

# Vulture Mill

## Water Quality Assurance Revolving Fund ([WQARF](#)) Site

### Boundaries:

The Vulture Mill WQARF Site (Site) is located just east of North Tegner (Highways 89 and 93) about one mile northwest of the center of the [Town of Wickenburg](#). The eastern boundary of the Site is approximately one-quarter mile west of the Hassayampa River Channel. The Site is on private land owned by four separate parties. The [tailings](#) and affected soil are found in an area about 35 acres on up to five separate properties.



Old Closed Ore Mine

The Site's geographic boundaries depicted on the [Site map](#) represent the Arizona Department of Environmental Quality's (ADEQ) interpretation of data available at the time the map was constructed. The map is intended to provide the public with basic information as to the estimated extent of known contamination as of the date of map production. The actual extent of contamination may be different. Therefore, the boundaries for the Site may change in the future as new information becomes available.

### Site Status Update:

All remedial activities at the Site have been completed. Approximately 90,000 cubic yards of contaminated soil were excavated, compacted, and placed underneath two feet of clean soil. An irrigation system was installed and provides water to a grass cover which was planted during the summer of 2005. Periodic operation and maintenance is being conducted to maintain the [soil cover](#) and site engineering features. Groundwater monitoring of wells in the vicinity have not detected [lead](#) or [arsenic](#) at concentrations above drinking water standards.

The [Arizona Department of Transportation](#) has completed construction of the Highway 93 Wickenburg Interim Bypass road immediately east of the Site.

### Community Involvement Activities:

A [community advisory board](#) (CAB) had been formed for this Site, met regularly in their community, and assisted in the remedial process until the [Record of Decision](#) (ROD) was completed. These CAB meeting minutes can be found in the official files at the Information Repositories listed below.

### Site History:

**1863-1962:** Milling and stockpiling of gold ore from the [Vulture Mine](#) took place from 1863 until the early 1900s. The stockpiled tailings were processed briefly from 1957 to 1962. The original

milling process consisted of crushing and flotation. The concentrates were stockpiled at the Vulture Mill and processed using cyanide in the early 1890s.

**1997-1998:** Beginning in 1997, the Arizona Department of Environmental Quality (ADEQ) conducted a [remedial investigation](#) (RI)/[feasibility study](#) (FS) to determine the nature and extent of current and future effects of the contamination on the groundwater. The Site was placed on the [WQARF Registry](#) in April of 1998 with an eligibility and evaluation score of 65 out of a possible 120. Results of these investigations are summarized in the July 10, 1998 RI report and the August 14, 1998 FS report.

ADEQ characterized the nature and extent of current and potential future effects of contamination in soil. The results are summarized in the October 5, 1998 Tailings Characterization Report. Also in October 1998, the [Proposed Remedial Action Plan](#) (PRAP) was prepared to evaluate the groundwater and soil remedial cleanup alternatives to address the potential human health risk posed by the metals in the soil at the Site. The selected alternative was excavation, consolidation, and [capping](#) of the tailings on the Site.



**Headframe over the Mine Shaft**

**1999:** A human health risk assessment (HHRA), dated June 25, 1999, was performed to evaluate the no action alternative and soil cover alternatives. The HHRA concluded that the no action alternative may result in significant risk to future on-site residents. The report also concluded that this significant risk will be eliminated if the soil cover alternative is implemented provided the soil cover is maintained and remains in place.

In September, ADEQ issued a ROD that formally adopted remedial alternatives for groundwater and soil at the Site. The selected groundwater remedy consists of groundwater monitoring and institutional controls for installing new wells within the control area defined in the ROD. The selected soil remedy consists of excavation, consolidation, and placement of a soil cover and associated stormwater controls.

**2000:** In December, a Final Remedy Design Submittal (100%) was prepared.

**2001-2002:** At the request of local property owners, additional soil sampling was conducted between March and July 2001 to further define the vertical and horizontal extent of the contamination. During the course of the investigation, laboratory results indicated that the limits of impacted soil were considerably further south than had been originally estimated. The tailings were found on an additional three properties. The results of the supplemental soil sampling are summarized in the October 2002 Soil Characterization report.

Based upon the new data, the December 2000 plans and specifications to implement the soil remedy were modified and sent out to bid May 2002. In September 2002, ADEQ awarded a \$4.2 million contract to remediate the Underdown and Ringwood properties, and to develop a plan to include the Deibel and Schlueter properties. In December 2002, the construction contractor mobilized to the Site.

**2005:** Grass was planted during the summer on the soil cover.

**2007:** Repairs were made to the slope irrigation system and additional grass was [hydroseeded](#) on the slope. Groundwater monitoring of wells in the vicinity did not detect lead or arsenic at concentrations above drinking water standards.

**2008:** A Site inspection was conducted.

**2009:** Site inspections were conducted.

**2010:** Semi-annual site inspections are continuing on the property.

### **Contaminants:**

The current contaminants of concern at the Site include [lead](#) and [arsenic](#). The highest concentration of lead in the tailings is reported to be approximately 14,000 parts per million (ppm). The average concentration of lead in the mill tailings exceeds the concentration allowed on residential property (400 ppm) or non-residential property (2,000 ppm). Other contaminants at the Site include iron and [manganese](#). Contaminants of concern at the Site may change as new data become available.

### **Public Health Impact:**

Elevated levels of lead are found in the groundwater nearby, including areas in which private wells are used for drinking water. ADEQ has tested the water from potentially affected wells and found that properly constructed wells show no lead in concentrations known to be harmful to people. The town's drinking water supply is regularly tested and is required by law to meet all state and federal drinking water standards.

A [human health risk assessment](#) for the tailings/soils was completed in June 1999. This report documents that the Site in its current condition presents an unacceptable risk. A key factor in this determination is the fact that bioavailability tests on the tailings found the lead to be, on average, 68% bioavailable. This result is higher than typical conservative estimates used in risk assessments on similar sites (typically 50%).

### **Site Hydrogeology:**

The Site is located in the southern portion of the Upper Hassayampa Basin in the Central Highlands Hydrologic Province. The Upper Hassayampa Basin encompasses approximately 740 square miles and includes relatively small [alluvial](#) sub basins. The Basin is bounded on the north by the Weaver Mountains, on the northwest by the Date Creek Mountains, on the south by the Vulture Mountains, and on the east by the Bradshaw Mountains. Elevations in the basin range from 2,000 feet above mean sea level (amsl) in the valley to more than 7,000 feet amsl at the mountain ridges.

The Hassayampa River watershed drains an area of approximately 1,470 square miles in central Arizona. The headwaters originate in the Bradshaw Mountains, and flows southward through the Upper Hassayampa Basin to the Gila River near Phoenix. Most of the runoff infiltrates into the subsurface before reaching the Hassayampa River. Perennial flow occurs at several locations within the Hassayampa River watershed but not within the Site.

Approximately seven miles south of Wickenburg, the Hassayampa River enters the broad Hassayampa Plain where the river crosses a major fault (the Narrows) which is down-thrown to the south and virtually all of the runoff from the Hassayampa River infiltrates into the bed of the river. The main water-bearing units of the Upper Hassayampa Basin are the basin fill deposits, which consist of gravel, sand, silt, and clay. Along the Hassayampa River, the granitic intrusive or volcanic rock is overlain by a thin accumulation of alluvial deposits.

Depth to groundwater within the Upper Hassayampa Basin ranges from a few feet along the Hassayampa River and other major drainages, to more than 800 feet in the middle portion of the basin. The regional direction of groundwater flow is generally south approximately parallel to the axis of the Hassayampa River. Depth to groundwater within the vicinity of the Site ranges from a few feet to about 50 feet.

**Contacts:**

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\*In Arizona, but outside the Phoenix area, call toll-free at (800) 234-5677.

**Information Repository:**

Interested parties can review select Site documents at the [Wickenburg Library](#) located at 164 E. Apache Street in Wickenburg, Arizona, (928) 684-2665.

The complete official Site file can be reviewed at the ADEQ Main Office located at 1110 W. Washington Street, Phoenix, Arizona. With 24-hour notice, an appointment to review related documentation is available Monday through Friday from 8:30 a.m. to 4:30 p.m. at the ADEQ Records Management Center, 1110 W. Washington Street in Phoenix. Please call (602) 771-4380 or (800) 234-5677 to schedule an appointment to review these documents.