ADEQ Arizona Department of Environmental Quality

Memorandum

Date: January 20, 2016
To: Trevor Baggiore, WQD Director
From: Jason Sutter, Surface Water Hydrogeologist
Subject: Proposal to Remove Coors Lake from Appendix B

Freeport McMoRan Bagdad (FMIB) submitted a letter to ADEQ supporting the removal of Coors Lake from Arizona Administrative Code Title 18, Chapter 11, Article 1 (AAC R18-11-1), Appendix B on October 19, 2015. The correspondence included a Technical Memorandum from HydroGeoLogica, Inc. detailing the development of Coors Lake.

Coors Lake is an isolated water body that has no significant nexus to a downstream water. Although the lake occupies a depression in an ephemeral tributary to Copper Creek, mining activities, including the development of a stockpile immediately to the west of the lake, have effectively isolated the lake from both Copper and Boulder Creeks. Given the size of the stockpile and comparably small size of the lake's watershed there is no ability for water to leave the lake and impact the chemical, physical, and biological integrity of downstream waters.

ADEQ supports the removal of Coors Lake from Appendix B and its coverage as a Waters of the United States as it relates to the Clean Water Act (CWA) programs administered by ADEQ. ADEQ has not made a jurisdictional determination related to the CWA 404 program as that decision is under the purview of the Army Corps of Engineers and EPA.

The proposed change is included in the 2016 Triennial Review rules package that will be released for public notice in early 2016.

Attachments
Freeport McMoRan Bagdad letter to ADEQ dated October 19, 2015

FREEPORT-McMoRan

Bagdad Operations
Mine Shop Road
Bagdad, AZ 86321

Brent Callen
Sr. Environmental Engineer
Telephone: 928-633-3472
Fax: 928-633-3472
e-mail: brent_callen@fmi.com

October 19, 2015

Via Email (lestarge.wendy@azdeq.gov) & Regular Mail

Wendy LeStarge
Arizona Department of Environmental Quality
1110 West Washington Street
Phoenix, Arizona 85007

Re: FMBI Comments on ADEQ Proposed Rulemaking to Revise Arizona's Surface Water Quality Standards (21 Ariz. Admin. Reg. 1895-1976 (Sept. 18, 2015))

Dear Ms. LeStarge:

The enclosed legal summary and technical memorandum provide Freeport-McMoRan Bagdad Inc. (FMBI) comments in support of the Arizona Department of Environmental Quality (ADEQ) proposed revisions to Arizona's surface water quality standard regulations (*see* 21 Ariz. Admin. Reg. 1895-1976 (Sept. 18, 2015)). Specifically, the enclosed materials provide additional legal and technical support for ADEQ's proposal (*see* 21 Ariz. Admin. Reg. at 1898, 1902, 1938) to remove Coors Lake (located within the Bill Williams Watershed) from Appendix B of Arizona's surface water quality standard regulations.

The enclosed materials definitively confirm ADEQ's determination that Coors Lake is not subject to federal Clean Water Act (CWA) jurisdiction (*i.e.*, is not a jurisdictional "navigable water"), and therefore should be removed from Arizona's surface water quality standard regulations.[1] As explained in the enclosed materials, the determination that Coors Lake is not subject to CWA jurisdiction applies whether under (1) the definition of "waters of the United States" currently applicable in Arizona or (2) the revised definition of "waters of the United States" that the U.S. Environmental Protection Agency and the Army Corps of Engineers published in June 2015.

Thank you for the opportunity to submit the enclosed comments.

Sincerely,

Brent Callen

[1] Arizona's surface water quality standards apply *only* to waters that are jurisdictional "navigable waters" as defined under the CWA. *See, e.g.*, A.R.S. §§ 49-221(A), 49-222(A); A.A.C. R18-11-102(A).

Enclosures
cc: Linda Taunt, ADEQ (lc1@azdeq.gov)
Jason Sutter, ADEQ (js9@azdeq.gov)

Legal Summary of the Non-Jurisdictional Status of Coors Lake, Bagdad Arizona

October 19, 2015

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Executive Summary

On September 18, 2015 (*see* 21 Ariz. Admin. Reg. ("A.A.R.") 1898, 1902, 1938), the Arizona Department of Environmental Quality ("ADEQ") proposed to remove Coors Lake from Appendix B of Arizona's surface water quality standard regulations found at Arizona Administrative Code ("A.A.C.") Title 18, Chapter 11, Article 1. ADEQ's rationale for removing Coors Lake from Appendix B is based on the isolated status of the feature as a result of mining activities. 21 A.A.R. at 1898. Freeport-McMoRan Bagdad Inc. ("FMBI") is submitting this legal summary, and supporting technical memorandum,[1] to provide further support for the fact that Coors Lake is not subject to federal Clean Water Act ("CWA") jurisdiction and therefore should be removed from Appendix B of Arizona's surface water quality standard regulations as proposed by ADEQ.

The supporting technical memorandum documents that Coors Lake is an isolated water-filled depression that formed in the early 1980s adjacent to ongoing mining activities at the Bagdad mine. Coors Lake formed within land that formerly drained to Copper Creek, an ephemeral wash which had been cut off from downstream surface waters prior to 1970 as a result of mining activities at the Bagdad mine. Based on these uncontroverted facts, Coors Lake is exempt from CWA jurisdiction whether under (1) the definition of "waters of the United States" currently applicable in Arizona or (2) the revised definition of "waters of the United States" that the U.S. Environmental Protection Agency ("EPA") and the Army Corps of Engineers published in June 2015.[2]

With respect to the definition of "waters of the United States" currently applicable in Arizona, EPA and the Corps specifically exempt "water-filled depressions created in dry land incidental to construction activity" and the Corps exempts "water-filled depressions . . . created in any area not previously considered a 'water of the United States,' as a result of mining, processing and reclamation activities." Coors Lake clearly falls within the scope of these exemptions since it is a water-filled depression created in dry land incidental to the ongoing construction and development of the active Bagdad mine. Finally, given the isolated status of Coors Lake, it has no nexus or connection with any downstream surface water, much less with any downstream traditional navigable water. This fact alone eliminates Coors Lake from CWA jurisdiction consistent with applicable U.S. Supreme Court precedent.

With respect to the revised definition of "waters of the United States," Coors Lake is expressly excluded from CWA jurisdiction since the revised definition provides that certain features are not "waters of the United States" even when they may otherwise meet the criteria for

[1] *See* attached October 2015 technical memorandum from Anita Johnson of HydroGeoLogica, Inc. to Brent Callen of FMBI.

[2] Pursuant to a preliminary injunction issued by a North Dakota federal judge on August 27, 2105 (*see North Dakota v. EPA*, No. 3:15-CV-59, 2015 WL 5060744 (D.N.D. Aug. 27, 2015)) and an "order of stay" issued by the 6th Circuit Federal Court of Appeals on October 9, 2015 (*see In re EPA*, __ F.3d __, 2015 WL 5893814 (6th Cir. Oct. 9, 2015)), the revised definition of "waters of the United States" is not currently enforceable or applicable in Arizona.

jurisdiction under other sections of the revised definition. The list of excluded features includes "water-filled depressions created in dry land incidental to mining or construction activity, including pits excavated for obtaining fill, sand, or gravel that fill with water." Coors Lake clearly meets this exemption and therefore is expressly excluded from CWA jurisdiction under the revised definition of "waters of the United States." Further, even absent the application of the "water-filled depression" exemption, because Coors Lake has been hydrologically isolated from any downstream surface waters since prior to the effective date of CWA regulation, and has no type of nexus or connection with any "traditional navigable water," Coors Lake would not in any event meet any of the categories of "waters of the United States" identified in the revised definition.

Factual Background

As explained in the enclosed technical memorandum, prior to mining activities at the Bagdad mine, Copper Creek (an ephemeral drainage located to the east and south of Boulder Creek in the vicinity of the Bagdad mine) carried stormwater runoff to Boulder Creek. Boulder Creek is a tributary of Burro Creek, which in turn is a tributary of the Big Sandy River in the Bill Williams Watershed. By 1970, however, flow through Copper Creek to Boulder Creek had been completely cut off by mining activities at the Bagdad mine, which included excavation activities at the Bagdad open pit and placement of development rock stockpiles in the Copper Creek drainage. These activities (completed prior to CWA regulation) entirely severed Copper Creek and its drainage area from any connection with any downstream surface water, including its prior connection with Boulder Creek.

Coors Lake was formed in the early 1980s within the isolated Copper Creek drainage on private property owned by FMBI as a result of the ongoing expansion of development rock stockpiles associated with the Bagdad mine. Ultimately, the placement of mine rock allowed water to collect in a dry depression within an upper portion of the previously isolated Copper Creek drainage. The water that collected in this formerly dry depression as a result of ongoing mine construction and development is now known as Coors Lake. Although the primary source of water for Coors Lake has been storm runoff, FMBI has occasionally routed overflow from the Town of Bagdad's drinking water system to Coors Lake for water management purposes. FMBI also has allowed the Arizona Game and Fish Department ("AGFD") to stock the water-filled depression with fish and has allowed public access to the feature across its privately-owned land.

In January 2011, the U.S. Fish and Wildlife Service and AGFD prepared a report titled "*Biological Assessment of the Arizona Game and Fish Department's Statewide and Urban Fisheries Stocking Program for 2011-2021*." One of the water bodies discussed in Chapter 11 (Bill Williams River Watershed) of the report is Coors Lake. The report (pp. 11-5, 11-78, 11-81, 11-85, and 11-92) specifically documents and discusses the closed/isolated status of Coors Lake. However, the report erroneously characterizes Coors Lake as an impoundment or former tributary of Butte Creek. Butte Creek is an ephemeral tributary of Boulder Creek and is located north and east of Copper Creek. As noted above and in the enclosed technical memorandum, Coors Lake was not formed within the Butte Creek drainage, but rather within dry lands of the

historical Copper Creek drainage that had been severed from any downstream surface water connection prior to 1970.

Legal Background

Congress passed the CWA in 1972 with the stated objective "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." 33 U.S.C. § 1251(a). CWA jurisdiction extends only to "navigable waters," defined to mean "the waters of the United States, including the territorial seas." *Id.* § 1362(7). The CWA also requires states to adopt and periodically review water quality standards for "navigable waters." *Id.* § 1313(c).

Consistent with the CWA, Arizona's water quality control act requires ADEQ to establish surface water quality standards. A.R.S. § 49-222. However, unlike some other states, Arizona's surface water quality standards found in A.A.C. Title 18, Chapter 11, Article 1 only apply to waters that are jurisdictional "navigable waters" as defined under the CWA. *See, e.g., id.* §§ 49-221(A), 49-222(A); A.A.C. R18-11-102(A). Consequently, if a water is not subject to CWA jurisdiction, it similarly is not subject to Arizona's surface water quality standards

In 1980 (*see* 45 Fed. Reg. 33424 (May 19, 1980) (codified at 40 C.F.R. § 122.2)), EPA adopted the version of its regulatory definition of "waters of the United States" that has substantially existed until EPA and the Corps recently proposed to revise the definition in June 2015. After several iterations in which the Corps attempted to keep its regulatory definition of "waters of the United States" focused on "traditional navigable waters," the Corps adopted a regulatory definition of "waters of the United States" in 1986 (*see* 51 Fed. Reg. 41250-51 (Nov. 13, 1986) (codified at 33 C.F.R. § 328.3(a))) that substantially tracked EPA's definition.

In the preamble to the Corps 1986 rule, the Corps stated that it generally does not consider certain waters to be "waters of the United States" including "water-filled depressions created in dry land incidental to construction activity and pits excavated in dry land for the purpose of obtaining fill, sand, or gravel unless and until the construction or excavation operation is abandoned and the resulting body of water meets the definition of waters of the United States (see 33 CFR 328.3(a))." 51 Fed. Reg. at 41217. The EPA adopted the same language in the preamble to its final rule regarding CWA Section 404 permit definitions and exemptions. 53 Fed. Reg. 20765 (June 6, 1988).

The U.S. Supreme Court decisions in *Solid Waste Agency of Northern Cook County v. United States Army Corps of Engineers*, 531 U.S. 159 (2001) ("*SWANCC*") and *Rapanos v. United States*, 547 U.S. 715 (2006 ("*Rapanos*") established further limits on EPA and Corps jurisdiction under the CWA. In *SWANCC*, the Court rejected the Corps' assertion of jurisdiction over certain isolated ponds and wetlands based on a purported connection to interstate commerce based on use of those waters by migratory birds, which supported bird-watching, hunting, and other commercial activities. The Court explained that Congress did not authorize the Corps (or EPA) to regulate "nonnavigable, isolated, intrastate waters." 531 U.S. at 171. The decision in *SWANCC* leaves truly "isolated" waters (*i.e.*, those without a hydrologic connection to navigable

waters) unregulated by the CWA because they do not have a "substantial nexus" to traditional navigable waters.

In *Rapanos*, the Court considered whether four Michigan wetlands, located near ditches or man-made drains that eventually emptied into traditional navigable waters over 20 miles away, constituted "waters of the United States" subject to CWA jurisdiction. A four-Justice plurality held that the Corps had jurisdiction over tributaries of traditional navigable waters but only if such tributaries are "relatively permanent, standing or continuously flowing bodies of water" and that jurisdiction did not extend to tributaries "through which water flows intermittently or ephemerally, or channels that periodically provide drainage for rainfall." 547 U.S. at 739.

Justice Kennedy wrote a concurring opinion, in which he also rejected the Corps' assertion of CWA jurisdiction. However, Justice Kennedy rejected jurisdiction based on an entirely different standard. Justice Kennedy returned to the "significant nexus" standard of *SWANCC*, and held that the government's jurisdiction under the CWA extends to wetlands that "possess a 'significant nexus' to waters that are or were navigable in fact or that could reasonably be so made." *Id.* at 759. Specifically, Justice Kennedy held that wetlands adjacent to tributaries possess the requisite nexus, "if the wetlands, either alone or in combination with similarly situated lands in the region, significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as 'navigable'" but not for features that have only a "speculative and insubstantial" connection to such waters. *Id.* at 780.

In response to the *SWANCC* and *Rapanos* decisions, EPA and the Corps recently published a rule that revised the regulatory definition of "waters of the United States." 80 Fed. Reg. 37054-127 (June 29, 2015). Notably, the revised definition provides that certain features "are not 'waters of the United States' even where they otherwise meet the terms of paragraphs [4 through 8 of the revised definition including] . . . water-filled depressions created in dry land incidental to mining or construction activity, including pits excavated for obtaining fill, sand, or gravel that fill with water." 80 Fed. Reg. at 37105, 37107, 37109, 37111, 37112, 37114, 37116, 37118, 37120, 37122, 37124, 37126. Although the revised definition was intended to be effective on August 28, 2015, on August 27, 2015 a North Dakota federal judge enjoined EPA and the Corps from enforcing the revised definition in Arizona and in the other 12 states that joined Arizona in challenging the revised definition. *North Dakota v. EPA*, No. 3:15-CV-59, 2015 WL 5060744 (D.N.D. Aug. 27, 2015). On October 9, 2015, the 6th Circuit of the Federal Court of Appeals stayed the revised definition on a nationwide basis. *In re EPA*, __ F.3d __, 2015 WL 5893814 (6th Cir. Oct. 9, 2015).

I. Coors Lake is exempt from CWA jurisdiction under the currently applicable regulatory definition of "waters of the United States"

As noted above, the revised definition of "waters of the United States" that EPA and the Corps published in June 2015 is not currently enforceable in Arizona. However, as explained in

more detail below, Coors Lake is exempt from CWA jurisdiction under either the existing definition currently applicable in Arizona or under the revised definition published in June 2015.

A. Coors Lake is an exempt water-filled depression created incidental to the ongoing construction and development of the Bagdad mine

Both EPA and Corps have clarified that they do not regulate water-filled depressions created in dry land incidental to construction activity or certain mining activities under the regulatory definition of "waters of the United States." *See, e.g.*, 51 Fed. Reg. at 41217 (Corps); 64 Fed. Reg. 39336-37 (July 21, 1999) (Corps); 53 Fed. Reg. at 20765 (EPA). As recently clarified by EPA and the Corps, this long-existing exclusion for water-filled depressions incidental to construction and mining activity (as well as other similar exclusions) "reflect the agencies' long-standing practice and technical judgment that certain waters and features are not subject to the CWA." 80 Fed. Reg. at 37097.

Mining operations, in particular copper mining operations in Arizona, take place over vast stretches of land—typically several square miles. Mining operations are dynamic, with different phases of activities such as construction, extraction and removal, and reclamation, occurring at varying times and in different areas throughout the mine site. Each of these phases include large-scale earth moving, which inevitably and routinely result in the inundation of formerly dry areas and the potential creation of water-filled depressions or other similar features. Although some of these features can be very large given the scale of modern mining, these features historically have not been deemed "waters of the United States" consistent with the EPA and Corps exclusions discussed above.

As applied to Coors Lake, Figure 1 in the enclosed technical memorandum (1948 topographical map) provides an outline of the location of Coors Lake that documents (along with other information in the technical memorandum) that the lake was formed on dry land in the 1980s incidental to mining-related construction activity (*i.e.*, expansion of an overburden/waste rock stockpile). The expanded placement of overburden/waste rock incidental to the ongoing mining activities at Bagdad allowed stormwater to collect in the formerly dry area immediately adjacent to the stockpile creating a water-filled depression eventually referred to as Coors Lake. Based on the above discussion and the information included in the enclosed technical memorandum, Coors Lake unquestionably is excluded from CWA jurisdiction based on long-standing agency policies to exclude water-filled depressions created incidental to construction and mining activities from CWA regulation.

B. Coors Lake is hydrologically isolated from any downstream traditional navigable water and has no nexus, much less any significant nexus, with any such water

As documented in the enclosed technical memorandum, the historical drainage in which Coors Lake is located (*i.e.*, Copper Creek) was cut off from any downstream surface waters prior to 1970. Additional mine development after 1970 continued to further enhance the complete

severance of the Copper Creek drainage from any downstream waters including the dry depression area in which Coors Lake was ultimately formed in the early 1980s. Based on the historical information and hydrologic modeling summarized in the enclosed technical memorandum, Coors Lake has no potential connection whatsoever to any downstream waters, much less any connection to the nearest downstream traditional navigable water, which is the Colorado River located many miles and drainages from Coors Lake. Consistent with U.S. Supreme Court precedent in *SWANNC* and *Rapanos*, there is absolutely no ability for Coors Lake to have any effect on the chemical, physical, and biological integrity of the downstream Colorado River. Rather, the evidence is clear that Coors Lake exists in complete isolation of not only the Colorado River but also of any drainages located adjacent to Coors Lake.

II. Coors Lake is exempt from CWA jurisdiction under the EPA and Corps revised definition of "waters of the United States"

EPA and the Corps published a revised definition of "waters of the United States" in June 2015 with an effective date of August 28, 2015. 80 Fed. Reg. 37054-127 (June 29, 2015). Because of the above-mentioned preliminary injunction issued by the North Dakota federal district court and the nationwide stay issued by the 6th Circuit Federal Court of Appeals, the revised definition is not currently enforceable or applicable in Arizona. However, even if the revised definition does at some point become enforceable in Arizona, Coors Lake clearly would be excluded from CWA jurisdiction under the revised definition.

A. Coors Lake is an exempt "water-filled depression" incidental to mining

The revised definition establishes certain exemptions from the regulatory definition of "waters of the United States," including "water-filled depressions created in dry land incidental to mining or construction activity, including pits excavated for obtaining fill, sand, or gravel that fill with water." 80 Fed. Reg. at 37105, 37107, 37109, 37111, 37112, 37114, 37116, 37118, 37120, 37122, 37124, 37126. Many of these exemptions, including the "water-filled depression" exemption, "reflect the agencies' long-standing practice and technical judgment that certain waters and features are not subject to the CWA." 80 Fed. Reg. at 37096-97. In fact, EPA and the Corps explained (*see* 80 Fed. Reg. at 37099) that its exclusion for certain "water-filled depressions" was consistent with the agencies' prior exclusion of such features as explained in the agencies' 1986 (Corps) and 1988 (EPA) preambles discussed above.

Importantly, unless a water qualifies itself as a traditional navigable water, an interstate water, or a territorial sea, any water that qualifies for any of the exemptions outlined in the revised definition, including the "water-filled depression" exemption, is categorically <u>not</u> considered a "waters of the United States." This is so even if the exempted water meets one of the other categories of "waters of the United States" (*e.g.*, tributary of a traditional navigable water, impoundment of a "water of the United States, certain waters found to have a significant nexus to a traditional navigable water, interstate water, or a territorial sea) identified in the revised definition.

As applied to Coors Lake, the water is not a traditional navigable water (*i.e.*, it is not in any way part of a "highway"[3] for commerce) or an interstate water (*i.e.*, it does not cross state boundaries). Consequently, if it meets one of the exemptions in the revised definition it is categorically excluded from CWA jurisdiction.

The enclosed technical memorandum documents that Coors Lake was created incidental to mining activity (*i.e.*, the construction and development of the Bagdad mine). The technical memorandum also documents that Coors Lake was formed in "dry land," or as explained by in the preamble to the revised definition: "areas of the geographic landscape that are not water features such as streams, rivers, wetlands, lakes, ponds and the like." 80 Fed. Reg. at 37098. Coors Lake was formed in a dry depression area (*i.e.*, dry land) of an upper portion of the Copper Creek drainage that had been severed from downstream waters prior to 1970. Based on the above discussion and the information included in the enclosed technical memorandum, Coors Lake unquestionably meets the exemption in the revised "waters of the United States" for "water-filled depressions created in dry land incidental to mining" and is categorically exempt from CWA jurisdiction.

B. Coors Lake does not meet any of the categories describing "waters of the United States" under the revised definition and would be excluded from CWA jurisdiction even if the "water-filled depression" exemption were not available

Even if Coors Lake were somehow determined not to qualify for the "water-filled depression" exemption, Coors Lake does not meet any of the eight categories identified in the revised definition as "waters of the United States." First, as noted above, Coors Lake is not a traditional navigable water, interstate water, or a territorial sea. *See* paragraphs 1 through 3 of the revised definition of "waters of the United States." There are no territorial seas in Arizona and the closest downstream traditional navigable water or interstate water to Coors Lake is the Colorado River located many river miles and drainages away from Coors Lake. Second, Coors Lake is not an impoundment or tributary of a traditional navigable water, interstate water, or a territorial sea nor is it adjacent to any such feature. *See* paragraphs 4 through 6 of the revised definition of "waters of the United States." As explained above and in the enclosed technical memorandum Coors Lake was formed in a dry depression within lands already severed from downstream waters prior to CWA regulation.

Third, Coors Lake is not a prairie pothole, Carolina bay, Delmarva bay, pocosin, western vernal pool, or Texas coastal wetland. *See* paragraph 7 of the revised definition of "waters of the United States." Fourth, Coors Lake is not located within the 100-year floodplain of a traditional

[3] Under federal law, waters are traditional navigable waters if they are capable of being navigated *and* if they can be used, or are susceptible of being used "'as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water.'" *PPL Montana LLC v. Montana*, 132 S.Ct. 1215, 1228 (2012) (quoting *The Daniel Ball*, 10 Wall. 557, 563 (1870)). The main focus of the federal test for what waters qualify as traditional navigable waters, as described by the U.S. Supreme Court, is whether the water body is being used as a "highway" for commerce. *Utah v. U.S.*, 403 U.S. 9, 11 (1971).

navigable water, interstate water, or territorial sea (*i.e.,* Coors Lake is not located within the 100-year floodplain of the Colorado River). *See* paragraph 8 of the revised definition of "waters of the United States."

Finally, although Coors Lake may be located within 4,000 feet of what may be defined under the revised definition as the ordinary high water mark of Butte Creek, an ephemeral wash tributary to Boulder Creek (*see* paragraph 8 of the revised definition of "waters of the United States"), Coors Lake is completely isolated from Butte Creek or any of its tributaries and does not have any connection or nexus to Butte Creek and clearly would not have any significant nexus to any downstream traditional navigable water or interstate water (*i.e.,* the Colorado River). As documented in the enclosed technical memorandum, Coors Lake was formed in a dry depression within an area of land already isolated from downstream waters prior to CWA regulation. Additionally, the hydrologic modeling summarized in the enclosed technical memorandum confirms that Coors Lake has no potential of ever overflowing into any adjacent drainages and is also isolated from a subsurface or groundwater perspective. In other words, Coors Lake is completely isolated from any drainages that may ultimately flow to the Colorado River and is located many miles and drainages from the Colorado River. Consequently, Coors Lake has no ability to affect, much less to significantly affect, the chemical, physical, or biological integrity of the Colorado River. Further, given the complete isolation of Coors Lake and its substantial distance from the Colorado River, it does not perform any of the "aquatic functions" listed in the definition of "significant nexus" found in the revised definition of "waters of the United States" that are in any way relevant to the Colorado River.

Conclusion

As this legal summary and the supporting technical memorandum demonstrate, Coors Lake is not subject to CWA jurisdiction whether under the currently applicable regulatory definition of "waters of the United States" or under the enjoined revised definition of "waters of the United States." Because Coors Lake is not a "waters of the United States" as defined under applicable EPA and Corps regulatory definitions, it must be removed from Appendix B of Arizona's surface water quality standards as proposed by ADEQ.

HydroGeoLogica, Inc.
414 Garden Glen Ct., Golden, CO 80403
Phone: (303) 263 1367
Email: amjohnson@hydrogeologica.com

TECHNICAL MEMORANDUM

To:	Brent Callen
Company:	Freeport McMoRan Bagdad Inc.
From:	Anita Johnson
Date:	October 2015
Subject:	**Development of Coors Lake**

Introduction

This technical memorandum presents a historical and hydrologic study of Coors Lake and its watershed which was developed for Freeport-McMoRan Bagdad Inc. (FMBI). The study concludes that the land area (i.e., upper Copper Creek catchment) that includes Coors Lake is hydrologically isolated and has been for over 45 years. From an historical perspective, the entire upper Copper Creek catchment was cut off from downstream surface waters (i.e., Boulder Creek) by the Bagdad open pit and other mining activities. Coors Lake was formed in the early 1980s on lands within the isolated upper Copper Creek catchment as a result of the ongoing placement of mine waste rock. The placement of the waste rock eventually allowed water to collect in a dry depression (now known as Coors Lake) adjacent to the waste rock on land within the isolated upper Copper Creek catchment. Hydrologic modeling of Coors Lake under both current natural and statistically wet conditions supports the hydrologically isolated status of the lake.

Approach

Available photographic, geologic, hydrologic, and hydrogeologic data for the Coors Lake area were reviewed and evaluated. This information is described in more detail below, and includes:

- Historical and recent topographic maps
- Historical aerial photographs
- Geologic maps
- Climate data
- Groundwater levels in nearby wells.

A site inspection was performed to ensure that the available topographic data adequately represent current surface water flow paths and potential surface water discharge points. A history of the Coors Lake area was developed based on the available historical data. A GoldSim water balance model of the lake was constructed to represent hydrologic performance of Coors Lake under current conditions and synthetic wet and storm conditions in order to predict the likelihood of the basin overflowing. This memorandum summarizes historical and current hydrologic conditions, together with a description of

how the current system may be expected to respond to selected climate scenarios based on GoldSim modelling.

History

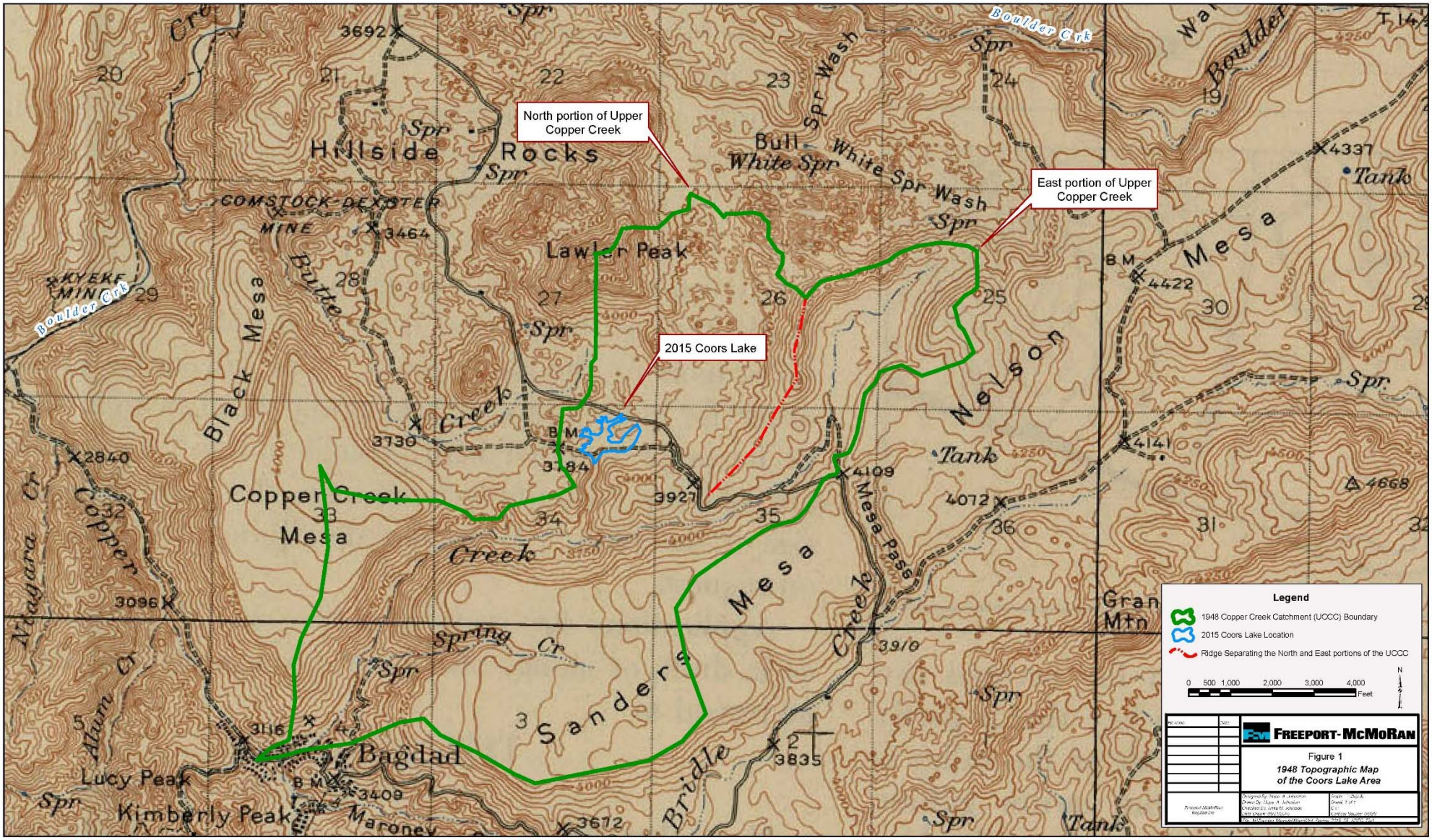
This history is based on examination of available aerial photographs (attached on the following pages as Figures 1 through 4).

1. Pre – 1968 (Figure 1)
   a. Pre-mining situation with minimal mining disturbance. Figure 1 illustrates the historical boundary of the upper Copper Creek catchment/drainage area **and** the dry depression that is the location of the existing Coors Lake within the north portion of the upper Copper Creek catchment. No blue line is indicated in the dry depression area prior to mining suggesting that the area was dry land. During sufficiently large enough storm events prior to mining, stormwater runoff would have flowed through this depression and into the upper Copper Creek drainage before flowing in a southwesterly direction between Copper Creek Mesa and Sanders Mesa and ultimately reporting to Boulder Creek.

2. 1970 (Figure 2)
   a. Flow through Copper Creek to Boulder Creek has been cut off by mining (*i.e.,* Bagdad open pit) and placement of development stockpiles in the drainage between Sanders and Copper Creek mesas. Ultimately, the entire Copper Creek drainage, including the location of the existing Coors Lake, has been isolated from downstream waters since before 1970. Figure 2 also illustrates that the Coors Lake area was a dry depression in 1970.

3. 1981 – 1983 (Figure 3)
   a. Stockpile development has advanced east along the north side of Sanders Mesa.
   b. The small area (referred to as the north portion of the upper Copper Creek catchment on Figure 1) that had historically been part of the upper Copper Creek catchment, becomes further isolated from other portions of the upper Copper Creek catchment as a result of ongoing mining activities.
   c. Water from the north portion of the upper Copper Creek catchment begins collecting in the dry depression against the stockpile now known as Coors Lake.

4. Mid 1980's – Present (Figure 4)
   a. A diversion is built from the east portion of upper Copper Creek to Coors Lake
   b. Excess drinking water supply to Bagdad town site is diverted to Coors Lake as necessary to manage water supply system.
   c. Lake elevation dependent on precipitation and diversions from town site drinking water supply.


North portion of Upper Copper Creek
East portion of Upper Copper Creek
2015 Coors Lake
Hillside
Rocks
Bull White Spr
White Spr Wash
Lawler Peak
Black Mesa
Butte
Nelson Mesa
Copper Creek Mesa
Sanders Mesa
Bridle Mesa
Mesa Pass
Creek
Spring Cr
Boulder Crk
Bagdad
Lucy Peak
Kimberly Peak
Maroney
Tank
Legend
1948 Copper Creek Catchment (UCCC) Boundary
2015 Coors Lake Location
Ridge Separating the North and East portions of the UCCC
0 500 1,000 2,000 3,000 4,000 Feet
FREEPORT-McMoRan
Figure 1
1948 Topographic Map of the Coors Lake Area

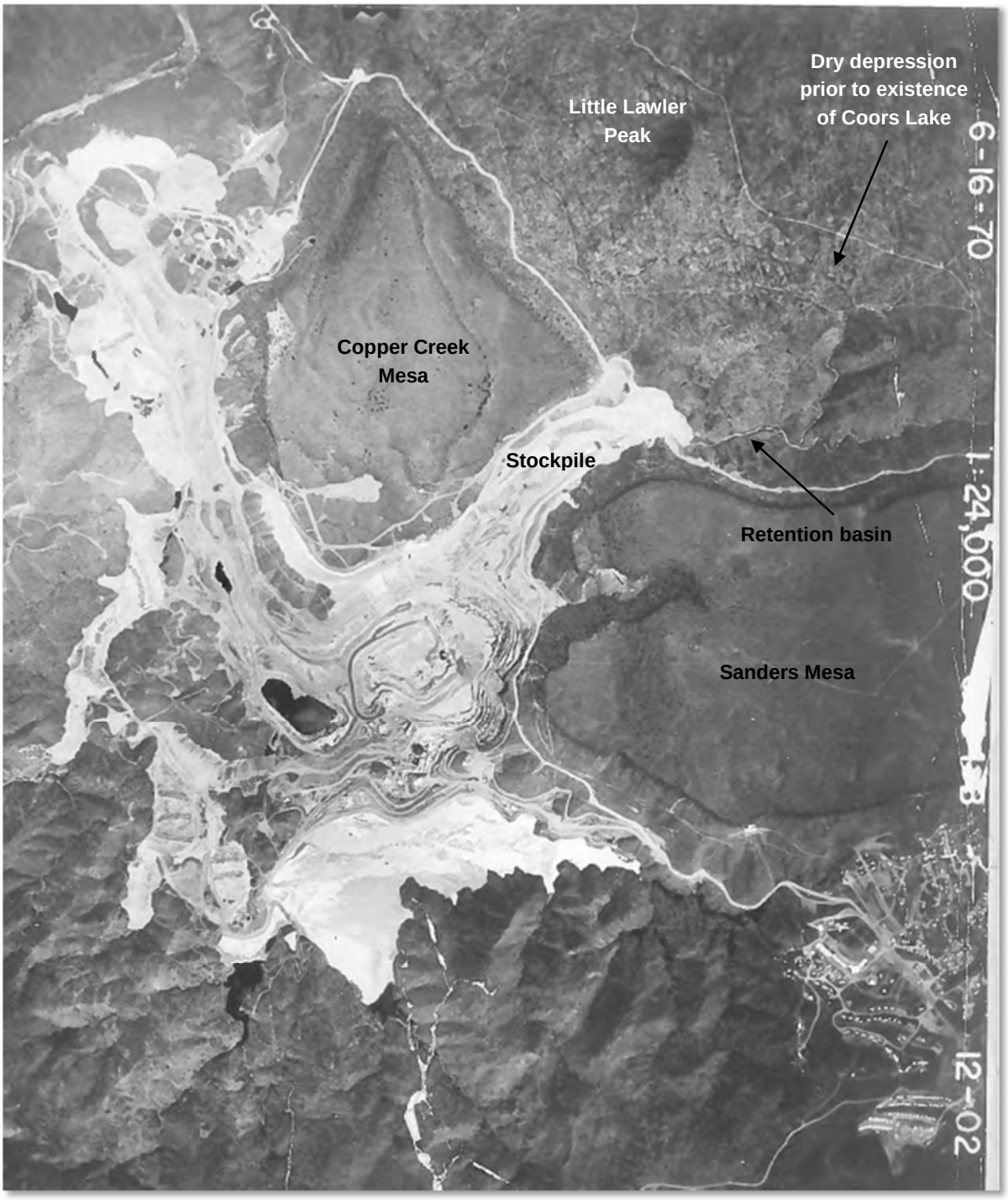


Figure 2: 1970 Aerial Photograph

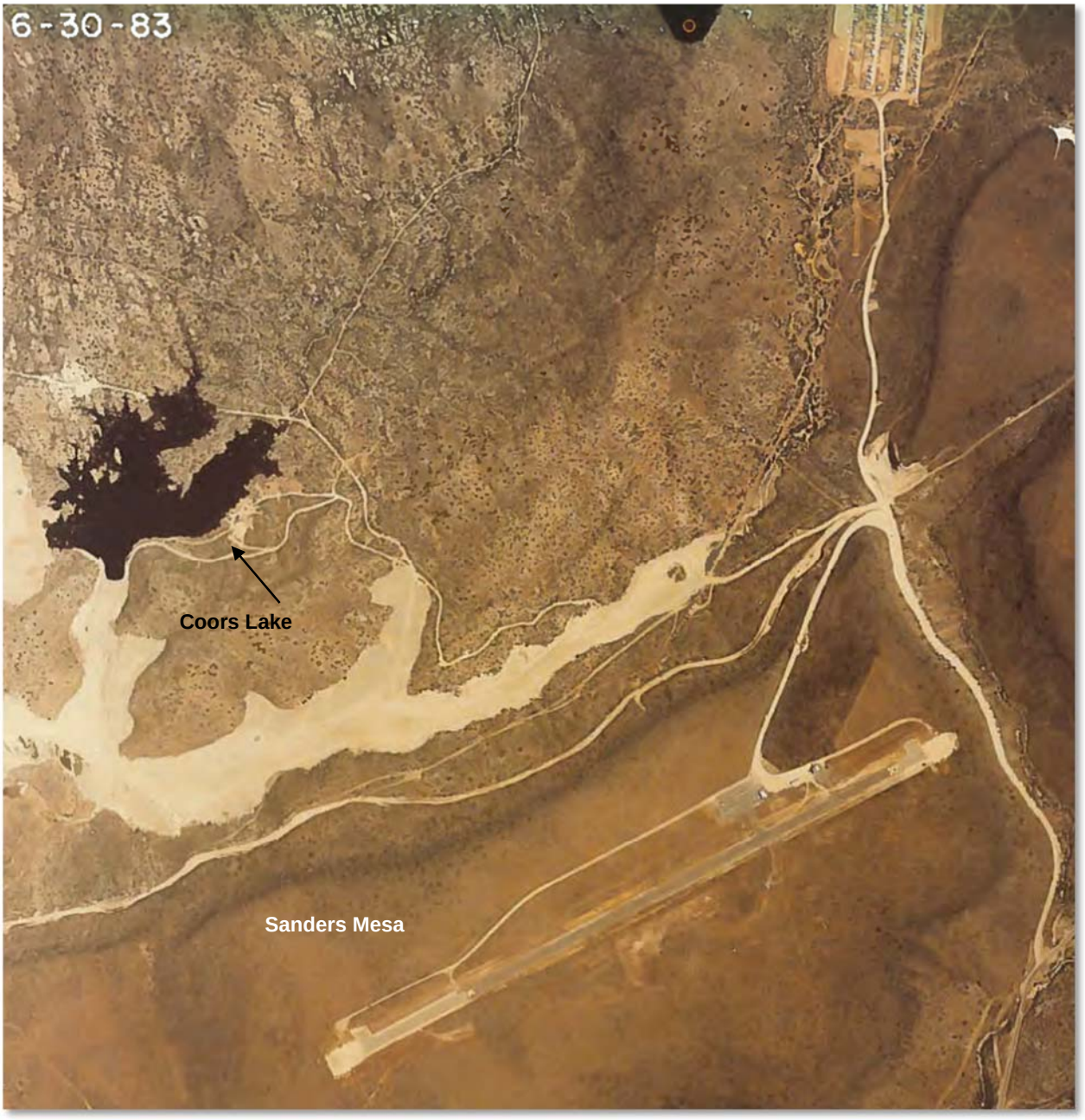


Figure 3: 1983 Aerial Photograph

Figure 4: May 2008 Aerial Photograph showing Coors Lake

Site inspection observations

A site inspection was performed during the week of June 22nd, 2015 to clarify catchment boundaries and other hydrologic features. The following observations were made:

- **East portion of upper Copper Creek catchment:** This drainage area originally drained into Copper Creek. Mining activities in the mid-1980's resulted in a diversion being built, re-routing the east portion of upper Copper Creek into the Coors Lake basin approximately 1,000 feet east of the security gate. The existing drainage channel was evaluated to determine exactly which areas of the upper Copper Creek drainage currently drain into the Coors Lake basin. Some surface water diversions were observed on the south side of the east fork of Copper Creek catchment along the mine access road.
- **Coors Lake basin:** The Coors Lake basin has an overflow elevation of approximately 3,810 feet above mean sea level (amsl) from a location northwest of Coors Lake. If Coors Lake were to fill, water could flow from this point into a low-lying area to the northwest.

Current hydrology of the Coors Lake area

Two groundwater monitoring wells were installed approximately 1,000 feet east of Coors Lake in January 2013. The shallow well (12-051) is open-hole and has a depth of 380 feet below ground surface (bgs), and the deep well (12-058) has a depth of 1,350 feet bgs with an open interval from 149.5 feet bgs to

1,289.7 feet bgs. Groundwater levels in these wells in May 2015 were 3,673 feet amsl in the shallow well, and 3,642 feet amsl in the deep well.

It is estimated that the water depth in Coors Lake in May 2015 was approximately 37 feet at its deepest point. The elevation of the water in the lake was approximately 3,766 feet amsl, approximately 100 feet higher than groundwater levels observed in the nearby monitoring wells, suggesting that Coors Lake does not receive groundwater. Some of the water in Coors Lake infiltrates out of the base of the lake floor and into the underlying unsaturated zone. The infiltration rate is uncertain and depends on the amount of sedimentation that exists and the hydraulic conductivity of the lake floor. Any infiltration to groundwater from Coors Lake would drain towards the pit (SWS 2014). The spill elevation for Coors Lake is 3,810 feet amsl. If the water level in the lake were to reach this elevation, storage in the lake would be approximately 506 million gallons. Surface water and groundwater elevations in the area in May 2015 are illustrated in a schematic west–east cross-section through Coors Lake, Figure 5.

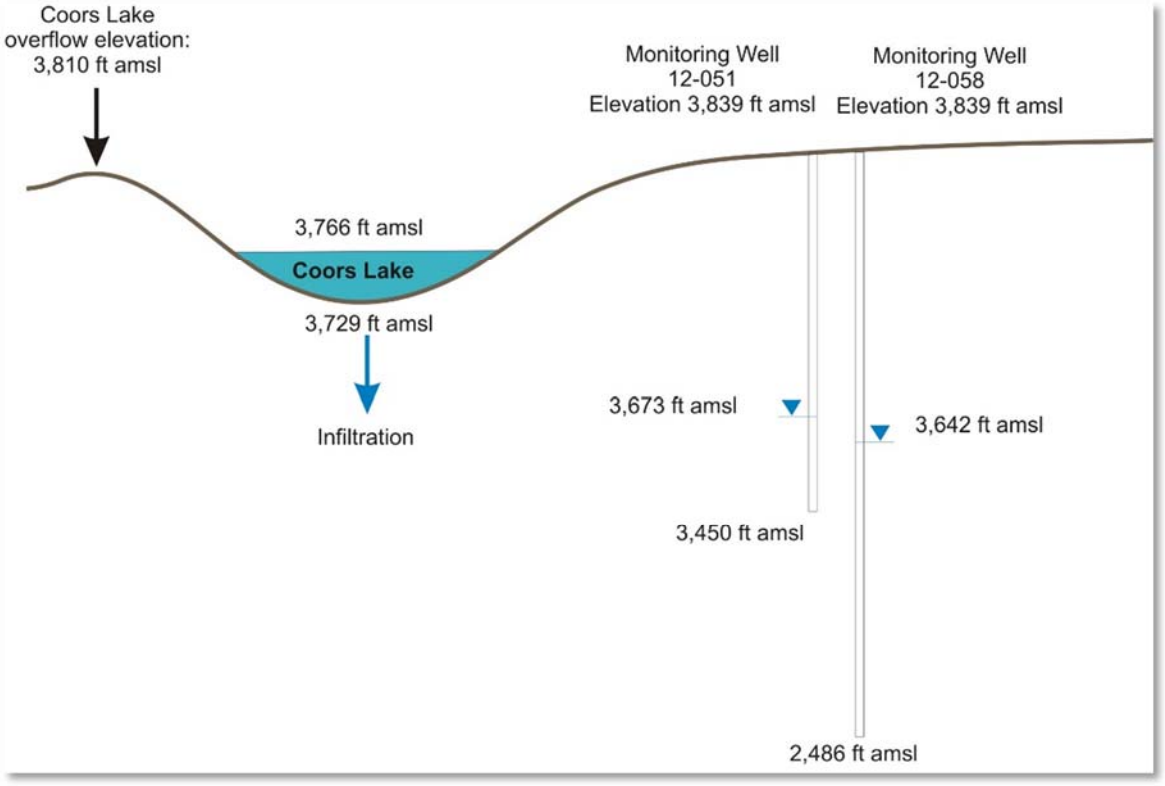


Figure 5: Schematic Surface and Groundwater Levels near Coors Lake, in Cross-section

GoldSim model and predications regarding Coors Lake filling

GoldSim model was developed to simulate climate scenarios for the current hydrologic condition of Coors Lake. The model includes a dashboard to allow users to vary climatic and other parameters to evaluate scenarios for Coors Lake management. A base case model was constructed first, representing existing and most likely average climatic conditions. A wet scenario was then simulated.

Model Description

Figure 6 illustrates the opening screen of the model showing Coors Lake and Lawler Peak. The model simulates daily time steps beginning in January 2015 and running through the end of the year 2051. The model uses measured precipitation data from the Security Gate weather station, and measured evaporation data from Mulholland Evaporation Ponds for the historical modelling period January 2015 – April 2015. For the future (predicted) period of the model, from May 2015, long-term average monthly evaporation rates are used. Predicted precipitation rates are calculated based on long-term historical data from the Western Research Climate Center WRCC, using a synthetic precipitation generator built into GoldSim.

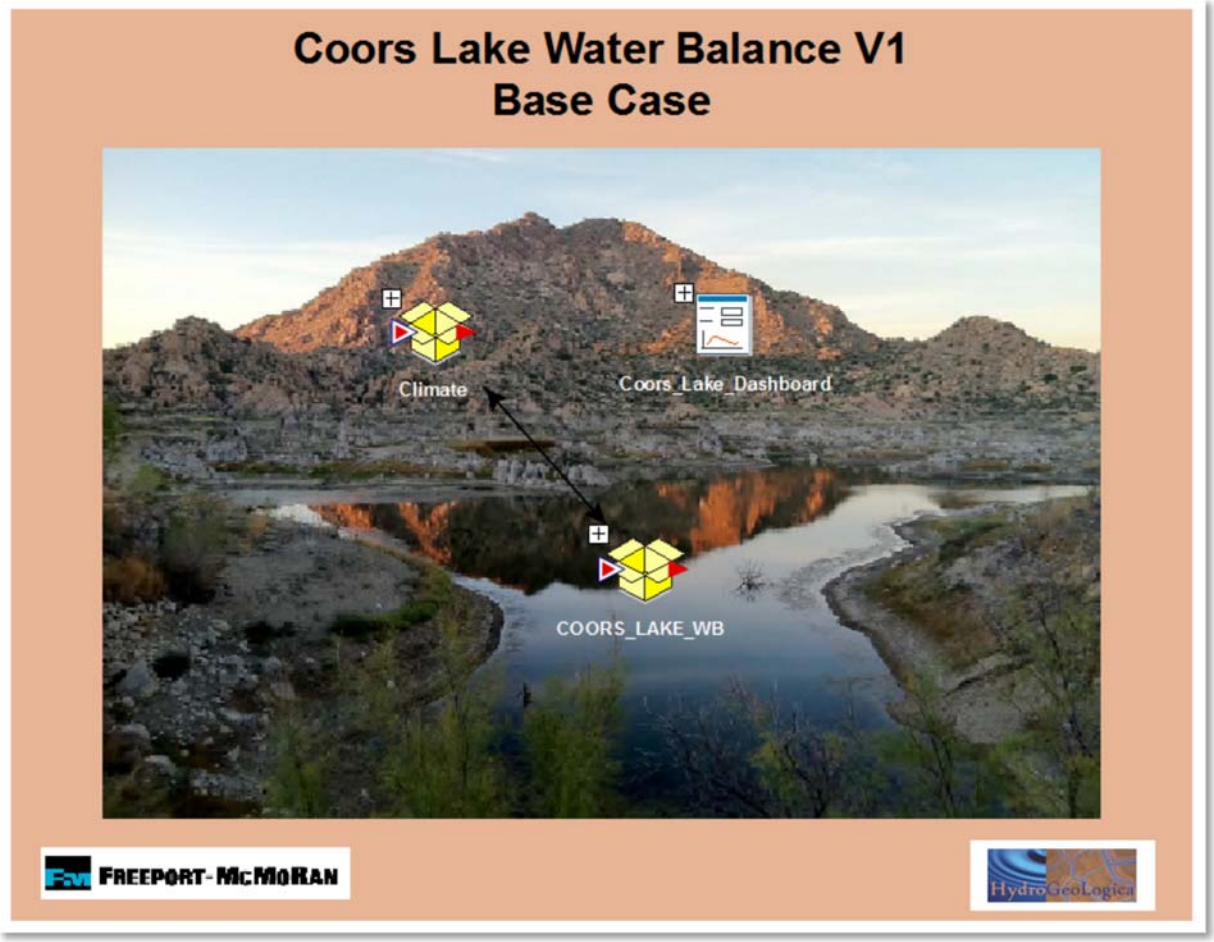


Figure 6: GoldSim Model Opening Screen

Synthetic Precipitation Calculations

Seventy-one years of precipitation data from WRCC Bagdad station were evaluated and the data were sorted based on annual totals. Statistics for the driest 18 years indicate precipitation ranging from 2.9-10.5 in/yr. Statistics from the median (average) 34 years indicated precipitation ranging from 13.5 - 16.5 in/yr and for the wettest 18 years precipitation ranged from 16.6 to 27.9 in/yr. The synthetic precipitation

generator in the model generates daily rainfall based on selected climate characteristics such that average conditions occur 50% of the time, and dry or wet conditions each occur 25% of the time. It also factors in the daily distribution of monthly rainfall based on long-term observations of the number of dry days per month at Mammoth Tailings Storage Facility to ensure that rainfall events of realistic magnitude are generated.

Water Balance Calculations

The Coors Lake Water Balance is illustrated in Figure 7.

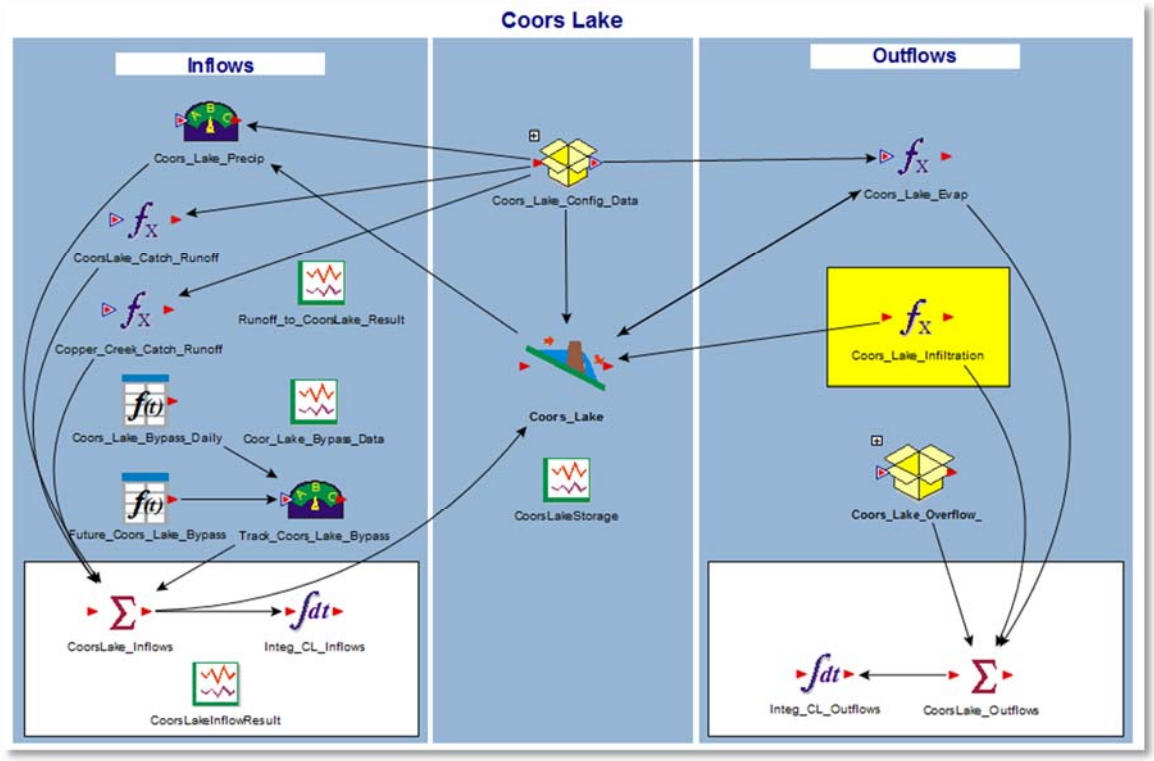


Figure 7: Coors Lake Water Balance

The water balance illustrated in Figure 7 indicates that there are four inflows to Coors Lake:

- Direct precipitation: This is calculated in the model based on the area of the lake surface and the precipitation rate.
- Runoff from Coors Lake basin catchment: This is calculated based on the area of the catchment (approximately 29 million square feet), the rate of precipitation onto the catchment and a runoff curve number. The curve number method for runoff calculations is described in United States Department of Agriculture (1986). A curve number of 72 was selected for the Base Case model, representing Group B soils and fair desert shrub.
- Runoff from Copper Creek catchment: This is calculated in the same way as runoff for Coors Lake basin catchment, but using the catchment area for Upper Copper Creek (approximately 19 million square feet).
- Coors Lake Bypass: This is excess flow from the Francis Creek water supply which is occasionally diverted into Coors Lake for operational reasons. Measured values for this flow

rate are used for January through April 2015. Estimated flow rates are used for May to December 2015. Zero flow is expected thereafter.

There are 3 possible outflow mechanisms from Coors Lake:

- Lake Evaporation: This is calculated in the model based on the area of the lake surface and the evaporation rate.
- Infiltration: This parameter has not been quantified. An estimate of 50 gpm was used. The model is insensitive to this parameter between values of 0 and 500 gpm.
- Overflow: If the inflows to Coors Lake exceed losses to evaporation and infiltration, the model allows water to build up in Coors Lake and overflow to the west once the maximum storage (approximately 506 million gallons) is reached.

A reservoir element in the GoldSim model (shown in Figure 7) is used to track water storage in Coors Lake at each of the daily model time steps. Calculations are based on inflows, outflows and the topography of the lake bed. The topography (stage-area-storage relationship) is stored in the Coors_Lake_Config_Data container above the reservoir element (Figure 7).

Dashboard Controls

Figure 8 illustrates the dashboard for the Coors Lake water balance.

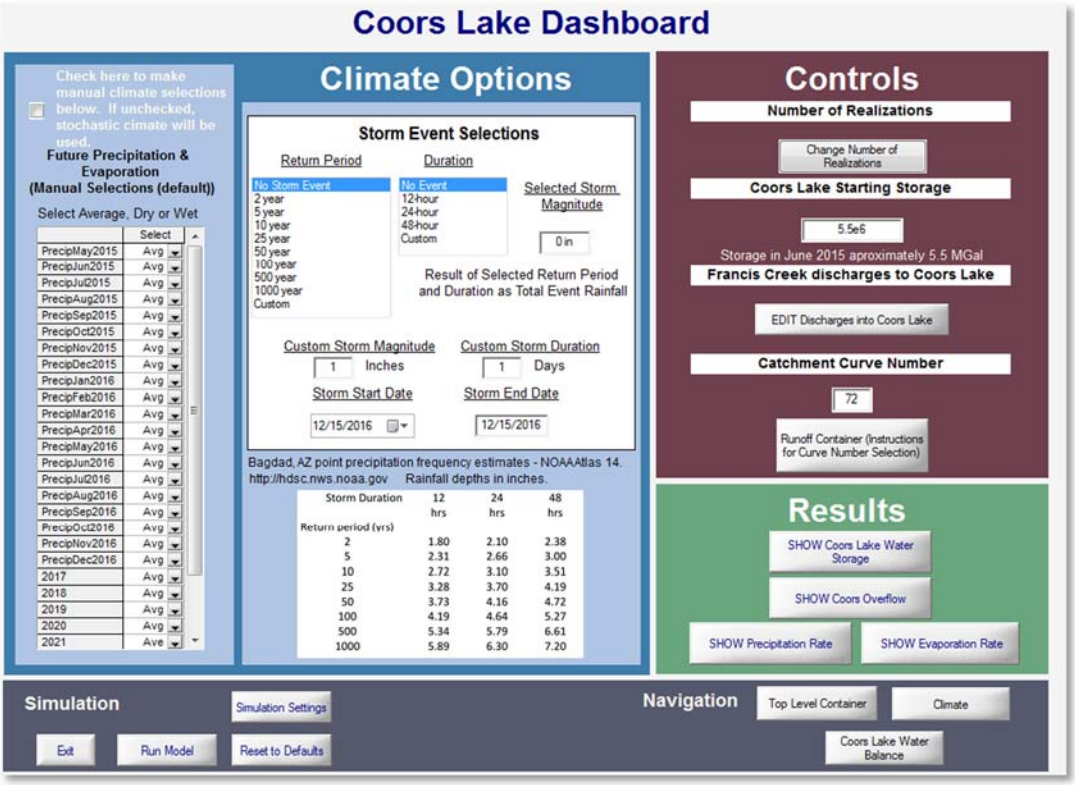


Figure 8: Coors Lake Water Balance Dashboard

The dashboard allows users to modify precipitation rates and storms, the number of realizations to be simulated (default is 100), the starting storage in Coors Lake, discharge rate to Coors Lake from Francis Creek water supply and the runoff curve number. Users can also view results: Coors Lake water storage, Coors Lake overflow rate (typically zero).

The base case model uses the following default values:

- Stochastic climate
- No storm event
- 100 realizations
- A starting storage in Coors Lake of 5.5 million gallons which is the estimated storage in May 2015.
- A runoff curve number of 72
- An infiltration rate from the pond to the underlying unsaturated zone of 50 gpm
- Limited, estimated discharges into Coors Lake from Francis Creek water supply through the end of 2015, and zero thereafter.

Results

The base case scenario predicts that Coors Lake is not expected to fill or overflow at any time. Figure 9 illustrates Coors Lake storage for the base case scenario together with the maximum storage possible before the lake will overflow (506 million gallons). The graph shows the 90% statistic. This means that there is a 90% probability that the water storage shown by the red line will not be exceeded. The drop-down menu for 'Display' allows users to illustrate the results differently. The results for individual realizations can be viewed as probabilities or custom statistics. The peak in storage predicted near the beginning of the modelled period relates to the expected inflows of greater than zero from the Francis Creek water supply. Once these taper to zero, predicted storage is lower.

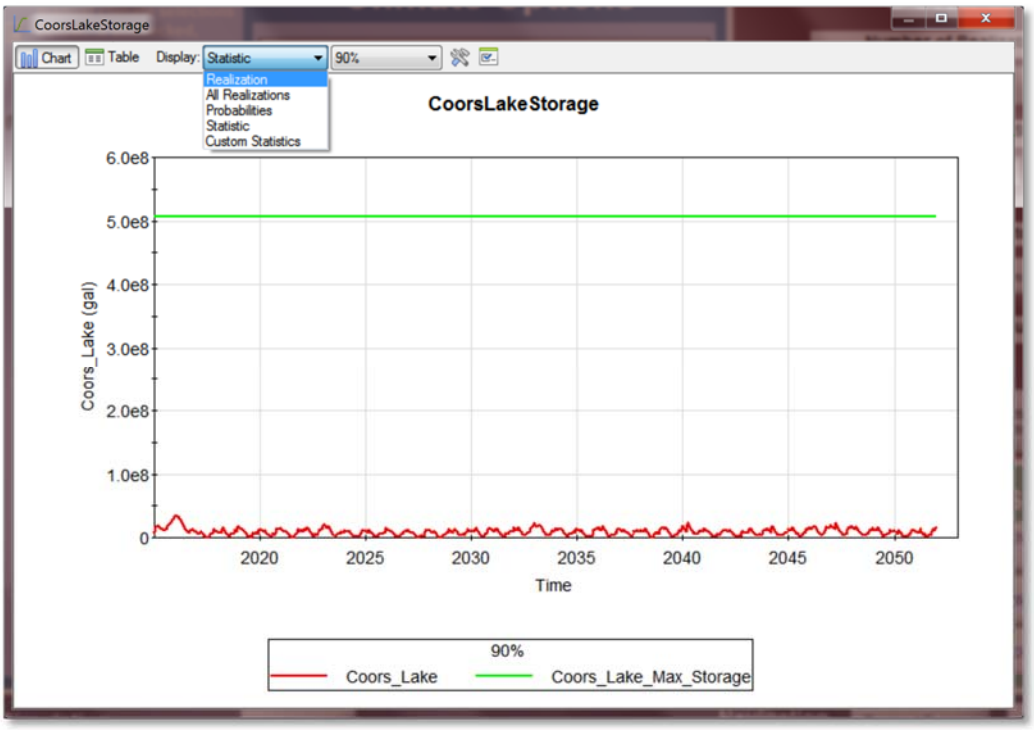


Figure 9: Base Case Results for Coors Lake Storage

An alternative scenario was run in which wet conditions were manually selected on the dashboard from May 2015 through December 2016. A 100-yr, 48-hr storm was then superimposed on these wet conditions starting on December 15, 2016. The results are shown in Figure 10. Coors Lake water storage peaks at 70 million gallons in December 2016. This leaves approximately 436 million gallons of excess storage capacity in Coors Lake. No overflow from Coors Lake is anticipated.

Both the base case and wet scenarios indicate that that overflow from Coors Lake is extremely unlikely in the future assuming all inflows are natural (i.e., precipitation and runoff).

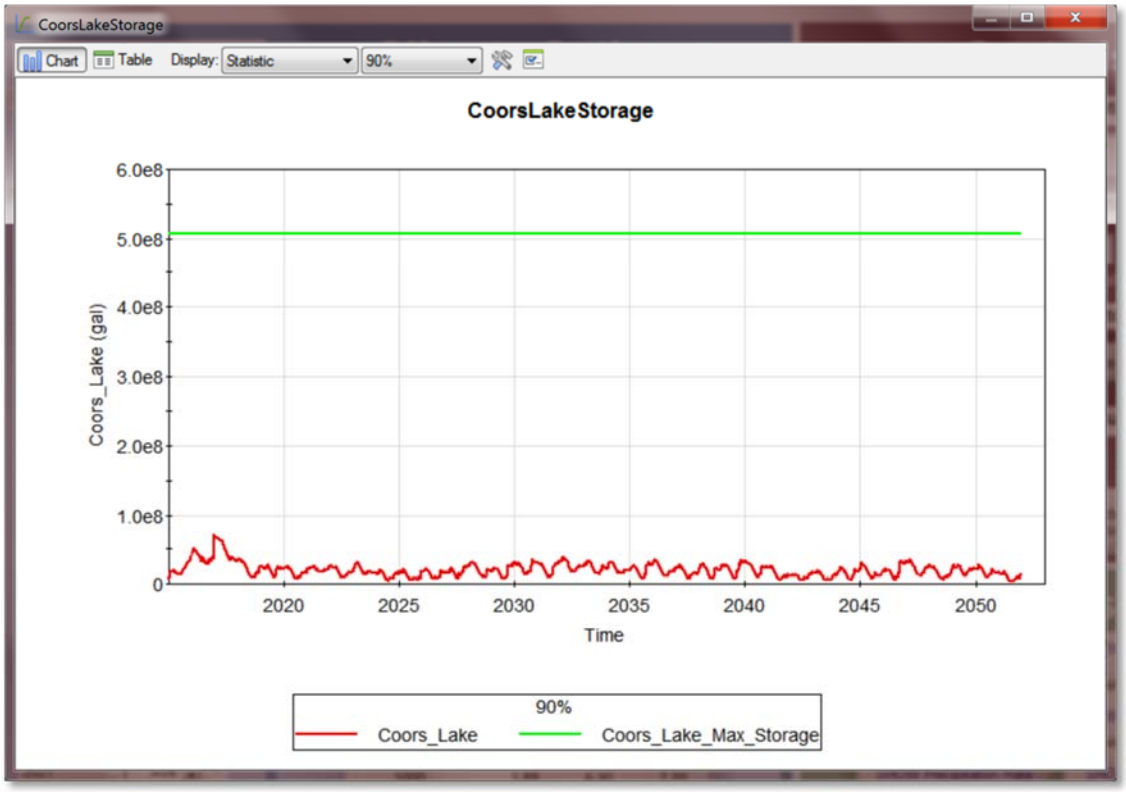


Figure 10: Wet Case Results for Coors Lake Storage

Summary and Conclusion

The entire upper Copper Creek catchment drainage area, including the existing Coors Lake area, was cut off from downstream surface waters prior to 1970 as a result of mining and stockpile development. *See* Figure 2. Coors Lake appears to have formed in the early 1980s as a result of stockpiling of mine waste rock. Coors Lake developed in the dry depression upstream of the stockpiled materials within the already isolated upper Copper Creek catchment. *See* Figures 1, 3, and 4.

Coors Lake has been maintained by rainfall and runoff most of the time since its development with occasional additional inflow associated with water management since the late 1980s. There have been periods when the area has been dry and periods when water levels have been higher than they are today.

Under the current hydrologic regime, if the lake level were to rise to elevation 3,810 feet amsl, water would discharge into a small depression to the northwest of the lake (Figure 5). However, hydrologic modelling of the system indicates that under wet but natural conditions, with no additions to Coors Lake from excess mine water, it is extremely unlikely that the water level in Coors Lake would ever reach elevation 3,810 feet amsl. *See* Figures 9 and 10.

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