



# **Shapefile of the Elevation of the Bedrock Surface Beneath the Rocky Flats Alluvial Fan, Boulder and Jefferson Counties, Colorado**

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## **ABSTRACT**

The Rocky Flats alluvial fan is a large early Pleistocene gravel deposit at the mouth of Coal Creek Canyon along the eastern flank of the Colorado Front Range in Jefferson and Boulder Counties, Colorado. Elevations of the bedrock surface beneath the alluvial fan gravels have been compiled at selected points from a variety of sources and recorded in a digital dataset suitable for importing into commonly used GIS and image processing software packages.

## **INTRODUCTION**

The Rocky Flats alluvial fan is the remnant of a large alluvial fan deposit (Rocky Flats Alluvium) that formed in early Pleistocene time at the mouth of the unglaciated Coal Creek drainage basin along the eastern flank of the Colorado Front Range (Scott, 1960; Wells, 1967; Madole, 1991). The fan was deposited across the beveled edges of steeply dipping Mesozoic strata along the east flank of the Front Range on a bedrock surface described as a pediment (Scott, 1960). A pediment is generally understood to be a gently sloping, concave upward bedrock surface of low relief developed at the base of an abrupt mountain front (Gary and others, 1972). The basal bedrock surface upon which the Rocky Flats alluvial fan was deposited, the pediment, has long been recognized to contain irregularities (Malde, 1955; Ackermann, 1974; Shroba and Carrara, 1994; 1996).

Data from drill holes that penetrate the bedrock beneath the Rocky Flats alluvial fan, geophysical measurements that identify the alluvium/bedrock interface, and the mapped lithologic contact between the alluvium and the underlying bedrock are available from various sources. The purpose of this report is to bring together these data in a digital dataset of the elevation of the bedrock surface beneath the Rocky Flats alluvium. Because of the difficulty in precisely geographically locating some of data points from the source data, the primary use of the dataset should be for investigating the broad geometry of the bedrock surface, rather than detailed site studies.

## **DATASET**

Because of the widespread use of ArcInfo, ArcView, and ArcGIS, the digital dataset was compiled as a point Shapefile. In addition to the elevation of the bedrock surface at each point, attributes were added to each point that give the thickness of the Rocky Flats alluvium (either measured or calculated), the primary source of information for the point, and any identification number the source information associated with the point.

## **ATTRIBUTES**

The important attributes of the Shapefile are *Elevation*, *Source*, *Source\_ID*, and *Thickness*.

### **Elevation**

Elevation of the bedrock surface beneath the Rocky Flats alluvial fan is the primary data in this dataset. The elevations were either taken directly from the data source or calculated from thickness information provided by the data source (see below). For those calculated bedrock

surface elevations, the thickness of the Rocky Flats alluvium at the point was subtracted from the surface elevation of the point as measured from the 10m digital elevation model (DEM) for the area (U.S. Geological Survey, 1999).

### **Source**

The source attribute identifies the primary publication, map, or existing digital dataset for the alluvium thickness or bedrock surface elevation at the point.

### **Source\_ID**

Some of the sources have identification numbers associated with the drill holes. These ID's are included so that users can refer to the original data if desired.

### **Thickness**

Values for the thickness attribute represent measured thickness posted on source maps and data and thickness calculated by the difference between the surface elevation and posted bedrock elevations at the data point. For several points, values of the thickness attribute were interpreted from seismic plots showing the bedrock/alluvium interface. The value of thickness at points along the exposed alluvium/bedrock contact is 0 because of erosion of the once more extensive fan deposit and does not represent the original thickness of the deposit at those points.

## **DATA SOURCES**

All of the data points in this dataset have been derived from existing data; no new measurements were conducted as part of this study. Much of this information has been compiled from the results of geologic investigations of the U.S. Department of Energy Rocky Flats Plant (now the Rocky Flats Environmental Technology Site) by independent contractors (Dames and Moore, 1981a; 1981b; EG&G Rocky Flats, Inc., 1991). An abundance of drill holes and trenches were created by these studies to help characterize the Rocky Flats alluvium in the general vicinity of the Plant.

A description of each of the data sources, and how they were used to prepare this dataset, is given below.

### **EG&G (1991) Text Ref. Map No. 6**

EG&G Text Ref. Map No. 6 is an alluvium isopach map that includes postings of the thickness of the alluvium and the drill hole identifier at each point. The map was prepared as part of a broad investigation of the stratigraphy and geologic structure of the region around the Rocky Flats Plant (EG&G, 1991). The thickness posted on the map at each point was subtracted from the elevation of the digital elevation model at that point to derive the corresponding bedrock surface elevation.

### **Anonymous (1993) Sitewide Bedrock Elevation Map**

The Sitewide Bedrock Elevation Map contains posting of the elevation of the bedrock surface beneath the Rocky Flats alluvial fan at numerous points in the vicinity of the Rocky Flats Environmental Technology Site. This map is one of several maps acquired from EG&G Rocky Flats, Inc. by R.R. Shroba (R.R. Shroba, U.S. Geological Survey, oral commun., 2003) in

support of detailed geological mapping by the U.S. Geological Survey at Rocky Flats (Shroba and Carrara, 1994; 1996). The map has no author or institutional identifiers, but similarities in scale, format, and drill hole identifiers suggest that the map was probably prepared by EG&G. The map contains the points shown on the EG&G (1991) Text Ref. Map No. 6, along with numerous additional points (drill holes), all of which show a bedrock elevation, but no thickness measurement. For common points on the two maps, the posted bedrock elevations (Site Bedrock Elevation Map) were compared to elevations calculated by subtracting the thickness (EG&G, 1991, Text Ref. Map No. 6) from the DEM (U.S. Geological Survey, 1999) elevation. Differences of 1-2 feet were common, probably due to rounding when the DEM was converted from meters to integer feet. This small difference suggests that the additional bedrock elevations on the map are probably a good representation of the bedrock surface as well, even though they can't be checked.

### **Ackermann, 1974**

Subsurface profiles interpreted from seismic and resistivity soundings by Ackermann (1974, Figs. 7 and 8) show the interface between the Rocky Flats Alluvium and the underlying bedrock in the vicinity immediately north and west of Rocky Flats Lake. Alluvium thickness was measured on the profiles at 12 points corresponding to the shot points for the seismic study. The locations of these points were visually transferred from the index map (Ackermann, 1974, Fig. 1) to the digital database file overlying the Digital Raster Graph of the USGS 1:24,000 topographic quadrangle for location reference. The points were digitized into the Shapefile, the elevation of the surface at each point was measured from the DEM, and the thickness of the alluvium was subtracted from the surface elevation to derive the bedrock surface elevation.

### **U.S. Geological Survey Open-File Report 00-9**

In 1974, the Colorado Geological Survey published an atlas of sand, gravel and quarry aggregate for the 9 counties in the Colorado Front Range urban corridor (Schwochow and others, 1974a). In cooperation with the Colorado Geological Survey, the U.S. Geological Survey digitized the original 1:24,000 scale resource maps in Arc/INFO and released the data in USGS Open-File Report 00-9 (Schwochow and others, 1974b). The digital maps show the lithologic contacts of various sand and gravel deposits, including the Rocky Flats Alluvium, and this digital mapping was used to define the alluvium/bedrock contact of the Rocky Flats alluvial fan in this dataset. Points were digitized along the contact at approximately 100 m intervals and the elevations of the points were measured on the DEM and recorded in the dataset. The alluvium thickness at these points is 0 because of erosion and does not reflect the original deposit thickness at the point.

### **U.S. Geological Survey, 1999, National Elevation Dataset (DEM)**

A portion of the National Elevation Dataset (NED) 1/3 arc second (10 m resolution) data covering the Rocky Flats alluvial fan and vicinity was downloaded from U.S. Geological Survey EROS Data Center website at: <http://seamless.usgs.gov/> for use as a base for calculations of the elevation of the bedrock surface based on thickness data. The downloaded DEM was reprojected to UTM Zone 13N using the NAD1983 datum and the elevations were converted to feet by multiplying by a factor of 3.280833 ft/m and rounding to the nearest integer foot.

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