

The Cinder Lake Landfill (CLL) is located approximately 12 miles northeast of Flagstaff, Arizona, and approximately 1 mile east of U.S. Highway 89 in Coconino County, Arizona (Figure 3-1). CLL property is located in Sections 2 and 11, in Township 22 North (T.22 N.), Range 8 East (R.8 E.) (Figure 3-2).

### **3.1 GENERAL DESCRIPTION OF THE FACILITY**

The facility is currently operating as Coconino County's primary municipal solid waste disposal facility and services a population of approximately 110,000. CLL currently comprises approximately 175 acres and approximately 110 acres have been utilized for landfill operations. The proposed lateral expansion is located along the eastern boundary of the existing landfill site (Figure 3-3). With the proposed expansion, the entire landfill site will consist of approximately 344 acres. As shown on Figure 3-4, the expanded landfill will also include land in Sections 1 and 12 of T.22.N.

The City of Flagstaff has been the sole operator of CLL since the initial permit for landfill operations, issued by the USFS (Permit No. 53) on December 10, 1963. Based on records reviewed, it appears that the site was used as a borrow source for cinders during the first two years. MSW landfilling likely began in 1965. Additions to the leased area occurred in 1975, 1979, 1981, and 1986.

From 1965 to the mid-1980s a dragline was used to excavate soil from trenches. The trenches were then filled with MSW. Trenches ranged from 60 to 80 feet in width and were approximately 25 to 35 feet deep. MSW was dumped into the trenches with only minor compaction. In the early 1980's, City engineers estimated in-place MSW density of 500 pounds/cubic yard at CLL.

In 1985 a compactor was purchased and in 1990/91 a scraper and D-8 were purchased to replace the dragline operation. At that point, trenching was discontinued and CLL operation became a cut and cover operation.

The current extent of refuse or landfilled area, within CLL property was determined based on aerial photography and boring logs prepared by Western Technologies, Inc. (WTI) and Woodward-Clyde during drilling of borings through the landfilled area and trenching around the southeast perimeter of the landfill. The thickness of refuse ranges from approximately 13 feet to 38 feet.

### **3.2 OWNER, OPERATOR AND AGENT INFORMATION**

CLL is located on National Forest Service System (USFS) lands and is currently authorized by a special use permit (see Appendix B). The address of the land owner is:

United States Forest Service  
Coconino National Forest  
(520) 527-8288

The City of Flagstaff (City) is in the process of purchasing land including the existing landfill and proposed lateral expansion area. The sale of the land to the City is expected to be completed by mid-summer 1998.

CLL has been operated and managed by the City since its development in the 1960s. The operator address is:

City of Flagstaff Department of Public Works  
211 West Aspen Avenue  
Flagstaff, Arizona 86001  
(520) 779-7685 x276 (Ben Fisk)

The mailing address of the facility is:

City of Flagstaff Department of Public Works  
c/o Mr. William Menard, Director  
211 West Aspen Avenue  
Flagstaff, Arizona 86001

There are no acting agents authorized to act on behalf of the City. All inquiries should be directed to the City.

### **3.3 FACILITY INFORMATION**

#### **3.3.1 Major Design Features**

The existing landfill, which is divided into three areas, is an unlined facility. The lateral expansion area, which is divided into two areas, will be lined. The average depth of excavation in the expansion areas is 45 feet. Excavation, working face, and final cover slopes will be constructed and maintained at a 3:1 (H:V) inclination. Additional facility design information is presented in Section 8.

#### **3.3.2 Climate**

The climate in the Flagstaff area is characterized by extreme temporal and spatial variations in both precipitation and temperature. Typically, the amounts of winter precipitation and summer precipitation are approximately equal.

Winter storms commonly distribute low-intensity precipitation over large areas and may last several days. Winter precipitation includes significant snowfall in the higher elevations and may remain on the ground for days to weeks. It has been estimated that approximately 75 percent of winter precipitation falls as snow (Sellars and Hill, 1974).

Summer storms occur in the study area during July, August, and September. These storms are generally convectional, characterized by events of high intensity, short duration, and small in areal extent. Occasionally during the late summer, large, moist air-mass storms originating off the coast of Mexico produce heavy rains lasting from one to several days causing local flooding of ephemeral washes (McGavock et al., 1986 and Sellars and Hill, 1974).

***Temperature Data***

The National Oceanic and Atmospheric Administration (NOAA) operates a cooperative weather station at the Sunset Crater National Monument. This station is located in the study area, approximately 3 miles north of CLL property. Mean monthly temperature data for the summer months of July and August in addition to the winter months of December and January have been tabulated and averaged for the period 1970 through 1995 (Table 3-1). Mean monthly temperatures during this period ranged from approximately 61.7 degrees Fahrenheit (°F) to 68.2°F during the summer months of July and August to approximately 19.9°F to 36.3°F during the winter months of December and January (NOAA, 1993, Western Regional Climate Center, 1998). Annual temperatures range from a low of about -20°F to a high of about 90°F.

***Precipitation and Evaporation Data***

Total annual precipitation data have been tabulated for the Sunset Crater cooperative weather station for the period 1970 through 1995 (Table 3-2). Total annual precipitation during this period ranged from approximately 9.3 inches to approximately 26.0 inches. The majority of the precipitation in the winter season occurs as snowfall. The mean total annual precipitation for this station was approximately 17.1 inches during the period 1970 through 1995 (NOAA, 1993, Western Regional Climate Center, 1998). The evaporation rate in the area is approximately 22 inches annually.

***Winds***

Winds are of varying velocity, depending on the season, and are generally out of the southwest. Approximately 60 percent of the time, wind speeds are generally less than 5.5 miles per hour (mph). Wind speeds are between 5.5 and 15 mph approximately 40 percent of the time. Wind rose information is presented on the plan set for Section 8.

**3.3.3 Local Vegetation Types**

The area is characterized by rolling open land, ponderosa pine forest, widely spaced shrubs of rabbit-brush and currant, and a sparse cover of grasses and herbs. No regionally sensitive, threatened, or endangered wildlife species are known to occur in the area of the landfill; however, two plant species classified Sensitive by the USFS *Penstemon clutei* and *Phacelia serrata* were identified (see Decision Notice of No Significant Impact included in Appendix B).

**3.3.4 Regional Physiography**

The landfill site is situated in a geographic feature known as Cinder Lake. Cinder Lake is a relatively small dry sedimentary basin covering a regional area of approximately 5 square miles. It is located in the Colorado Plateau Physiographic Province and in the eastern part of the San Francisco volcanic field as described by Thornbury (1965). Topographically, the regional slope of the basin is roughly north to south. The terrain is rugged and irregular and includes groups of dissected extinct volcanoes consisting of numerous cinder cones and associated flows and cinder

deposits. Deposition of alluvial material in the basins between many of the extinct volcanoes has formed relatively flat and treeless area referred to as “parks” (Cosner, 1962). Cinder Lake is one of these parks. Land surface elevations range from approximately 6,600 feet above mean sea level (amsl) to 6,700 feet amsl on CLL property.

### **3.3.5 Adjoining Land Uses**

Land use in the area of CLL comprises recreational and housing developments (Figure 3-2). Recreational uses within the Forest Service land include the Cinder Hills Off Road Vehicle Area, a designated recreation area (Northland Research, 1991). Sunset Crater National Monument is located approximately 3 miles north of CLL. Two areas designated as Wilderness areas are located in the study: the Kachina Peaks Wilderness Area and the Crater Wilderness Area (Figure 3-2).

Two housing developments are located on private land approximately 1 mile away from CLL to the west and the south. These housing developments are located in the Doney Park area south of CLL and the Black Bill Park area west of CLL near U.S. Highway 89 (Figure 3-2).

### **3.3.6 Drainage Characteristics**

Temporary drainage ditches or dikes will be constructed adjacent to working areas and excavations to prevent ponding and surface runoff from discharging into the landfilled areas. All final cover surfaces will be sloped at a 3 to 5% grade to facilitate drainage. Surface water will be directed to perimeter conveyance ditches. These ditches will transport water to the infiltration ponds located along the perimeter of CLL. For a more detailed discussion, including the stormwater drainage design refer to Section 8.1.2.

## **3.4 LANDFILL CAPACITY**

CLL currently accepts municipal solid waste (MSW) on a regional basis within a radius of approximately 75 miles. On average, CLL receives an estimated average of 390 tons of refuse per day. Daily disposal rate at CLL varies from approximately 2,000 tons per day (tpd) during the summer to approximately 200 tpd during the winter. CLL operates seven days per week. Historic (beginning in 1985 when a scale was installed at CLL ) and projected disposal rates for CLL are provided in (Tables 3-3 and 3-4).

As shown on Table 3-4, the expected remaining capacity of the landfill including the expansion is approximately 25.2 million cubic yards. Capacity estimates are based on an assumed growth rate at 3% per year. The remaining site life is estimated to be 44 years.

A refuse to soil ratio of 3:1 was used to determine the quantity of daily/intermediate cover required for the landfill. The estimated daily/intermediate cover required is 6.3 million cubic yards. Approximately 1.62 million cubic yards will be needed for final cover.

**Table 3-1  
MEAN MONTHLY TEMPERATURE DATA FOR SELECTED MONTHS  
SUNSET CRATER CO-OPERATIVE STATION**

Year	Temperature (Degrees Fahrenheit)	
	July/August	December/January
1970	66.4/64.6	29.9/25.5
1971	68.2/63.9	25.5/31.3
1972	67.4/62.8	26.7/33.0
1973	63.8/65.2	33.0/27.9
1974	65.3/63.3	26.2/28.7
1975	66.0/63.2	28.4/29.6
1976	64.7/61.7	27.5/24.7
1977	65.3/63.6	35.5/30.9
1978	66.7/63.9	26.0/23.4
1979	65.3/62.9	29.7/31.1
1980	66.8/65.0	36.3/31.7
1981	64.6/62.3	34.4/29.0
1982	64.7/64.6	29.2/30.2
1983	66.6/63.4	35.6/27.9
1984	65.0/63.6	27.8/26.3
1985	67.1/64.4	30.8/35.4
1986	64.6/64.6	27.9/26.0
1987	63.1/No Data	26.4/25.3
1988	65.4/62.6	25.1/20.6
1989	67.0/61.8	26.4/25.0
1990	66.5/62.4	20.6/23.7
1991	65.4/65.3	23.4/20.0
1992	65.6/62.9	22.4/30.1
1993	65.3/64.7	27.8/30.2
1994	68.2/66.8	30.1/29.7
1995	67.1/67.3	28.3/No Data

Source: National Oceanic and Atmospheric Administration, 1993 and Western Regional Climate Center, 1998.

**Table 3-2**  
**ANNUAL PRECIPITATION DATA**  
**SUNSET CRATER CO-OPERATIVE STATION**

<b>Year</b>	<b>Annual Precipitation (inches)</b>
1970	17.12
1971	15.05
1972	21.93
1973	14.58
1974	12.14
1975	15.34
1976	15.25
1977	11.61
1978	21.12
1979	12.61
1980	15.14
1981	21.62
1982	22.76
1983	16.90
1984	14.42
1985	18.98
1986	18.97
1987	20.34
1988	15.62
1989	9.29
1990	23.33
1991	16.65
1992	25.99
1993	18.50
1994	16.13
1995	11.11

Source: National Oceanic and Atmospheric Administration, 1993 and  
Western Regional Climate Center, 1998

**Table 3-3  
HISTORIC LANDFILL DISPOSAL RATES**

Fiscal Year(a)	Total Tons	Waste Types					
		Paper Sludge		Other Waste(b)		General Municipal(c)	
		Tons	Percent	Tons	Percent	Tons	Percent
1985/1986	112,207	--	--	--	--	--	--
1986/1987	147,549	--	--	--	--	--	--
1987/1988	112,400	--	--	--	--	--	--
1988/1989	116,438	--	--	--	--	--	--
1989/1990	117,714	--	--	--	--	--	--
1990/1991	127,629	19,816	15.5	1,966	1.5	105,847	83.0
1991/1992	149,000	30,132	20.2	2,730	1.8	116,138	78.0
1992/1993	170,948	25,701	15.0	2,412	1.4	142,835	83.6
1993/1994	136,367	26,883	19.7	1,372	1.0	108,112	79.3
1994/1995	117,768	12,060	10.2	3,054	2.6	102,654	87.2
1995/1996	139,176	27,965	20.1	7,712	5.5	103,499	74.4
1996/1997	142,269	36,848	25.9	2,691	1.9	102,750	72.2

Source: City of Flagstaff, 1993.

(a) Fiscal year runs from July 1 to June 30

(b) Defined as waste from lint-traps, grease traps, etc.

(c) Computed by subtracting paper sludge tons and other commercial waste tons from total tons

(--)= Data not available