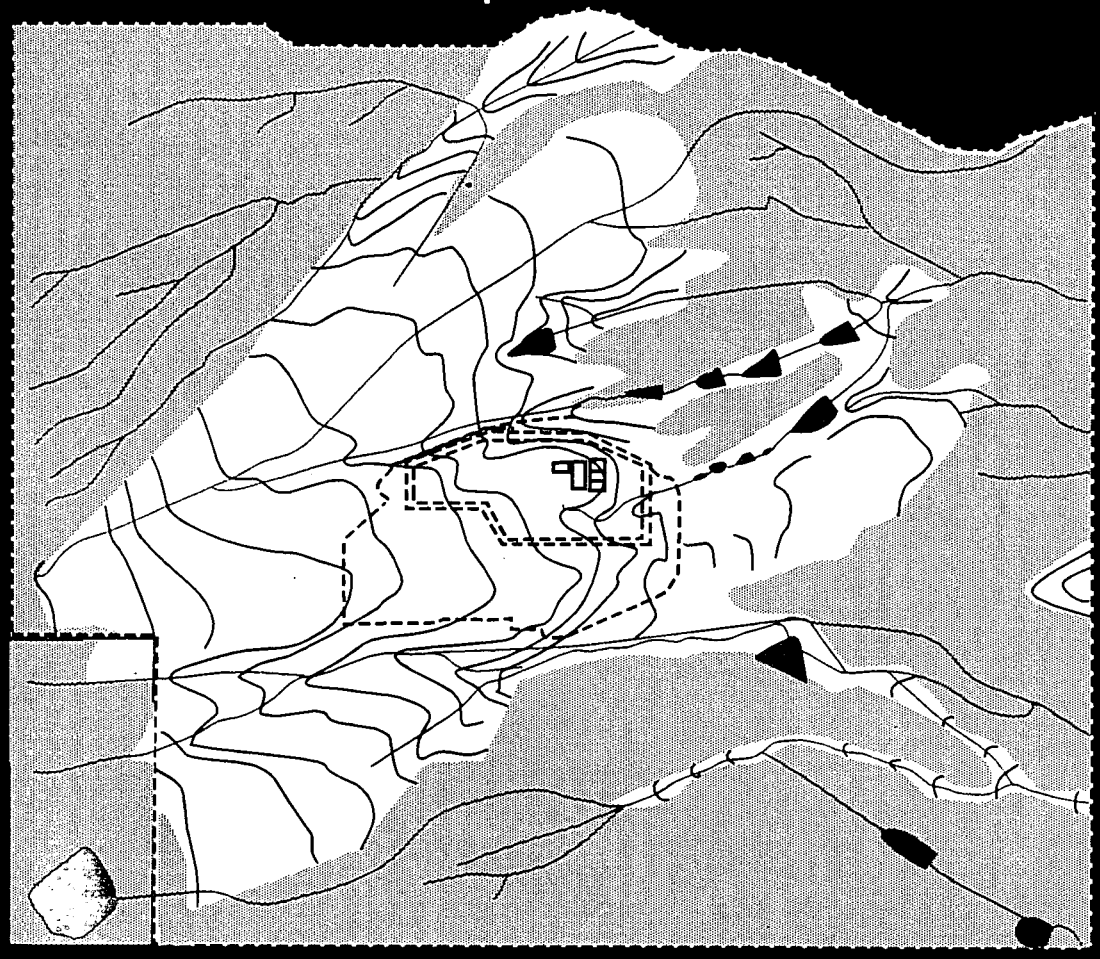
Hydrogeologic Characterization Report for the Rocky Flats Environmental Technology Site

Volume II of the Sitewide Geoscience Characterization Study

Plates

Final Report
April 1995



EG&G ROCKY FLATS

Rocky Flats Environmental Technology Site
Golden, Colorado

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ADMIN RECORD

SW-A-004196

Methodology Used to Generate Maps, Cross Sections, and Stream Profiles

Plates 2 through 7 illustrate the distribution and seasonal fluctuation of groundwater levels within the surficial deposits at Rocky Flats during 1993. Plates 2 and 3 present the potentiometric surface within the surficial deposits during the second and fourth quarter, respectively; Plates 4 and 5 present the saturated thickness of the surficial deposits during the 2nd and 4th quarter, respectively; Plate 6 presents the saturated thickness difference within the surficial deposits during 1993. Plate 7 presents the average depth to groundwater during 1993. Only surficial deposit wells were used to generate the plates. Censorship of the data excluded wells screened across the surficial deposit/bedrock contact with the screen extending more than 2 feet into bedrock and the spurious water levels reported in Table C-1. Groundwater level measurements at RFETS are taken within the first ten days of each quarter. Groundwater level measurements recorded during the first ten days of the second and fourth quarters of 1993 were used to generate Plates 2, 3, 4, and 5. Occasionally, more than one water level measurement was recorded for an individual well during the first ten days of the quarter. When this occurred, the first recorded groundwater level measurement was used. This allowed comparison of values from different wells so as to provide a "snap shot" of the groundwater potentiometric surface. All groundwater level measurements recorded during 1993 were used to calculate the average depth to groundwater and saturated thickness difference values for Plates 6 and 7. Methods used to construct these plates are summarized below.

- Unsaturated areas were delineated using corresponding seasonal well data, site specific operable unit report information, and the Bedrock-Surface Elevation Map (Plate 4-4, EG&G, 1995b). Seep areas (Plate 9) were based on published information (Wetlands Assessment - Rocky Flats site (ASI, 1990), Surficial Geologic Map of the Rocky Flats Site (Plate 4-1, EG&G, 1995a), aerial photography, and field inspections (conducted in July and August of 1994).

- Plates 2 and 3 present the potentiometric surface within unconsolidated surficial deposits for the second and fourth quarter of 1993, respectively. Water-level measurements recorded below the bottom of the screen were excluded from the data set. Potentiometric surface contours were drawn using well data, topographic control, seep information, and site-specific operable unit potentiometric surface information (OU1 Phase III RFI/RI Report [EG&G, 1994c]); Draft Final Phase I RFI/RI Report OU4 (DOE, 1994b); Phase II RFI/RI Report, 903 Pad, Mound and East Trenches Area, Operable Unit No. 2, Preliminary Draft (DOE, 1993a); Proposed Interim Measures/Interim Remedial Action Decision Document for the Rocky Flats Industrial Area ([DOE, 1994h]).

- Plates 4 and 5 present the saturated thickness of the unconsolidated surficial deposits for the second and fourth quarter of 1993, respectively. Saturated

thickness values were calculated by subtracting the top of bedrock elevation from the water-level elevation within individual surficial deposit wells. These values were plotted and hand contoured.

- Plate 6 presents the saturated thickness difference within the unconsolidated surficial deposits during 1993. The saturated thickness difference at each well was calculated by subtracting the lowest groundwater-level elevation recorded during 1993 from the highest groundwater-level elevation recorded during 1993. If a well was ever recorded "dry" during 1993 then the top-of-bedrock elevation was used as the lowest groundwater-level elevation. Saturated thickness difference values were posted and contoured.

- Plate 7 presents the average depth to groundwater within the unconsolidated surficial deposits during 1993. Well data were censored prior to the construction of the average depth-to-water plate. Wells that exhibited "dry" reading frequencies greater than 50 percent were deemed dry (on average) for the 1993 period of record. These wells were posted as unsaturated. For wells with less than 50 percent "dry" reading frequency, the "dry" reading measurements were included in the average-depth-to-water calculation by using the depth to bedrock as a datum. Average-depth-to-groundwater values were posted and contoured.

Plate 8 presents impermeable areas within the industrial area. This map was based on aerial photography and field inspections conducted in August of 1994.

The Building Footprint, Foundation Drain, and Groundwater Diversion/Extraction System Map is presented in Plate 23. Locations of the building foundation depths, foundation drains, storm drains, and French drains were based on published information from the Draft Technical Memorandum—Operable Unit No. 8 (DOE, 1994i). The locations of the groundwater diversion structures were based on OU-specific reports such as the Draft Final Phase III RFI/RI Report OU1 (DOE, 1992d), the Draft Final Phase I RFI/RI Report OU4 (DOE, 1994b), and the OU7 Final Work Plan (DOE, 1994e). The area affected by sanitary sewer infiltration was based on published information from the Sanitary Sewer Infiltration/Inflow and Exfiltration Study (ASI, 1991).

The regional hydrogeologic cross sections (Plates 10 through 16) and stream profiles (Plates 17 through 20) were constructed using hydrogeologic data from monitoring wells and boring logs. The stratigraphic information presented on these cross sections and stream profiles was based on the Surficial Geologic Map of the Rocky Flats Site, Bedrock Surface Elevation Map, the Base of Weathered-Bedrock Elevation Map (Plates 4-1, 4-4, and 5-10, EG&G, 1995a), and the 2nd and 4th Quarter Potentiometric Surface Maps of the Unconsolidated Surficial Deposits (Plates 2 and 3). The index map showing the locations of the wells used to construct these cross sections and stream profiles is presented in Figure P-1.

Groundwater Flow in Cross Section G-G'

Equipotential contours and groundwater flow lines are shown on cross section G-G' to illustrate patterns of groundwater movement beneath the Rocky Flats pediment, including the Industrial Area. The cross section illustrates two-dimensional flow patterns (lateral and vertical) in an inherently three-dimensional flow system. Flow perpendicular to the section cannot be shown. Ideally, cross sections selected for equipotential mapping are located such that flow perpendicular to the section is minimized. For cross section G-G' this condition is met approximately, as potentiometric surface maps show that flow is approximately parallel to the trend of the cross section.

Construction of Equipotential Lines

The equipotential lines shown on cross section G-G' were constructed using water levels measured in monitoring wells during April 1994. In some portions of the cross section, the measured water level of a well completed in unweathered bedrock is within the screened interval, and vertical gradients calculated from the water table approach a value of 1.0 ft/ft. A vertical gradient greater than 1.0 suggests unsaturated flow conditions. Geologic logs of deep wells at Rocky Flats confirm that alternating intervals of wet and dry sediments are frequently encountered during drilling. These characteristics are indicative of a variably saturated flow system. However, in constructing hydraulic head contours for this cross section, it was assumed that the geologic section was completely saturated below the water table because detailed information regarding the locations of variably saturated strata could not be shown at the scale of the cross section.

Construction of Arrows of Potential

Potential flow lines are oriented perpendicular to equipotential contours. These flow lines are only meant to indicate the direction of groundwater flow and do not indicate the magnitude of flow. Darcy fluxes in the LHSU are much less than those in the UHSU due to the relative low permeability of LHSU geologic units. These arrows assume isotropic hydraulic conductivities of all hydrogeologic units. In reality, the hydraulic conductivity of hydrogeologic units at the Rocky Flats site may be anistropic (directionally dependent), with lateral hydraulic conductivity significantly greater than vertical values. Because limited testing data are unable to quantify the degree of anistropy, the flow lines were constructed assuming isotropic conditions. As a result, the flow arrows conservatively overestimate the potential for vertical flow.

Potential Groundwater Flow Patterns

The hydraulic head contours and flow lines shown on cross section G-G' illustrate several important characteristics of the groundwater flow system at the Rocky Flats site. These characteristics include:

- Predominantly lateral flow in the unconsolidated alluvial deposits and weathered bedrock of the upper hydrostratigraphic units,
- Zones of variable saturation beneath the Rocky Flats Industrial Area indicated by vertical hydraulic gradients that approach 1.0 ft/ft, and
- Suspected faults that serve as apparent barriers to lateral flow in unweathered bedrock.

No flow arrows are shown in areas where water-level data indicate that vertical gradients approach a value of 1.0 ft/ft because of the variable saturated conditions which likely occur in these portions of the cross section. These variably saturated areas occur, for example, in the vicinity of the intersection with cross section D-D'.

Suspected faults appear to have an important influence on flow patterns in unweathered bedrock. Although locations and hydraulic characteristics of the faults have not been accurately determined, water-level data obtained in the vicinity of the faults have been used to infer several important flow characteristics. A zone of variable saturation is located east of each fault shown in cross section G-G' in the Industrial Area. West of each fault, water-level data indicate that the unweathered bedrock is fully saturated and under confined pressure. Apparently, groundwater west of a fault does not move laterally in sufficient quantities to fully saturate bedrock east of the fault. Groundwater in unweathered bedrock west of each fault moves vertically downward. Flow patterns in weathered bedrock and unconsolidated surficial deposits do not appear to be affected by faults.

Groundwater Flow in Cross Section D-D'

Equipotential contours and groundwater flow lines are shown on cross section D-D' to illustrate potential patterns of groundwater movement beneath the Rocky Flats pediment, including the Industrial Area. The cross section illustrates two-dimensional flow patterns (lateral and vertical) in an inherently three-dimensional flow system. Flow perpendicular to the section cannot be shown, so cross sections selected for equipotential mapping are ideally located such that flow perpendicular to the section is minimized. For cross section D-D' this condition is met only approximately, as potentiometric surface maps show that flow is generally parallel to the trend of the

cross section. Nevertheless, a qualitative representation of groundwater flow in the vicinity of stream channels incised into the pediment is represented.

Construction of Equipotential Lines

The equipotential lines shown on cross section D-D' were constructed using water levels measured in monitoring wells during April 1994. In some portions of the cross section, the measured water level of a well completed in unweathered bedrock is within the screened interval, and vertical gradients calculated from the water table approach a value of 1.0 ft/ft. A vertical gradient greater than 1.0 suggests unsaturated flow conditions. Geologic logs of deep wells at Rocky Flats confirm that alternating intervals of wet and dry sediments are frequently encountered during drilling. These characteristics are indicative of a variably saturated flow system. However, in constructing hydraulic head contours for this cross section, it was assumed that the geologic section was completely saturated below the water table because detailed information regarding the locations of variably saturated strata could not be shown at the scale of the cross section.

Construction of Arrows of Potential

Potential flow arrows are oriented perpendicular to equipotential contours. These flow lines are only meant to indicate the direction of groundwater flow and do not indicate the magnitude of flow. Darcy fluxes in the LHSU are much less than those in the UHSU due to the relative low permeability of LHSU geologic units. These arrows assume isotropic hydraulic conductivities of all hydrogeologic units. In reality, the hydraulic conductivity of hydrogeologic units at the Rocky Flats site may be anistropic (directionally dependent), with lateral hydraulic conductivity significantly greater than vertical hydraulic conductivity. Because limited testing data are unable to quantify the degree of anistropy, the flow lines were constructed assuming isotropic conditions. As a result, the flow arrows conservatively overestimate the potential for vertical flow.

Potential Groundwater Flow Patterns

The hydraulic head contours and flow lines shown on cross section D-D' illustrate several important characteristics of the groundwater flow system at the Rocky Flats site. These characteristics include:

- Predominantly lateral flow in the unconsolidated alluvial deposits and weathered bedrock of the upper hydrostratigraphic units,
- Zones of variable saturation beneath the Rocky Flats Industrial Area indicated by vertical hydraulic gradients that approach 1.0 ft/ft, and

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- Groundwater flow in the UHSU occurring from upland areas toward incised stream drainages.
- Vertical flow in the unweathered bedrock beneath the McKay and Upper Church ditches suggesting enhanced surficial recharge.

No flow arrows are shown in areas where water-level data indicate that vertical gradients approach a value of 1.0 ft/ft because of the variable saturated conditions likely indicated.

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Plate 1:
Groundwater Monitoring Well Location Map

Map ID: GW95

February 24, 1995

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Plate 2:
Potentiometric Surface of Unconsolidated Surficial Deposits Second Quarter 1993

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Plate 3:
Potentiometric Surface of Unconsolidated Surficial Deposits Fourth Quarter 1993

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Plate 4:
Saturated Thickness of Unconsolidated Surficial Deposits
Second Quarter 1993

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Plate 5:
Saturated Thickness of Unconsolidated Surficial Deposits
Fourth Quarter 1993

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Plate 6:
Saturated Thickness Difference of Unconsolidated Surficial Deposits 1993

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Plate 7:
Average Depth of Water in Unconsolidated Surficial Deposits

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Plate 8:
Impermeable Areas Map of the Industrial Area

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Plate 9:
Seep Location Map

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Plate 10:
Regional Hydrogeologic Cross Section A - A'

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Plate 11:
Regional Hydrogeologic Cross Section B - B'

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Plate 13:

Regional Hydrogeologic Cross Section

Regional Hydrogeologic Cross Section D -D'

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Plate 12:
Regional Hydrogeologic Cross Section C - C'

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Plate 14:
Regional Hydrogeologic Cross Section E - E'

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Plate 15:

Regional Hydrogeologic Cross Section

Regional Hydrogeologic Cross Section F - F'

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Plate 16:

Regional Hydrogeologic Cross Section

Regional Hydrogeologic Cross Section
G - G'

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Plate 17:

Regional Hydrogeologic Cross Section

Stream Profile Hydrogeologic Cross Section A - A'

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Plate 18:

Regional Hydrogeologic Cross Section

Stream Profile Hydrogeologic Cross Section B -B'

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Plate 19:

Regional Hydrogeologic Cross Section

Stream Profile Hydrogeologic Cross Section C -C'

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Plate 20a:

Regional Hydrogeologic Cross Section

Stream Profile Hydrogeologic Cross Section D - D'

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Plate 20b:

Regional Hydrogeologic Cross Section

Stream Profile Hydrogeologic Cross Section D - D'

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Plate 21:

Regional Hydrogeologic Cross Section

Aquifer Test Location Map

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Plate 22:

Regional Hydrogeologic Cross Section

Permitted Well Location Map

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Plate 23:

Regional Hydrogeologic Cross Section

Building Footprint, Foundation Drain and Groundwater Diversion/Extraction System Map

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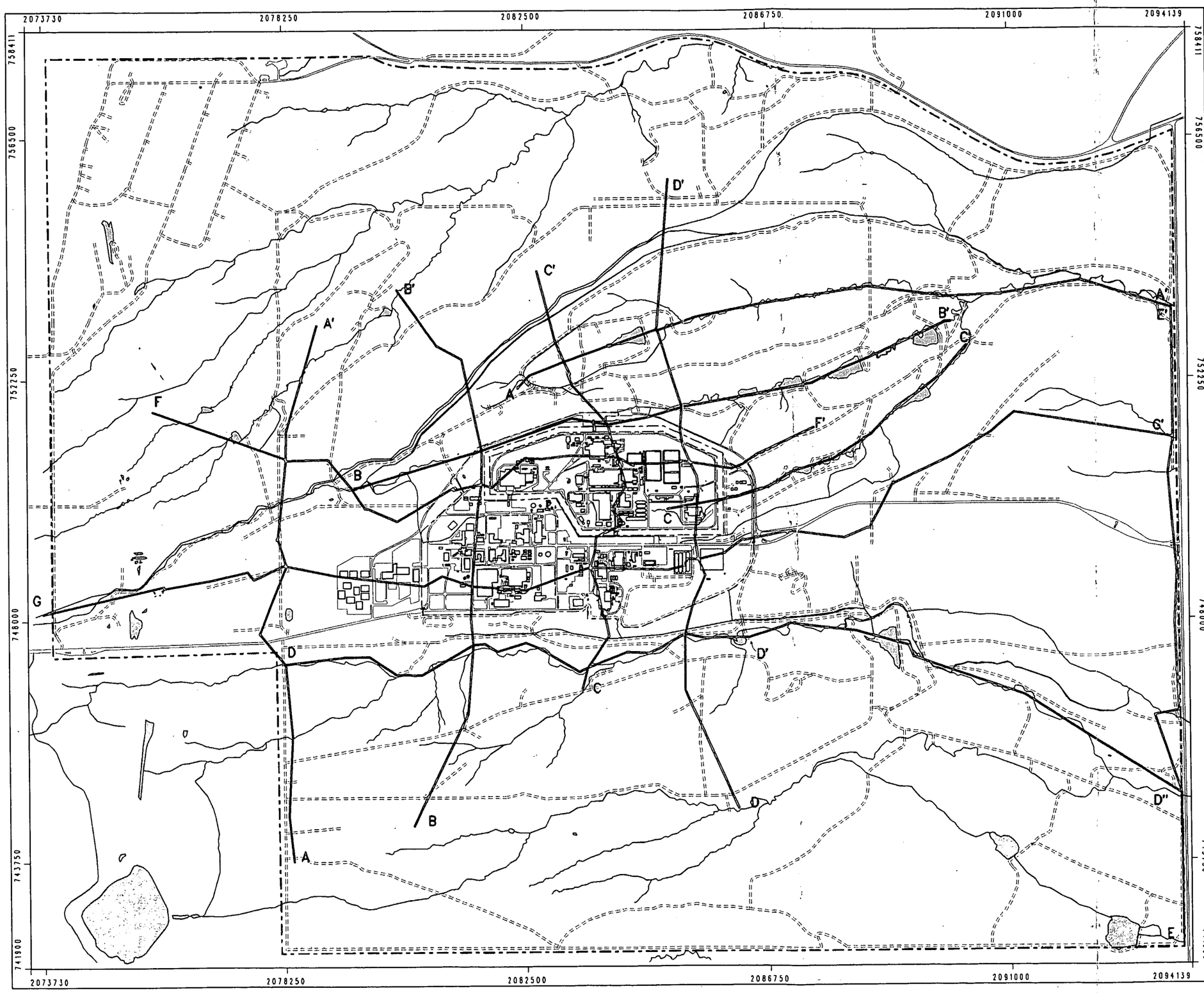

EXPLANATION

- Stream Profile Cross Section Line
- Regional Hydrogeologic Cross Section Line
- Streams, Ditches, and Drainages
- Paved Roads
- Dirt Roads
- Industrial Area and Security Zone Boundaries
- Buffer Zone Boundary
- Surface Water Impoundments
- Buildings

Scale = 1 : 20400
1 inch = 1700 feet

880 0 1700ft

State Plane Coordinate System
Colorado Central Zone
Datum: NAD27

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Rocky Flats Site, Golden, Colorado

Hydrogeologic
Cross Section
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OU01-A-000654	12
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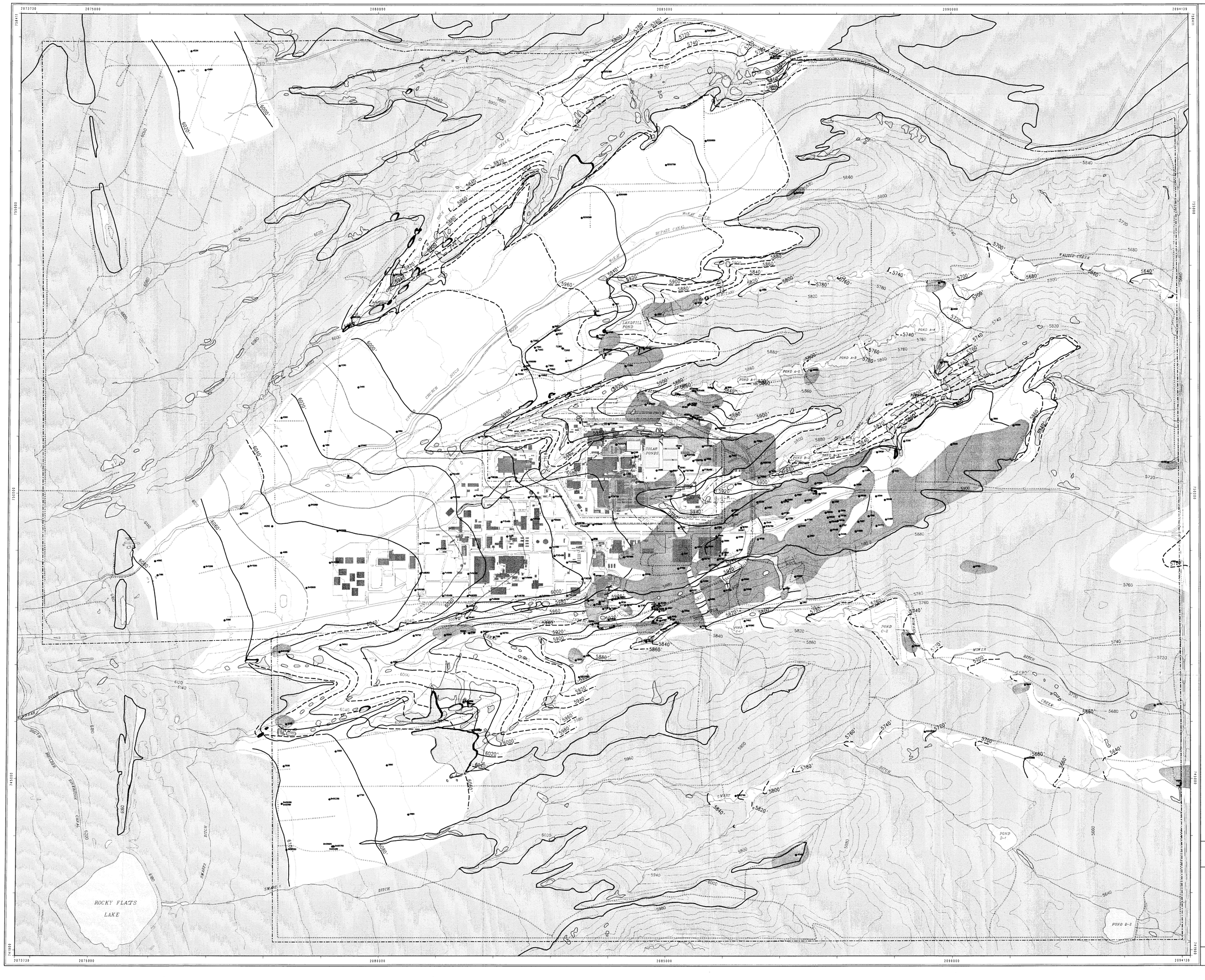


EXPLANATION

- Water Level Contour
- (dashed where inferred)
- Intermediate Water Level Contour
- (dashed where inferred)
- Approximate Extent of Unsaturated Areas
- Areas Without Groundwater Elevation Data
- Perennial Seep
- Ephemeral Seep

* Seep areas are based on published information (Wetlands Assessment - Rocky Flats Site (ASI, 1990); Well Evaluation Report (USDOE, 1994); USGS, Surficial Geologic Map (USGS, 1994)), August 1980 aerial photograph of the Rocky Flats Site, and field inspections (conducted in July and August of 1994). This map may not identify all seep locations.

* Unsaturated areas are based on well data and published information (OU1 Phase III RFI/RI Report (USDOE, 1992); OU4 Phase I RFI/RI Report - Draft Final (USDOE, 1994); Phase II RFI/RI Report 903 Pad, Mound and East Trenches Area, Operable Unit No. 2 - Preliminary Draft, December 1993 (USDOE, 1993); Proposed Interim Measures/Interim Remedial Action Decision Document for the Rocky Flats Industrial Area (USDOE, 1994b). This map may not identify all unsaturated areas.

- Topographic Contours
- Approximate Extent of Rocky Flats Alluvium
- Streams and Drainages
- Paved Roads
- Dirt Roads
- Rocky Flats Plant Site and Security Zone Boundaries
- Rocky Flats Site Boundary
- Surface Water Impoundments
- Buildings

N

Scale = 1 : 6000
1 inch = 500 feet

250 0 500 1000 1500ft

State Plane Coordinate System
Colorado Central Zone
Datum: NAD27

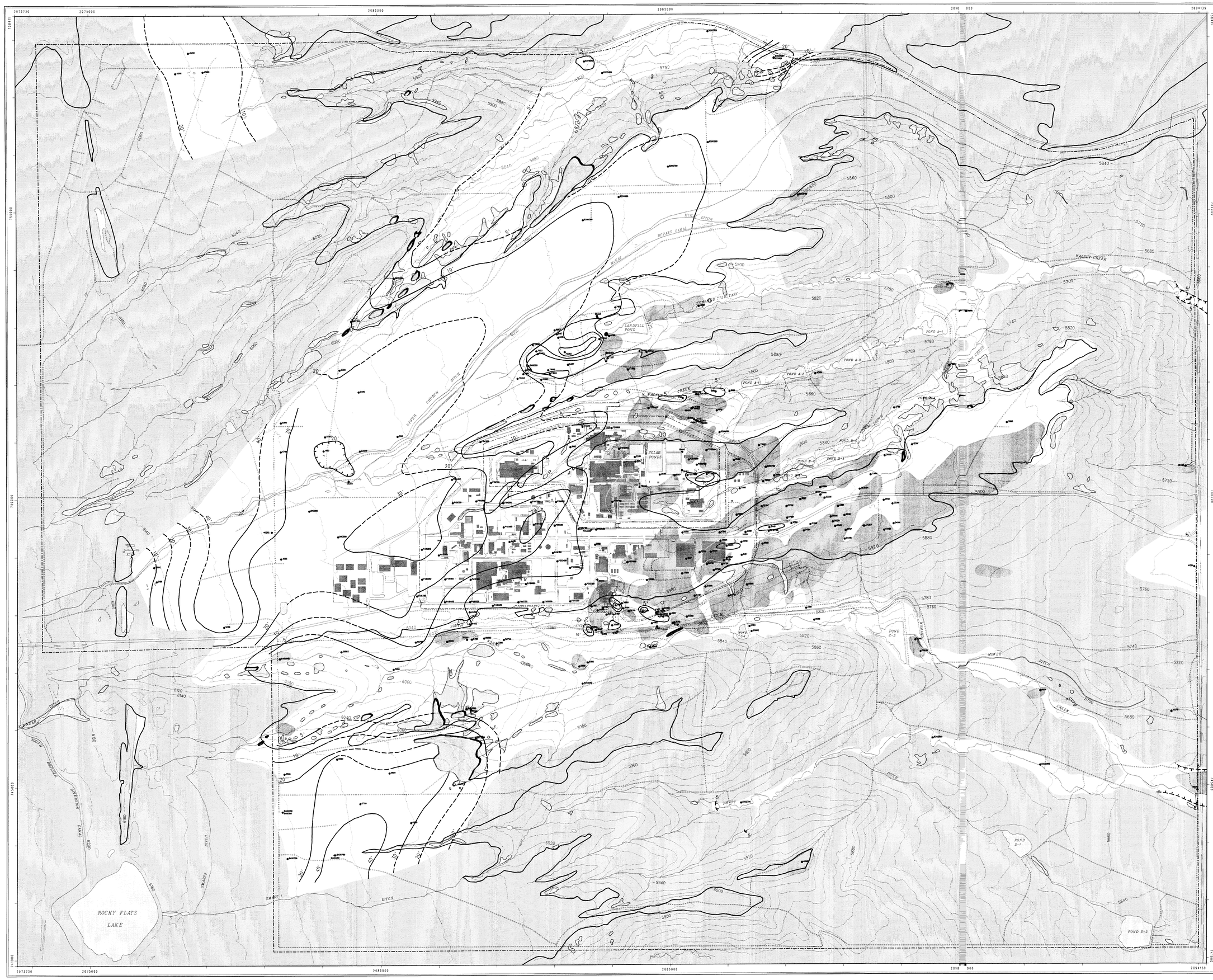
EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

Potentiometric Surface of Unconsolidated Surficial Deposits Fourth Quarter 1993

Hydrogeologic Characterization Report

April 1995	Plate 3

SW-A-004196



EXPLANATION

- Line of Equal Saturated Thickness Contour
- (dashed where inferred)
- Decreasing Line of Equal Saturated Thickness Contour
- (dashed where inferred)
- Approximate Extent of Unsaturated Areas
- Areas Without Groundwater Elevation Data
- Perennial Seep
- Ephemeral Seep

* Seep areas are based on published information (Wetlands Assessment - Rocky Flats Site (ASI, 1990); Well Evaluation Report (USDOE, 1994); USGS, Surficial Geologic Map (USGS, 1994)), August 1980 aerial photograph of the Rocky Flats Site, and field inspections (conducted in July and August of 1994). This map may not identify all seep locations.

* Unsaturated areas are based on well data and published information (OU1 Phase III RFI/RI Report (USDOE, 1992); OU4 Phase I RFI/RI Report - Draft Final (USDOE, 1994); Phase II RFI/RI Report 903 Pad, Mound and East Trenches Area, Operable Unit No. 2 - Preliminary Draft, December 1993 (USDOE, 1993); Proposed Interim Measures/Interim Remedial Action Decision Document for the Rocky Flats Industrial Area (USDOE, 1994b). This map may not identify all unsaturated areas.

- Topographic Contours
- Approximate Extent of Rocky Flats Alluvium
- Streams and Drainages
- Paved Roads
- Dirt Roads
- Rocky Flats Plant Site and Security Zone Boundaries
- Rocky Flats Site Boundary
- Surface Water Impoundments
- Buildings

Scale = 1 : 6000
1 inch = 500 feet

250 0 500 1000 1500ft

State Plane Coordinate System
Colorado Central Zone
Datum: NAD27

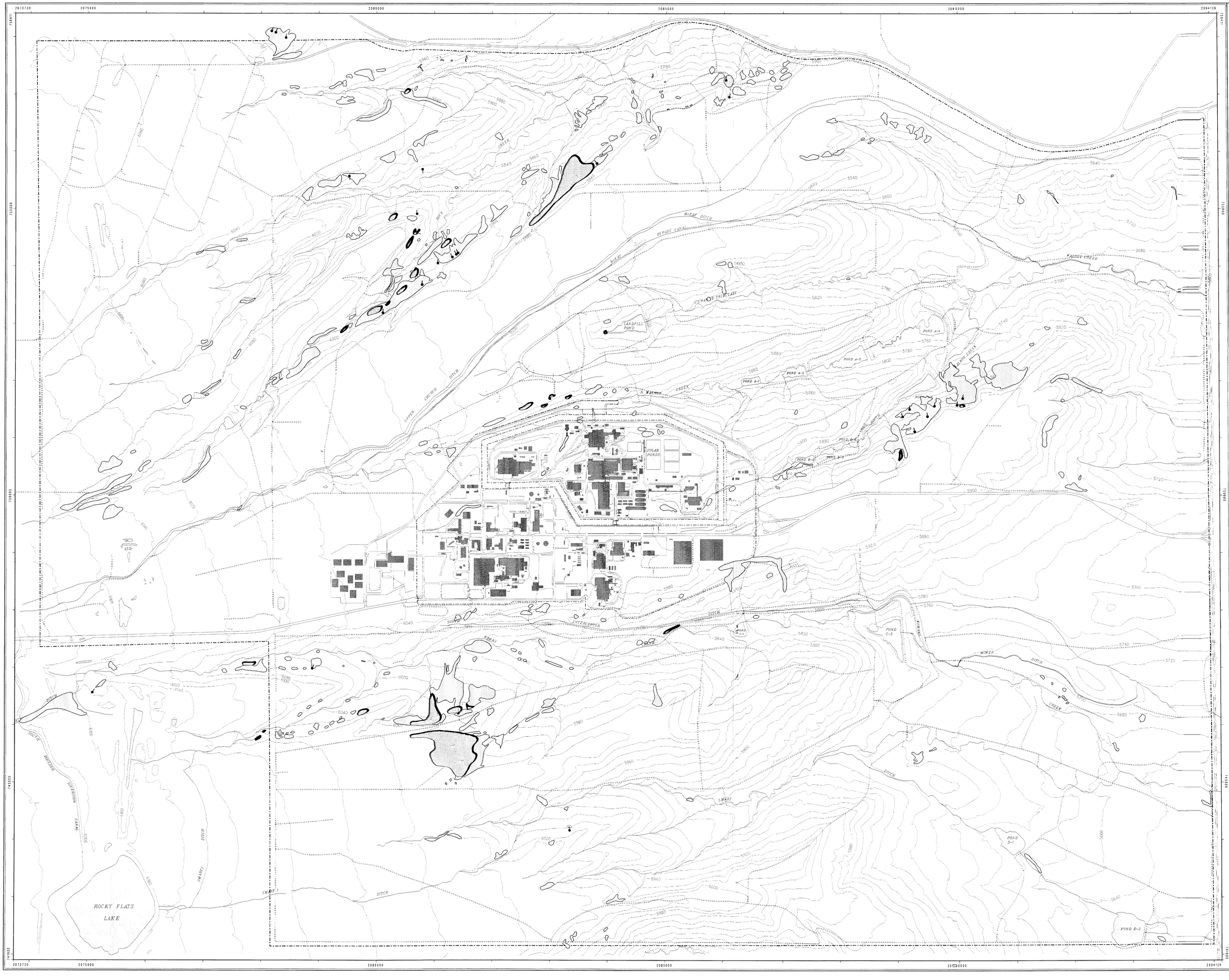
EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

Saturated Thickness of Unconsolidated Surficial Deposits Fourth Quarter 1993

Hydrogeologic Characterization Report

April 1995 | Plate 5

SW-A-004196



EXPLANATION

Perennial Seep

Ephemeral Seep

Spring

* Seep areas are based on published information (Wetlands Assessment - Rocky Flats Site (ASI, 1990); Well Evaluation Report (USDOE, 1994); USGS, Surficial Geologic Map (USGS, 1994)), August 1980 aerial photograph of the Rocky Flats Site, and field inspections (conducted in July and August of 1994). This map may not identify all seep locations.

Streams and Drainages

Paved Roads

Dirt Roads

Rocky Flats Plant Site and Security Zone Boundaries

Rocky Flats Site Boundary

Surface Water Impoundments

Buildings

Scale = 1 : 6000
1 inch = 500 feet

250 0 500 1000 1800ft

State Plane Coordinate System
Colorado Central Zone
Datum: NAD27

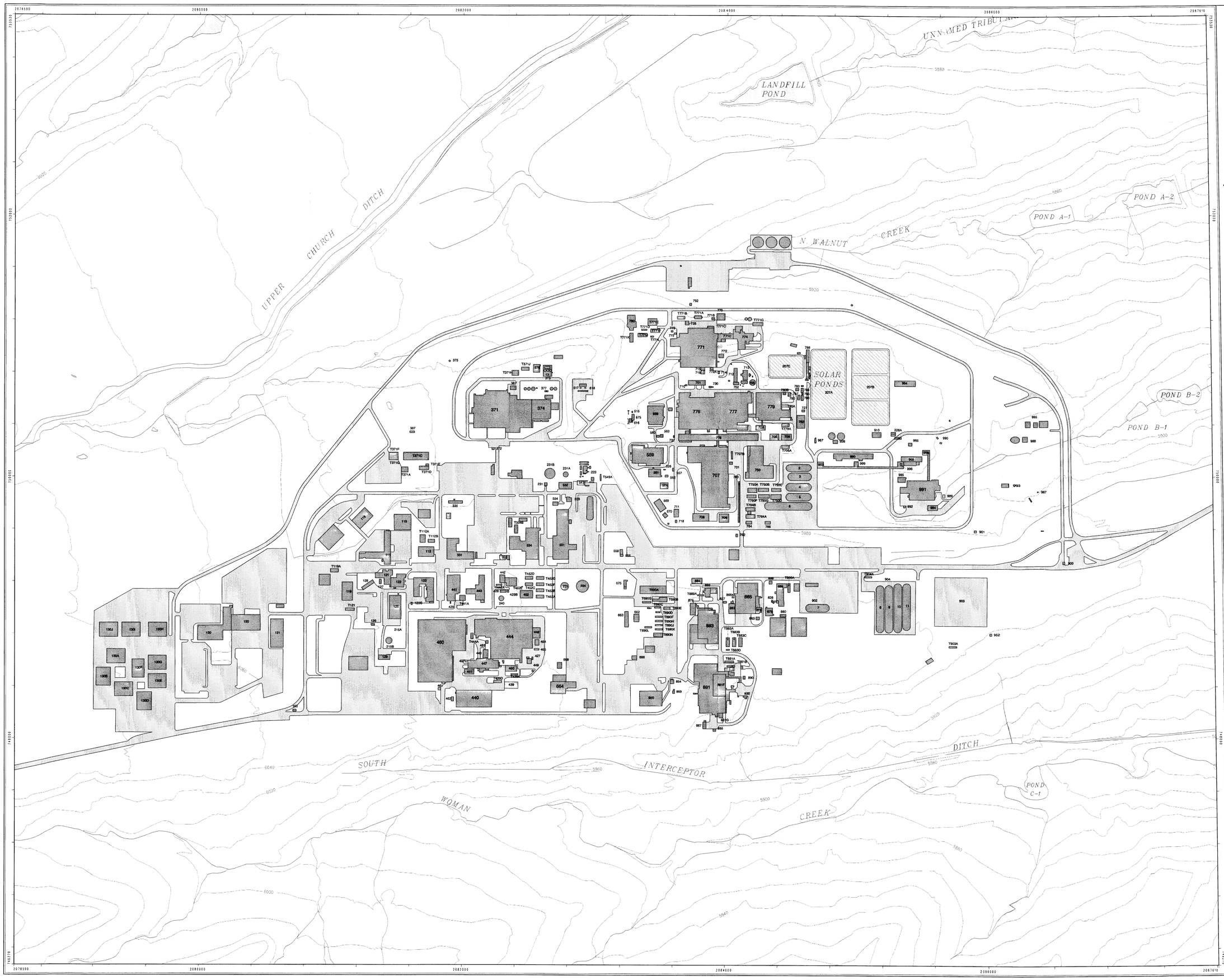
EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

Seep Location Map

Hydrogeologic Characterization Report

April 1995 | Plate 9

SW-A-004196



EXPLANATION

Impermeable Areas

- Pavement - 124.80 Acres
- Buildings - 57.35 Acres
- Lined Ponds - 8.23 Acres

* Impermeable Areas based on 1990 Aerial Photograph of the Industrial Area.

- Streams and Drainages
- Surface Water Impoundments

Scale = 1 : 2640
1 inch = 220 feet

110 0 220 440 660ft

State Plane Coordinate System
Colorado Central Zone
Datum: NAD27

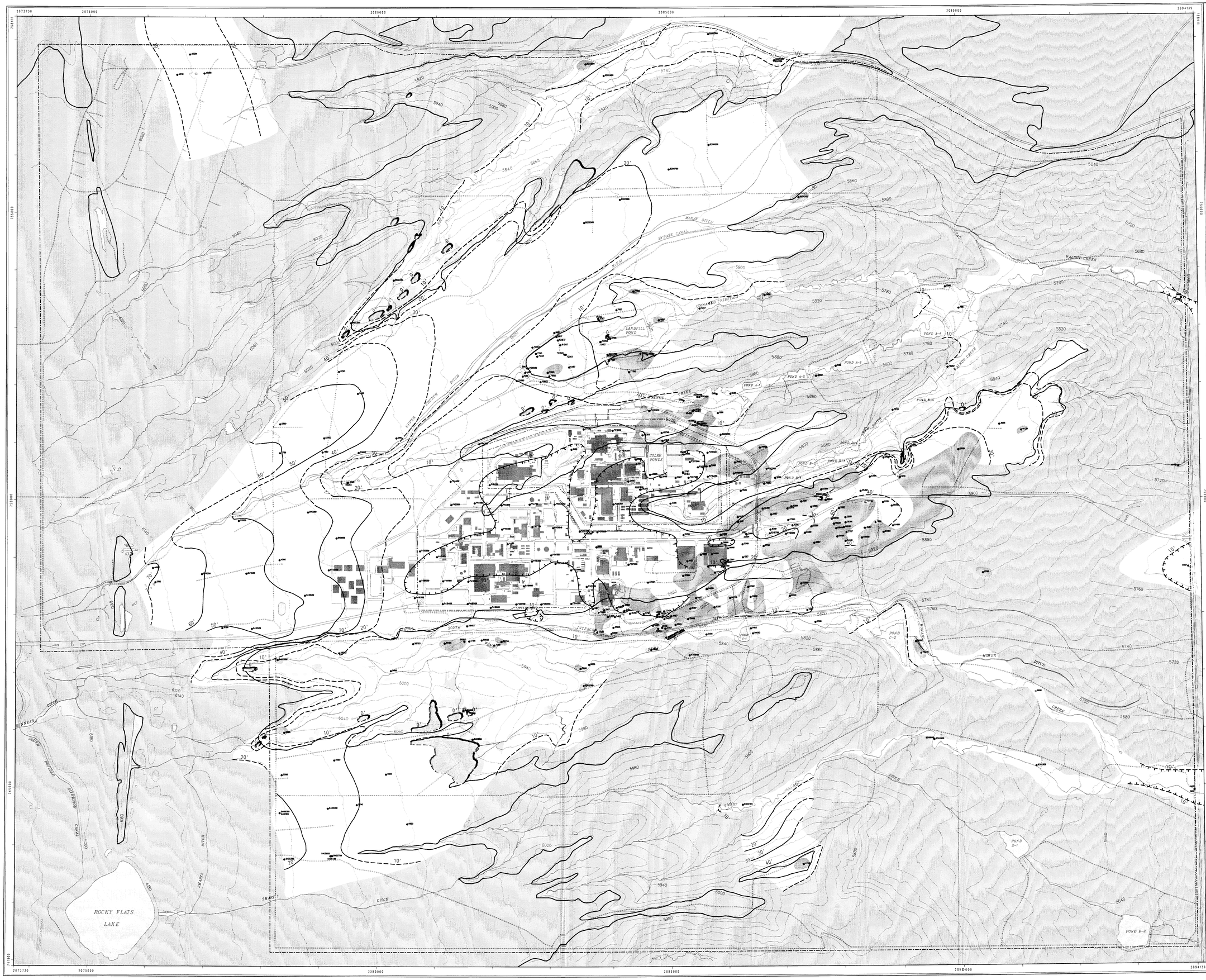
EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

Impermeable Areas Map of the Industrial Area

Hydrogeologic Characterization Report

April 1995 | Plate 8

SW-A-004196



EXPLANATION

- Line of Equal Depth to Water Contour
- (dashed where inferred)
- Decreasing Line of Equal Depth to Water Contour
- (dashed where inferred)
- Approximate Extent of Unsaturated Areas
- Areas Without Groundwater Elevation Data
- Perennial Seep
- Ephemeral Seep

* Seep areas are based on published information (Wetlands Assessment - Rocky Flats Site (ASI, 1990); Well Evaluation Report (USDOE, 1994); USGS, Surficial Geologic Map (USGS, 1994)), August 1980 aerial photograph of the Rocky Flats Site, and field inspections (conducted in July and August of 1994). This map may not identify all seep locations.

* Unsaturated areas are based on well data and published information (OU1 Phase III RFI/RI Report (USDOE, 1992); OU4 Phase I RFI/RI Report - Draft Final (USDOE, 1994); Phase II RFI/RI Report 903 Pad, Mound and East Trenches Area, Operable Unit No. 2 - Preliminary Draft, December 1993 (USDOE, 1993); Proposed Interim Measures/Interim Remedial Action Decision Document for the Rocky Flats Industrial Area (USDOE, 1994b). This map may not identify all unsaturated areas.

- Topographic Contours
- Approximate Extent of Rocky Flats Alluvium
- Streams and Drainages
- Paved Roads
- Dirt Roads
- Rocky Flats Plant Site and Security Zone Boundaries
- Rocky Flats Site Boundary
- Surface Water Impoundments
- Buildings

Scale = 1 : 6000
1 inch = 500 feet

250 0 500 1000 1500ft

State Plane Coordinate System
Colorado Central Zone
Datum: NAD27

EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

Average Depth to Water in Unconsolidated Surficial Deposits

Hydrogeologic Characterization Report

April 1995 | Plate 7

SW-A-004196

EXPLANATION

- Foundation Drain
- Storm Drain
- Tunnel
- Ditch
- Utility Tunnel
- Intercept System
- Surface-Water Diversion Ditch
- Slurry Wall
- Groundwater Intercept System
- (perforated)
- (non-perforated)
- Outfall
- Sump
- Manhole / Catch Basin
- Elevation Point
- FD Foundation Drain
- SD Storm Drain
- BOF Bottom of Footing
- BS Building Sump
- VCP Vitrified Clay Pipe
- CMP Corrugated Metal Pipe
- DIP Ductile Iron Pipe
- PVC PVC Pipe
- CI Cast Iron
- STL Steel
- FFE Finished Floor Elevation
- FDD Foundation Drain Depth
- RCP Reinforced Concrete Pipe
- CB Catch Basin
- MH Manhole
- Clay Embankment Core/Cutoff Trench (approximately located)
- Infiltration Area from Sewage Lines

* Draft Technical Memorandum 1 - Operable Unit No. 8 (EG&G, 1994); OU1 Phase III RFI/RI Report (USDOE, 1992); OU4 Phase I RFI/RI Report - Draft Final (USDOE, 1992); OU7 Final Work Plan (USDOE, 1994b); Sanitary Sewer Infiltration/Inflow and Exfiltration Study (ASI, 1991); Geotechnical Engineering Report for Geotechnical Analysis of Earthen Dams A-3, B-1, B-3, and Landfill Dam (EG&G, 1993).

- Topographic Contours
- Streams and Drainages
- Paved Roads
- Dirt Roads
- Rocky Flats Plant Site and Security Zone Boundaries
- Surface Water Impoundments
- Buildings

Scale = 1 : 2640
1 inch = 220 feet

110 0 220 440 660ft

State Plane Coordinate System
Colorado Central Zone
Datum: NAD27

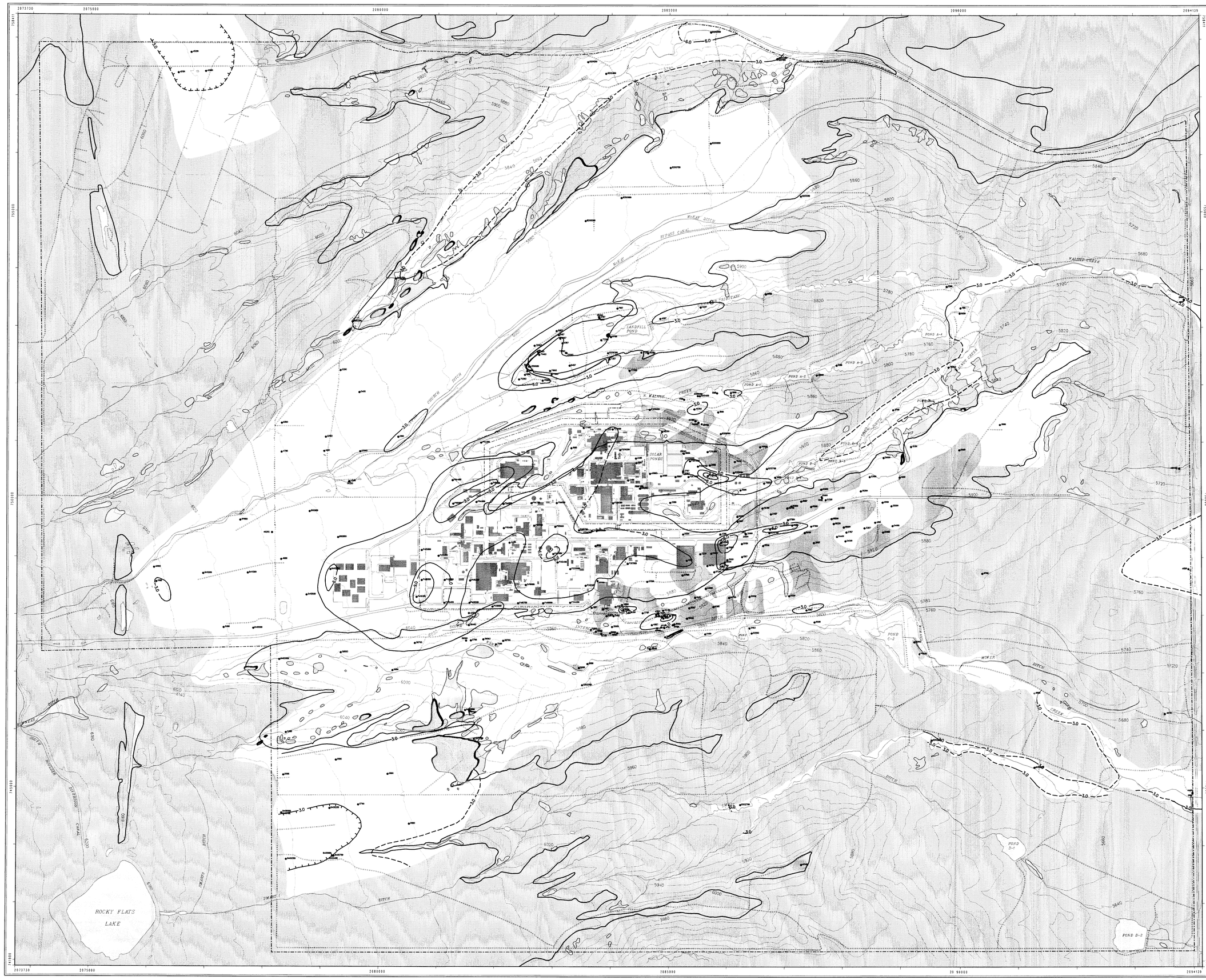
EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

Building Footprint, Foundation Drain, and Groundwater Diversion/Extraction System Map

Hydrogeologic Characterization Report

April 1995	Plate 23

SW-A-004196



EXPLANATION

- Line of Equal Saturated Thickness Difference Contour
- (dashed where inferred)
- Decreasing Line of Equal Saturated Thickness Difference Contour
- (dashed where inferred)
- Approximate Extent of Unsaturated Areas
- Areas Without Groundwater Elevation Data
- Perennial Seep
- Ephemeral Seep

* Seep areas are based on published information (Wetlands Assessment - Rocky Flats Site (ASI, 1990); Well Evaluation Report (USDOE, 1994); USGS, Surficial Geologic Map (USGS, 1994)); August 1990 aerial photograph of the Rocky Flats Site, and field inspections (conducted in July and August of 1994). This map may not identify all seep locations.

* Unsaturated areas are based on well data and published information (OU1 Phase III RFI/RI Report (USDOE, 1992); OU4 Phase I RFI/RI Report - Draft Final (USDOE, 1994); Phase II RFI/RI Report 903 Pad, Mound and East Trenches Area, Operable Unit No. 2 - Preliminary Draft, December 1993 (USDOE, 1993); Proposed Interim Measures/Interim Remedial Action Decision Document for the Rocky Flats Industrial Area (USDOE, 1994b). This map may not identify all unsaturated areas.

- Topographic Contours
- Approximate Extent of Rocky Flats Alluvium
- Streams and Drainages
- Paved Roads
- Dirt Roads
- Rocky Flats Plant Site and Security Zone Boundaries
- Rocky Flats Site Boundary
- Surface Water Impoundments
- Buildings

Scale = 1 : 6000
1 inch = 500 feet

250 0 500 1000 1500ft

State Plane Coordinate System
Colorado Central Zone
Datum: NAD27

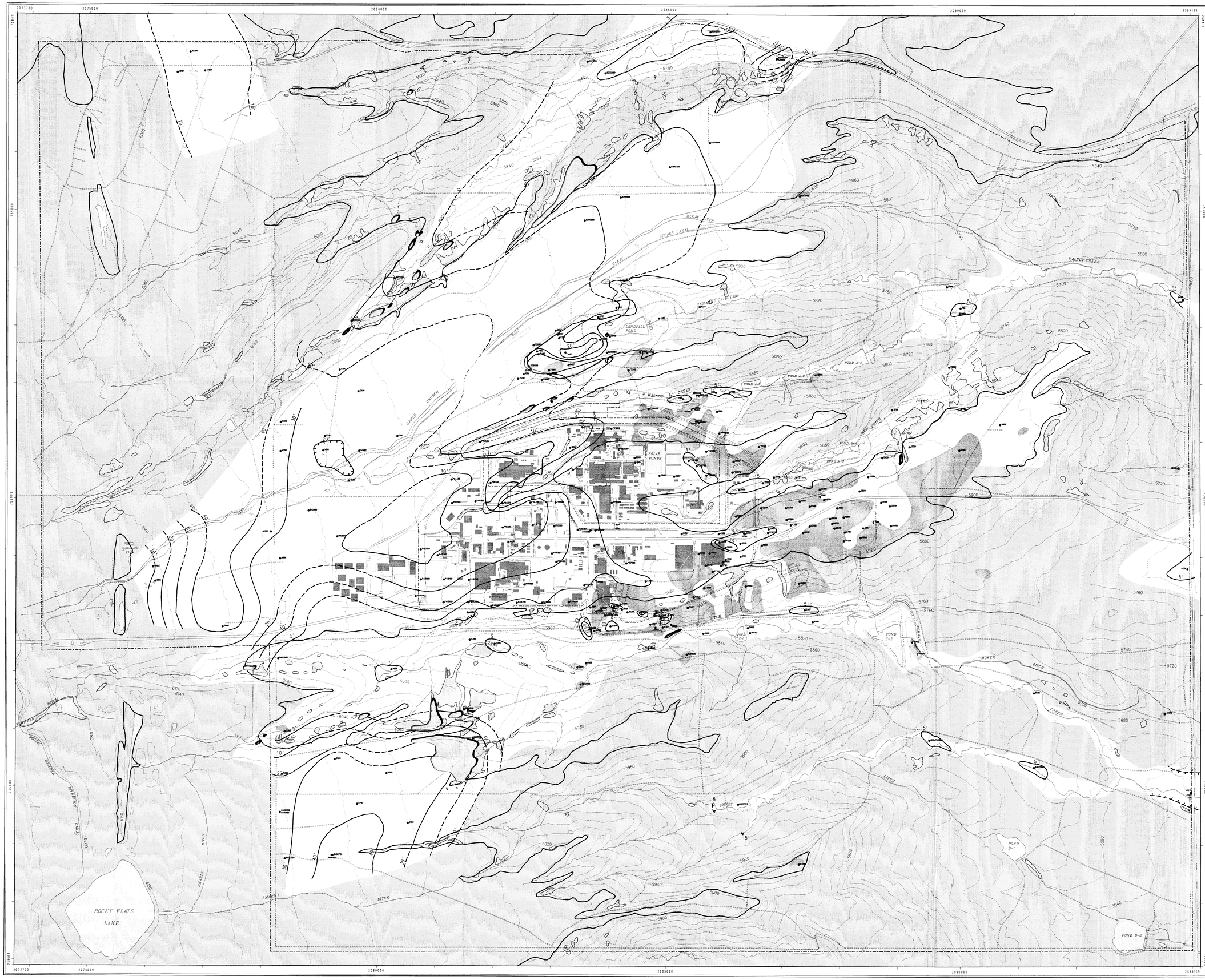
EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

Saturated Thickness Difference of Unconsolidated Surficial Deposits 1993

Hydrogeologic Characterization Report

April 1995 | Plate 6

SW-A-004196



EXPLANATION

- Line of Equal Saturated Thickness Contour
- (dashed where inferred)
- Decreasing Line of Equal Saturated Thickness Contour
- (dashed where inferred)
- Approximate Extent of Unsaturated Areas
- Areas Without Groundwater Elevation Data
- Perennial Seep
- Ephemeral Seep

* Seep areas are based on published information (Wetlands Assessment - Rocky Flats Site (ASI, 1990); Well Evaluation Report (USDOE, 1994); USGS, Surficial Geologic Map (USGS, 1994)), August 1980 aerial photograph of the Rocky Flats Site, and field inspections (conducted in July and August of 1994). This map may not identify all seep locations.

* Unsaturated areas are based on well data and published information (OU1 Phase III RFI/RI Report (USDOE, 1992); OU4 Phase I RFI/RI Report - Draft Final (USDOE, 1994); Phase II RFI/RI Report 903 Pad, Mound and East Trenches Area, Operable Unit No. 2 - Preliminary Draft, December 1993 (USDOE, 1993); Proposed Interim Measures/Interim Remedial Action Decision Document for the Rocky Flats Industrial Area (USDOE, 1994b). This map may not identify all unsaturated areas.

- Topographic Contours
- Approximate Extent of Rocky Flats Alluvium
- Streams and Drainages
- Paved Roads
- Dirt Roads
- Rocky Flats Plant Site and Security Zone Boundaries
- Rocky Flats Site Boundary
- Surface Water Impoundments
- Buildings

Scale = 1 : 6000
1 inch = 500 feet

250 0 500 1000 1500ft

State Plane Coordinate System
Colorado Central Zone
Datum: NAD27

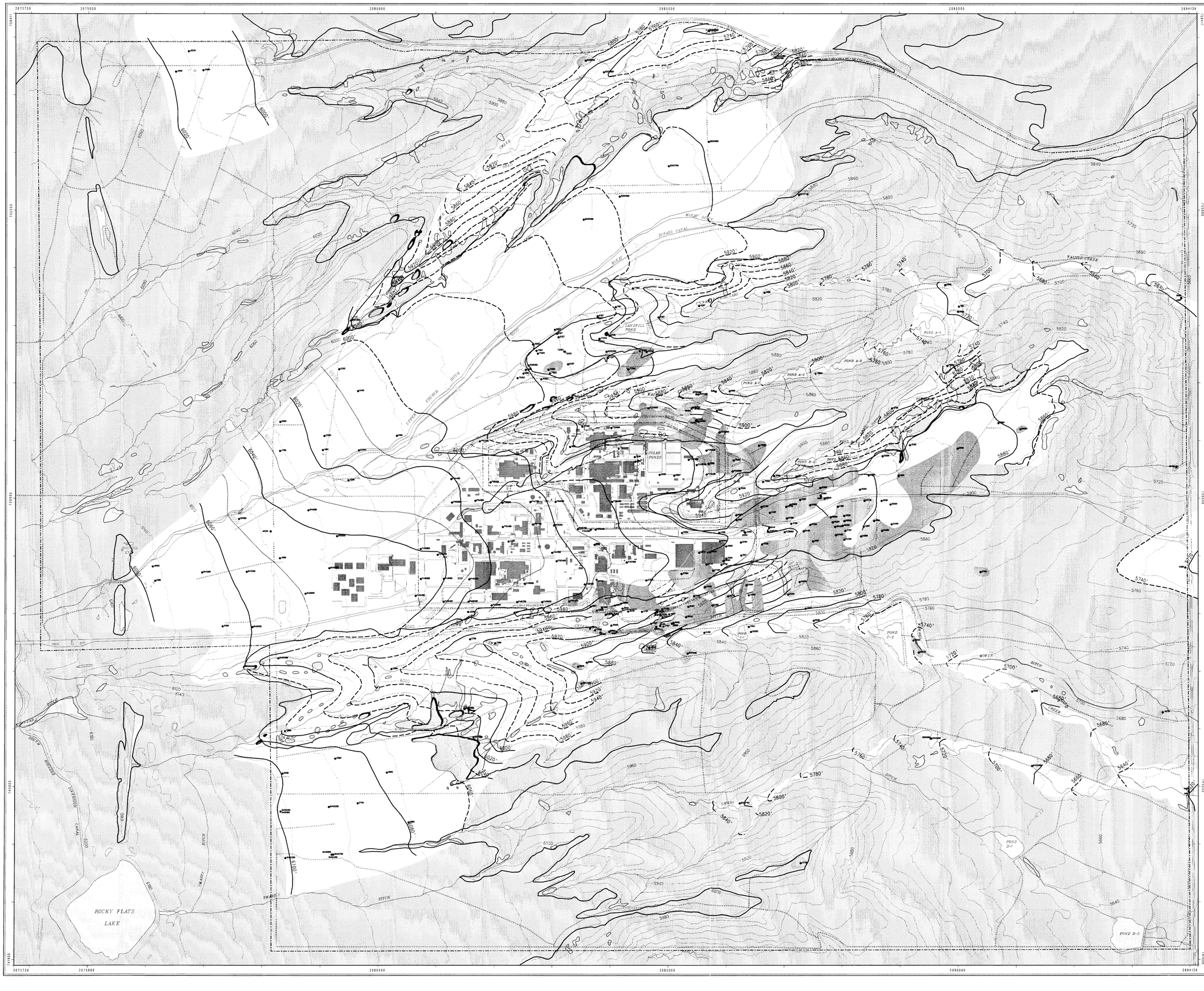
EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

Saturated Thickness
of
Unconsolidated
Surficial Deposits
Second Quarter 1993

Hydrogeologic Characterization Report

April 1995 | Plate 4

SW-A-004196



EXPLANATION

- Water Level Contour
- (dashed where inferred)
- Intermediate Water Level Contour
- (dashed where inferred)
- Approximate Extent of Unsaturated Areas
- Areas Without Groundwater Elevation Data
- Perennial Seep
- Ephemeral Seep

* Seep areas are based on published information (Wetlands Assessment - Rocky Flats Site (ASI, 1990); Well Evaluation Report (USDOE, 1994); USGS, Surficial Geologic Map (USGS, 1994)), August 1980 aerial photograph of the Rocky Flats Site, and field inspections (conducted in July and August of 1994). This map may not identify all seep locations.

* Unsaturated areas are based on well data and published information (OU1 Phase III RFI/RI Report (USDOE, 1992); OU4 Phase I RFI/RI Report - Draft Final (USDOE, 1994); Phase II RFI/RI Report 903 Pad, Mound and East Trenches Area, Operable Unit No. 2 - Preliminary Draft, December 1993 (USDOE, 1993); Proposed Interim Measures/Interim Remedial Action Decision Document for the Rocky Flats Industrial Area (USDOE, 1994b). This map may not identify all unsaturated areas.

- Topographic Contours
- Approximate Extent of Rocky Flats Alluvium
- Streams and Drainages
- Paved Roads
- Dirt Roads
- Rocky Flats Plant Site and Security Zone Boundaries
- Rocky Flats Site Boundary
- Surface Water Impoundments
- Buildings

N

Scale = 1 : 6000
1 inch = 500 feet

250 0 500 1000 1500ft

State Plane Coordinate System
Colorado Central Zone
Datum: NAD27

EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

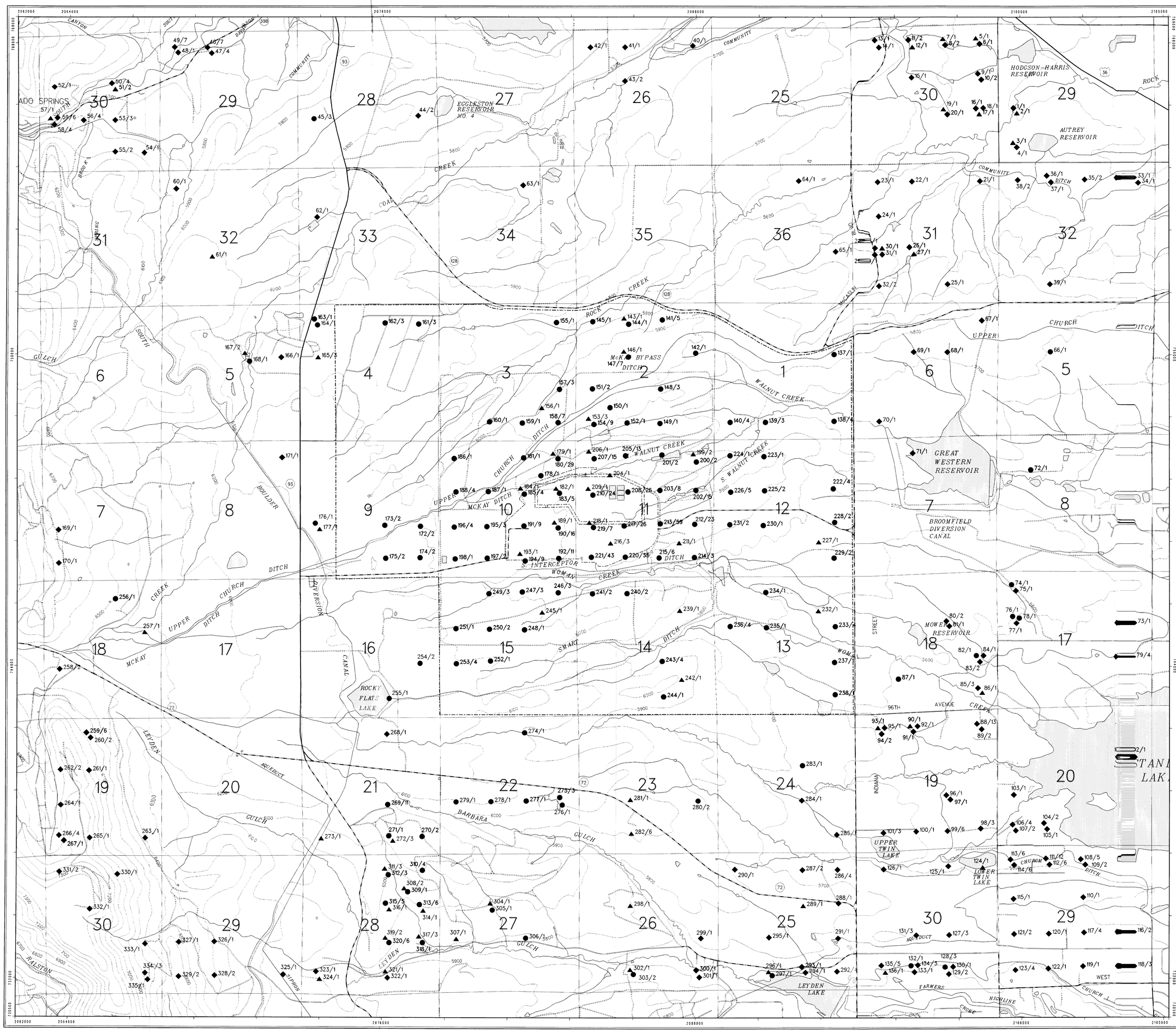
Potentiometric Surface
of
Unconsolidated
Surficial Deposits
Second Quarter 1993

SW-A-004196

Hydrogeologic Characterization Report

April 1995 | Plate 2

SW-A-004196



EXPLANATION

1/1 = Reference Number/Number of Wells
(Refer to Table 4-2 for well information.)

Use Codes for Permitted Wells

- Monitoring
- Industrial
- Commercial
- Municipal
- Household Use Only
- Domestic
- Crop Irrigation
- Stock
- Other

- Primary Roads
- Secondary Roads
- Light-duty Roads
- Unimproved Roads
- Trails
- Topography
- Streams, Ditches and Drainages
- Rocky Flats Site and Security Zone Boundaries
- Rocky Flats Buffer Zone Boundary

Scale = 1 : 14400
1 inch = 1200 feet

600 0 1200 2400 3600ft

State Plane Coordinate System
Colorado Central Zone
Datum: NAD27

EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

Permitted Well Location Map

Hydrogeologic Characterization Report

April 1995 | Plate 22

SW-A-004196

CROSS SECTION G–G'

WEST G — EAST G'

ELEVATION (feet above mean sea level)

EXPLANATION

Map Ofs — Designation of Surficial Deposits and Generalized Bedrock Profile

- af — Artificial Fill (Latest Recent)
- Qrc — Rocky Creek and Rock Creek Alluvium (Recent)
- Qt — Terrace Alluvium, undivided (Middle to Late Pleistocene)
- Qo — Slocum Alluvium (Middle Pleistocene)
- Qa — Verdos Alluvium (Early to Middle Pleistocene)
- Qd — Dry Creek Alluvium (Early Pleistocene)
- Qc — Colluvium, undivided (Middle Pleistocene to Recent)
- Qls — Landslide Deposits (Mid-late Pleistocene to Recent)
- ks — Arapahoe Formation (Late Cretaceous)
- kl — Laramie Formation (Late Cretaceous)
- kfh — Fox Hills Sandstone (Late Cretaceous)

Gravel (GR,GP,GM,GC) — Semi-consolidated Surficial Deposits USCS Soil Types

Sand (SW,SP,SM,SC)

Silt (ML,MH)

Clay (CL,CH,OH)

Sandstone — Bedrock Lithostratigraphy

Siltstone

Silty Claystone

Claystone

No Recovery

Unconsolidated Surficial Deposits

Weathered Arapahoe or Laramie Formation

Unweathered Arapahoe or Laramie Formation

Weathered Fox Hills Sandstone

Unweathered Fox Hills Sandstone

Weathered Pierre Shale

Unweathered Pierre Shale

Arapahoe Formation Channel Deposit

Location of Inferred Fault

Unconsolidated Surficial Deposits Potentiometric Surface
- 3rd Quarter 1993
- 4th Quarter 1993

Grass bar indicates screened interval. Black bar is wet/boring at time of drilling. Open bar indicates screened interval for well clusters. Water levels for second (2) level in well clusters are shown on alternate wells. NM = No Measurement

* See attached text describing equipotential lines

Equipotential line

Indicates direction of potential (No magnitude is implied)

VERTICAL EXAGGERATION (10X)

VERTICAL SCALE (feet) 0 – 200

HORIZONTAL SCALE (feet)

(See Figure P-1)

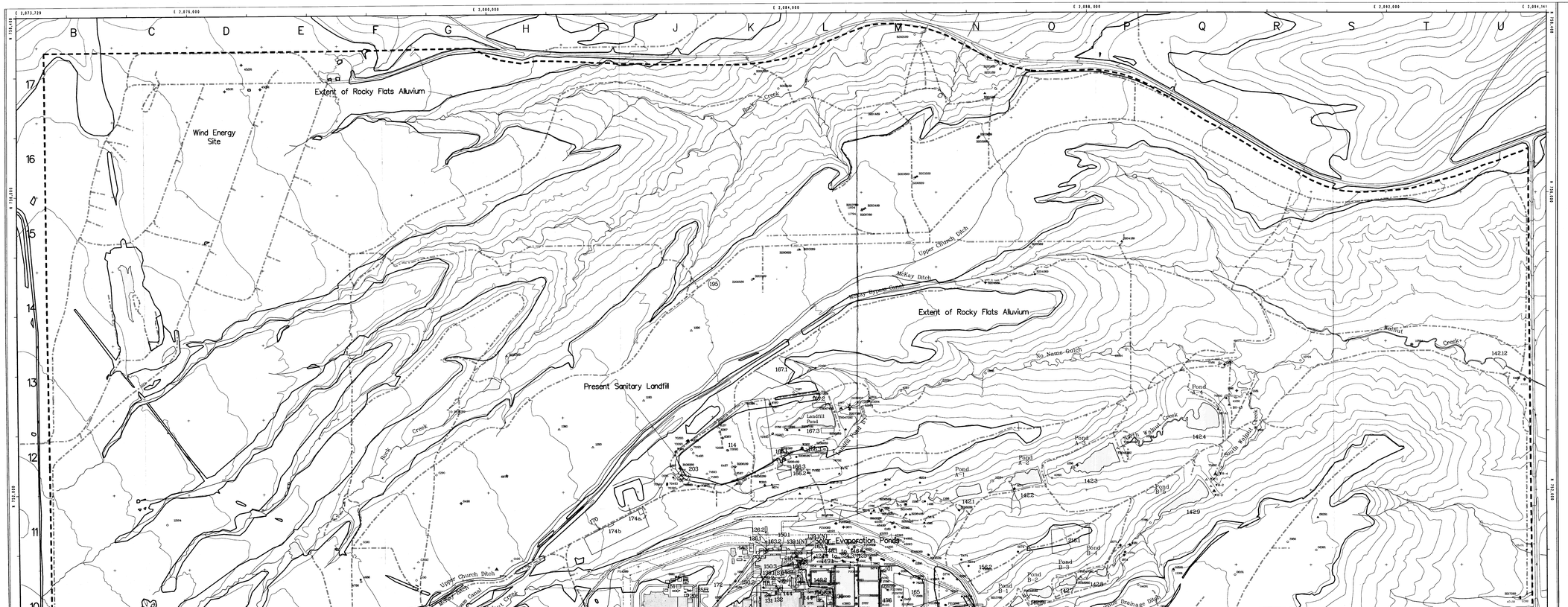
NO VERTICAL EXAGGERATION

VERTICAL SCALE (feet) 0 – 200'

HORIZONTAL SCALE (feet)

RMI RMI RMI

SW-A-004196



Groundwater Monitoring Well Location Map

(Posted as of 12/1/94)

Plate 1

WELL TYPES

- Boundary-AIP Wells
- CERCLA Wells
- RCRA-S Wells
- RCRA-C Wells
- Non-GMP Wells
- Plant Protection Wells
- New Sanitary Landfill Wells

Groundwater Monitoring Program Wells

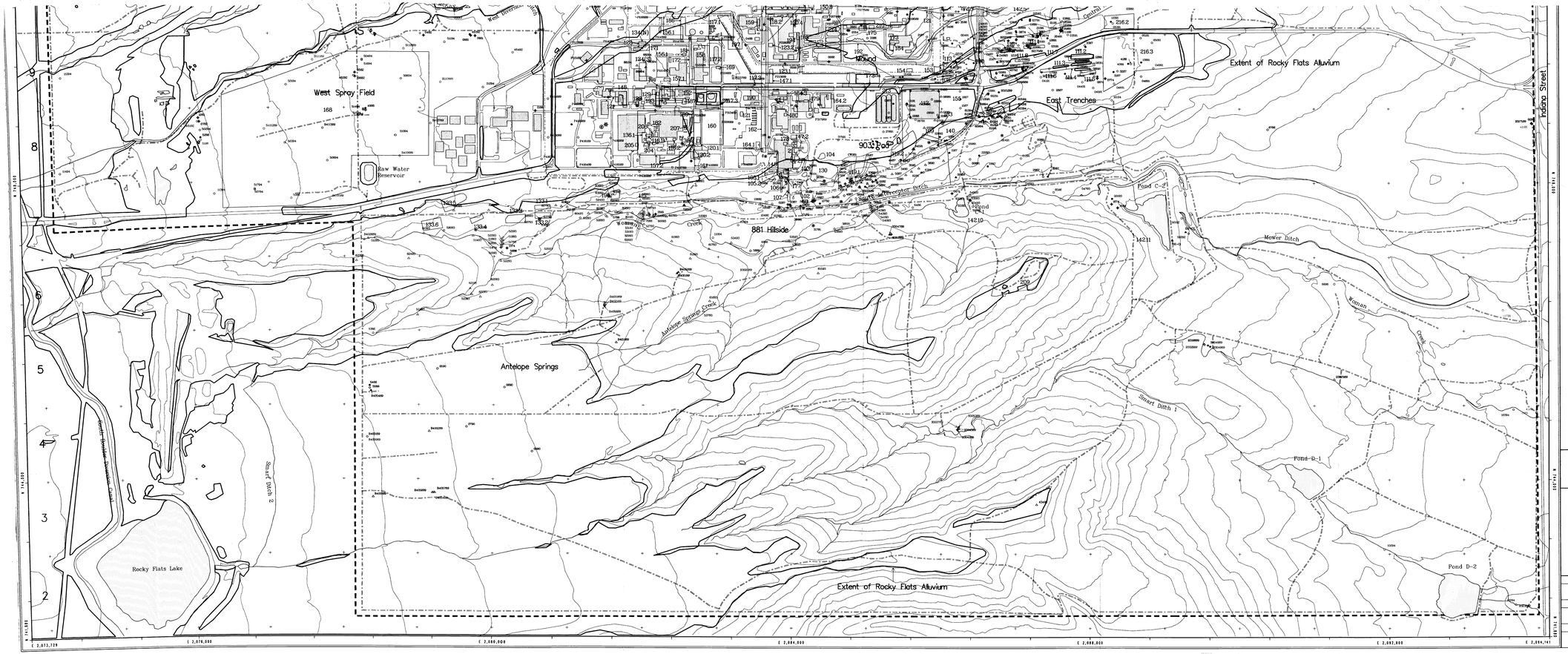
Completion Zone

- ● Bedrock
- ○ Alluvium
- ◉ Alluvium/Bedrock

Inactive Groundwater Monitoring Wells

Completion Zone

- ▲ Bedrock
- △ Alluvium
- ◭ Alluvium/Bedrock
- ◆ Abandoned Bedrock Wells
- ⌖ Abandoned Alluvium Wells
- ◒ Abandoned Alluvium/Bedrock Wells



Other

- Buildings and other structures
- Ponds and lakes
- Individual Hazardous Substance Sites
- Extent of Rocky Flats Alluvium
- Fences
- Contours (20' Intervals)
- Rocky Flats boundary
- Paved roads
- Dirt roads

DATA SOURCE:
Well locations from Geoscience spreadsheet, 12/94
Buildings, roads, and fences provided by Facilities Engr.
EG&G Rocky Flats, Inc. - 1991.
Hydrology provided by USGS - (date unknown)

Scale = 1 : 4800
1 inch represents 400 feet
1 centimeter represents approximately 48 meters

250 0 500 1000ft

0 200 400 600m

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy

Rocky Flats Environmental Technology Site

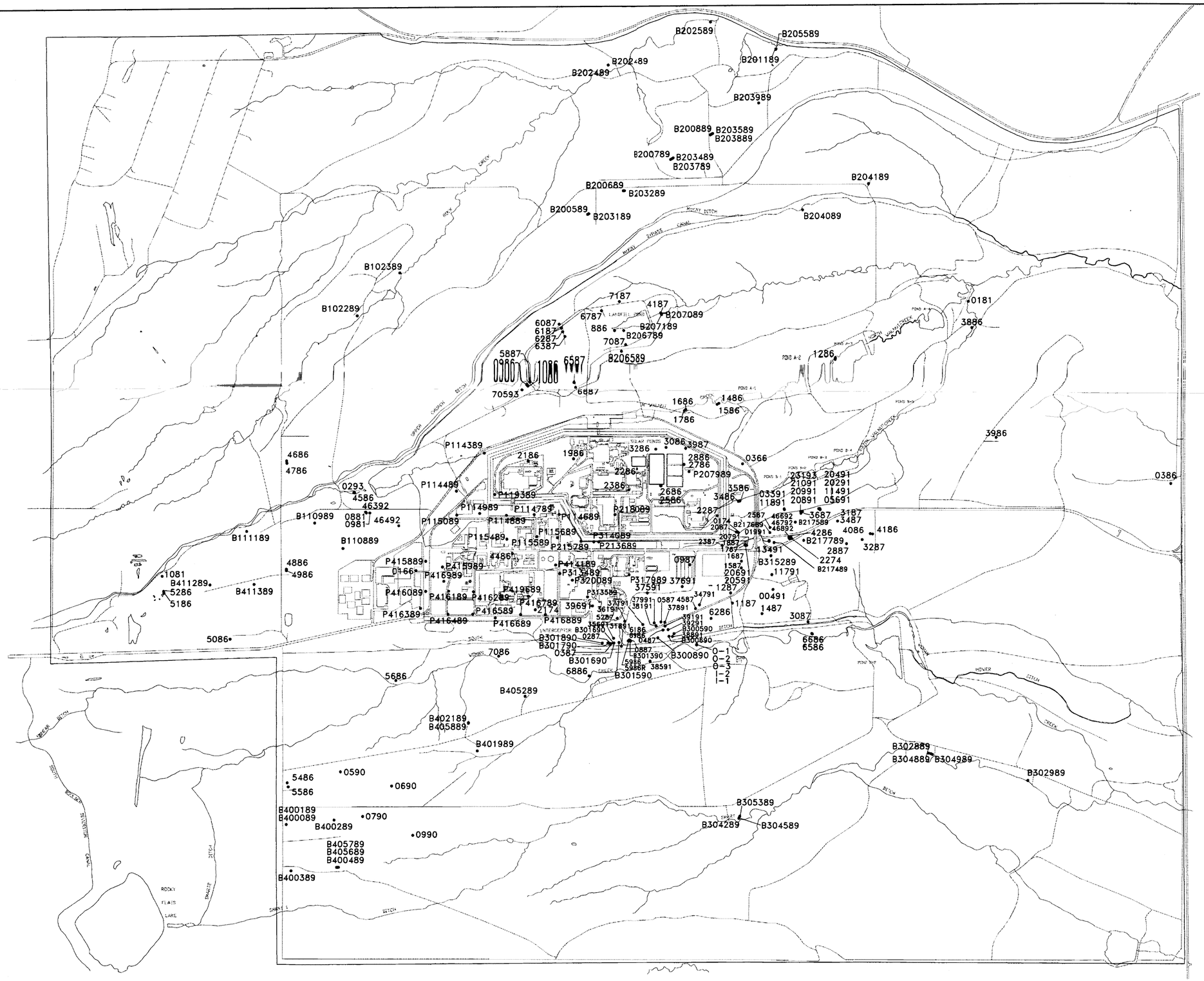
Prepared by:

EG&G ROCKY FLATS

Rocky Flats Environmental Technology Site
P.O. Box 464
Golden, Colorado 80402-0464

SW.A-004196

PROJECT NO.		BY / DEPARTMENT	DATE
Groundwater	GIS Analyst	B. Todeschini DM/GIS	02/24/95
MAP ID	Checked		
GW95	Approved	T. Loveath/Hydrogeologic Ops.	
DATE CREATED			
February 24, 1995			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37891
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4286
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20491
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ROCKY FLATS LAKE
SOUTH PLATTE RIVER
SOUTH PLATTE CANAL
WEST PLATTE DITCH
WEST CAMPUS DITCH
MIDDLE CREEK
NORTH CREEK
SOUTH CREEK
HOVER DITCH
HOVER CREEK
MIDDLE DITCH
SMART DITCH
SMART CREEK
MIDDLE DITCH
MIDDLE CREEK
NORTH DITCH
NORTH CREEK
MCKAY DITCH
MCKAY DITCH
LANDFILL POND
POND A-1
POND A-2
POND A-3
POND A-4
POND B-1
POND B-2
POND B-3
POND B-4
POND B-5
POND B-6
POND C-1
POND C-2
POND C-3
POND C-4
POND C-5
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POND C-7
POND C-8
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POND C-12
POND C-13
POND C-14
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POND C-18
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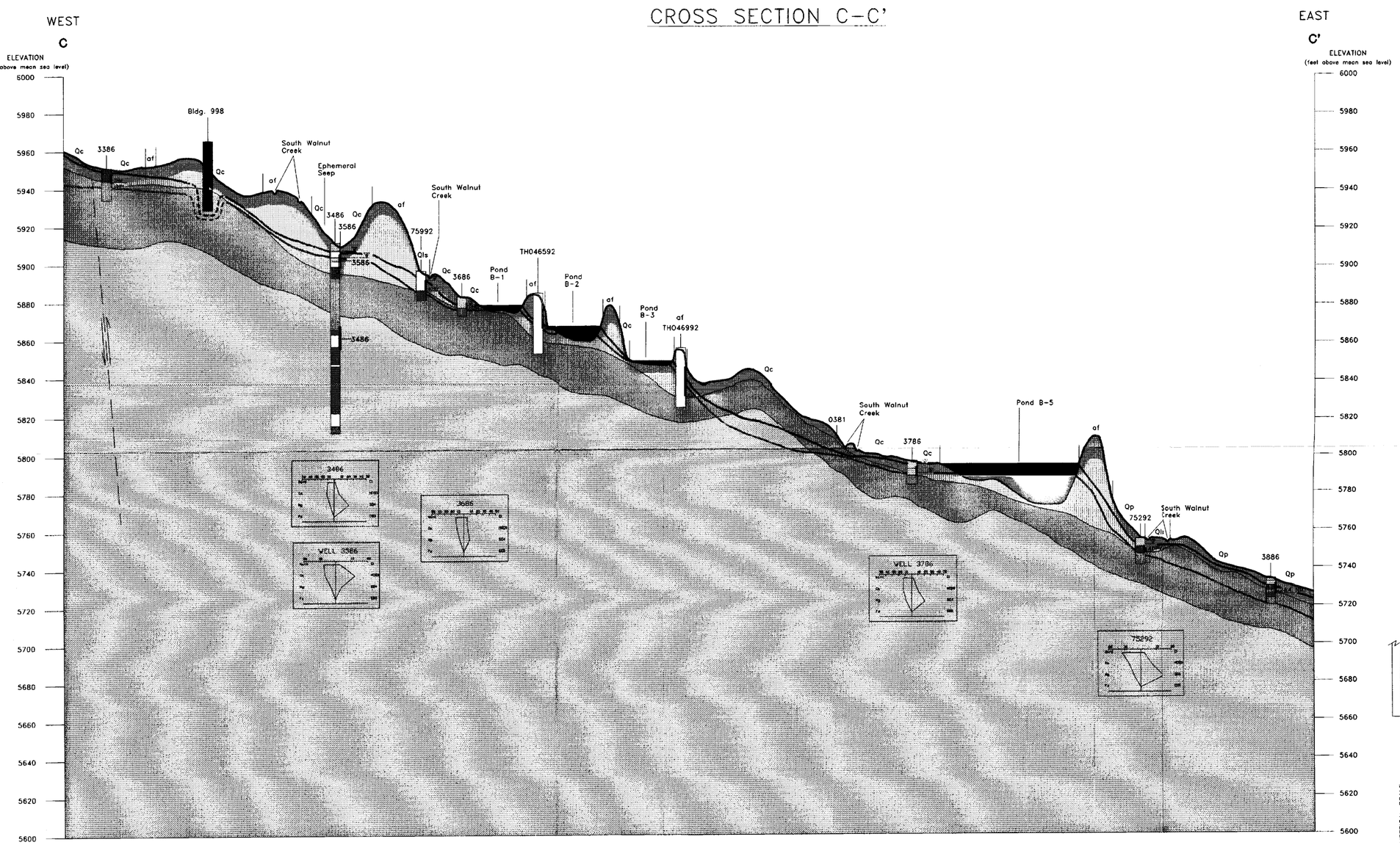
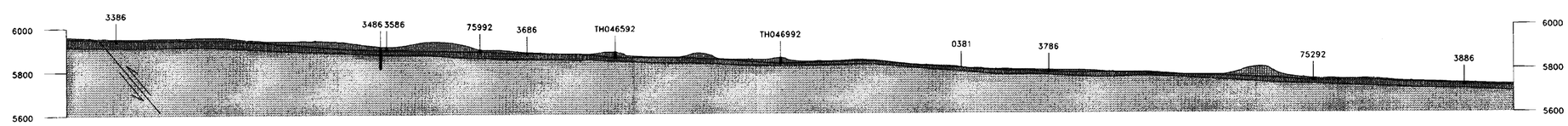
POND C-20
POND

CROSS SECTION C–C'





EXPLANATION

Bldg. 774 — Designation of Surficial Deposits and Generalized Building Profile

- af — Artificial Fill (Latest Recent)
- Qp — Piney Creek and Post-Piney Creek Alluvium (Recent)
- Qt — Terrace Alluvium, undivided (Middle to Late Pleistocene)
- Qs — Slocum Alluvium (Middle Pleistocene)
- Qv — Verdos Alluvium (Early to Middle Pleistocene)
- Qrf — Rocky Flats Alluvium (Early Pleistocene)
- Qc — Colluvium, undivided (Middle Pleistocene to Recent)
- Qls — Landslide Deposits (Middle Pleistocene to Recent)
- Ka — Arapahoe Formation (Late Cretaceous)
- Kl — Laramie Formation (Late Cretaceous)
- Kfh — Fox Hills Sandstone (Late Cretaceous)

Unconsolidated Surficial Deposits USCS Soil Types:
- Gravel (GW,GP,GM,GC)
- Sand (SW,SP,SM,SC)
- Silt (ML,OL,MH)
- Clay (CL,CH,OH)

Bedrock Lithofacies:
- Sandstone
- Siltstone
- Silty Claystone
- Claystone

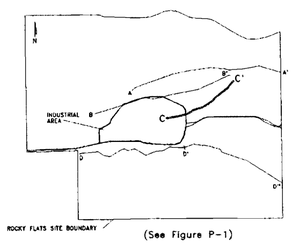
- No Recovery
- Unconsolidated Surficial Deposits
- Weathered Arapahoe or Laramie Formation
- Unweathered Arapahoe or Laramie Formation
- Location of inferred high angle reverse fault
- Unconsolidated Surficial Deposits Potentiometric Surface
  - 2nd Quarter 1993
  - 4th Quarter 1993

42192 — Black bar indicates screened interval; Well number is adjacent to screen for well clusters. Water levels for second (▽) and fourth (×) quarters are labeled on alluvial wells. NM = No Measurement

42192 — Black bar is well/boring

VERTICAL EXAGGERATION (10:1)

VERTICAL SCALE (feet): 20; 0
HORIZONTAL SCALE (feet): 0; 200



(See Figure P-1)

NO VERTICAL EXAGGERATION

VERTICAL SCALE (feet): 200'; 0
HORIZONTAL SCALE (feet): 0; 200'

X26
SW-A-004196

EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

STREAM PROFILE
HYDROGEOLOGIC CROSS SECTION
C-C'

Hydrogeologic Characterization Report

ROCK-FLT\HYD-C-C\DV-7

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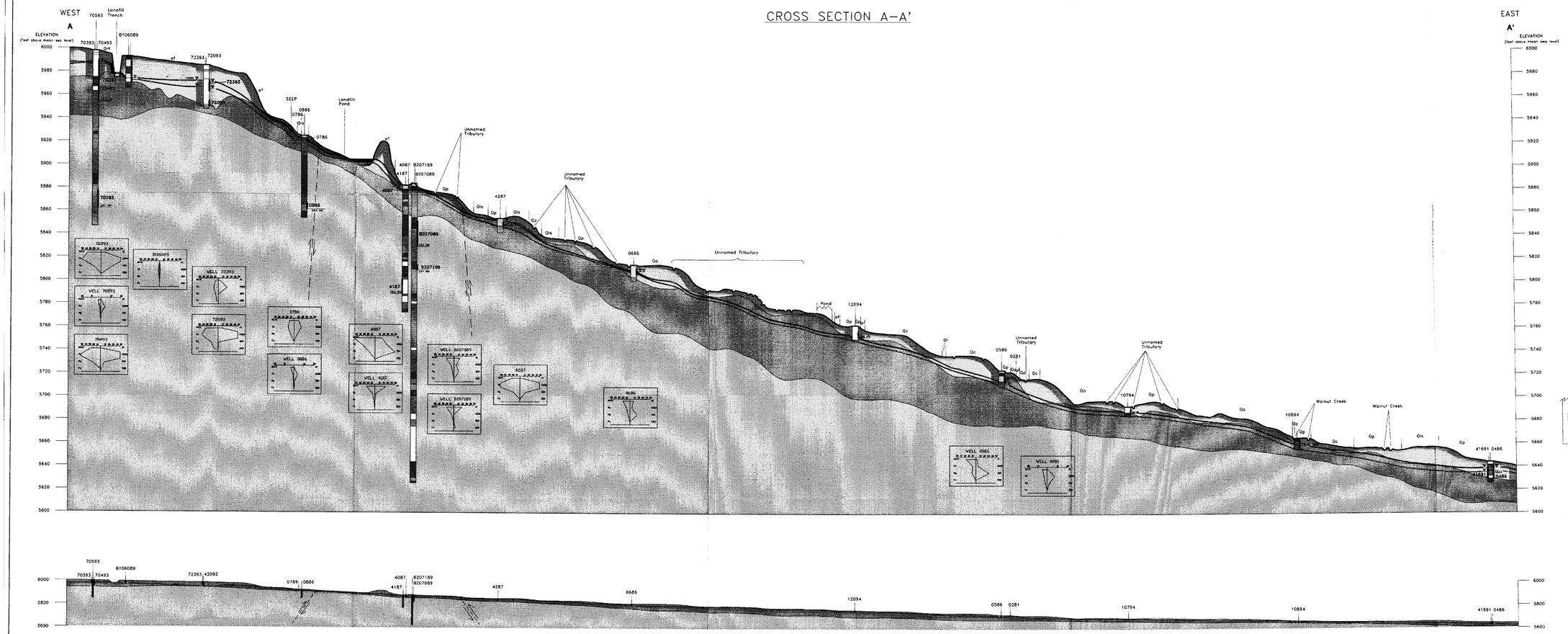
CROSS SECTION A–A'



EXPLANATION

Qrf — Designation of Surficial Deposits

- af — Artificial Fill (Latest Recent)
- Qp — Piney Creek and Post-Piney Creek Alluvium (Recent)
- Qt — Terrace Alluvium, undivided (Middle to Late Pleistocene)
- Qs — Slocum Alluvium (Middle Pleistocene)
- Qv — Verdos Alluvium (Early to Middle Pleistocene)
- Qrf — Rocky Flats Alluvium (Early Pleistocene)
- Qc — Colluvium, undivided (Middle Pleistocene to Recent)
- Qls — Landslide Deposits (Middle Pleistocene to Recent)
- Ka — Arapahoe Formation (Late Cretaceous)
- Kl — Laramie Formation (Late Cretaceous)
- Kfh — Fox Hills Sandstone (Late Cretaceous)

Unconsolidated Surficial Deposits USCS Soil Types:
- Gravel (GW,GP,GM,GC)
- Sand (SW,SP,SM,SC)
- Silt (ML,OL,MH)
- Clay (CL,CH,OH)

Bedrock Lithofacies:
- Sandstone
- Siltstone
- Silty Claystone
- Claystone

No Recovery

Unconsolidated Surficial Deposits

Weathered Arapahoe or Laramie Formation

Unweathered Arapahoe or Laramie Formation

Location of inferred high angle reverse fault

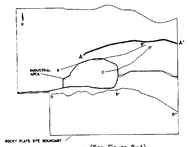
Unconsolidated Surficial Deposits Potentiometric Surface
- 2nd Quarter 1993
- 4th Quarter 1993

42192 — Black bar indicates screened interval; Well number is adjacent to screen for well clusters. Water levels for second (▽) and fourth (▽) quarters are labeled on alluvial wells. n/a = No Measurement

42192 — Black bar is well/boring

VERTICAL EXAGGERATION (10:1)

VERTICAL SCALE (feet): 20, 0
HORIZONTAL SCALE (feet): 0, 200



(See Figure P-1)

NO VERTICAL EXAGGERATION

VERTICAL SCALE (feet): 200', 0
HORIZONTAL SCALE (feet): 0, 200'

SW-A-004196

EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

STREAM PROFILE
HYDROGEOLOGIC CROSS SECTION
A-A'

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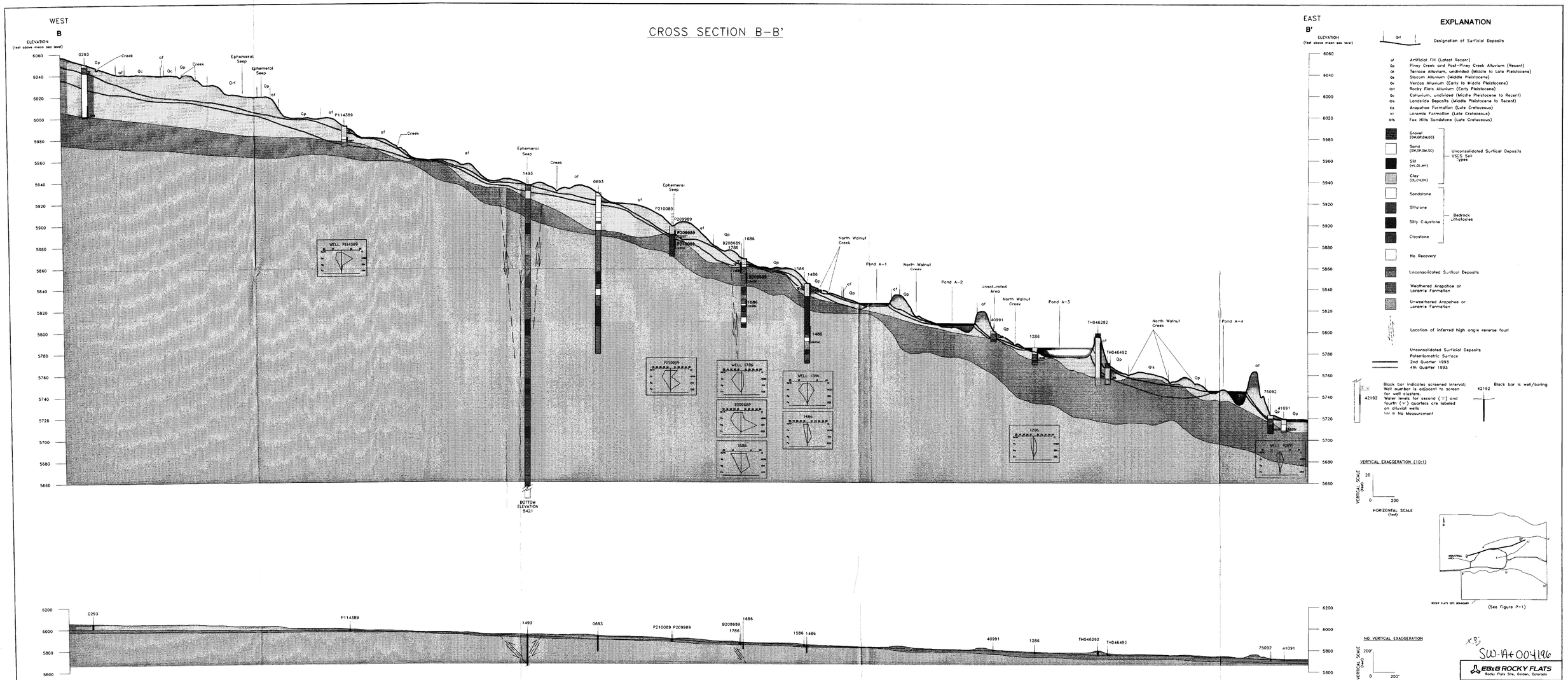
80CK-FLT\WTD-A-A\DV-6

CROSS SECTION B–B'



x3

SW-A-004196

EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

STREAM PROFILE
HYDROGEOLOGIC CROSS SECTION B-B'

Hydrogeologic Characterization Report

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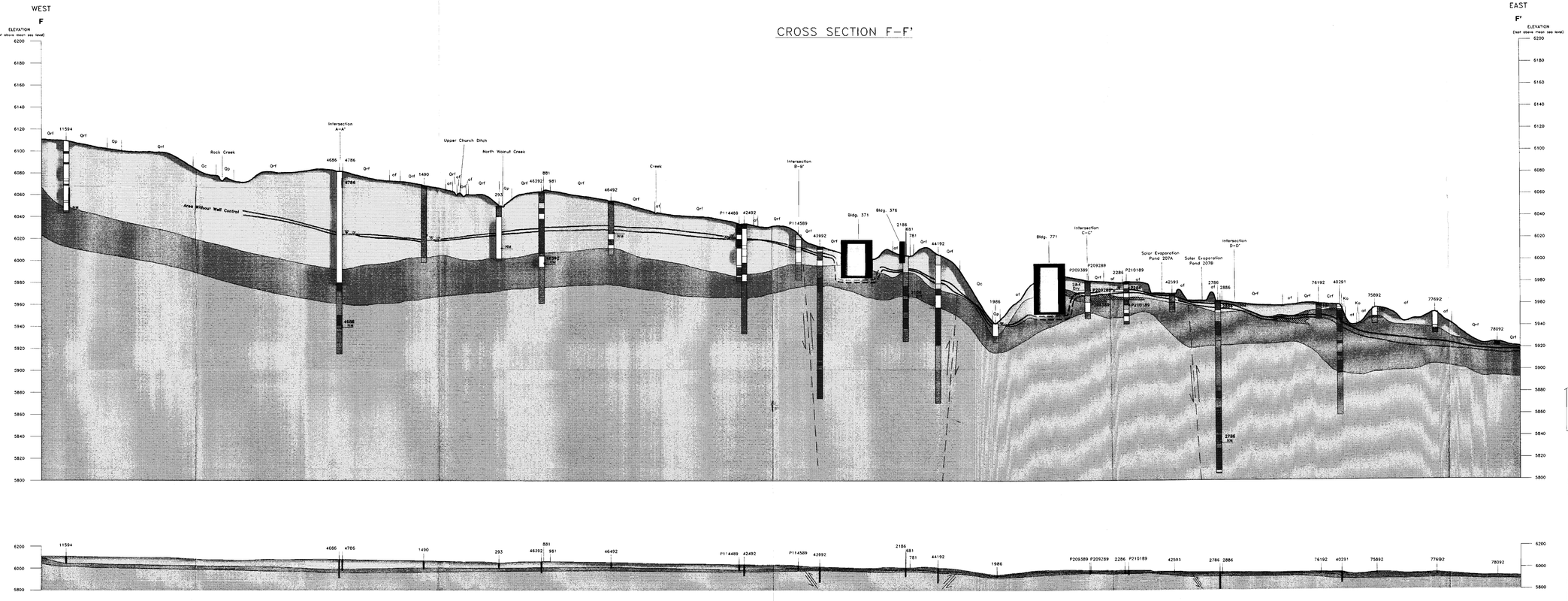
ROCK-FL\P_HYD-B-B'.DV-7

CROSS SECTION F–F'



EXPLANATION

Bldg. 774 — Qrf — Designation of Surficial Deposits and Generalized Building Profile

af	Artificial Fill (Latest Recent)
Op	Piney Creek and Post-Piney Creek Alluvium (Recent)
Qr	Terrace Alluvium, undivided (Middle to Late Pleistocene)
Qs	Slocum Alluvium (Middle Pleistocene)
Qv	Verdos Alluvium (Early to Middle Pleistocene)
Qrf	Rocky Flats Alluvium (Early Pleistocene)
Qc	Colluvium, undivided (Middle Pleistocene to Recent)
Qls	Landslide Deposits (Middle Pleistocene to Recent)
Ka	Arapahoe Formation (Late Cretaceous)
Kl	Laramie Formation (Late Cretaceous)
Kfh	Fox Hills Sandstone (Late Cretaceous)

Unconsolidated Surficial Deposits USCS Soil Types
- Gravel (GW,GP,GM,GC)
- Sand (SW,SP,SM,SC)
- Silt (ML,OL,MH)
- Clay (CL,CH,OH)

Bedrock Lithofacies
- Sandstone
- Siltstone
- Silty Claystone
- Claystone

No Recovery

Unconsolidated Surficial Deposits

Weathered Arapahoe or Laramie Formation

Unweathered Arapahoe or Laramie Formation

Arapahoe Formation Channel Deposit

Location of inferred fault

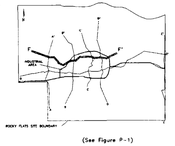
Unconsolidated Surficial Deposits Potentiometric Surface
- 2nd Quarter 1993
- 4th Quarter 1993

42192 — Black bar indicates screened interval; Well number is adjacent to screen for well clusters. Water levels for second (▽) and fourth (▽) quarters are labeled on dry/dry wells. (NM) = No Measurement

42192 — Black bar is well/boring

VERTICAL EXAGGERATION (10:1)

VERTICAL SCALE (feet) 20 0 — HORIZONTAL SCALE (feet) 0 200



(See Figure P-1)

NO VERTICAL EXAGGERATION

VERTICAL SCALE (feet) 200' 0 — HORIZONTAL SCALE (feet) 0 200'

SW-A-004196

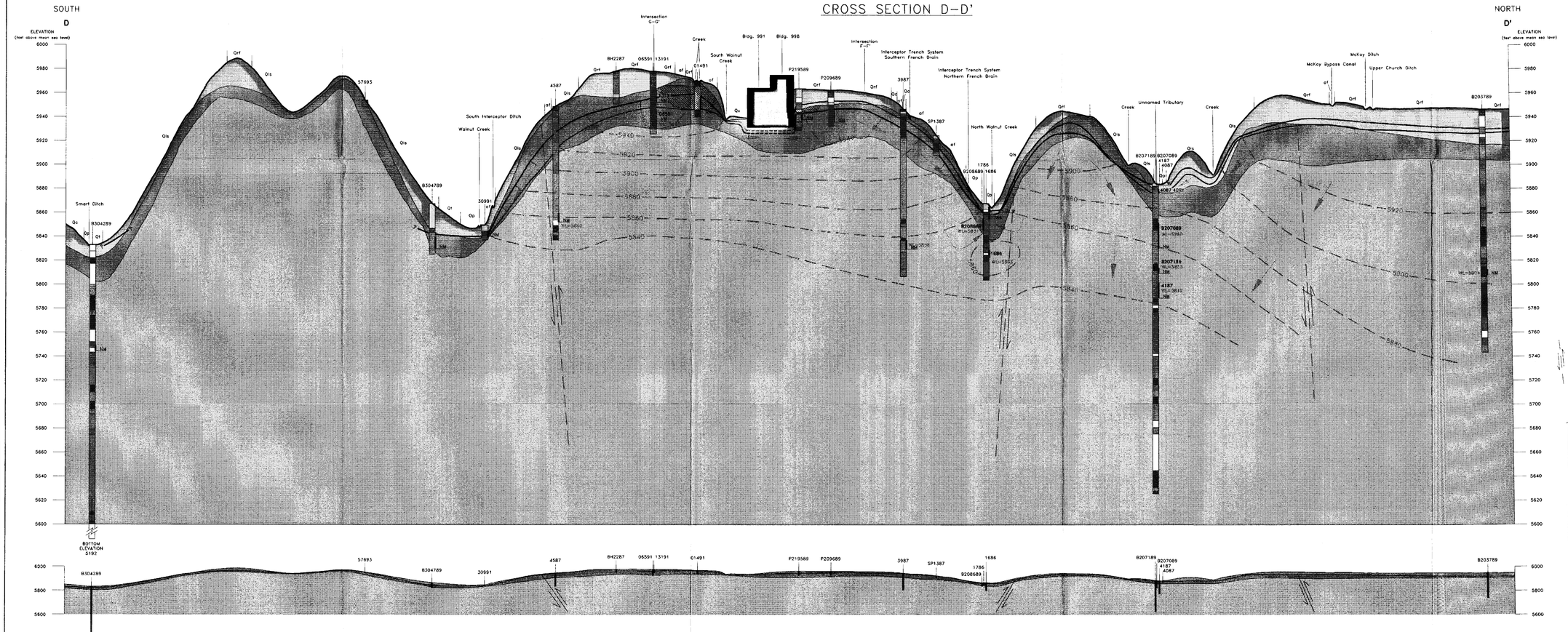
EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

REGIONAL HYDROGEOLOGIC CROSS SECTION F-F'

Hydrogeologic Characterization Report

ROCK-FLT-XFD-RF-FLT-EV-5 | Date April 1995 | Plate 15

CROSS SECTION D–D'



EXPLANATION

Bldg. 995 — Designation of Surficial Deposits and Generalized Building Profile

- af — Artificial Fill (Latest Recent)
- Qp — Piney Creek and Post-Piney Creek Alluvium (Recent)
- Qt — Terrace Alluvium, undivided (Middle to Late Pleistocene)
- Qs — Slocum Alluvium (Middle Pleistocene)
- Qv — Verdos Alluvium (Early to Middle Pleistocene)
- Qrf — Rocky Flats Alluvium (Early Pleistocene)
- Qc — Colluvium, undivided (Middle Pleistocene to Recent)
- Qls — Landslide Deposits (Middle Pleistocene to Recent)
- Ka — Arapahoe Formation (Late Cretaceous)
- Kl — Laramie Formation (Late Cretaceous)
- Kfh — Fox Hills Sandstone (Late Cretaceous)

Unconsolidated Surficial Deposits USCS Soil Types:
- Gravel (GW,GP,GM,GC)
- Sand (SW,SP,SM,SC)
- Silt (ML,OL,MH)
- Clay (CL,CH,OH)

Bedrock Lithofacies:
- Sandstone
- Siltstone
- Silty Claystone
- Claystone

- No Recovery
- Unconsolidated Surficial Deposits
- Weathered Arapahoe or Laramie Formation
- Unweathered Arapahoe or Laramie Formation
- Arapahoe Formation Channel Deposit

Location of inferred fault

Unconsolidated Surficial Deposits Potentiometric Surface
- 2nd Quarter 1993
- 4th Quarter 1993

* See attached text describing equipotential lines

Equipotential line

Indicates direction of potential (No magnitude intended)

42192 — Black bar indicates screened interval; Well number is adjacent to screen for well clusters. Water levels for second (▽) and fourth (▼) quarters are labeled on alluvial wells. NM = No Measurement

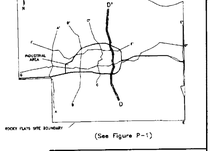
42192 — Black bar is well/boring

VERTICAL EXAGGERATION (10:1)

VERTICAL SCALE 20 0 — HORIZONTAL SCALE (feet) 200

NO VERTICAL EXAGGERATION

VERTICAL SCALE 200' 0 — HORIZONTAL SCALE (feet) 200'



(See Figure P-1)

EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

REGIONAL HYDROGEOLOGIC CROSS SECTION D-D'

Hydrogeologic Characterization Report

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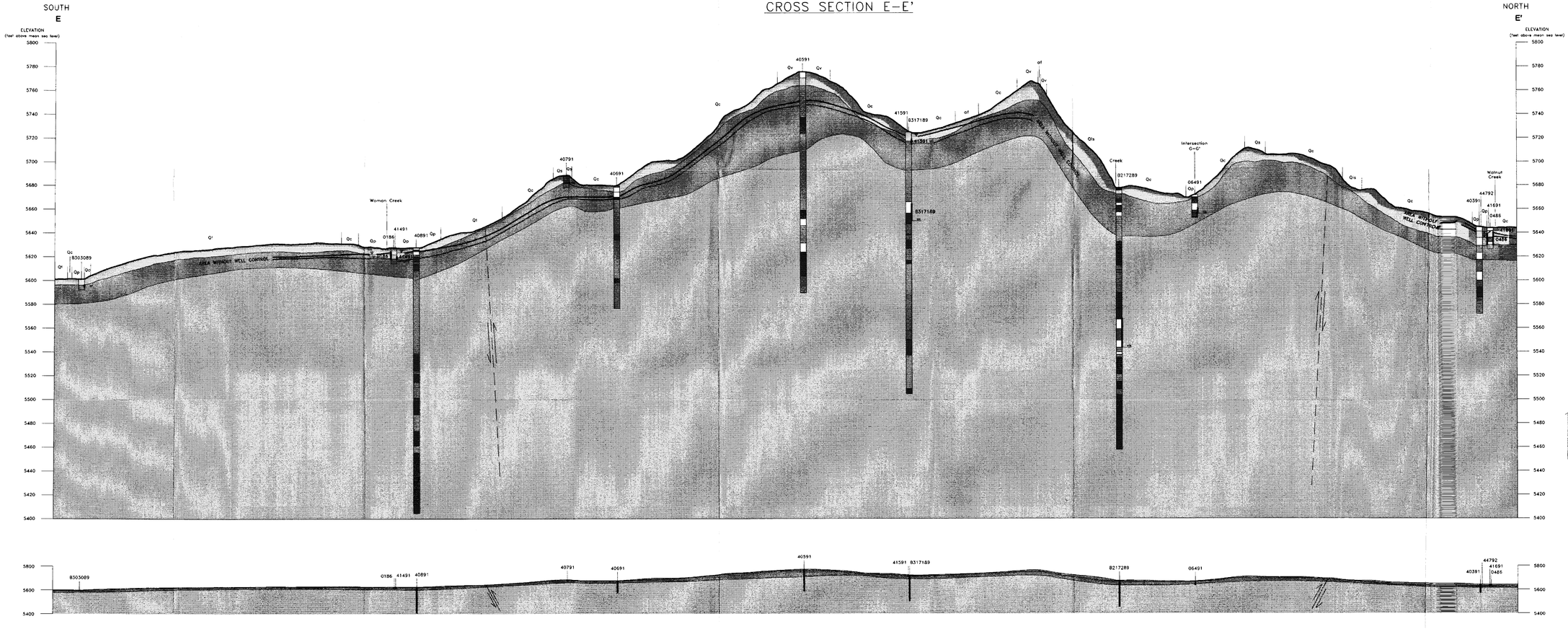
ROCK-FLT-HYD-RIO-01-DV-4

SW-A-004196

CROSS SECTION E–E'



EXPLANATION

Qrf — Designation of Surficial Deposits

- af — Artificial Fill (Latest Recent)
- Qp — Piney Creek and Post-Piney Creek Alluvium (Recent)
- Qt — Terrace Alluvium, undivided (Middle to Late Pleistocene)
- Qs — Slocum Alluvium (Middle Pleistocene)
- Qv — Verdos Alluvium (Early to Middle Pleistocene)
- Qrf — Rocky Flats Alluvium (Early Pleistocene)
- Qc — Colluvium, undivided (Middle Pleistocene to Recent)
- Qls — Landslide Deposits (Middle Pleistocene to Recent)
- Ks — Arapahoe Formation (Late Cretaceous)
- Kl — Laramie Formation (Late Cretaceous)
- Kfh — Fox Hills Sandstone (Late Cretaceous)

Unconsolidated Surficial Deposits USCS Soil Types:
- Gravel (GW,GP,GM,GC)
- Sand (SW,SP,SM,SC)
- Silt (ML,OL,MH)
- Clay (CL,CH,OH)

Bedrock Lithofacies:
- Sandstone
- Siltstone
- Silty Claystone
- Claystone

- No Recovery
- Unconsolidated Surficial Deposits
- Weathered Arapahoe or Laramie Formation
- Unweathered Arapahoe or Laramie Formation
- Location of inferred fault

Unconsolidated Surficial Deposits Potentiometric Surface
- 2nd Quarter 1993
- 4th Quarter 1993

42192 — Black bar indicates screened interval; Well number is adjacent to screen for well clusters. Water levels for second (▽) and fourth (▽) quarters are labeled on alluvial wells. NM = No Measurement

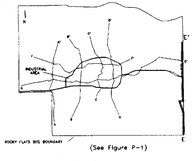
42192 — Black bar is well/boring

VERTICAL EXAGGERATION (10:1)

VERTICAL SCALE (feet): 0, 20
HORIZONTAL SCALE (feet): 0, 200

NO VERTICAL EXAGGERATION

VERTICAL SCALE (feet): 0, 200'
HORIZONTAL SCALE (feet): 0, 200'



(See Figure P-1)

SW-A-004196

EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

REGIONAL HYDROGEOLOGIC CROSS SECTION E-E'

Hydrogeologic Characterization Report

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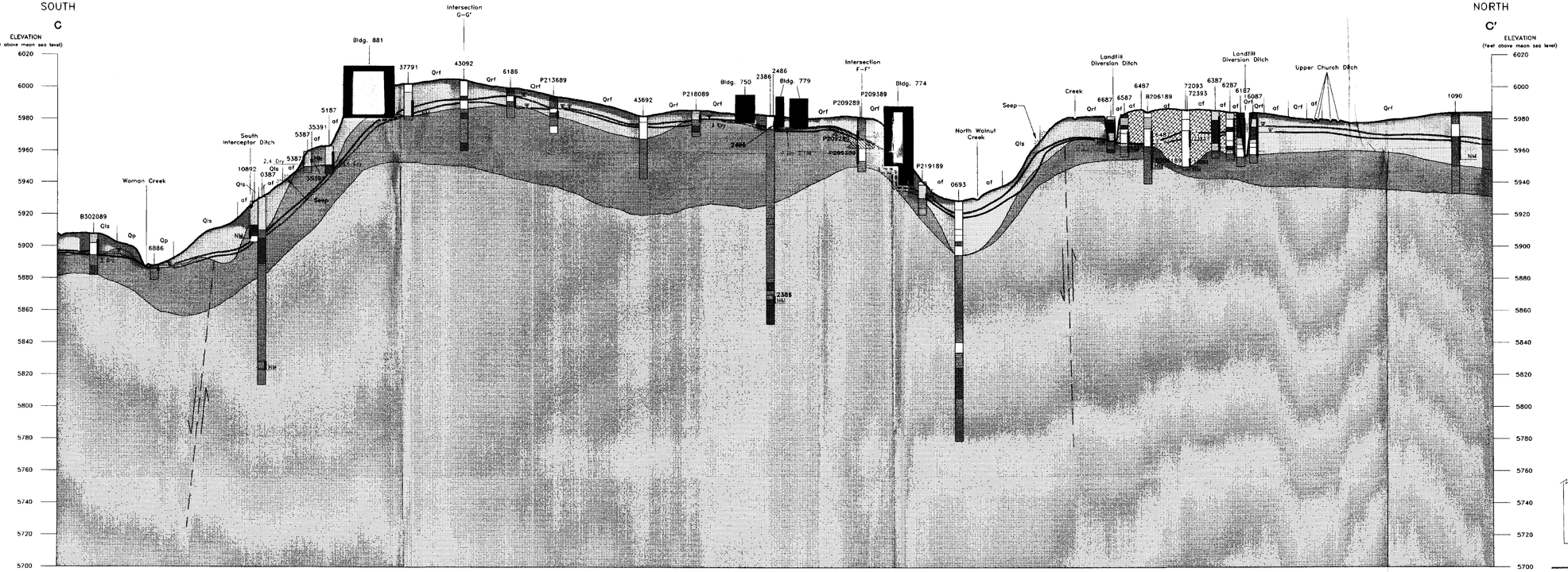
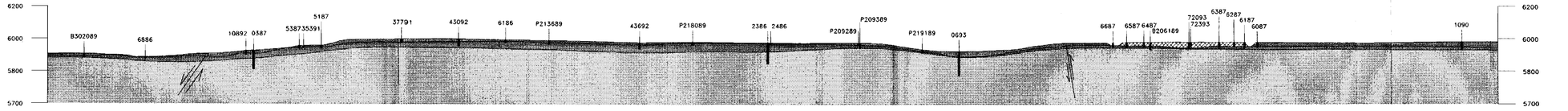
ROCK-FLT\HYD-RE-E\DV-4

CROSS SECTION C–C'





EXPLANATION

Bldg. 774 / Qrf — Designation of Surficial Deposits and Generalized Building Profile

- af — Artificial Fill (Latest Recent)
- Qp — Piney Creek and Post-Piney Creek Alluvium (Recent)
- Qt — Terrace Alluvium, undivided (Middle to Late Pleistocene)
- Qs — Slocum Alluvium (Middle Pleistocene)
- Qv — Verdos Alluvium (Early to Middle Pleistocene)
- Qrf — Rocky Flats Alluvium (Early Pleistocene)
- Qc — Colluvium, undivided (Middle Pleistocene to Recent)
- Qls — Landslide Deposits (Middle Pleistocene to Recent)
- Ka — Arapahoe Formation (Late Cretaceous)
- Kl — Laramie Formation (Late Cretaceous)
- Kfh — Fox Hills Sandstone (Late Cretaceous)

Unconsolidated Surficial Deposits USCS Soil Types:
- Gravel (GW,GP,GM,GC)
- Sand (SW,SP,SM,SC)
- Silt (ML,OL,MH)
- Clay (CL,CH,OH)

Bedrock Lithofacies:
- Sandstone
- Siltstone
- Silty Claystone
- Claystone

- No Recovery
- Unconsolidated Surficial Deposits
- Weathered Arapahoe or Laramie Formation
- Unweathered Arapahoe or Laramie Formation
- Arapahoe Formation Channel Deposit
- Landfill
- Seep
- Location of inferred fault

42192 — Black bar indicates screened interval; Well number is adjacent to screen for well clusters. Water levels for second (▽) and fourth (△) quarters are labeled on alluvial wells. NM = No Measurement

42192 — Black bar is well/boring

Unconsolidated Surficial Deposits Potentiometric Surface
- 2nd Quarter 1993
- 4th Quarter 1993

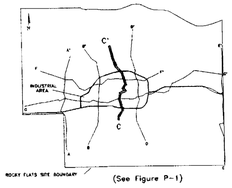
VERTICAL EXAGGERATION (10:1)

VERTICAL SCALE (feet): 20, 0 — HORIZONTAL SCALE (feet): 0, 200

NO VERTICAL EXAGGERATION

VERTICAL SCALE (feet): 200', 0 — HORIZONTAL SCALE (feet): 0, 200'

X 3.5



(See Figure P-1)

EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

REGIONAL HYDROGEOLOGIC CROSS SECTION C-C'

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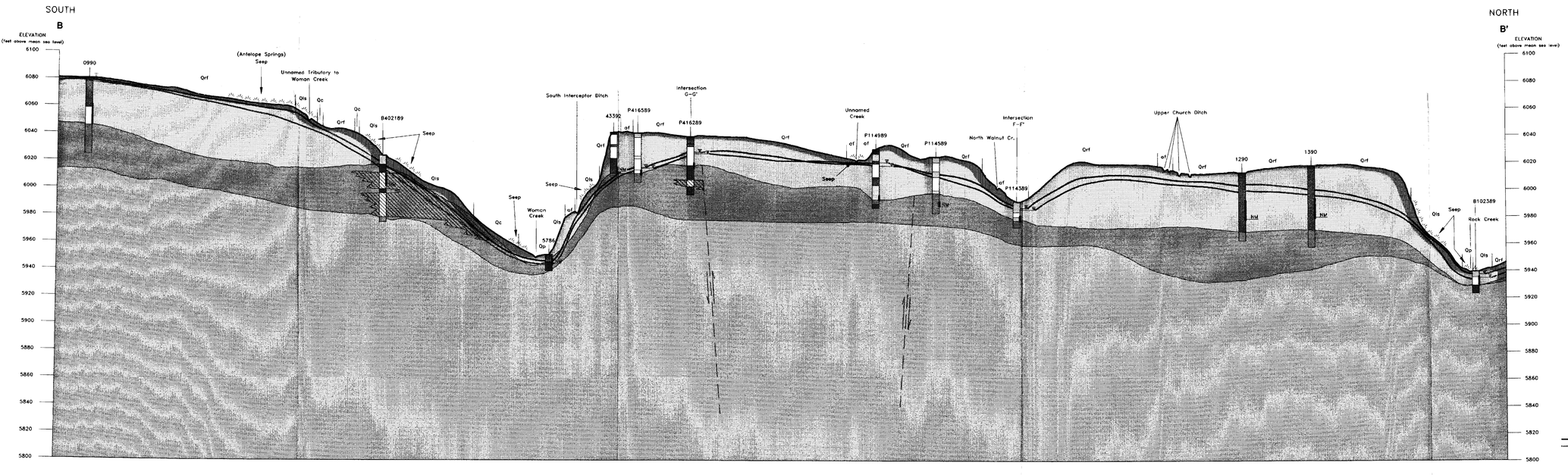
ROCK-FLT\HYD-RC-C\DV-5

SW-A-004196

CROSS SECTION B–B'



EXPLANATION

Qrf — Designation of Surficial Deposits and Generalized Building Profile

- af — Artificial Fill (Latest Recent)
- Qp — Piney Creek and Post-Piney Creek Alluvium (Recent)
- Qt — Terrace Alluvium, undivided (Middle to Late Pleistocene)
- Qs — Slocum Alluvium (Middle Pleistocene)
- Qv — Verdos Alluvium (Early to Middle Pleistocene)
- Qrf — Rocky Flats Alluvium (Early Pleistocene)
- Qc — Colluvium, undivided (Middle Pleistocene to Recent)
- Qls — Landslide Deposits (Middle Pleistocene to Recent)
- Ka — Arapahoe Formation (Late Cretaceous)
- Kl — Laramie Formation (Late Cretaceous)
- Kfh — Fox Hills Sandstone (Late Cretaceous)

Unconsolidated Surficial Deposits USCS Soil Types:
- Gravel (GW,GP,GM,GC)
- Sand (SW,SP,SM,SC)
- Silt (ML,OL,MH)
- Clay (CL,CH,OH)

Bedrock Lithofacies:
- Sandstone
- Siltstone
- Silty Claystone
- Claystone

- No Recovery
- Unconsolidated Surficial Deposits
- Weathered Arapahoe or Laramie Formation
- Unweathered Arapahoe or Laramie Formation
- Arapahoe Formation Channel Deposit
- Seep
- Location of inferred fault

42192 — Black bar indicates screened interval; Well number is adjacent to screen for well clusters. Water levels for second (▽) and fourth (△) quarters are labeled on alluvial wells. hyd = No Measurement

42192 — Black bar is well/boring

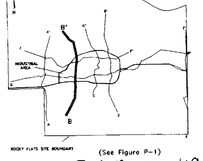
Unconsolidated Surficial Deposits Potentiometric Surface
- 2nd Quarter 1993
- 4th Quarter 1993

VERTICAL EXAGGERATION (10:1)

VERTICAL SCALE (feet): 20, 0
HORIZONTAL SCALE (feet): 0, 200

NO VERTICAL EXAGGERATION

VERTICAL SCALE (feet): 200', 0
HORIZONTAL SCALE (feet): 0, 200'



(See Figure P–1)

SW-A-004196

EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

REGIONAL HYDROGEOLOGIC CROSS SECTION B-B'

Hydrogeologic Characterization Report

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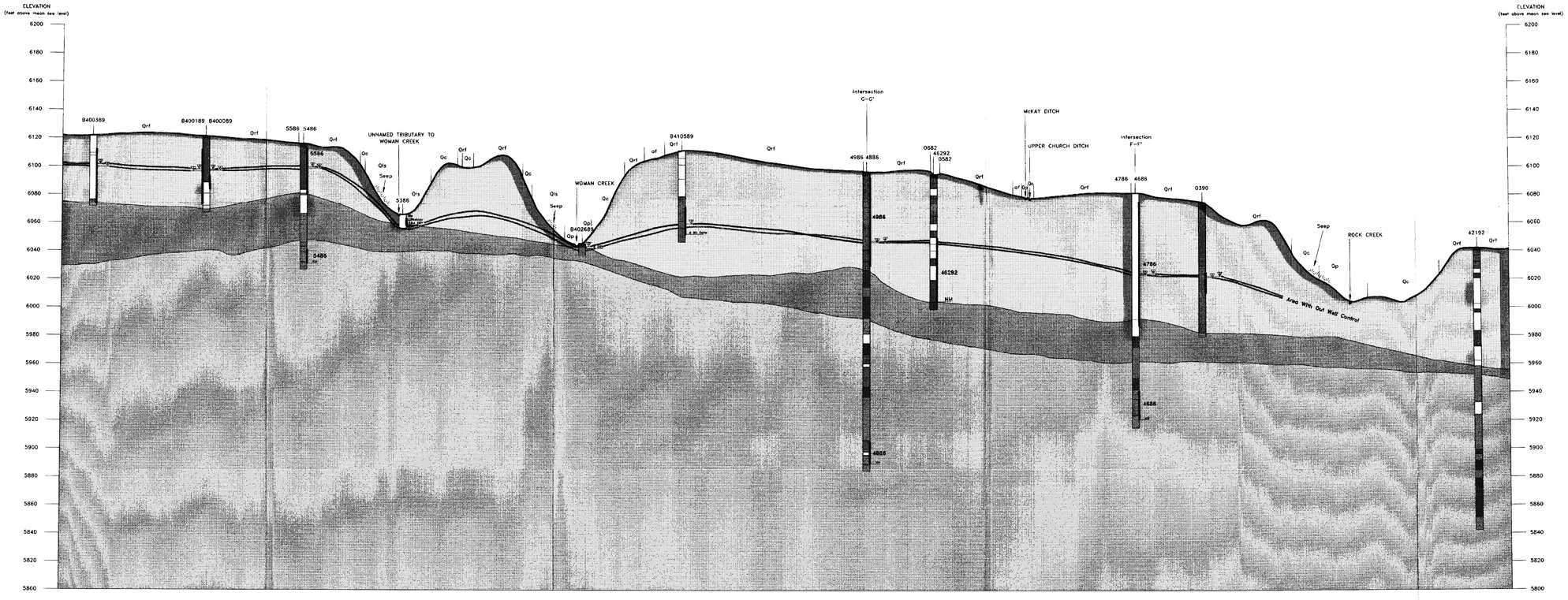
ROCK-FLT\HYD-RB-B\JV-5

CROSS SECTION A–A'



EXPLANATION

Qrf — Designation of Surficial Deposits

- af — Artificial Fill (Latest Recent)
- Qp — Piney Creek and Post-Piney Creek Alluvium (Recent)
- Qt — Terrace Alluvium, undivided (Middle to Late Pleistocene)
- Qs — Slocum Alluvium (Middle Pleistocene)
- Qv — Verdos Alluvium (Early to Middle Pleistocene)
- Qrf — Rocky Flats Alluvium (Early Pleistocene)
- Qc — Colluvium, undivided (Middle Pleistocene to Recent)
- Qls — Landslide Deposits (Middle Pleistocene to Recent)
- Ka — Arapahoe Formation (Late Cretaceous)
- Kl — Laramie Formation (Late Cretaceous)
- Kfh — Fox Hills Sandstone (Late Cretaceous)

Unconsolidated Surficial Deposits USCS Soil Types:
- Gravel (GW,GP,GM,GC)
- Sand (SW,SP,SM,SC)
- Silt (ML,OL,MH)
- Clay (CL,CH,OH)

Bedrock Lithofacies:
- Sandstone
- Siltstone
- Silty Claystone
- Claystone

- No Recovery
- Unconsolidated Surficial Deposits
- Weathered Arapahoe or Laramie Formation
- Unweathered Arapahoe or Laramie Formation
- Seep

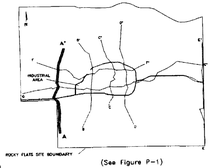
42192 — Black bar indicates screened interval; Well number is adjacent to screen for well clusters. Water levels for second (▽) and fourth (▽) quarters are labeled on original wells. NM = No Measurement

42192 — Black bar is well/boring

Unconsolidated Surficial Deposits Potentiometric Surface
- 2nd Quarter 1993
- 4th Quarter 1993

VERTICAL EXAGGERATION (10:1)

VERTICAL SCALE (feet): 20; 0
HORIZONTAL SCALE (feet): 0; 200



(See Figure P-1)

NO VERTICAL EXAGGERATION

VERTICAL SCALE (feet): 200'; 0
HORIZONTAL SCALE (feet): 0; 200'

SW-A-004196

X34

EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

REGIONAL HYDROGEOLOGIC CROSS SECTION A-A'

Hydrogeologic Characterization Report

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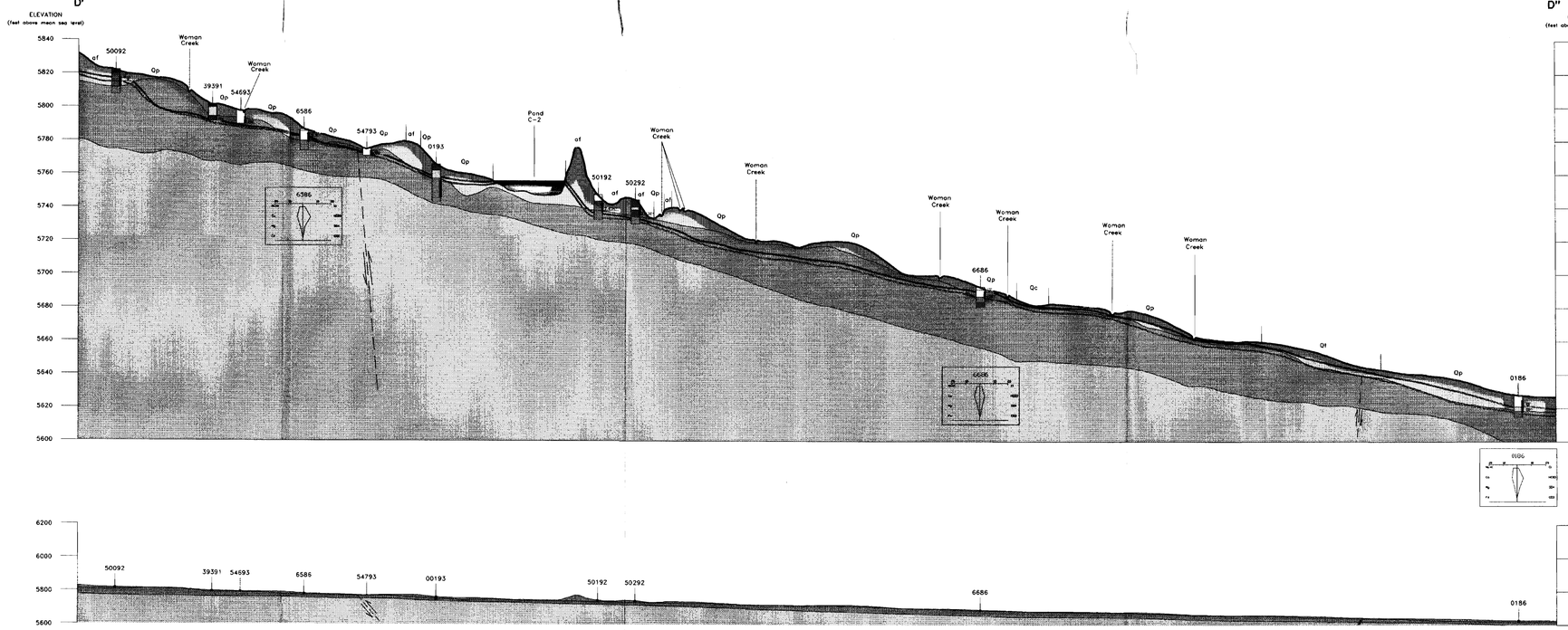
ROCK-FL7\HYD-RA-A\DV-6

CROSS SECTION D'–D''



VERTICAL EXAGGERATION (10:1)

VERTICAL SCALE (feet) 20 0

HORIZONTAL SCALE (feet) 200

NO VERTICAL EXAGGERATION

VERTICAL SCALE (feet) 200' 0

HORIZONTAL SCALE (feet) 200'

EXPLANATION

Grt — Designation of Surficial Deposits

- af — Artificial Fill (Latest Recent)
- Qp — Piney Creek and Post-Piney Creek Alluvium (Recent)
- Qt — Terrace Alluvium, undivided (Middle to Late Pleistocene)
- Qs — Slocum Alluvium (Middle Pleistocene)
- Qv — Verdos Alluvium (Early to Middle Pleistocene)
- Qrf — Rocky Flats Alluvium (Early Pleistocene)
- Qc — Colluvium, undivided (Middle Pleistocene to Recent)
- Qls — Landslide Deposits (Middle Pleistocene to Recent)
- Ka — Arapahoe Formation (Late Cretaceous)
- Kl — Laramie Formation (Late Cretaceous)
- Kfh — Fox Hills Sandstone (Late Cretaceous)

Unconsolidated Surficial Deposits USCS Soil Types:
- Gravel (GW,GP,GM,GC)
- Sand (SW,SP,SM,SC)
- Silt (ML,OL,MH)
- Clay (CL,CH,OH)

Bedrock Lithofacies:
- Sandstone
- Siltstone
- Silty Claystone
- Claystone

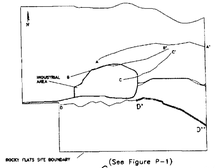
- No Recovery
- Unconsolidated Surficial Deposits
- Weathered Arapahoe or Laramie Formation
- Unweathered Arapahoe or Laramie Formation

Location of inferred high angle reverse fault

42192 — Black bar indicates screened interval; Well number is adjacent to screen for well clusters. Water levels for second (▽) and fourth (▽) quarters are labeled on alluvial wells. NM = No Measurement

42192 — Black bar is well/boring

Unconsolidated Surficial Deposits Potentiometric Surface
- 2nd Quarter 1993
- 4th Quarter 1993



(See Figure P-1)

SW-A-004196

EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

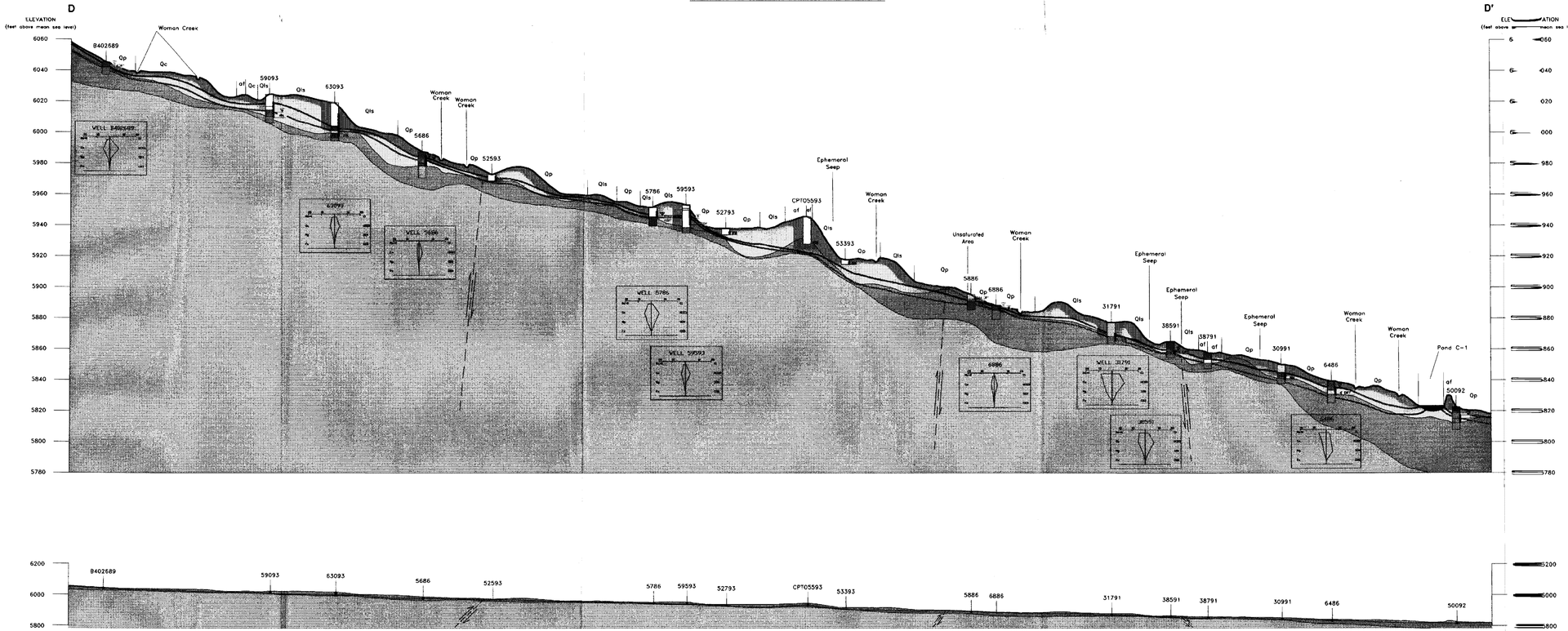
STREAM PROFILE
HYDROGEOLOGIC CROSS SECTION D'-D''

Hydrogeologic Characterization Report

Date April 1995 | Plate 20b

ROCK-FLT\HYD-D-D-Z\DV-7

CROSS SECTION D–D'



EXPLANATION

Qrf — Designation of Surficial Deposits

- af — Artificial Fill (Latest Recent)
- Qp — Piney Creek and Post-Piney Creek Alluvium (Recent)
- Qt — Terrace Alluvium, undivided (Middle to Late Pleistocene)
- Qs — Slocum Alluvium (Middle Pleistocene)
- Qv — Verdos Alluvium (Early to Middle Pleistocene)
- Qrf — Rocky Flats Alluvium (Early Pleistocene)
- Qc — Colluvium, undivided (Middle Pleistocene to Recent)
- Qls — Landslide Deposits (Middle Pleistocene to Recent)
- Ka — Arapahoe Formation (Late Cretaceous)
- Kl — Laramie Formation (Late Cretaceous)
- Kfh — Fox Hills Sandstone (Late Cretaceous)

Unconsolidated Surficial Deposits USCS Soil Types:
- Gravel (GW,GP,GM,GC)
- Sand (SW,SP,SM,SC)
- Silt (ML,OL,MH)
- Clay (CL,CH,OH)

Bedrock Lithofacies:
- Sandstone
- Siltstone
- Silty Claystone
- Claystone

- No Recovery
- Unconsolidated Surficial Deposits
- Weathered Arapahoe or Laramie Formation
- Unweathered Arapahoe or Laramie Formation

Location of inferred high angle reverse fault

Unconsolidated Surficial Deposits Potentiometric Surface
- 2nd Quarter 1993
- 4th Quarter 1993

42192 — Black bar indicates screened interval; Well number is adjacent to screen for well clusters. Water levels for second (=) and fourth (≠) quarters are labeled on alluvial wells. *NM = No Measurement

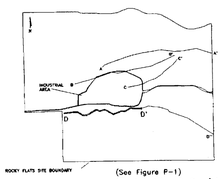
42192 — Black bar is well/boring

VERTICAL EXAGGERATION (10:1)

VERTICAL SCALE (feet) 20 — 0
HORIZONTAL SCALE (feet) 0 — 200

NO VERTICAL EXAGGERATION

VERTICAL SCALE (feet) 200' — 0
HORIZONTAL SCALE (feet) 0 — 200'



(See Figure P-1)

SW-A-004196

EG&G ROCKY FLATS
Rocky Flats Site, Golden, Colorado

STREAM PROFILE
HYDROGEOLOGIC CROSS SECTION
D-D'

Hydrogeologic Characterization Report

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ROCK-FLT\HYD-D-D-1\DV-7