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Title: EXPLORATION FOR CARLIN-TYPES DEPOSITS IN A MATURE TERRAIN: MAINTAINING NEVADA'S GOLD RUSH

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Abstract: Nevada produced 6.85 Moz of gold in 2005, placing it fourth in the world. About 80% of its production comes from Carlin-type deposits. However, annual production has dropped 7 of the last 8 years, from its peak in 1998, when a record 8.82 Moz were produced. Only one new >2 Moz deposit has been found since 1998, and exploration is currently focusing on heavily drilled areas with known resources. Is Nevada beginning a long decline that mature terrains inevitably experience?

Challenges directed at better understanding Carlin-type deposits, that, if met, could very well prolong Nevada's position as one of the world's great gold provinces include better understanding of the: 1) Sources of the gold. If magmatic, what is the petrology of coeval magmatism and what are the magmatic-hydrothermal processes that could lead to Carlin-type rather than typical porphyry systems? If leached from the crust, are enriched supracrustal rocks or the type of basement important? 2) Pre-mineral structural architecture and fluid pathways. Do crustal-scale structures exist and did they serve as the main conduits for the hydrothermal fluids? Is the Roberts Mountain thrust the lowest most regional thrust and what is the architecture of the various allochthons? What is the relative importance of thin-skinned versus thick-skinned tectonics? Is fluid flow pervasive or is localized and fracture-controlled? Are there multiple upwelling zones or is there significant lateral fluid flow? 3) Depositional mechanisms. Is sulfidation the dominant mechanism? Are there other important mechanisms, especially ones that lead to high grades? 4) Uplift, weathering, and burial history. When does uplift and oxidation take place? Why do oxidation depths vary widely? What is the post-mineral extensional history? Is gold more mobile in the supergene environment than currently thought? 5) Tops, sides and bottoms of Carlin-type deposits. Patterns in alteration, lithogeochemistry, isotopes, and thermochronology need to be recognized and developed into vectoring tools that can guide drilling. 6) Detecting gold deposits through cover. Numerous orientation studies have demonstrated signals in soils and other media above covered deposits, yet limited understanding of process has hampered interpretation and routine, confident application of these techniques. Hydrogeochemistry shows promise.

Progress has been made on these challenges, but more is needed to better constrain regional and district-scale 4D models and processes that will enable explorers to become more predictive. Meeting the challenges requires studies from the atomic to crustal scales and will necessitate cooperative projects between multiple companies and research

institutions that share resources and results. The traditional practice of individual researchers working with individual companies needs to change. Models for cooperative research exist, but bureaucratic walls that are disincentives to cooperation need to be torn down.