

Chapter G. Mineral Resource Potential of the Virgin River Area of Critical Environmental Concern, Clark County, Nevada

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Summary and Conclusions

There are 27 current placer claims in or adjacent to the Virgin River Area of Critical Environmental Concern (ACEC), but there is insufficient information available to evaluate placer deposits of precious metals in the area, and the potential for the occurrence of gold placer deposits is unknown. There is no potential for the occurrence of other deposits of locatable or leasable minerals.

The Virgin River ACEC has potential for the occurrence of deposits of sand and gravel aggregate that are similar to currently active sand and gravel operations nearby. Two tracts have high potential for sand and gravel aggregate deposits and two have low potential. Potential for the occurrence of crushed-stone aggregate deposits in the area is low.

Introduction

This report was prepared for the U.S. Bureau of Land Management (BLM) to provide information for land planning and management, and, specifically, to determine mineral resource potential in accordance with regulations at 43 CFR 2310, which governs the withdrawal of public lands. The Clark County Conservation of Public Land and Natural Resources Act of 2002 temporarily withdraws the lands described herein from mineral entry, pending final approval of an application for permanent withdrawal by the BLM. This report provides information about mineral resource potential on these lands.

The Virgin River ACEC was studied in the field to confirm descriptions of the geology that were gleaned from the scientific literature. No samples were collected.

Definitions of mineral resource potential and certainty levels are given in appendix 1, and are similar to those outlined by Goudarzi (1984).

Lands Involved

The Virgin River ACEC is about 9 km southwest of Mesquite, Nevada, and lies just south of Interstate 15 along

the Virgin River (fig. 1). Access to the area is by Nevada State Highway 170 (Riverside exit off I-15). The area includes the Virgin River, its floodplain and adjacent riverbanks. A legal description of these lands is included in appendix 2.

Physiographic Description

The Virgin River ACEC consists primarily of the floodplain of the Virgin River (fig. 2), much of which may be inundated during rare storm events. Elevations along the river range from 455 m at the upstream end to 407 m at the downstream end, and the highest elevations along the riverbank are about 500 m.

Geologic Setting

The Virgin River ACEC lies along the eastern margin of the central part of the Basin and Range Province, which adjoins the Grand Canyon region of the Colorado Plateaus on the east. The Virgin River flows along the axis of the Virgin River depression, a deep structural basin that marks the northern border of the South Virgin Mountains.

Geology

The central part of the area was mapped by Williams and others (1997) at a scale of 1:24,000 (Riverside Quadrangle), and they provide detailed descriptions of the rock units in the area. The north bank and a small portion of the south bank of the Virgin River expose the Pliocene and upper Miocene Muddy Creek Formation. All other deposits in the ACEC are Quaternary in age.

The area is on the divide between the Mesquite Basin and the Mormon Basin, which together form the Virgin River depression. The depth to basement in the ACEC is about 2 to 3 km, although the depression is considerably deeper both upstream and downstream (Langenheim and others, 2000).

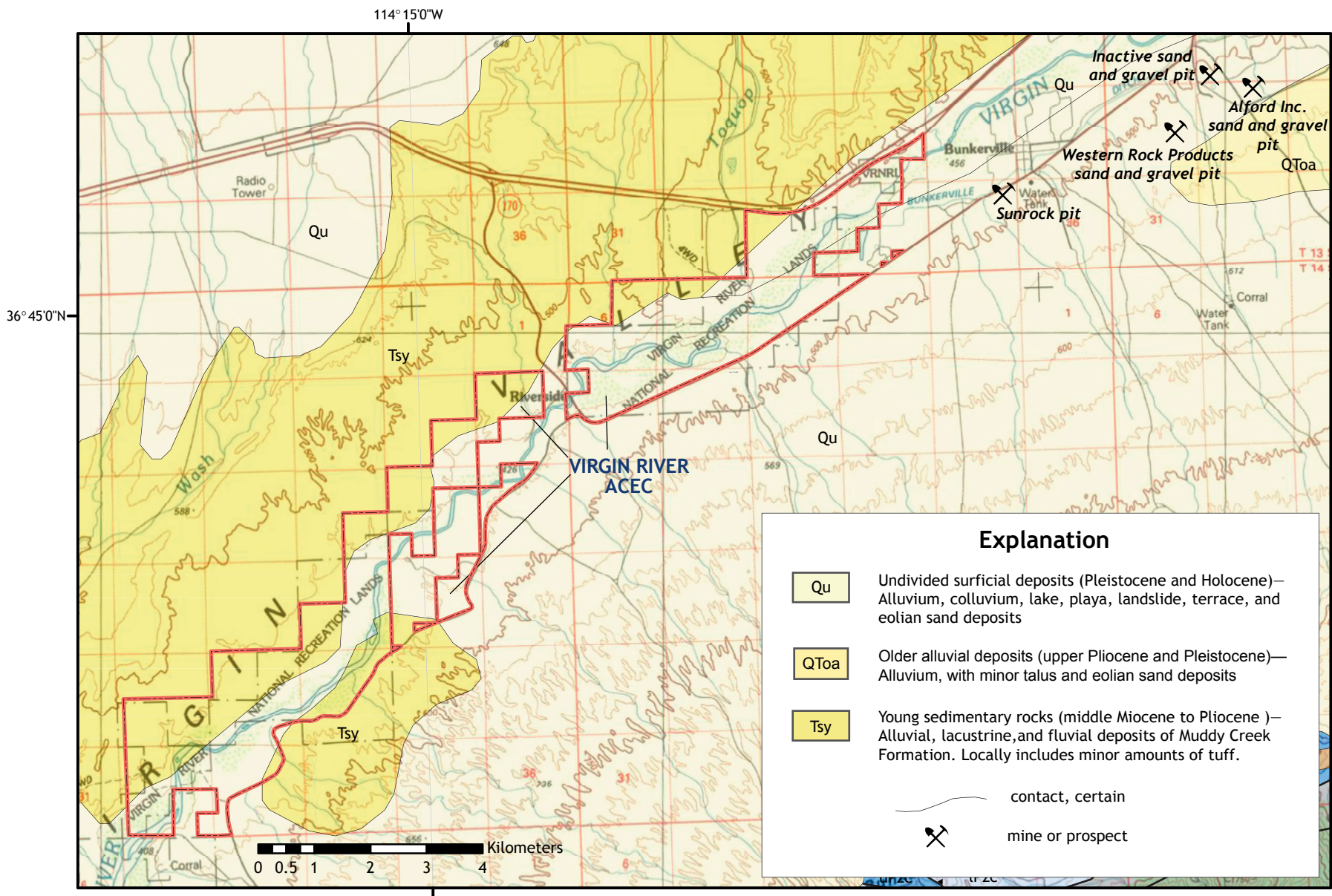


Figure 1. Generalized geology of the Virgin River Area of Critical Environmental Concern (ACEC; outlined in pink). Geology modified from Stewart and Carlson (1978).

Muddy Creek Formation

The Muddy Creek Formation in the ACEC is mostly sandstone and siltstone, but it also includes some evaporite deposits (mostly gypsum), as well as limestone, conglomerate, and breccia. A fluvial facies of the Muddy Creek Formation that consists primarily of sandstone with minor conglomerate was deposited by an ancestral Virgin River before more recent incision.

Quaternary Deposits

Quaternary deposits in the ACEC were mostly deposited in floodplain, stream terrace, and alluvial fan settings. The floodplain and stream terrace sediments were deposited by the Virgin River. The alluvial fan deposits were derived from areas to the south and east, including Black Ridge and the South Virgin Mountains. All of the stream terrace and alluvial fan deposits may be capped by caliche horizons (as much as 2 m thick) in various stages of development.

Floodplain and Channel Deposits

These deposits are the topographically lowest in the area, and are the result of activity of the present day Virgin River. Williams and others (1997) mapped two units in the main channel area. An approximately 2-m-thick unit of fine to medium sand with lesser amounts of silt and gravel is characterized as bar deposits, active channel fill, and abandoned channel fill. The floodplain deposits are also approximately 2 m thick and consist primarily of sand, with some gravel. The floodplain deposits are volumetrically the most abundant in the lower areas of the Virgin River Valley.

Terrace Deposits

The terrace deposits are found at higher elevations above the floodplain. The terraces include sediments deposited by both the present-day and ancestral Virgin Rivers. Terrace deposits closest to the modern floodplain are predominantly



Figure 2. Floodplain of the Virgin River.

sand with lesser amounts of gravel, silt, and clay. Higher elevation terrace deposits are primarily gravel and can be as much as 50 m thick. Clast composition is variable. Deposits originally derived from the Virgin Mountains and Black Ridge may contain limestone, dolomite, gneiss, granite, pegmatite, quartzite, and chert, and they are found on the southeast side of the river. Sediments originally derived from the Mormon Mountains have mostly carbonate clasts and lack the igneous and metamorphic clasts. Terrace deposits with Mormon Mountain lithologies lie on the northwest side of the river.

Alluvial Fan and Pediment Deposits

These sediments are part of a large alluvial fan complex that slopes to the northwest from the flanks of the Virgin Mountains and Black Ridge. The distributary channels of the fan are upwards of 100 m wide and contain gravelly braided stream deposits. The depth of incision is between about 15 m and 30 m. The interchannel areas of the alluvial fan complex also contain abundant gravel and may be greater than 35 m thick. Clast composition of the alluvial fan deposits is consistent with their derivation from the Virgin Mountains.

Mining History

There are several active sand and gravel mining operations on the south bank of the Virgin River, near the townsite of Bunkerville, outside of the ACEC. No other present-day or historic mining operations are known.

Mineral Deposits

The sand and gravel deposits near Bunkerville are the only known mineral deposits of any kind within the ACEC. Other known mineral deposits are about 10 km to the southeast, on the northern flank of the Virgin Mountains. These include the Key West and Great Eastern nickel-platinum deposits and the Hodges-Wharton tungsten prospect.

A sand and gravel aggregate operation, operated by Sunroc Corporation, is located about 2 km east of the ACEC, and several other small sand and gravel pits are 2 to 3 km farther upstream (fig. 1).

Mineral Exploration and Development

There are 27 current placer claims within and adjacent to the Virgin River ACEC. All were located in 2003 and 2004 by American Gold Corporation. We have no additional information about these claims, but presume they are for placer gold exploration. We noted no evidence of recent disturbances in the area.

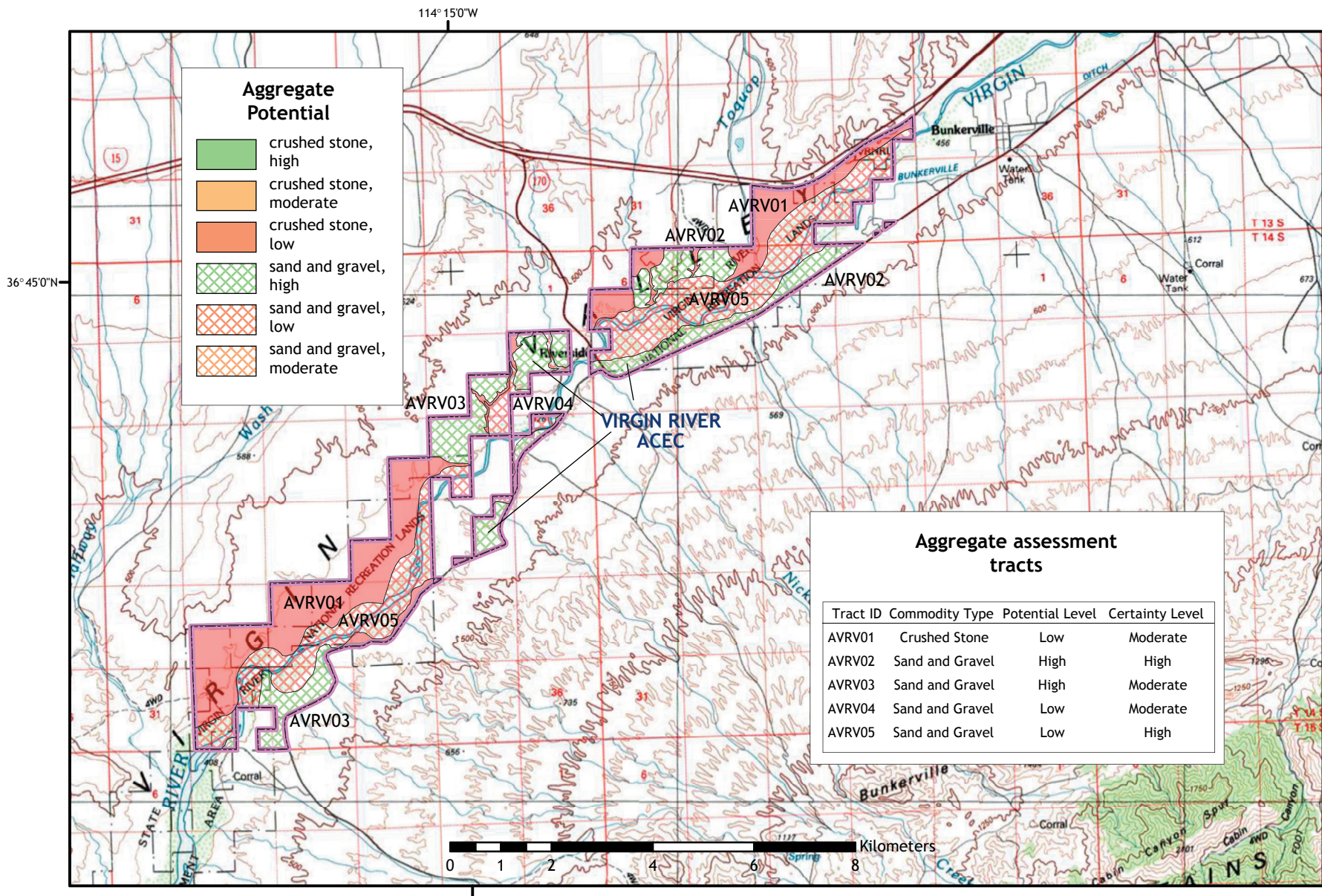


Figure 3. Mineral resource potential tracts for aggregate resources in the Virgin River Area of Critical Environmental Concern (ACEC).

Mineral Resource Potential

Locatable Minerals

There are no known lode mineral deposits in the Virgin River ACEC. Because there is no appropriate bedrock, there is no potential for the existence of undiscovered deposits. The potential for placer gold deposits is unknown, but there are no known important sources of gold upstream from the ACEC.

Leasable Minerals

The entire Virgin River ACEC is within the region considered by the BLM to be moderately favorable for oil and gas (Smith and Gere, 1983). An exploratory oil well, Virgin River U.S.A. No. 1-A, was drilled by Mobil Oil Corp. to a depth of 5,964 m about 10 km southwest of the ACEC on Mormon Mesa. The well, Nevada's deepest as of 1986, was collared in the Muddy Creek Formation and bottomed in granitic rock. It was a dry hole (Garside and others, 1988).

There is no indication of potential for brine or evaporite deposits of sodium or potassium. Evaporite deposits in the Muddy Creek Formation contain primarily gypsum.

The Virgin River ACEC contains no known deposits of other leasable minerals, and the potential for their occurrence is low.

Salable Minerals

The Virgin River ACEC is favorably located for the development of aggregate resources. It is in close proximity to both I-15 and the Mesquite-Bunkerville road, which provide ideal transportation routes to Mesquite and to metropolitan Las Vegas. Figure 3 illustrates the aggregate potential for various areas of the ACEC.

Crushed Stone.—Most of the exposed material in the ACEC is alluvium. Some partially consolidated beds in the Muddy Creek Formation, primarily along the northwest side of the river, can be considered to be rock, but their friable nature makes them unsuitable for crushed stone. These areas are assigned low potential for crushed-stone aggregate deposits, with a moderate level of certainty (tract AVR01, fig. 3).

Sand and Gravel.—Within this ACEC, the highest potential for the development of sand and gravel resources is on the northwest side of the river in the vicinity of Riverside, Nevada. This assessment is based on the apparent quality and quantity of the material as well as proximity to transportation routes. Two tracts have been designated to have high potential for sand and gravel aggregate, AVR02, with a high level of certainty, and AVR03, with a moderate certainty level (fig. 3).

Terrace gravels of the ancestral Virgin River are the primary aggregate resource in this area. Estimated thickness of the gravels is between 10 and 50 m. Sandy terrace sediments that are as much as 10 m thick cap these terrace gravels. Clast composition in the terrace gravels varies between the deposits

west and east of Riverside. Deposits east of Riverside in tract AVR02 contain carbonate clasts derived from the Mormon Mountains and thus have fewer chert and metamorphic clasts (Williams and others, 1997). These constitute a higher-quality aggregate resource, since the lack of silica-rich clasts can decrease the potential for alkali-silica reactivity (ASR) in concrete applications. Alluvial fan deposits south of the river, between the floodplain and Riverside Road, are also within this tract. They are about 30 m thick. Although it has high potential, the area between the road and the floodplain is narrow, no more than 400 m wide, and the space available for a possible mining operation could be problematic. These alluvial fan deposits are similar to those mined by Sunroc Sand and Gravel outside the eastern edge of the ACEC.

The other tract with high potential, AVR03, is primarily west of Riverside. The alluvial fan deposits there are somewhat thinner than those in tract AVR02, and they are not as accessible to I-15.

The areas within the floodplain (tract AVR05, fig. 3) of the Virgin River have low potential for sand and gravel aggregate deposits, with a high level of certainty. This is because the aggregate material that is in the floodplain and channel bar deposits is of lower quality, and is subject to periodic flooding.

Areas that encompass sandy terrace deposits and the Muddy Creek Formation also have low potential for sand and gravel aggregate deposits, with a moderate level of certainty (tract AVR04, fig. 3). The Muddy Creek Formation in the ACEC is poorly consolidated and sand-rich, with some conglomerate layers of limited thickness and lateral extent. Although this material could be utilized as a sand resource, the nearby terrace and alluvial fan gravels are of higher quality.

References

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