0030

Document Information Form

Mine Number: C/007/006

File Name: Incoming

To: DOGM

From:

Person N/A

Company N/A

Date Sent: N/A

Explanation:

IMPACT TO CULINARY WATER SUPPLIES

cc:

File in:
C/ 007 , 006, Incoming
Refer to:
- ☐ Confidential
- ☐ Shelf
- ☐ Expandable

Date _____ For additional information

contaminants over a relatively short period of time and that water quality would quickly return to premined conditions. According to a report recently completed for the Castle Valley Ridge area (U.S.G.S., 1988) chemical changes to water quality have occurred at inactive mines. Information provided indicates that increases in such parameters as calcium, magnesium, sulfate and bicarbonate were reported. According to the study completed at the Mohrland mine located to the south and east of the Gentry Ridge lease area:

> "...increased sulfate concentrations and decreased pH are probably caused by oxidation of sulfide minerals. Some, but not all, of the increase in sulfate may be from dissolution of gypsum that is used in the mine for dust control.... Water quality changes occur soon after part of a mine is abandoned.
>
> The water from this part of the mine (speaking of a collapsed section) is more acidic, more mineralized, and contains a greater concentration of sulfate compared with water from the active part of the mine... and ...Geochemical changes resulting from roof collapse after abandonment may increase the solubility of strontium minerals present in the Blackhawk Formation."

The fracturing of rock formations above the coal seam apparently exposes new surfaces and creates a fresh contact face for the transfer of minerals. Water quality diagrams presented in the Castle Valley report show increases in calcium between an active and abandoned mine section on the order of 3.4 to 6.9 meq/l. Increases in magnesium, sulfate and bicarbonate were from 2.0 to 5.0, 0.4 to 4.7 and 5.0 to 7.3 meq/l respectively. Because of the proximity to the CPMC permit area, and because of the similarity in hydrogeology, it is anticipated that similar variations may occur within the permit area.

Impact to Culinary Water Supplies

Culinary water supplies potentially located within the flow path of ground waters which could even remotely be potentially impacted by CPMC operations include the Tie Fork Wells. Potential impacts to Birch and Bear Canyon springs are believed to be negligible to nonexistent. A review of geological structure tends to indicate that the Tie Fork wells are located along the Eastern Boundary Fault of the Pleasant Valley Graben, while Birch and Bear Canyon springs are located in general orientation with the Western Boundary Fault of the Bear Canyon Graben.

It is believed that the general hydrologic flow paths feeding these water supplies (especially Tie Fork) is fault related and may be from the north through the CPMC permit area. Some of the water is believed to originate from Nuck Woodward Canyon, move southward through the Eastern Boundary Fault of the Pleasant Valley graben and enter the area of Tie Fork wells. It may also be possible for water to enter the fault in Nuck Woodward Canyon, move southward along the Eastern Boundary Fault of Pleasant Valley, south southeastward across Gentry Ridge toward the Western Boundary Fault of the Bear Canyon Graben, then southward towards Birch and Bear Canyon springs. The complexity and additional length of the later flow path greatly reduces the potential for impact on both Birch and Bear Canyon springs by mining.

The stability of flows within the Tie Fork water supply indicates that the recharge source consists of a large drainage area and that it is not readily influenced by surface sources. Little to no seasonal variation (except a temporary response to an earthquake which occurred in 1988) has been noted in the supply over n springs on the other hand show marked changes through

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the period of record, are influenced by drought, show seasonal variation and are probably influenced by heavy localized precipitation events.

Further clarification of spring impacts has been made possible by the joint efforts of CPMC and CVSSD. A comparison of data collected from the Upper and Lower Tie Fork wells, Big Bear Spring, Little Bear Spring, and Birch Spring; with historic mining within Gentry Ridge has provided some interesting revelations. Graphs provided within Exhibit 728a show the following mining impacts to the springs noted.

Tie Fork Wells. As indicated elsewhere, an earthquake resulted in a temporary increase in flow rates of approximately 70% from this source during the later part of 1988. Flows generally returned to normal over the next four year period, at which time longwall mining within the Gentry Ridge tract began to intercept the local ground water table (within the later part of 1991 or early spring of 1992). By the summer of 1993 it was evident that flows within the source were declining, and continued to do so until the summer of 1995 wherein they again began to rebound. This general rebound began within a few months of termination of longwall mining. By the summer of 1996 flows from the source had returned to a value exceeding the pre-earthquake peak flow. In summary, there appears to have been a direct and rapid impact to this source by the mining within Gentry Ridge. The spring now appears to have fully recovered.

Long term impacts to Tie Fork wells may also include changes to water quality since water will re-enter mine workings upon abandonment and follow the general dip of the mined coal seam to the south southwest. If sufficient voids exist within the fault system to carry the in-mine water, then the natural flow paths will be re-established and total recharge will be restored to the Tie Fork system. It is even possible that an additional amount of water may be recharged to the Tie Fork system if it is found that other in-mine waters are re-directed to the same point of recharge, and if the geologic formation will carry the increased flow volummes.

A deterioration of water quality is possible to the Tie Fork wells under this recharge scenario if 1) waters are indeed connected and 2) water is not filtered adequately through natural media before reaching the Tie Fork wells. This deterioration of water quality may be mitigated naturally if the source of Tie Fork water is deep and not heavily influenced by fault waters found within the Gentry Ridge faults encountered within the mine.

Analyses have been completed for uniform flow conditions which evaluate the impact that a potential contamination source may have on the sandstone units lying beneath minable coal within Castle Valley ridge, and possibly eventually the Tie Fork Wells. These analyses are based upon a dispersion and subsequent dilution of the contaminant as it moves down gradient away from the mined area. Assumptions used for the calculations shown in Exhibit 728e include:

- The initial contamination source extends the full width of the projected mining within Gentry Ridge to a height of eight feet.
- Vertical permeabilities are ten times less than horizontal permeabilities (10H:1V).
- The contaminant plume disperses at an angle of 30°. A greater dispersion angle results in less downstream impact.

These assumptions were applied to two separate conditions. Under the first condition it was assumed that any contamination source would be limited to the Spring Canyon sandstone unit. This condition would