Site Description

Independence Valley (NW Elko)

(updated 2012)

Geologic setting: Independence Valley is a structural basin between the Independence Mountains (E), the Tuscarora Mountains (W), and Bull Run Mountains (NW). Independence Valley contains 35-39 Ma tuffs and tuffaceous sediments, which overlie Paleozoic clastic and volcanic rocks and are overlain by Miocene lava and pyroclastic flows. The rocks were deformed by Pleistocene-era normal faults trending north-south and northwest and by folds trending north-south (Sibbett, 1982, p. 1264).

The surface expression of the Hot Sulphur Springs system is controlled by a fault trending N20ºE. Seismic reflection surveys suggest the fault bounds a ~750 m-wide graben on its east side (Goranson and van de Kamp, 2005). Exposed argillic alteration is limited to the spring area, while quartz-sericite alteration, which predates the present thermal system, is present along the fault zone (Sibbett, 1982, p. 1272).

Geothermal features:

Hot Sulphur Springs (Map): The Tuscarora Geothermal Area is located in northern Independence Valley, ~80 km north-northwest of Elko and ~17 km north of Tuscarora. Bowman and Cole (1982) determined that Independence Mountains were the source of recharge for the hydrothermal fluids. A closer highland area was ruled out as the source because it contained insufficiently depleted non-thermal fluids. Geothermal evidence also suggested that fluid flow trends south-east to northwest (Flynn and Buchanan, 1990, p. 55).

Hot Sulphur Springs are located along Hot Creek near the east edge of the Tuscarora Mountains (SE¼ Sec. 5 and Sec. 8, T41N, R52E). Over 25 hot springs are found along a north-northeast 4.8-km linear zone, and sinter is present in 1.6 km of the zone (Pilkington and Lange, 1980). The springs have reported temperatures of 50-95°C (Bowman and Cole, 1982), and an estimated reservoir temperature of 128°C based on silica geothermometry (Mariner and others, 1974). AMAX exploration geothermometry indicated a reservoir temperature of 216ºC, and Goranson and van de Kamp (2005) reported an estimated reservoir temperature of 165.6ºC. A few small thermal springs occur south and southwest of the main thermal area, in NE¼ Sec. 17.

The springs actively deposit siliceous and calcareous precipitates (Sibbett, 1982, p. 1264). Deposits include an inactive opaline sinter mound 35 m high and 1 km long at the southern springs, and a

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small area of travertine at the northern springs. The northern springs, some of which are boiling, have the greater discharge rate. A thermal spring on the west side of Hot Creek issues from a low calcite and sediment mound. Two siliceous sinter mounds about 40 cm high are present on the calcareous mound. An intermittently-flowing thermal spring occurs 900 m south of the main sinter mound, and a rapidly flowing 21ºC spring (75 to 100 L/min) occurs 3 km south-southwest of the main sinter mound (Sibbett, 1982, p. 1264, 1270). The geochemistry of the Tuscarora area is discussed further by Bowman and Cole (1982).

In the late 1970s, Amax Exploration drilled 38 temperature-gradient drill holes in the area; the maximum temperature reported from this drilling was 117°C at 522 m. A large-diameter well drilled in 1980 to 1662 m encountered relatively low-temperature geothermal fluids. The flow probably originated near 900 m in the Ordovician Valmy Formation, with temperatures in the 107°C range (Pilkington, 1980). A slim hole (HSS-2), drilled in 2004 to 1162 m (NE¼ NW¼ SE¼ Sec. 8, T41N, R52E) encountered a geothermal reservoir below 760 m in fractured Tertiary volcanic rocks. The maximum temperature was 170.6°C at 1126 m in fractured Paleozoic rocks.

Petaini Springs:

Leasing information: In 2009 reports surfaced that Energy Investors Fund: HSS II LLC intended to re-enter an existing production well at Hot Sulphur Springs for exploratory and development purposes. The results were apparently successful, for ORMAT reported on Feb. 10 2010 that it signed an agreement to acquire 100% of HSS II LLC's interest in Hot Sulphur Springs and construct a power plant that is scheduled to come into operation in 2012.

Bibliography: