Excerpts from *Geologic Characterization Report* (EG&G, 1995)

Soil Formation

"Soil that has formed as a result of weathering processes and plant growth within the upper part of the Rocky Flats Alluvium is one of the most strongly developed soils in the Colorado Piedmont. At the Rocky Flats site, soils within the major drainages are well-drained, clayey gravel soils that have formed in material derived from Cretaceous claystones. Elsewhere across the site, the soils have formed on mixed alluvial deposits and are well-drained, cobbly, and gravelly."

USCS Soil Maps

"At the surface, the soil type is related to the presence of absence of the Rocky Flats Alluvium. Where the Rocky Flats Alluvium is present, the surface-soil type is gravel; where the Rocky Flats Alluvium is absent, the surface-soil type is predominantly clay. Clay deposits shown on [the Surficial Geologic Map] are correlative to landslide, colluvium, and terrace units shown on [the Surface-Soil Type Map]. Sand and gravelly sand deposits are common along major drainages throughout the site and often correspond to the deposits of the Piney Creek and Verdos Alluvium. The largest contiguous area of sand deposits occurs in the Industrial Area."

"Geologic core logs were used to determine the USCS soil types for each map. For the USCS surface-soil map, the shallowest soil type recorded for each drill-core location was selected from lithologic logs. The geologic map prepared by the USGS subdivides surficial deposits into three main types: artificial fill, alluvium, and colluvium."

1. Artificial fill

"Artificial fill was defined during mapping activities as compacted and uncompacted fill material composed of varying amounts of sand and finer material heterogeneous cobbles and boulders and refuse. The deposits of artificial fill are commonly less than 10 feet thick, although some of the earth dams and landfills are greater than 30 feet thick."

2. Alluvial Deposits

"Alluvial deposits of various ages are present at the Rocky Flats site. These deposits comprise the Slocum Alluvium, Verdos Alluvium, and Rocky Flats Alluvium and are composed of clay, silt, sand, and heterogeneous pebbles, cobbles, and boulders. Alluvial deposits are mainly present on pediments, but are also present along flood plains, stream channels, and terraces along Rock Creek, Walnut Creek, Woman Creek and their tributaries. ... The Rocky Flats Alluvium is the most laterally extensive alluvial deposit in the Rocky Flats area."

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3. Colluvial Deposits

"The colluvial deposits present at the Rocky Flats site include colluvium as well as landslide and slump deposits. Colluvial deposits are composed of clay, silt, sand, and gravel and occur along valley slopes. The development of colluvial material along modern drainage slopes results from small-scale grravity slumping and mass wasting of the surficial deposits. Colluvial material generally coarsens in a down-slope direction; grain-size variations are the result of sorting associated with slope failure set in motion by frequent stream incisement."

Table 4-1
Unified Soil Classification System

Major Divisions			Letter	Description
Coarse-Grained Soils	Gravel and Gravelly Soils	Clean Gravels (<5% fines)	GW	Well-graded gravels or gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		Gravels with Fines (>12% fines)	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sand and Sandy Soils	Clean Sand (<5% fines)	SW	Well-graded sands or gravelly sands, little or no fines
			SP	Poorly graded sands or gravelly sands, little or no fines
		Sands with Fines (>12% fines)	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
Fine-Grained Soils	Silts and Clays	Low Plasticity	ML	Inorganic silts and very fine sands, rock flour, silty or clayey sands, or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
		High Plasticity	MH	Inorganic silts, micaceous or diatomaceous fine sand or silty soils
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
Highly Organic Soils			PT	Peat, humus, swamp soils with high organic contents

Modified from Harlan *et al.*, 1989.

Table 4-4
Description of Lithofacies

Sandy Lithofacies:	
Composition:	>~45% sand, <~30% gravel, and <~30% fines (silt and clay)
USCS Classifications:	SW, SP, SM, SC, and GC divisions.
Name:	sand, gravelly sand, clayey sand, silty sand.
Description, Depositional Mechanism & Environment:	Very well to poorly sorted sands that commonly contain reworked bedrock. Suspended load (water-lain) deposits formed by grain-flow, scour-fill, and sand-wave mechanisms. Dune deposits are also present. Deposited in a fluvial environment in channel scours during periods of intermittent or normal stream flow.
Geometry:	Forms sandy lenses and planar sand bodies of limited lateral extent. Commonly cut by sandy gravel lithofacies; cuts and is laterally associated with clayey gravel lithofacies.
Average Composition: (for all sediments classified)	22% gravel, 57% sand, 15% silt, 6% clay.
Comments:	May contain some gravel-poor sediments with more than 30% but less than 45% fines.
Sandy Gravel Lithofacies:	
Composition:	>~45% gravel, <~25% fines (silt and clay), 0–49% sand.
USCS Classification:	GW, GP, GC, and GM divisions.
Name:	gravel, sandy gravel, clayey gravel, silty gravel.
Description, Depositional Mechanism & Environment:	Poorly sorted, clast-supported gravels with no matrix; commonly referred to as sieve deposits. Storm channel, stream-flood, and slurry-type deposits formed by debris flow and sheet-flood mechanisms. Deposited in fluvial environments during periods of increased runoff and sedimentation.
Geometry:	Forms laterally extensive sandy and gravelly deposits within channels. Is in contact with all lithofacies; clean gravel deposits generally rest on or cut sandy lithofacies.
Average Composition: (for all sediments classified)	64% gravel, 23% sand, 8% silt, 5% clay.
Comments:	May contain sand beds less than 1 foot thick.

Table 4-4
Description of Lithofacies (continued)

Clay and Silt Gravel Lithofacies:	
Composition:	>~20% and <~50% gravel, >~25% fines (silt and clay), 0–45% sand.
USCS Classification:	GC, GM, SM, and SC divisions.
Name:	clayey gravel, silty gravel, clayey sand, silty sand.
Description, Depositional Mechanism & Environment:	Matrix-supported gravels and sands with appreciable amount of finer material. Poorly sorted; lacks internal structure or framework. Deposited rapidly in fluvial environments by debris flow and bedload transport mechanisms.
Geometry:	Forms channel fill and plug deposits within channels and linguoid/transverse bar deposits adjacent to channels. Commonly adjacent to the sandy lithofacies; often incised into the sandy or clay and silt lithofacies.
Average Composition: (for all sediments classified)	38% gravel, 25% sand, 20% silt, 17% clay.
Clay and Silt Lithofacies:	
Composition:	>~45% fines (silt and clay), <~45% sand, <~20% gravel.
USCS Classification:	ML, CL, MH, and CH divisions.
Name:	clay, silty clay, sandy clay, gravelly clay, silt, gravelly silt, sandy silt, clayey silt.
Description, Depositional Mechanism & Environment:	Very well to poorly sorted clays and silts. Commonly bedded or laminated. Deposited by suspended load mechanisms in overbank, levee, crevasse-spray, waning-flood, and flood-plain environments.
Geometry:	Forms planar or "drape" deposits along the margins of channels. Commonly lateral to the sandy gravel lithofacies; often deposited on topographic highs. Does not cut any other lithofacies.
Average Composition: (for all sediments classified)	7% gravel, 22% sand, 39% silt, 32% clay.