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Geodatabase of Environmental Information for Air Force Plant 4 and Naval Air Station-Joint Reserve Base Carswell Field, Fort Worth, Texas, 1990-2004

By Sachin D. Shah and Sean M. Quigley

Introduction

Air Force Plant 4 (AFP4) and adjacent Naval Air Station-Joint Reserve Base (NAS-JRB) at Fort Worth, Tex., constitute a government-owned, contractor-operated (GOCO) facility that has been in operation since 1942. Contaminants from the facility, primarily volatile organic compounds (VOCs) and metals, have entered the ground-water-flow system through leakage from waste-disposal sites (landfills and pits) and from manufacturing processes (U.S. Air Force, Aeronautical Systems Center, 1995).

The U.S. Geological Survey (USGS), in cooperation with the U.S. Air Force (USAF), Aeronautical Systems Center, Environmental Management Directorate (ASC/ENVR), developed a comprehensive database (or geodatabase) of temporal and spatial environmental information associated with the geology, hydrology, and water quality at AFP4 and NAS-JRB. The database of this report provides information about the AFP4 and NAS-JRB study area including sample location names, identification numbers, locations, historical dates, and various measured hydrologic data. This database does not include every sample location at the site, but is limited to an aggregation of selected digital and hard-copy data of the USAF, USGS, and various consultants who have previously or are currently working at the site.

Purpose and Scope

The USGS developed this geodatabase to provide interested parties and the general public a verified source of data regarding geologic, hydrologic, water-quality, and well-construction data collected during 1990-2004. Collection of data was limited to digital data from the USGS, ASC/ENVR, Air Force Center for Environmental Excellence (AFCEE), and various consultants, and to hard-copy data of the USGS. These data were aggregated into a singular geodatabase.

Description of the Study Area

The AFP4 and NAS-JRB study area is in northwest Fort Worth, Tex. (fig. 1). The study area is drained primarily by the West Fork Trinity River. AFP4 and NAS-JRB together encompass about 3,600 acres on the southeastern shore of Lake Worth. Land-surface altitudes range from about 680 feet (ft) above NAVD88 along the southern boundary of AFP4 to about 550 ft above NAVD88.

NAS-JRB was opened as Tarrant Field Airdrome and was used to train pilots under the jurisdiction of the Gulf Coast Army Air Field Training Command (HydroGeologic, Inc., 2002). In 1948, the base was renamed Carswell Air Force Base, and the 7th Bomber Wing became the host unit. In 1994, the U.S. Navy assumed responsibility for much of the facility, and its name changed from Carswell Air Force Base to NAS-JRB.

The main feature of AFP4 is a 1-mile-long aircraft assembly building built on a topographic high that overlies a north-south trending bedrock high. The facility has been used to manufacture military aircraft, radar units, missile components, and spare parts. The fabrication and assembly of these aircraft and aircraft parts required various kinds of solvents, paints, metals, oils, fuels, and other toxic chemicals (Kuniansky and others, 1996).

Geodatabase

Geodatabases are spatial extensions of tabular data that allow users to correlate numerical data with physical and spatial components. With geodatabases, geographic data can be manipulated to represent the real world using a geographic information system (GIS) to produce maps, interactive queries, and various types of spatial analyses.

Environmental data collected at AFP4 and NAS-JRB created the need for consolidation of the data into a comprehensive temporal and spatial database. The numerous data sources and wide variety of data structures that needed to be consolidated into the geodatabase were addressed by using a comprehensive design scheme that supported a range of hydrologic, geologic and water-quality data.

The geodatabase design uses a GIS-based thematic layer approach for the creation of the layers of AFP4 and NAS-JRB. Using thematic layers, the geodatabase separates features into relational tables on the basis of how they interact and correspond to one another. Environmental data were primarily obtained from the Environmental Restoration Program Information Management System (ERPIMS) database administered by ASC/ENVR and AFCEE staff. These data were provided in digital tabular format and imported into the geodatabase. Construction and lithologic logs were obtained from hard-copy consultant reports, entered manually, and used to supplement discrepancies and gaps in ERPIMS-derived data. Digital map layers acquired from ASC/ENVR and contractors were imported into the geodatabase and used to construct the topological relation between attribute data and spatial features.

Duplicate sampling locations and sites in the ERPIMS-derived data were identified and reduced to unique records using several data quality assurance techniques. Database queries were performed as an initial pass using every field of each record for the tabular data. A GIS was used to analyze the spatial proximity and location of sampling locations to further verify duplication errors. Additionally, a high-resolution digital elevation model (DEM) was used in conjunction with a GIS to identify erroneous well measuring point and land-surface elevation records and/or data values. Upon analysis of water-quality sample results, unit conversion errors were identified based on previous and subsequent sample results, and the respective data values corrected.

After removal of duplicate records and data value corrections, 4,098 site locations were used to populate the final database. All locations were given a site reference identification code to ensure unique record integrity, while location identification numbers inherited from the ERPIMS database were maintained to allow cross referencing. With the exception of the modifications previously discussed, data accuracy is dependent on the original data source. This database should not be used to make final management decisions on the status of restoration activities at AFP4 and NAS-JRB. Monitoring and remediation efforts are continually developing at this and other GOCO facilities, and data continue to be collected and analyzed as part of the restoration program objectives. This database will consequently be subject to revision and updates.

Summary

Air Force Plant 4 (AFP4) and adjacent Naval Air Station-Joint Reserve Base (NAS-JRB) at Fort Worth, Tex., have been in operation since 1942. Contaminants from AFP4, primarily VOCs and metals, have entered the ground-water-flow system through leakage from waste-disposal sites.

The U.S. Geological Survey, in cooperation with the U.S. Air Force Aeronautical Systems Center, Environmental Management Directorate, have developed a comprehensive geodatabase of temporal and spatial environmental data collected at AFP4 and NAS-JRB. The numerous data sources and wide variety of data structures that needed to be consolidated into the geodatabase were addressed by using a comprehensive design scheme that supported a range of hydrologic, geologic, and water-quality data.

The geodatabase design uses a thematic layer approach for the creation of the layers of AFP4 and NAS-JRB using a GIS. Using thematic layers, the geodatabase separates various features into relational tables on the basis of how they interact and correspond to one another. These relational tables represent a collection of features and the relations between them. Using the geodatabase, geographic data at the site are manipulated to produce maps, implement interactive queries, and perform spatial analyses.

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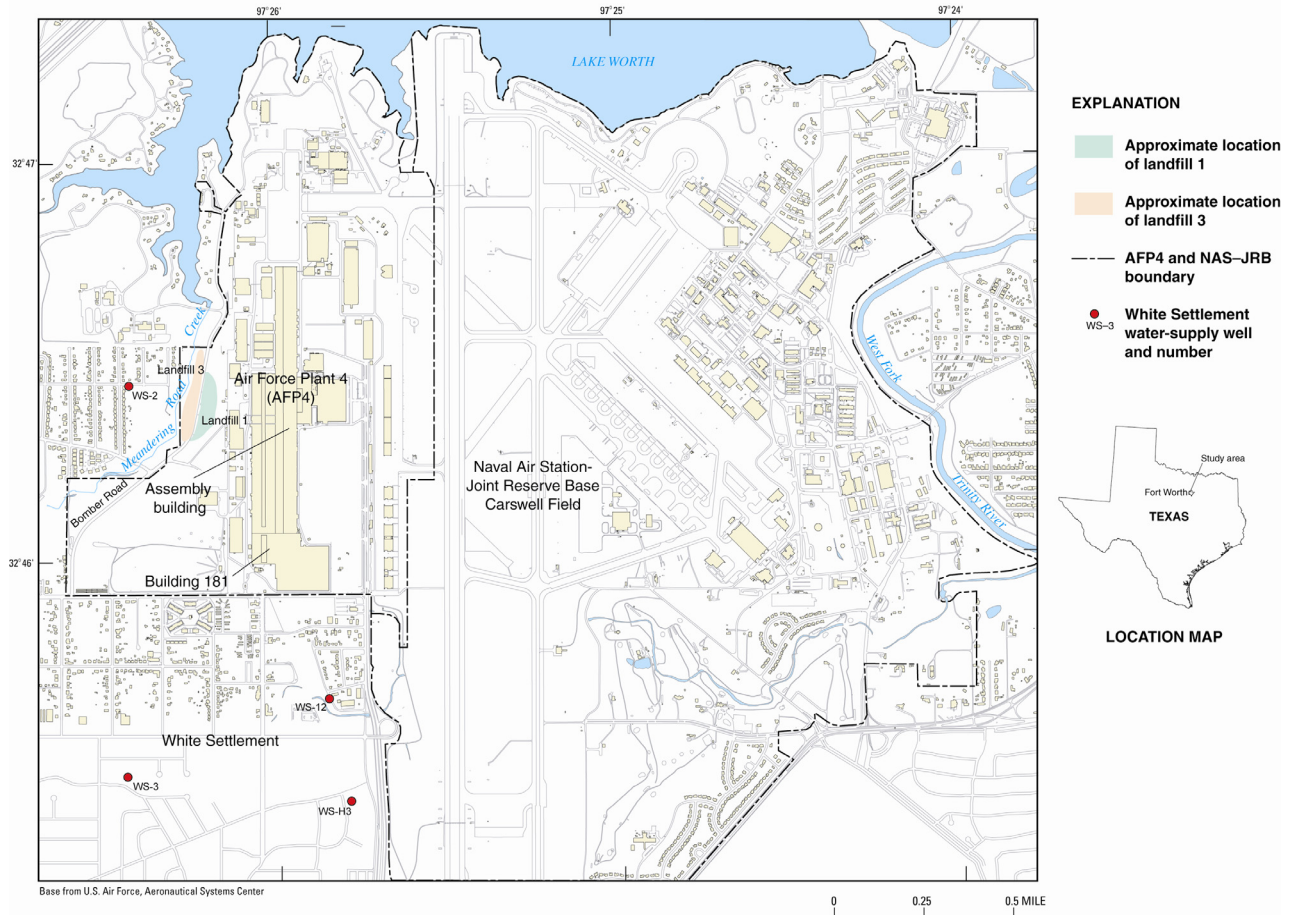


Figure 1. Location of Air Force Plant 4 (AFP4) and Naval Air Station-Joint Reserve Base Carswell Field (NAS-JRB) study area, Fort Worth, Texas.