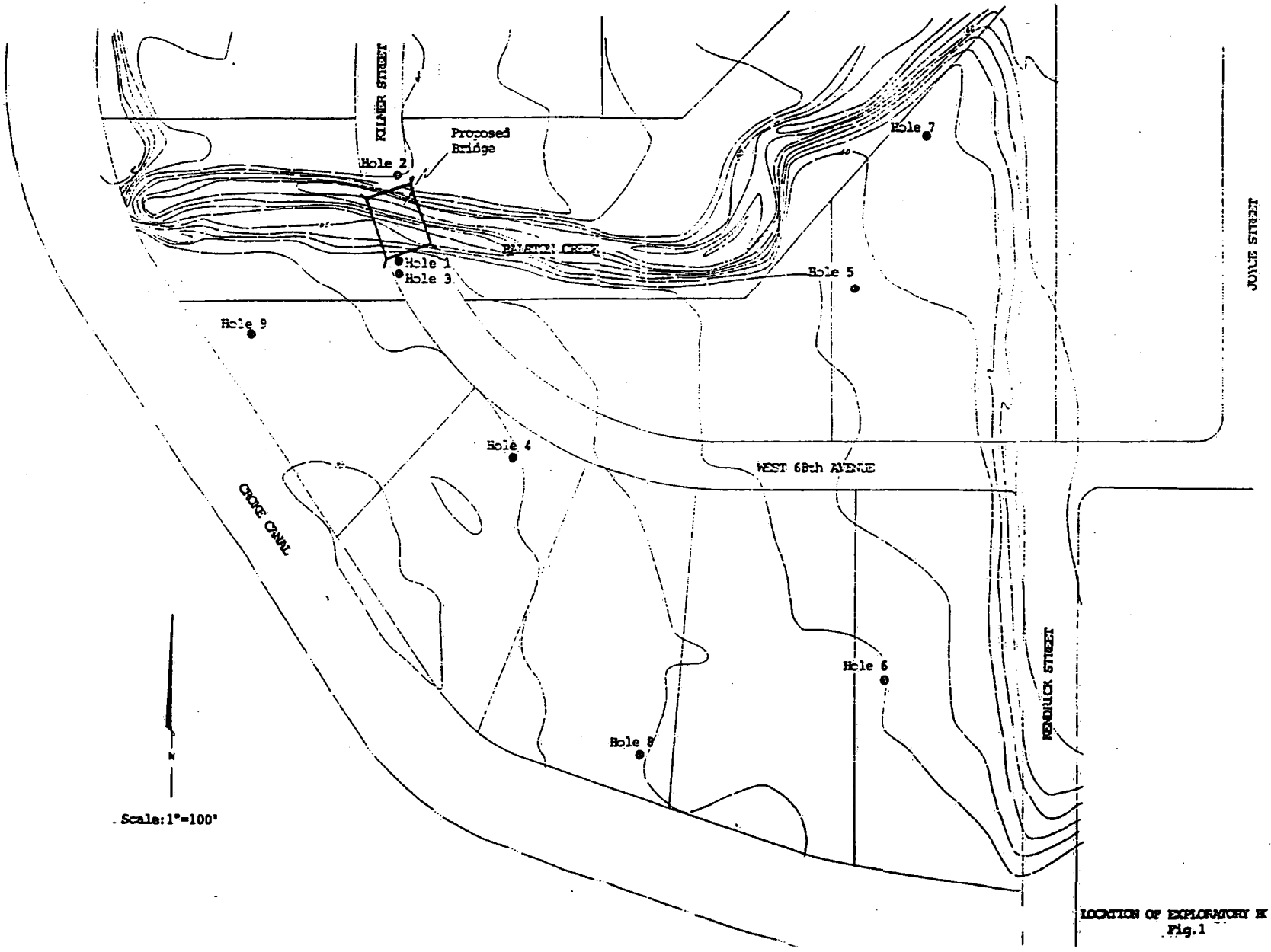
Undisturbed drive sample. The symbol 15/12 indicates that 15 blows a 140 pound hammer falling 30 inches were required to drive the sa 12 inches.

Standard Split Spoon Sample.

Indicates P.V.C. pipe installed to depth shown.

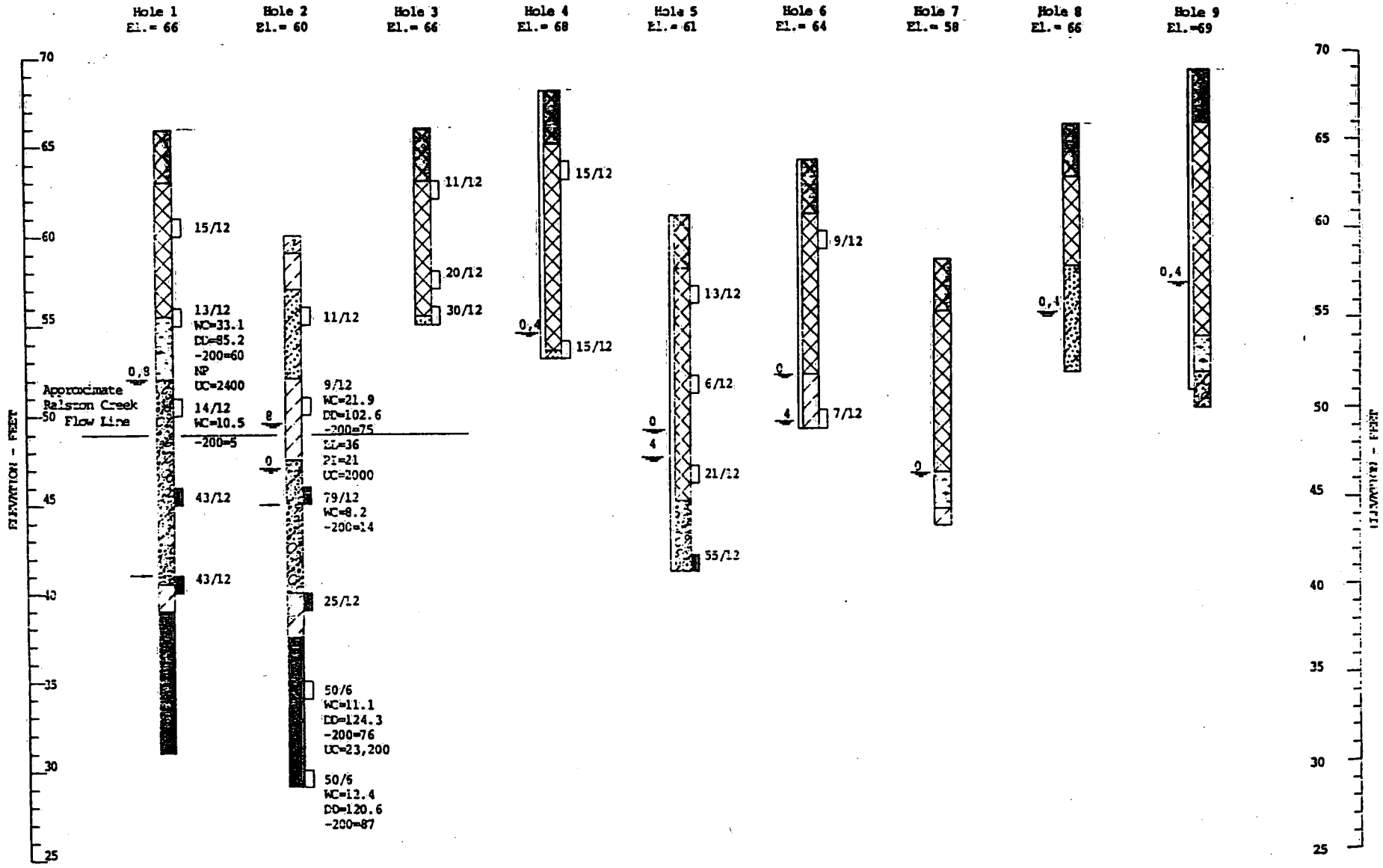
Indicates depth to free water.

Depth at which hole caved.



23,548

LOCATION OF EXPLORATORY H
Fig.1



23.548

LOGS OF EXPLORATORY HOLES
Fig. 2

Fill, man-made, sandy clay.

Trash fill, man-made, clay, metal, plastic, wood, paper organic materials.

Organic silt, slightly sandy, slightly clayey, stiff, moist to very moist, black.

Clay (CL), sandy, medium to stiff, moist to very moist, red to brown, occasionally gravel.

Gravel, silty to sandy, poorly graded, medium dense to very dense, wet, brown, scattered cobbles.

Weathered Claystone, sandy, firm to medium hard, moist, rust to brown.

Claystone, sandy, very hard, moist, grey.

Undisturbed drive sample. The symbol 15/12 indicates that 15 blows of a 140 pound hammer falling 30 inches were required to drive the sampler 12 inches.

Standard Split Spoon Sample.

Indicates P.V.C. pipe installed to depth shown.

4 Indicates depth to free water.

Depth at which hole caved.

NOTES:

1. Test holes were drilled on January 14 and 18, 1982 with a 6-inch diameter continuous flight hollow stem and 4-inch diameter continuous flight power auger.
2. Location of test holes are approximate and were determined by pacing from existing Croke Channel.
3. Elevations of test hole were determined by interpolation between contours on the plan provided.
4. The locations and elevations of test holes should be considered accurate only to the degree implied by the method used.
5. The stratification lines shown on the test hole logs represent the approximate boundary between soil types and the transition may be gradual.
6. Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. These data have been reviewed and interpretations made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rain fall, temperature and other factors at the time measurements were made.
7. WC = Water Content (%);
   DD = Dry Density (pcf);
   -200 = Percent Passing No. 200 Sieve;
   LL = Liquid Limit (%);
   PI = Plasticity Index (%);
   NP = Non Plastic;
   UC = Unconfined Compressive Strength (psf).

LEGEND AND NOTES
Fig. 3

CA-1-79

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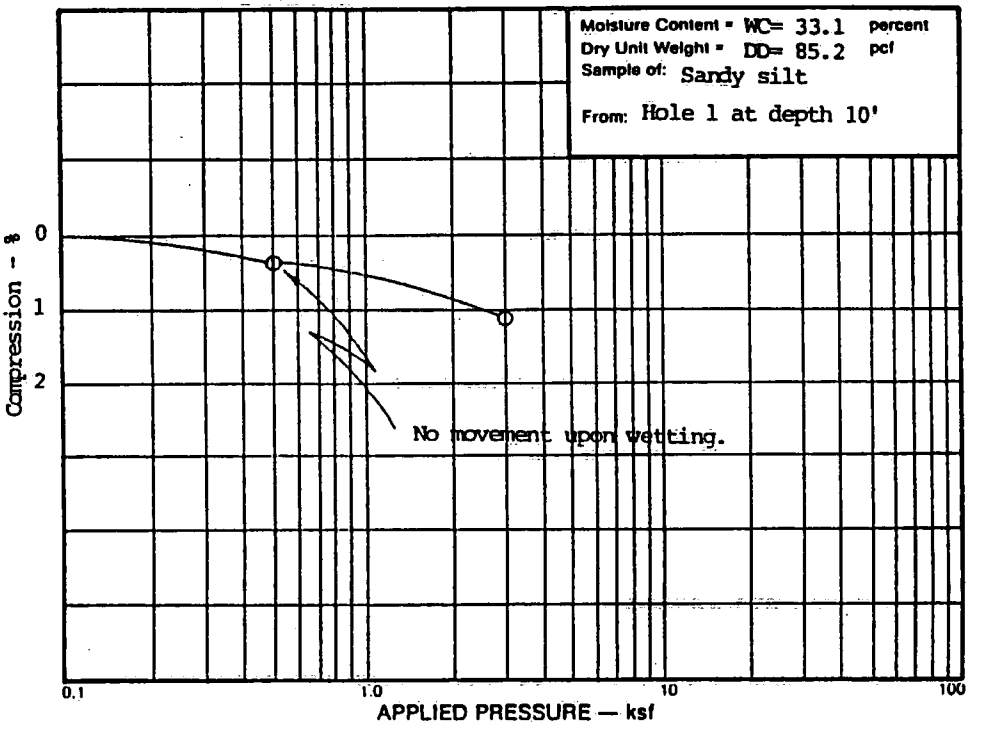

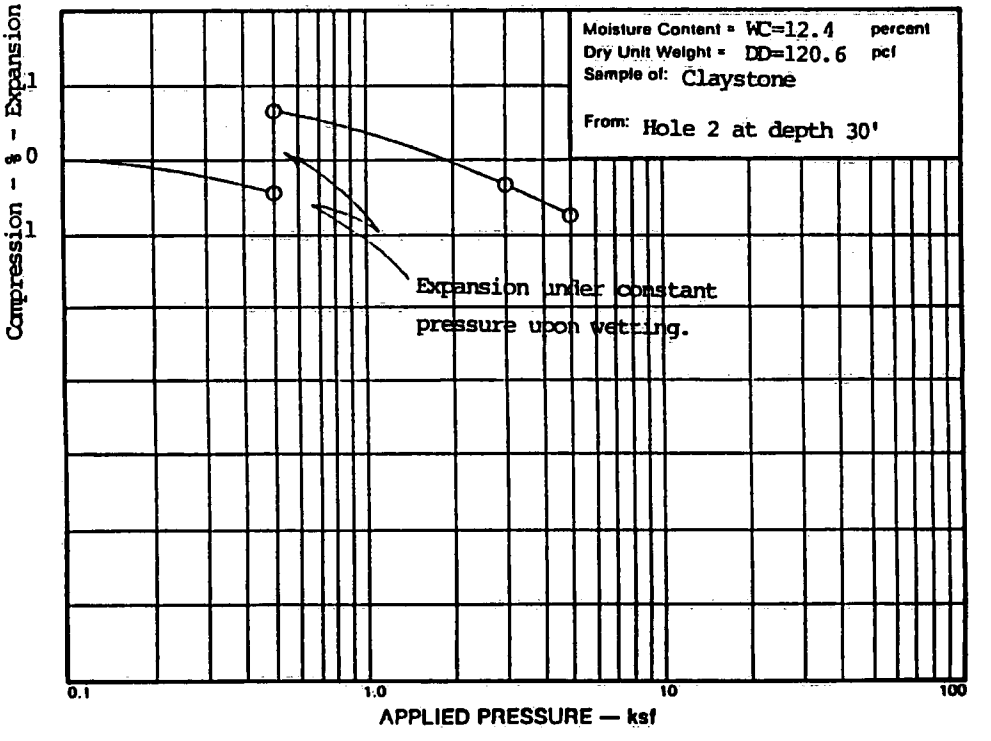

23,548 SWELL-CONSOLIDATION TEST RESULTS Fig. 4

CHEN AND ASSOCIATES

TABLE I

SUMMARY OF LABORATORY TEST RESULTS

Job No. 23,548
Page 1 of 1

SAMPLE LOCATION		NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (PCF)	GRADATION		PERCENT PASSING NO. 200 SIEVE	ATTERBERG LIMITS		UNCONFINED COMPRESSIVE STRENGTH (PSF)		SOIL OR BEDROCK TYPE
HOLE	DEPTH (FEET)			GRAVEL (%)	SAND (%)		LIQUID LIMIT (%)	PLASTICITY INDEX (%)			
1	10	33.1	85.2			60		NP	2400		Sandy silt
	15	10.5	—	44	51	5					Silty sand and gravel.
2	9	21.9	102.6			75	36	21	2000		Sandy clay
	14	8.2	—	50	36	14					Clayey sand and gravel
	25	11.1	124.3			76			23200		Claystone
	30	12.4	120.6			87					Claystone

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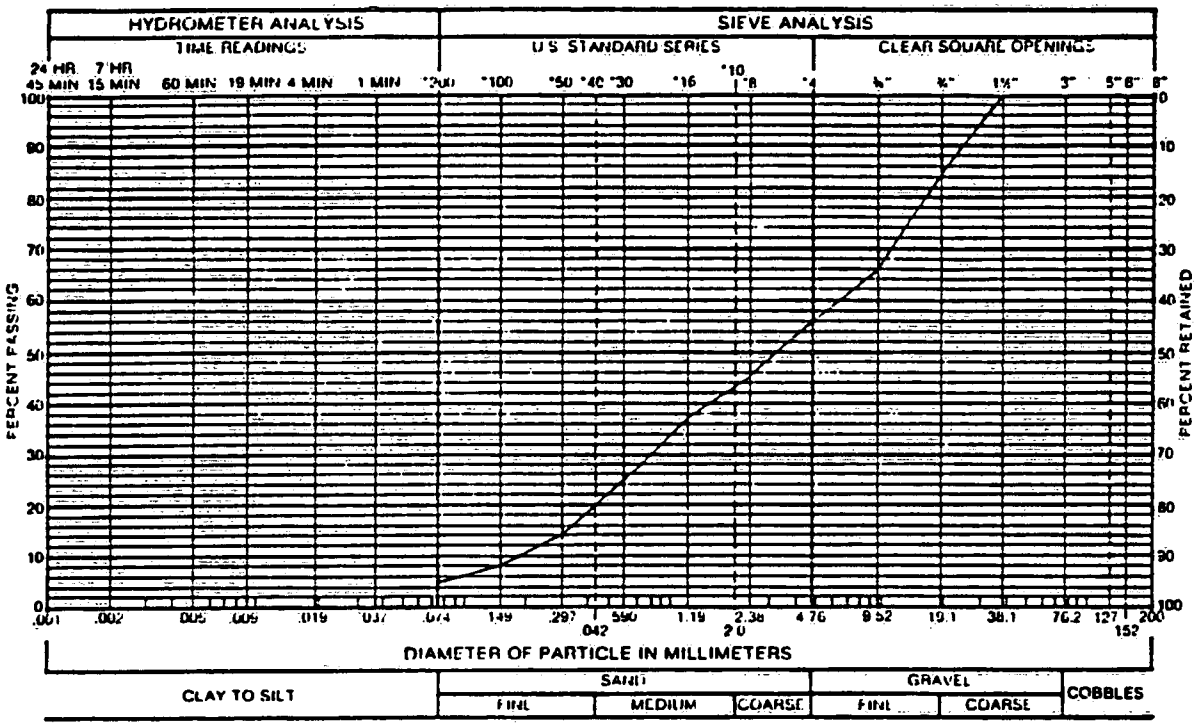
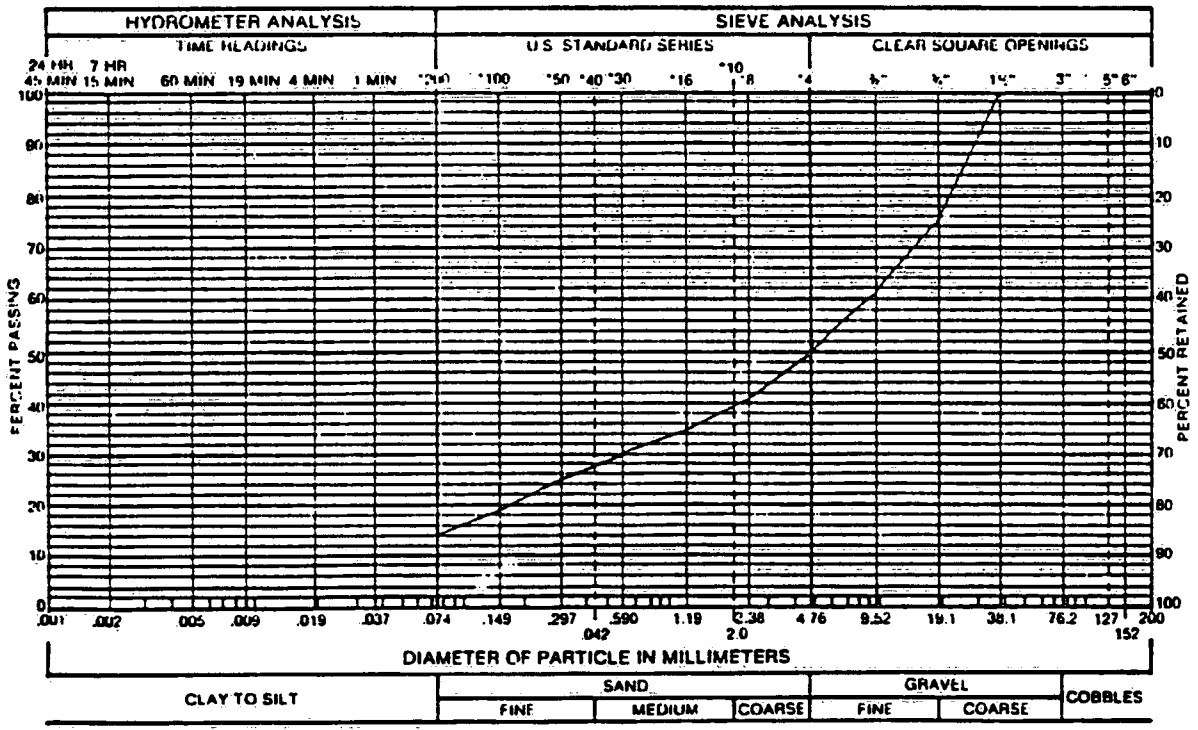


GRAVEL 44 % SAND 51 % SILT AND CLAY 5 %

LIQUID LIMIT % PLASTICITY INDEX %

SAMPLE OF Silty sand and gravel FROM Hole 1 at depth 15'



GRAVEL 50 % SAND 36 % SILT AND CLAY 14 %

LIQUID LIMIT % PLASTICITY INDEX %

SAMPLE OF Clayey sand and gravel FROM Hole 2 at depth 14'

GRADATION TEST RESULTS

APPENDIX I

FIELD GC (GAS CHROMATOGRAPH) DATA

GEO
CORPORATION

ERCE
Stanford Place 3, Suite 415
4582 South Ulster St Pkwy
Denver, CO 80237
Attention: Mr. Dave Runyon

Mr. Runyon:

Here are the analytical results for the project done on site at 69th and Indiana in Arvada, Colorado. There were 6 water samples collected, and subsamples were taken from all of these and analyzed.

The instrumentation was calibrated for the SW-846 Method 8020 suite of analytes and unleaded gasoline by Method 8015. Of these, the benzene, toluene, ethylbenzene, and xylene subset (BTEX), and the total volatile hydrocarbons (TVH) are reported.

The PQL for the BTEX analytes is 5 ug/L and for the total volatile hydrocarbons it is 2 mg/L.

The sample analysis for boring #8 was lost due to generator failure. Notation in the analysis log book showed sample run (BH08 WS01) to be clean.

If there are any questions concerning the data or the analysis, please feel free to call.

Cordially,

Adam P. Macdonald

Adam P. Macdonald
Geochemist
GEO Environmental
(303) 279-4655

Client: ERCE
Chromatographer: Adam P. Macdonald
Analysis Date: December 26, 1991
Analysis: SW-846 Method 8015/8020
Location: 69th & Indiana Arvada, CO
Sample Number: BH01 WS01

Analyte	Concentration	
Benzene	<5	ug/L
Toluene	<5	ug/L
Ethylbenzene	<5	ug/L
Total Xylenes	<5	ug/L
Total Volatile Hydrocarbons	<2	mg/L

Client: ERCE
Chromatographer: Adam P. Macdonald
Analysis Date: December 26, 1991
Analysis: SW-846 Method 8015/8020
Location: 69th & Indiana Arvada, CO
Sample Number: BH02 WS01

Analyte	Concentration	
Benzene	<5	ug/L
Toluene	<5	ug/L
Ethylbenzene	<5	ug/L
Total Xylenes	<5	ug/L
Total Volatile Hydrocarbons	<2	mg/L

Client: ERCE
Chromatographer: Adam P. Macdonald
Analysis Date: December 26, 1991
Analysis: SW-846 Method 8015/8020
Location: 69th & Indiana Arvada, CO
Sample Number: BH03 WS01

Analyte	Concentration	
Benzene	<5	ug/L
Toluene	<5	ug/L
Ethylbenzene	<5	ug/L
Total Xylenes	<5	ug/L
Total Volatile Hydrocarbons	<2	mg/L

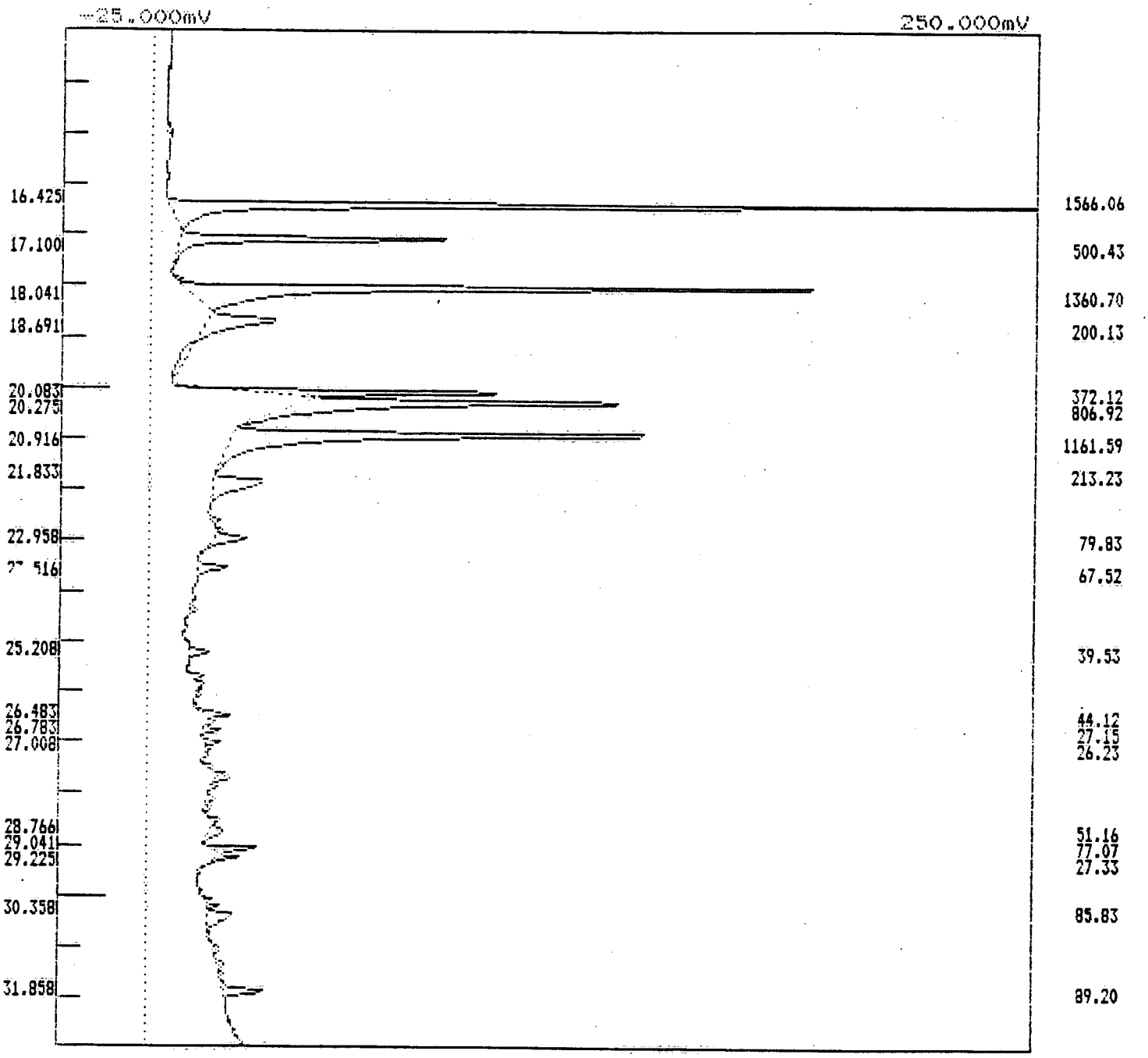
Client: ERCE
Chromatographer: Adam P. Macdonald
Analysis Date: December 26, 1991
Analysis: SW-846 Method 8015/8020
Location: 69th & Indiana Arvada, CO
Sample Number: RALSTON CRK WS01

Analyte	Concentration	
Benzene	<5	ug/L
Toluene	<5	ug/L
Ethylbenzene	<5	ug/L
Total Xylenes	<5	ug/L
Total Volatile Hydrocarbons	<2	mg/L

Client: ERCE
Chromatographer: Adam P. Macdonald
Analysis Date: December 26, 1991
Analysis: SW-846 Method 8015/8020
Location: 69th & Indiana Arvada, CO
Sample Number: BH06 WS01

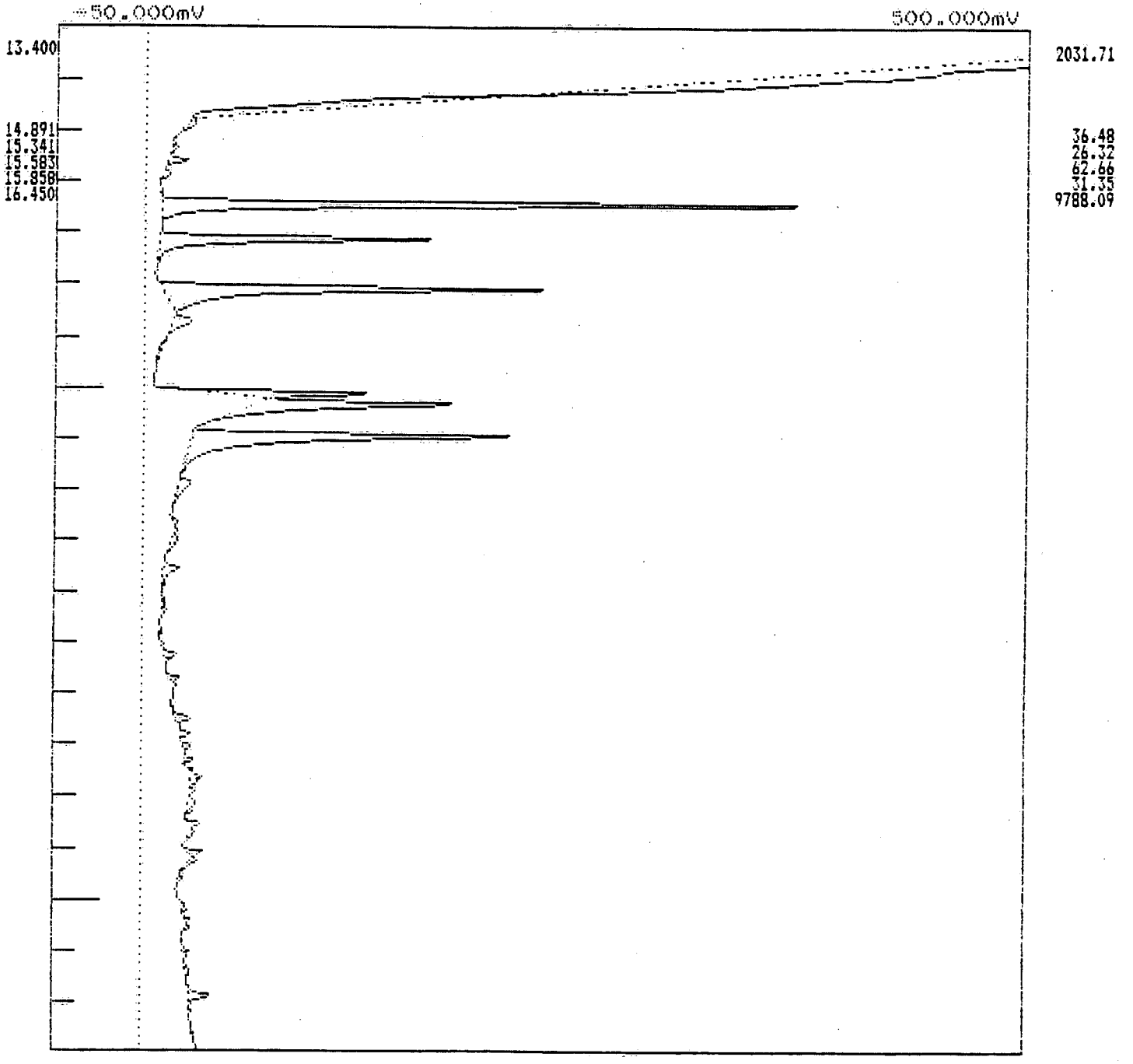
Analyte	Concentration	
Benzene	<5	ug/L
Toluene	<5	ug/L
Ethylbenzene	<5	ug/L
Total Xylenes	<5	ug/L
Total Volatile Hydrocarbons	<2	mg/L

Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 5 CH 1 PID
Conditions : 250NG BTEX CALIB STD
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225A1.CHR
Temperature : 8020.TEM
Components : 8020A.CPT
Date : 12/26/1991
Time : 07:06:29



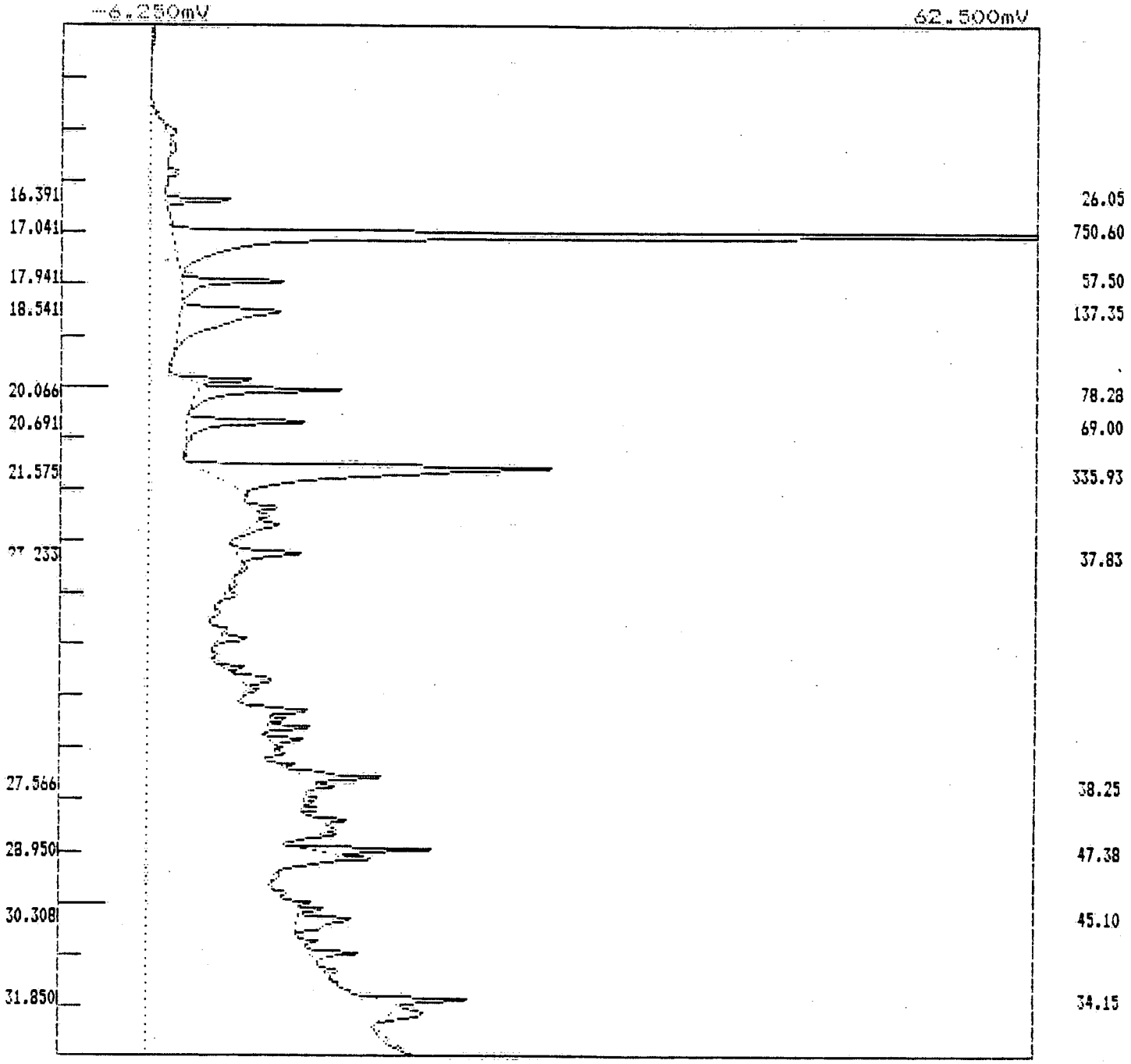
Component	Number	Retention	Area	External	Internal	Units
Benzene	1	16.425	1566.06	206.06	76.4270	NG
F3-Toluene surr	2	17.100	500.43	404.42	150.0000	NG
Toluene	3	18.041	1360.70	179.04	66.4053	NG
Ethylbenzene	5	20.083	372.12	186.06	271.8159	NG
m -Xylene	6	20.275	806.92	216.91	316.8863	NG
o -Xylene	7	20.916	1161.59	223.38	326.3371	NG
BFB - surr	8	21.833	213.23	102.68	150.0000	NG
7			5981.06	1518.56	1357.8717	

Control file : 8020.CON
Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 5 CH 2 FID
Conditions : 250NG BTEX CALIB STD
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225B1.CHR
Temperature : 8020.TEM
Components : 8020TPGH.CPT
Date : 12/26/1991
Time : 07:06:29



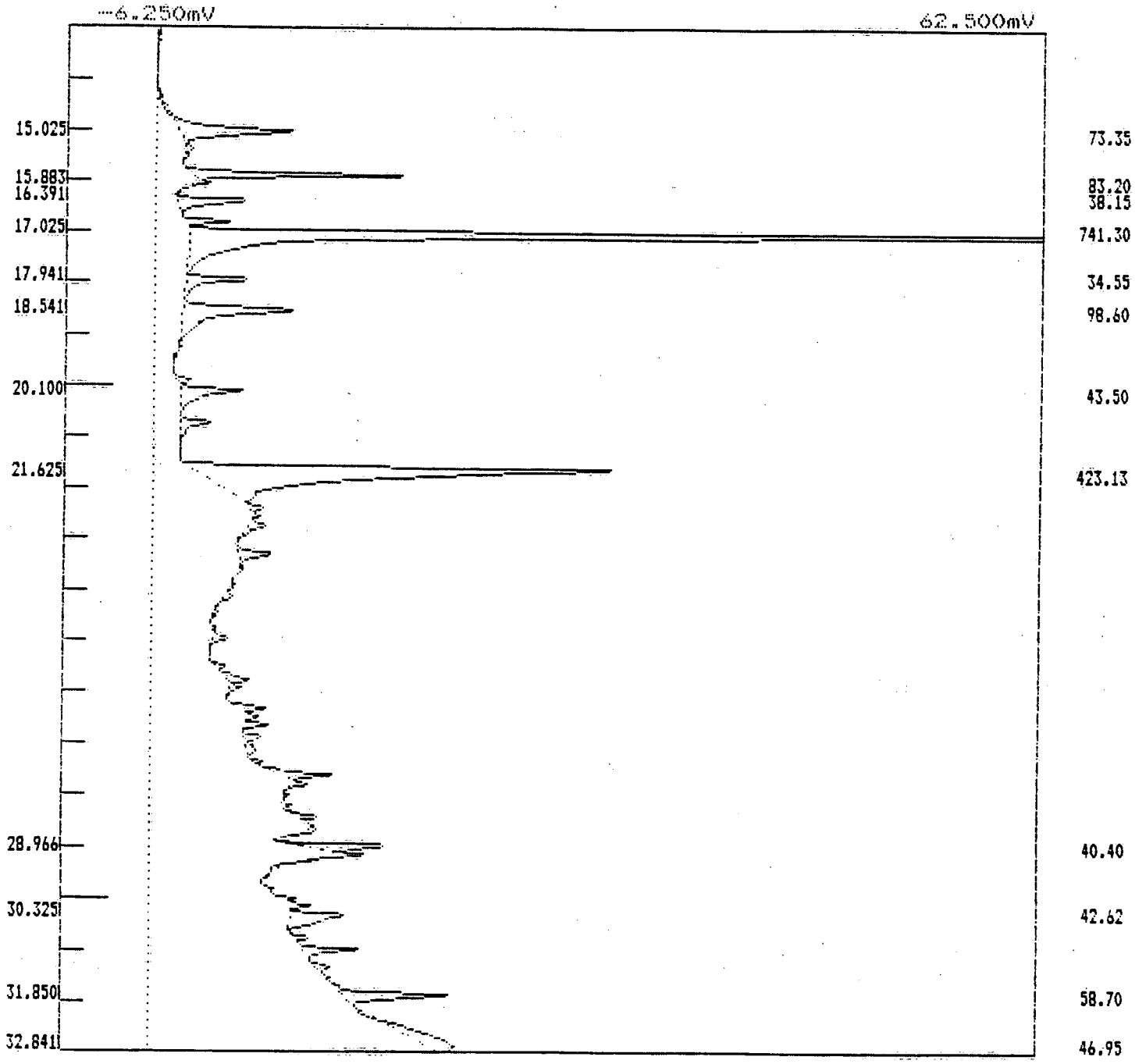
Component	Number	Retention	Area	External	Internal	Units
TOTL PRGBL H-C	1	16.450	9788.09	N/A	N/A	
1			9788.09	N/A	N/A	

Control File : 8020.CON
Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 5 CH 1 PID
Conditions : 5 ML DI H2O BLANK (250NG SURR'S)
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225A2.CHR
Temperature : 8020.TEM
Components : 8020A.CPT
Date : 12/26/1991
Time : 09:26:18



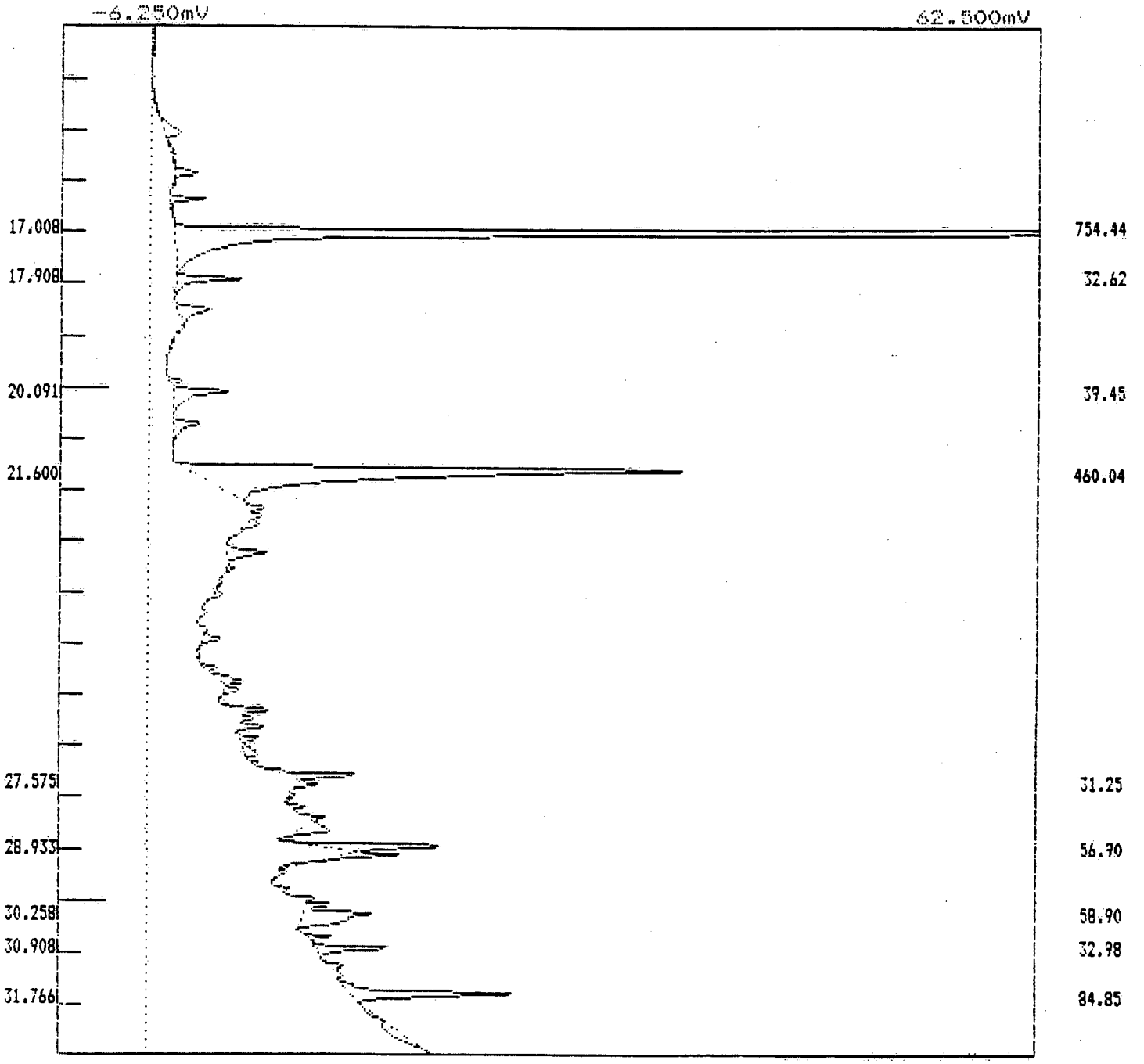
Component	Number	Retention	Area	External	Internal	Units
Benzene	1	16.391	26.05	3.43	0.8872	NG
FB-Toluene surr	2	17.041	750.60	579.54	150.0000	NG
Toluene	3	17.941	57.50	7.57	1.9582	NG
m -Xylene	6	20.066	78.28	21.04	24.7398	NG
o -Xylene	7	20.691	69.00	13.27	15.6013	NG
BFB - surr	8	21.575	335.93	127.58	150.0000	NG
6			1317.35	752.43	343.1865	

Control file : 8020.CON
Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 5 CH 1 PID
Conditions : BH01 WS01 5ML PURGE COLLECTED @ 1057 @ 12'
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225A3.CHR
Temperature : 8020.TEM
Components : 8020A.CPT
Date : 12/26/1991
Time : 11:11:45



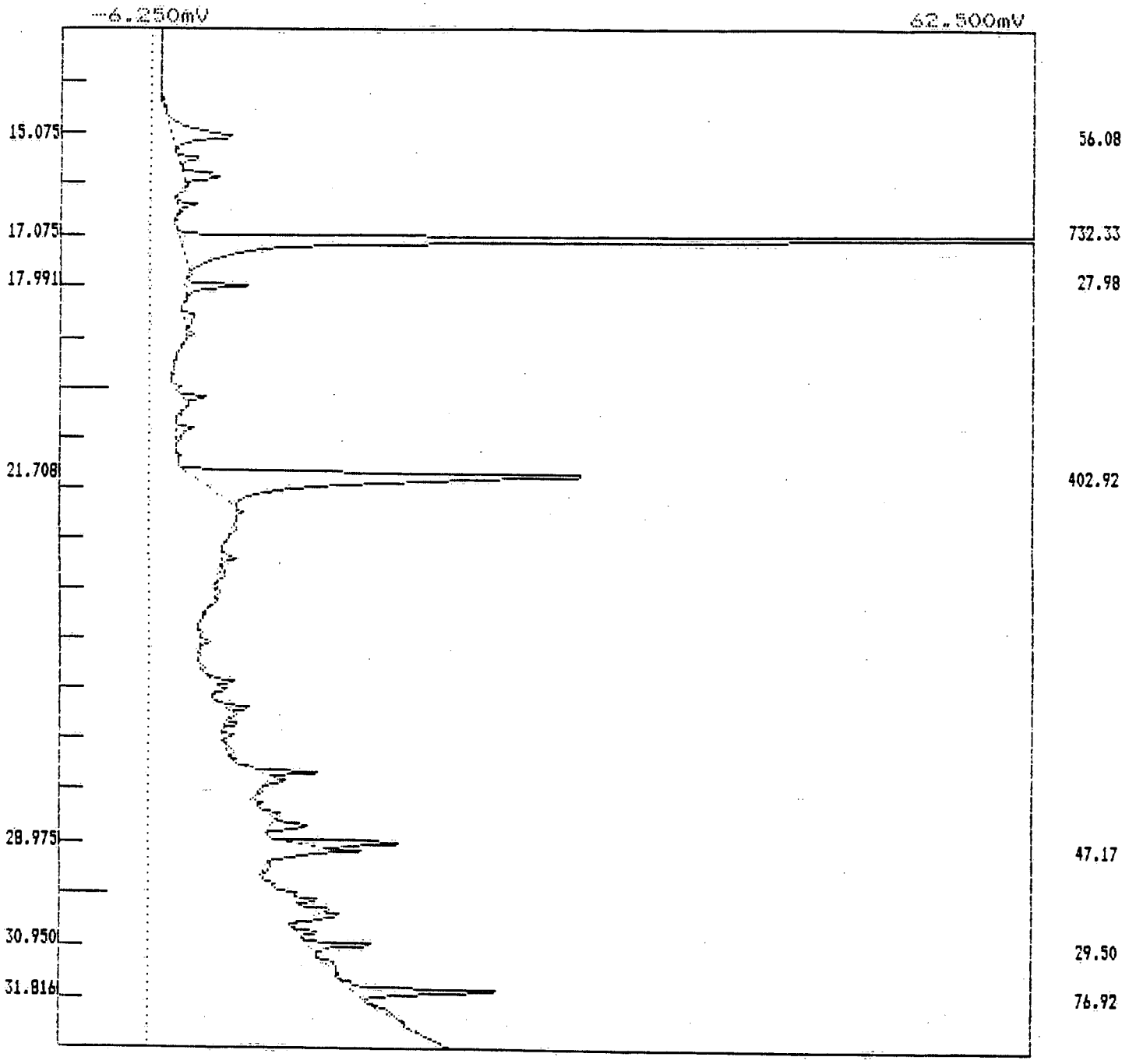
Component	Number	Retention	Area	External	Internal	Units
Benzene	1	16.391	38.15	5.02	1.3140	NG
F3-Toluene surr	2	17.025	741.30	573.04	150.0000	NG
T uene	3	17.941	34.55	4.55	1.1900	NG
m, -Xylene	6	20.100	43.50	11.69	12.0738	NG
BFB - surr	8	21.625	423.13	145.28	150.0000	NG
5			1280.63	739.58	314.5778	

Control file : 8020.CON
Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 5 CH 1 PID
Conditions : RALSTON CRK WS01 5ML PURGE COLLT'D @1325@SURF.
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225A4.CHR
Temperature : 8020.TEM
Components : 8020A.CPT
Date : 12/26/1991
Time : 13:33:35



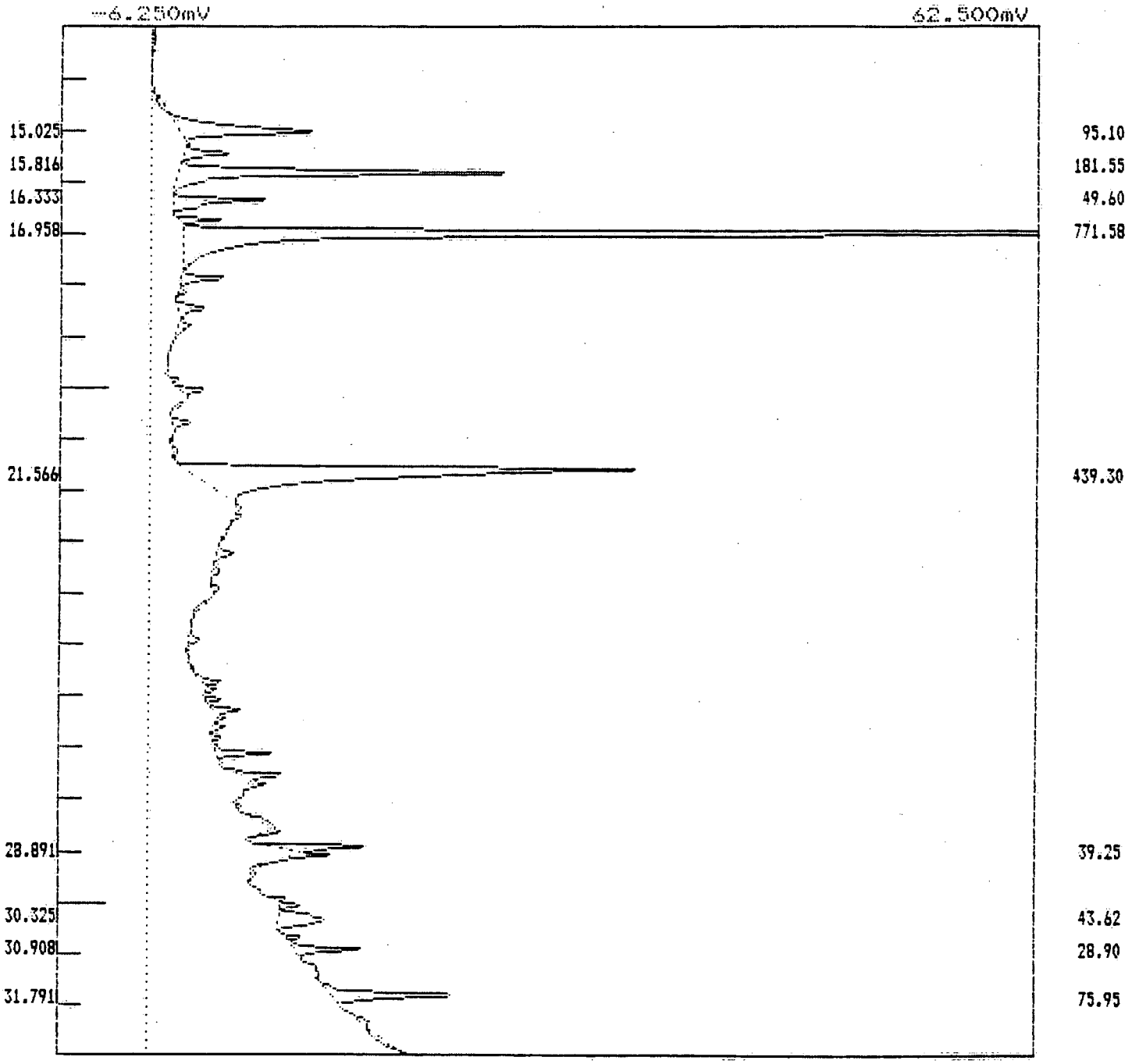
Component	Number	Retention	Area	External	Internal	Units
F3-Toluene surr	2	17.008	754.44	582.24	150.0000	NG
Toluene	3	17.908	32.62	4.29	1.1059	NG
m -Xylene	6	20.091	39.45	10.60	10.4128	NG
1 - surr	8	21.600	460.04	152.77	150.0000	NG
4			1286.55	749.90	311.5188	

Control file : 8020.CON
Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 5 CH 1 PID
Conditions : BH03 WS01 5ML PURGE COLLECTED @ 1352 @ 18'
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225A5.CHR
Temperature : 8020.TEM
Components : 8020A.CPT
Date : 12/26/1991
Time : 14:21:11



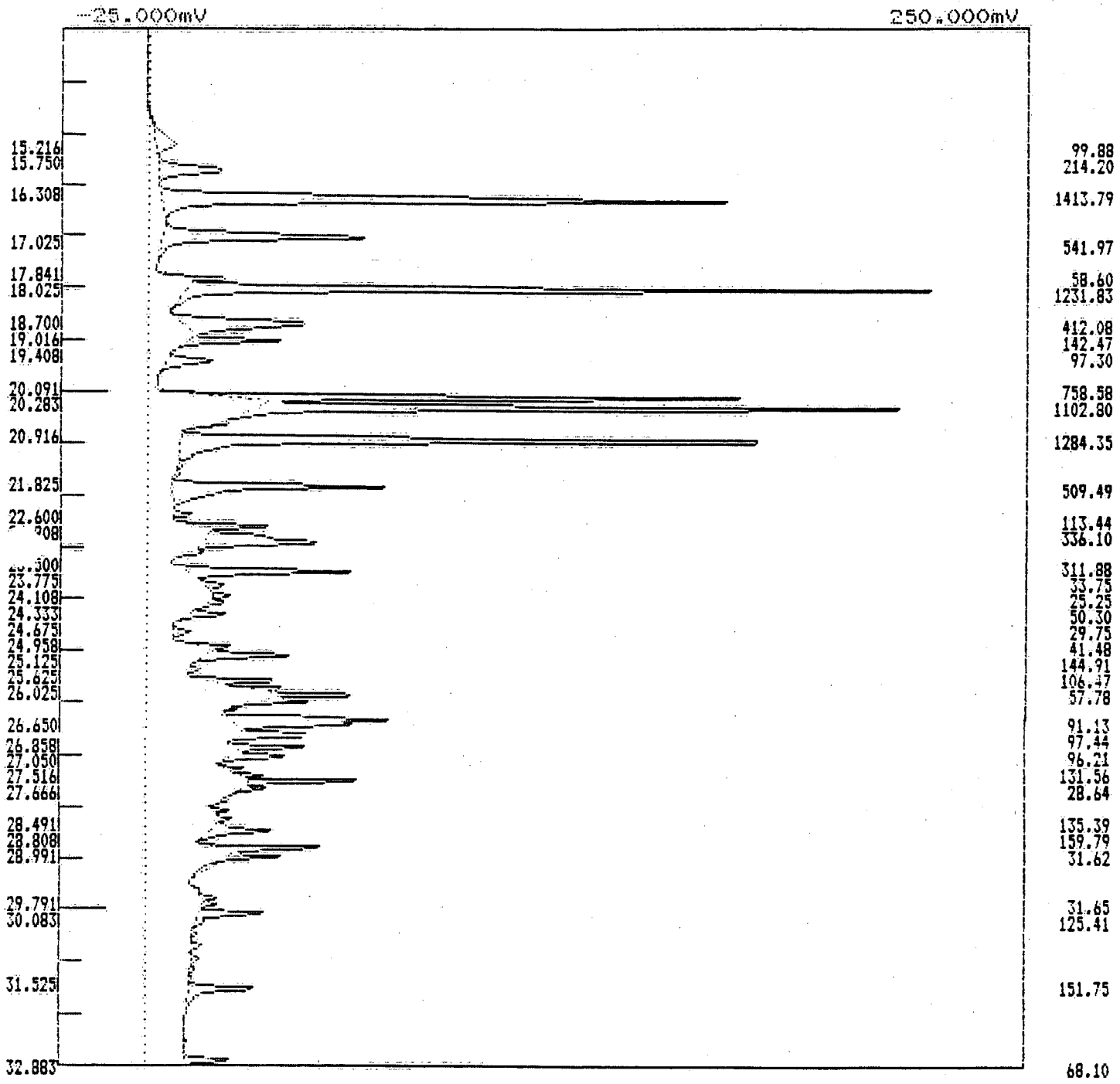
Component	Number	Retention	Area	External	Internal	Units
F3-Toluene surr	2	17.075	732.33	566.76	150.0000	NG
Toluene	3	17.991	27.98	3.68	0.9742	NG
[illegible] - surr	8	21.708	402.92	141.17	150.0000	NG
3			1163.23	711.61	300.9742	

Control file : 8020.CON
Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 5 CH 1 PID
Conditions : BH06 WS01 5ML PURGE COLLECTED @ 1453 @ 18'
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225A6.CHR
Temperature : 8020.TEM
Components : 8020A.CPT
Date : 12/26/1991
Time : 15:19:45



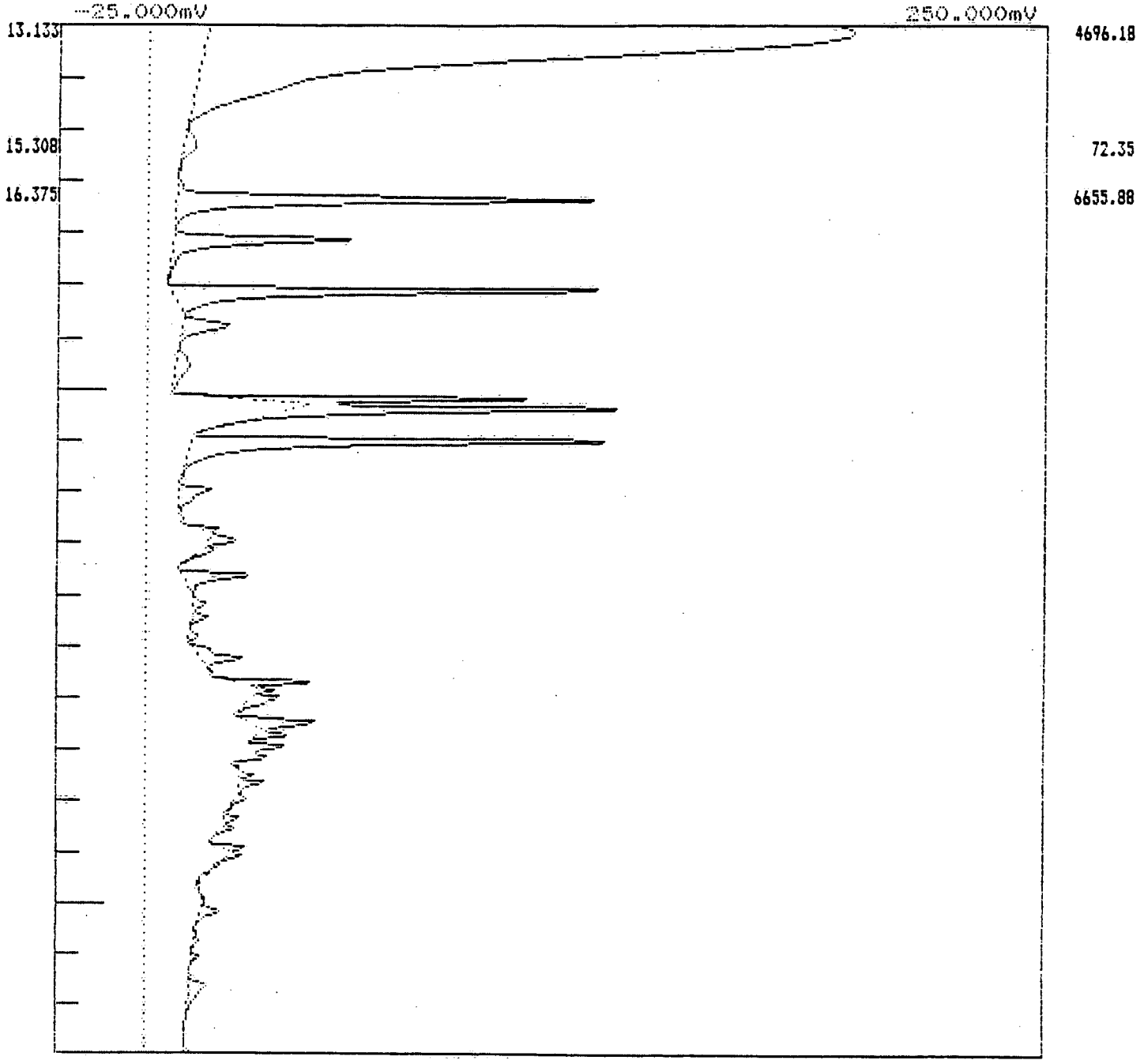
Component	Number	Retention	Area	External	Internal	Units
Benzene	1	16.333	49.60	6.53	1.6474	NG
F3-Toluene surr	2	16.958	771.58	594.23	150.0000	NG
I - surr	8	21.566	439.30	148.56	150.0000	NG
3			1260.48	749.32	301.6474	

Control file : 8020.CON
Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 6 CH 1 PID
Conditions : 250NG BTEX CALIB STD
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225C1.CHR
Temperature : 8020.TEM
Components : 8020CD23.CPT
Date : 12/26/1991
Time : 07:07:01



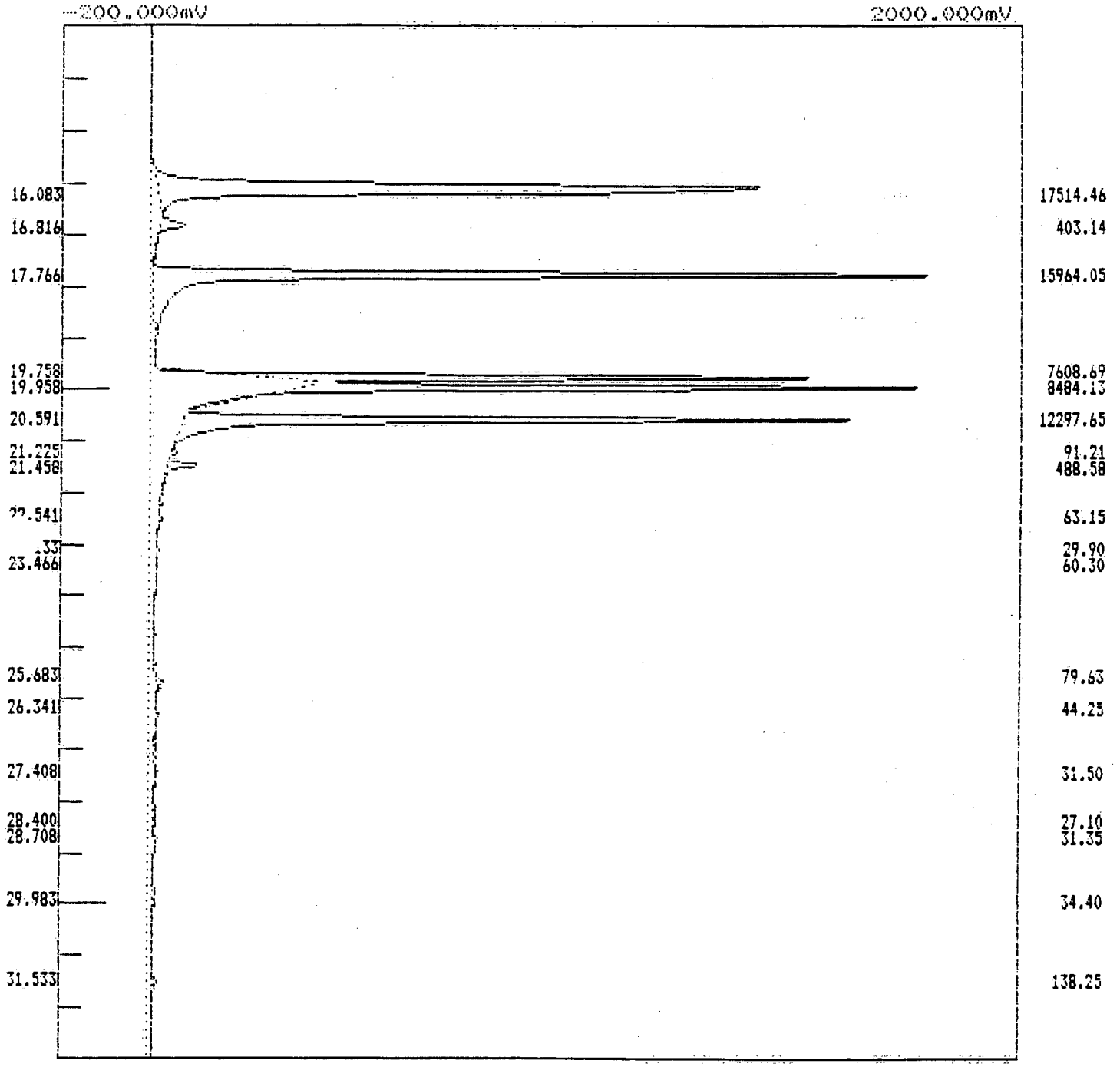
Component	Number	Retention	Area	External	Internal	Units
B ene	1	16.308	1413.79	251.12	74.7528	NG
F. toluene surr	2	17.025	541.97	503.90	150.0000	NG
Toluene	3	17.841	58.60	N/A	N/A	NG
Toluene	3	18.025	1231.83	250.59	74.5956	NG
Ethylbenzene	5	20.091	758.58	249.01	190.3119	NG
m/p-Xylene	6	20.283	1102.80	251.80	192.4420	NG
o-Xylene	7	20.916	1284.35	251.87	192.4984	NG
BFB - surr	8	21.825	509.49	196.27	150.0000	NG

Control file : 8020.CON
Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 6 CH 2 FID
Conditions : 250NG BTEX CALIB STD
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225D1.CHR
Temperature : 8020.TEM
Components : 8020TPGH.CPT
Date : 12/26/1991
Time : 07:07:01



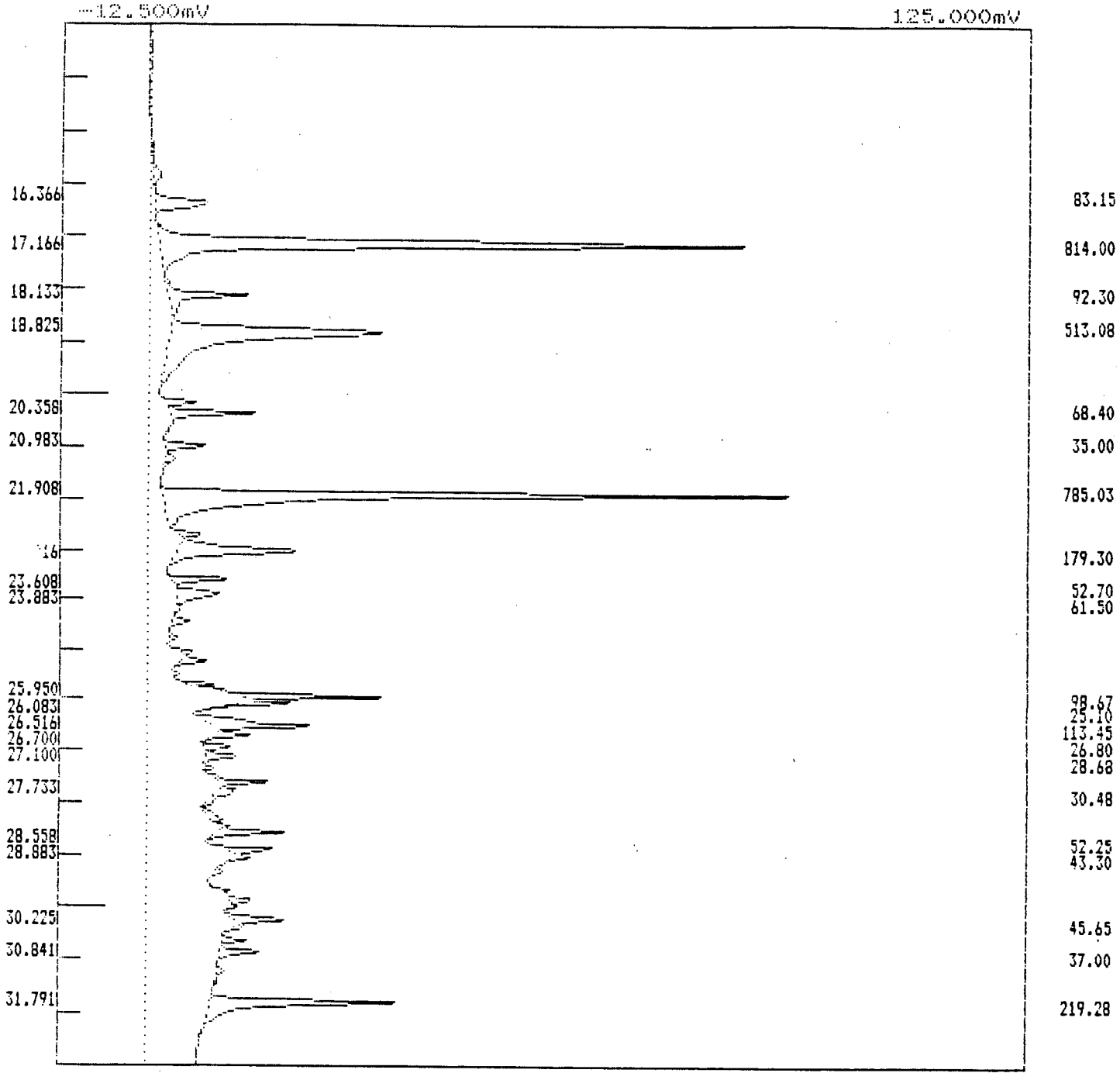
Component	Number	Retention	Area	External	Internal	Units
TOTL PRGBL H-C	1	16.375	6655.88	N/A	N/A	
1			6655.88	N/A	N/A	

Control file : 8020.CON
Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 6 CH 1 PID
Conditions : 500ONG BTEX CALIB STD (250NG SURR'S)
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225C3.CHR
Temperature : 8020.TEM
Components : 8020CD23.CPT
Date : 12/26/1991
Time : 10:50:50



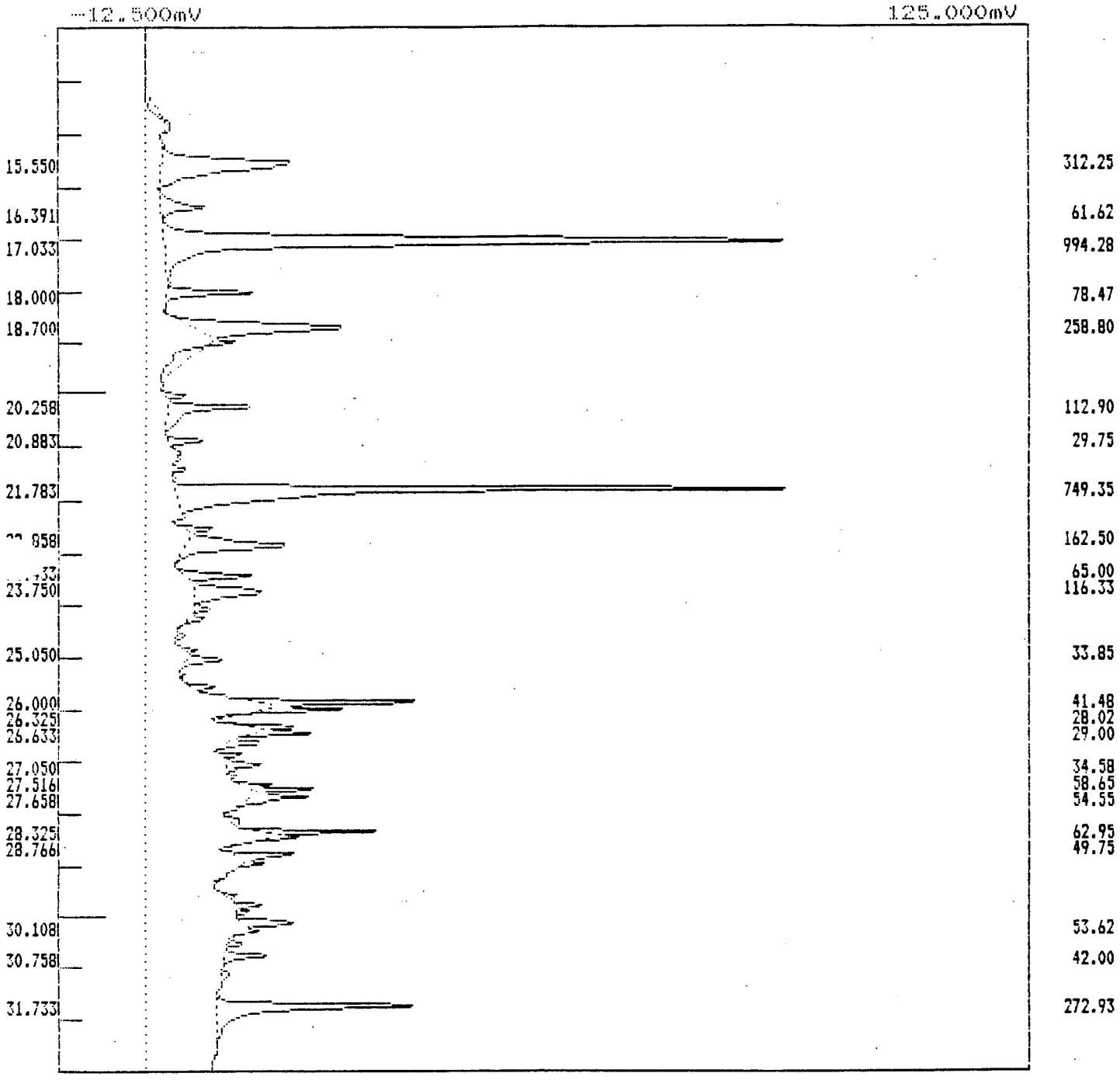
Component	Number	Retention	Area	External	Internal	Units
[illegible]zene	1	16.083	17514.46	5001.31	1943.2584	NG
PJ Toluene surr	2	16.816	403.14	386.05	150.0000	NG
Toluene	3	17.766	15964.05	5001.31	1943.2552	NG
Ethylbenzene	5	19.758	7608.69	4999.09	3967.3364	NG
m/p-Xylene	6	19.958	8484.13	5002.66	3970.1669	NG
o-Xylene	7	20.591	12297.65	4998.99	3967.2535	NG
BFB - surr	8	21.225	91.21	51.07	150.0000	NG
BFB - surr	8	21.458	488.58	189.01	150.0000	NG

Control file : 8020.CON
Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 6 CH 1 PID
Conditions : 5ML DI H2O BLANK (250NG SURR'S)
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225C4.CHR
Temperature : 8020.TEM
Components : 8020CD23.CPT
Date : 12/26/1991
Time : 11:29:45



Component	Number	Retention	Area	External	Internal	Units
F [illegible]zene	1	16.366	83.15	N/A	N/A	NG
[illegible]-Toluene surr	2	17.166	814.00	734.82	150.0000	NG
Toluene	3	18.133	92.30	N/A	N/A	NG
m/p-Xylene	6	20.358	68.40	N/A	N/A	NG
o-Xylene	7	20.983	35.00	N/A	N/A	NG
BFB - surr	8	21.908	785.03	291.92	150.0000	NG
6			1877.88	67.79	296.0000	

Control file : 8020.CON
Operator : GEO ENVIRONMENTAL
Description : INSTRUMENT 6 CH 1 PID
Conditions : BH02 WS01 5ML PURGE COLLECTED @ 1330 @ 15'
: ERCE 69TH & INDIANA ARVADA, CO
: SW-846 METHOD 8015/8020
File : 1225C6.CHR
Temperature : 8020.TEM
Components : 8020C.CPT
Date : 12/26/1991
Time : 14:43:34



Component	Number	Retention	Area	External	Internal	Units
[illegible]ene	1	16.391	61.62	N/A	N/A	NG
[illegible]luene surr	2	17.033	994.28	887.86	150.0000	NG
Toluene	3	18.000	78.47	N/A	N/A	NG
m/p-Xylene	6	20.258	112.90	N/A	N/A	NG
o-Xylene	7	20.883	29.75	N/A	N/A	NG
BFB - surr	8	21.783	749.35	279.53	150.0000	NG
6			2026.38	224.01	296.0000	