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DIVISION OF
OIL, GAS & MINING

January 12, 1990

Dr. Dianne R. Nielson, Director
Utah Division of Oil, Gas and Mining
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Salt Lake City, UT 84180-1203

Subject: Water pollution and fish kill in Grassy Trail Creek from Sunnyside Reclamation and Salvage, Inc.'s 002A outfall point (UPDES Permit No. UT-0022942)

Dear Dianne:

As you know, Sunnyside Reclamation and Salvage, Inc. (SRS) has had three unlawful discharges during 1989, that represented pollution (Utah Code 23-15-6) to a substantial segment of Grassy Trail Creek. Their 002A outfall point (UPDES Permit No. 0022942) located at the Sunnyside Coal Mines (ACT-007-007) in Carbon County, Utah has been the pollution source in all three instances. The enclosed report details the pollution problems and associated fish kills.

The pollution event that began March 24, 1989 (2,000 gallons of 5% oil:95% water emulsion) totally killed all fish life in a 3.3 mile section of Grassy Trail Creek - 1,122 trout valued at \$1,662.74 (reference April 14, 1989 and April 17, 1989 correspondence from Timothy Provan to Don Ostler and Dianne Nielson, respectively).

The second pollution event that began April 15, 1989 coated the substrate along a 0.76 mile length of Grassy Trail Creek (between Pole and Pasture Canyons) with a layer of flocculant. The flocculant remains today and trout did not successfully spawn in that material during spring of 1989. Until the flocculant is removed from the stream's substrate, successful spawning cannot occur (reference correspondence from Larry Dalton to Bill Malencik and David Ariotti, April 21, 1989; and correspondence from Timothy H. Provan to Dianne Nielson, October 10, 1989).

The third and most recent pollution event began December 16, 1989. An emulsion oil spill (1,097 gallons of a 5% oil:95% water emulsion) again killed all fish life in a 3.3 mile section of Grassy Trail Creek. Ninety-nine trout valued at \$331.21 were lost (reference attached report).

All three spill events during 1989 reduced macroinvertebrate populations in the polluted zone of Grassy Trail Creek as compared to an immediate upstream area. The first oil spill in March reduced number of specimens for macroinvertebrates by 58% (3.3 mile downstream) to 91% (200 feet downstream). The spill in April measured at the same locations as in March reduced number of specimens by 43% and 50%. The oil spill in December reduced number of macroinvertebrated specimens by 62% (200 feet downstream) (reference correspondence from Timothy H. Provan to Don Ostler and Dianne Nielson, April 14, 1989 and April 17, 1989, respectively; and correspondence from Larry Dalton to Bill Malencik and David Ariotti, April 21, 1989; and correspondence from Timothy H. Provan to Dianne Nielson on October 10, 1989).

The following mitigation recommendations are provided for your consideration.

1. Utah Division of Wildlife Resources must be reimbursed \$1,993.95 by Sunnyside Reclamation and Salvage, Inc. for monetary value of the 1,221 fish killed by their pollution events in March and December, 1989.
2. The company must determine and demonstrate a suitable technique for removing soluble or emulsified oil from mine water. Spills in 1989 demonstrated that fish were killed while technology or existing materials failed to clean the water.
3. The company should expeditiously develop a detailed written plan that is available to all mine personnel so that inadvertent releases of soluble or emulsified oil does not occur.
 - a. Mine water contaminated with soluble or emulsified oil during routine mining practices should be diverted to underground sumps or old workings where it can be treated to remove the oil.
 - b. Automatic mechanical safeguards in the oil emulsion mixing and delivery system need to be established. Breakdowns in the current system have resulted in two unnecessary fish kills during 1989.
4. Future management of the ponds by the company should be such that frequent cleaning occurs. Also, one pond should be maintained empty while the other is in operation. If an inadvertent oil spill occurs, the mine water discharge could be directed to the empty pond. This will allow additional time to deal with contaminants before a discharge occurs. Both ponds need gated valves so that contaminants can be held and not automatically released, as is the case now.
 - a. Pond 002A now has a layer of coal fines and oil that has been precipitated to the bottom due to flocculant and other contaminants. Mine water discharge should be diverted to pond 002B. Pond 002A should be allowed to dry and be dredged. Pond sediments must be disposed of in an appropriate manner.

- b. Routine water quality monitoring and biomonitoring by the company should be increased. Physical and biological evidence in the stream demonstrates historic mine water discharges having high nutrient loads, toxic contaminants and coal fines.
5. In order to maintain the wild trout quality of the stream, restocking will be accomplished through natural downstream drift and capture/transplant of wild trout from the drainage. This will require four man-days effort (\$480) by Division biologists, and two vehicles traveling 140 miles @ \$0.32/mile (\$44.80). The company should be required to reimburse the Division \$524.80 for this procedure.
6. Because of the first fish kill, a substantial loss of angling opportunity has occurred. Experience in other drainages suggests that recovery of the fish population will take three or more years. We suggest that mitigation for this loss can be accomplished by the mine allowing public walk-in access for the life-of-the-mine along the full length of stream and at the Whitmore (Grassy Trail) Reservoir. Trespass along the stream has never been an issue, although the reservoir has been closed to trespass by the company. We would not recommend vehicle access for the public beyond the existing facilities or gate. The Division of Wildlife Resources would appropriately manage Whitmore Reservoir to accommodate the anticipated increase in angler use. No increase in use by anglers along the creek is anticipated. Please understand, this is only a suggestion that would help pacify public concern for the loss of a significant fishery. Implementation should be at the mine's discretion.
 - a. The mine should be encouraged to erect an informational sign near the mouth of the canyon indicating that the stream and reservoir are open to public walk-in access for purposes of angling.
7. Mitigation as riparian enhancement and stream substrate review should occur to compensate for damage to the aquatic habitat, reduction in macroinvertebrate populations and loss of all age classes of fish.
 - a. We recommend that the mine fence the stream such that livestock grazing is precluded between the reservoir and Sunnyside town. This will stabilize streambanks, reduce sediment loading, improve substrate conditions and allow for cooler summertime temperatures due to shade. An enhanced riparian will increase available detritus for use as forage by macroinvertebrates. An improvement in the macroinvertebrate population will enhance forage conditions for the fish. Also, greater stability in the stream's environment will result, ultimately benefiting the structure of the fish population.
 - b. The substrate in the 0.76 mile segment of Grassy Trail Creek that is now coated with flocculant should be monitored through spring runoff to see if any breakdown, scouring or movement of the flocculant

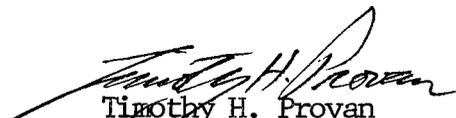
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material has resulted. After spring runoff we would like to revisit this issue and determine course of action, if any.

We would also recommend a task force review, with manufacturers, of flocculant toxicity to fish and potential alternative products that may be more environmentally positive.

Thank you for an opportunity to provide comment on this situation. If you have any further questions, please coordinate with the Resource Analyst, Larry Dalton (telephone 637-3310), in our Price regional office.

Sincerely,



Timothy H. Provan
Director

Enclosures

POLLUTION OF GRASSY TRAIL CREEK, 1989

Sunnyside Reclamation and Salvage, Inc. (SRS), -- P.O. Box 99, Sunnyside, Utah 84539 -- has had three unlawful discharges during 1989 from their 002A outfall point (UPDES Permit No. 0022942). This outfall point discharges an average of 1.65 million gallons per day (2.55 cfs) and is located in Pole Canyon on the Company's Sunnyside Coal Mine (ACT-007-007) property. Each discharge (March 24, April 15 and December 16) resulted in pollution (Utah Code 23-15-6) to a 3.3 mile segment of Grassy Trail Creek that lies in the lower reach of stream section No. 1. It supports protected aquatic wildlife (trout) and macroinvertebrates. These animals represent a biotic community as defined by Utah's coal mining regulations.

Description of Natural Environment

Natural flows in Pole Canyon are only intermittent. The 2.55 cfs mine water discharge from the 002A or 002B outfall points flows approximately 300 feet down Pole Canyon to its confluence with the perennial Grassy Trail Creek (N2 NE4, sec. 29, T14S, R14E, SLBM, Carbon County, Utah). Grassy Trail Creek without the mine water has an average annual discharge of 9.89 cfs (1978-1984) with a range of 0.04 (Feb. 1981) to 631 (May 1983) cfs during that same period of record.

Grassy Trail Creek, as a trout fishery, has two distinct areas (Figure 1). The two mile long stream Section No. 2 between Grassy Trail Reservoir and Water Canyon is the best reach due to less sedimentation and improved riparian habitat. Stream Section No. 1 is 5.6 miles long and lies between East Carbon City and Water Canyon. It shows substantial degradation due to livestock grazing and sedimentation from tributary drainages. Periodic mine water discharges and other mining activity over the years has impacted Section No. 1. Particularly evident are accumulations of coal fines in the substrate. If mine water discharges were of equal quality to the receiving stream, the

fishery downstream from the outfall point(s) would be better than the upstream areas due to increased flows. Unfortunately, such is not the case due to poor quality of mine water being discharged.

Trout in sufficient numbers to support sport angling activity have been reported by early community residents. Likely, Colorado cutthroat trout inhabited Grassy Trail creek prior to fish culture manipulations by man. Prior to 1969, no records exist concerning fisheries management of Grassy Trail Creek. Management by DWR of Grassy Trail Creek between 1969 and 1979 was with annual stockings of 400 to 1,000 catchable sized rainbow trout. Since 1980, fish management has been with self sustaining rainbow and brown trout populations through natural reproduction. Experimental stockings of 1,000 brown trout fingerlings per year occurred nearby to the coal preparation facilities area in 1984, 1985 and 1986. Albino rainbow trout (surplus brood stock 2 lbs. or larger) were stocked in 1987 (179 fish) and 1988 (150 fish).

Nongame fish are not evident in Grassy Trail Creek between East Carbon City and the Grassy Trail Reservoir. Populations estimates from electro-sampling by DWR in 1983, 1987 and 1989 showed 160 (57.1 lb/acre), 561 and 1,535 (163 lb/acre) trout per mile, respectively in Section 2. During 1983, only rainbow trout were present. By 1987, 66% of the fish population were rainbow and 34% were brown trout. A similar relationship of 74% rainbow and 26% brown trout was observed in 1989.

Population estimates from electro-sampling by DWR in 1969, 1970, 1983, 1986, 1987 and 1989 showed 90, 180, 0, 88, 87 and 350 trout per mile in Section No. 1. Prior to 1989, all of the fish sampled were rainbow trout. By 1989, 85% of the fish population were rainbow and 15% were brown trout.

March 24, 1989 Pollution Event (9 continuous days, plus 4 other separate days)

A spill of approximately 2,000 gallons of 5% oil:95% water emulsion occurred during late evening on Friday, March 24, 1989, within the Sunnyside No. 1 coal mine. The emulsion, containing a soluble Texaco oil product (D1670

LWM concentrate), is used as a hydraulic fluid in the shields on longwall mining units. SRS personnel noted the emulsion's milky-white discharge from Pole Canyon into Grassy Trail Creek early morning, Saturday, March 25, 1989. Pole Canyon was only discharging mine water at the time of the spill. Oil and grease standards for Pole Canyon's discharge are to be less than 10 mg/l

SRS personnel measured oil and grease in Pole Canyon as 59 mg/l on Saturday, March 25, 1989. Follow-up measurements by mine personnel showed oil and grease to be 256 mg/l on March 27, 1989 and 18.8 mg/l on March 29, 1989. By April 2 and 4, 1989, the level had dropped to 7.2 mg/l and 6.9 mg/l, respectively. These analysis were performed by Chem Tech in Murray, Utah.

Utah Division of Oil, Gas & Mining (DOGGM) measured the oil and grease level as 20.7 on march 29, 1989. Water pollution and violation of the UPDES permit spanned the nine day period from March 24 through April 1, 1989.

Note: the oil and grease level reached 11.5 mg/l on April 12, 1989 as measured by the Bureau of Water Pollution Control. Other exceedances have occurred in 1989, also (12.4 mg/l on April 28, 22.6 and 24.9 mg/l on May 5, as well as 16.1 mg/l on May 10). Each of these dates also represent pollution events.

Flow in Grassy Trail Creek, as measured by DWR on 3/28/89, upstream from Pole Canyon, was 3 cfs. Thus, Pole Canyon's mine water discharge equated to 46% of the 5.55 cfs flow in the impacted zone of Grassy Trail Creek. Grassy Trail Creek was turned a milky-white color due to the soluble oil emulsion.

On Monday, March 27, 1989 (2:30 pm) SRS began to inject a flocculant (Thatcher Chemical Product, T-Floc-IF9) into the mine water discharge system. Its purpose was to pull the oil out of the solution and deposit it on the bottom of the settling pond at Pole Canyon. The T-Floc was injected at a rate of 5 gallons/hr (72.7 ppm). The rate of injection for the flocculant was decreased on March 28, 1989, to 2 gallons/hr (29.2 ppm). The rate of injection for the flocculant was again decreased on April 1, 1989, to 0.67 gallons/hr (0.40 ppm).

DOGM (Bill Malencik) was notified by SRS personnel of the problem during late morning, Saturday, March 25, 1989. Notification by the mine of the U.S. Environmental Protection Agency (EPA) and the Utah Department of Health concerning the oil spill was not expeditious. Their notification occurred during late afternoon of Monday, March 27, 1989. Mike Reed (EPA) and Don Hilden (Utah Division of Environmental Health) were only told of the exceedance for the 10 mg/l oil and grease standards at the UPDES discharge point in Pole Canyon. No discussion of an oil spill into Grassy Trail Creek was made by the mine.

An anonymous complaintant notified DWR of the problem early morning Tuesday, March 28, 1989, since dead fish were evident in the stream. Simultaneously, the U.S. Fish and Wildlife Service and the Utah Department of Health's Division of Environmental Health in Price notified DWR. DWR proceeded to assess the polluted stream on that date.

DWR inspected the problem area on March 28 and 29, 1989. A 3.3 mile length of stream below the confluence of Pole Canyon with Grassy Trail Creek evidenced 72 dead trout (67 rainbow and 5 brown). This equates to 20 dead rainbow trout and 2 dead brown trout observed per mile. All dead fish were adults, 10 inches or longer. The fish appeared to have been dead for several days. No fish loss was evident upstream from the point of pollution. Intensive evaluation of the fish kill and instream habitat degradation due to oil emulsion was planned for April 7, 1989, when the water would be clear.

DWR's electro-survey of the stream on April 7, 1989 showed only two fish, both of which were adults, alive in the polluted zone (sample station 1-2-2 and 1-3C-1). An adjacent nonpolluted zone (sample station 1-3 B-1) showed a trout population of multiple age classes which equated to 350 fish/mile (85% rainbow and 15% brown). Fish biomass in the polluted zone was reduced to 4.6 lb/acre (1.97 kg/mile) compared to 126 lb/acre (54.25 kg/mile) immediately upstream in a nonimpacted area. Thus, a 97% loss in fish numbers -- 1,122 trout (954 rainbow and 168 brown)-- and a corresponding 96% decrease of fish biomass occurred in the 3.3 mile long impact zone (Table 1).

Macroinvertebrate populations in the polluted zone were also damaged. They were decreased in number of organisms by 91% (15 specimens/square foot) immediately below the point of pollution to 58% (67 specimens/square foot) 3.3 miles downstream as compared to the 160 specimens per square foot in the adjacent nonpolluted upstream segment.

The T-Floc, which is believed to have been injected after the aquatic organisms died, can be toxic due to its sodium hydroxide element. Total mortality of aquatic organisms, as reported by Thatcher Chemical Company, has been measured at 100 to 110 ppm (TTM, 96 hr). The highest level of T-Floc was 73 ppm, and it would have been diluted by 55% when it reached Grassy Trail Creek. Likely, the flocculant had no impact on the stream.

Monetary value of the 1,122 fish that were killed amounted to \$1,662.74 (Table 2). In addition, an opportunity for an unknown number of recreational fishing days has been lost. The substrate was temporarily damaged due to adherence of the emulsified oil and penetration of that oil into the interspaces of the gravels. This damaged the macroinvertebrate population, which represents the forage base for fish life.

Utah Department of Health's Division of Environmental Health issued a violation (Administrative Order 189-02) to SRS for the oil spill/fish kill on July 21, 1989. DOGM likely issued a violation on this event, also. No definitive action by either agency is known to have been taken to date (12-22-89) on these violations.

April 15, 1989 Pollution Event (5 days)

Sunnyside Reclamation and Salvage, Inc.'s mine water discharge pipe that flows 1.65 million gallons of water per day into the Pole Canyon UPDES (UT0022942) discharge pond (002A) broke on Saturday, April 15, 1989. The pipe was repaired that day, but its support blocks slipped allowing the water to discharge against the pond's bottom rather than onto the surface. The intense velocity of the water stirred up a black sludge primarily composed of coal

finer flocculated oil and other settleable solids. Thus, the pond discharged a high level of suspended solids into Grassy Trail Creek.

During a routine mine inspection on Tuesday, April 18, 1989, a DOGM employee noted the ongoing discharge. DOGM (Brent Stettler) notified DWR (Larry Dalton) and Walt Donaldson) early morning on Wednesday, April 19, 1989. It was then recommended that DOGM advise the mine to place a series of sediment traps in Grassy Trail Creek at the farthest downstream point where the sludge could be identified in order to contain it in the shortest reach of stream possible. DWR, on April 19, 1989, notified Southeastern Utah's Division of Environmental Health (secretary) of the problem, also. The mine, on April 19, 1989, placed a series of temporary sediment traps and filter dikes below the Pole Canyon Pond's effluent in order to lessen the amount of sludge reaching Grassy Trail Creek. The pond's effluent remained clouded with coal fines as of April 20, 1989, in spite of a series of straw settling basins and filter dikes placed by the mine in the 300 foot segment of Pole Canyon Creek between the pond and Grassy Trail Creek. DWR had contacted the mine (Carl Housekeeper) at 1:15 pm, April 19, 1989, to express concern relative to damage of Grassy Trail Creek's substrate from the black sludge. The mine was advised that it would be prudent to contain the sludge in as short a stream length as practicable in order to lessen further impacts to the stream's biotic system and ultimate cleanup costs.

On April 20, 1989, DOGM personnel (Bill Malencik, Lynn Kunzler and Brent Stettler) DWR (Larry Dalton) personnel, as well as mine officials (Bill Balaz and Carl Housekeeper) inspected the problem area. A 0.76 mile length of Grassy Trail Creek between Pole Canyon and Pasture Canyon evidenced substantial degradation of the substrate due to adherence of the sludge. Macroinvertebrates were essentially eliminated (only crane fly larvae could be found) in the upper segment immediately below Pole Canyon. (Note, macroinvertebrates had earlier been reduced by 91% due to an oil spill caused by the mine. Fish life had also been eliminated by the March 24, 1989 oil spill.) It was determined that the substrate needed to be mechanically cleaned of the sludge in order to facilitate recovery of the stream's biotic communities.

It was recommended that the mine immediately place a series of at least five temporary sediment traps/filter dikes within Grassy Trail creek at Pasture Canyon. A larger series could be needed, but the goal was to discharge clear water from the last filter dike. Such action will contain the sludge within the stream length where it currently exists. There was evidence that flows were moving the material further downstream; a precipitation event would accelerate that process. Cost for cleanup could be minimized by the company containing the sludge where it now lies. Additionally, the mine must stop the discharge of sludge from the Pole Canyon Pond (002A). It was hoped that Exxon Chemical Company would find an environmentally safe technique to precipitate the suspended solids with an anion treatment and/or float them with a cation treatment and ultimately capture the coal fines and other compounds of the sludge. (Sam Deal --Exxon Chemicals-- was on site 4-20-89, assessing how to treat the Pole Canyon pond in order to control suspended solids.)

The pond (002A) continued to discharge throughout spring, summer and fall of 1989; it has yet (12-22-89) to be dredged and cleaned. A new pond (002B) has been constructed, but was not put into use until 12-17-89. (Another emulsion oil spill on 12-16-89 prompted use of th 002B pond.) Discharge of sludge from the 002A pond persisted for several weeks. Department of Health's Division of Environmental Health issued a violation (Administrative Order 189-02) to SRS for discharging coal fines into Grassy Trail Creek on July 21, 1989. DOGM likely issued a violation on this event, also. No definitive action by either agency is known to have been taken to date (12-22-89) on these violations.

December 16, 1989 Pollution Event (3 days)

A spill of approximately 1,097 gallons of a 5% oil:95% water emulsion occurred during late evening on Saturday, December 16, 1989, within the Sunnyside No. 1 coal mine. The emulsion, containing a soluble Texaco oil product (D1670 LWM concentrate), is used as a hydraulic fluid in the shields on longwall mining units. SRS personnel noted the emulsion's milky-white

discharge from Pole Canyon into Grassy Trail Creek early morning, Sunday, December 17, 1989. Pole Canyon was only discharging mine water at the time of the spill.

Oil and grease standards for Pole Canyon's discharge are to be less than mg/l. SRS personnel measured oil and grease in Pole Canyon as 76.9 mg/l on Sunday, December 17, 1989. Follow-up measurements of Pole canyon discharge by mine personnel showed oil and grease to be 40.3 mg/l on December 18, 1989. Discharge from 002A pond stopped by December 19, 1989, since all water was diverted to the empty 002B pond. Water pollution and violation of the UPDES Permit spanned the three day period from December 16 through December 18, 1989.

Flow in Grassy Trail Creek, as estimated by DWR on 12-18-89, upstream from Pole Canyon, was 0.5 cfs. Thus, Pole Canyon's mine water discharge (0.78 cfs --352 gal/min-- as reported by SRS) equated to 61% of the 1.28 cfs flow in the impacted zone of Grassy Trail Creek. Grassy Trail Creek was again turned a milky-white color due to the soluble oil emulsion.

On Sunday (afternoon) , December 17, 1989, SRS began to inject a flocculant (Exxon Chemical Product, JAYFLOC-824) into the mine water discharge system. Its purpose was to pull the oil out of the solution and float it on the top of the settling ponds (002A and 002B) at Pole Canyon. Oil absorbency broms would then capture the oil. The JAYFLOC was injected into the mine water discharge at the rate of 0.0333 gallons/min (94.6 ppm).

DOGM (Bill Malencik) was notified by SRS personnel of the problem during late afternoon, Sunday, December 17, 1989. Notification by the mine of the U.S. Environmental Protection Agency (EPA) and the Department of Health concerning the oil spill was expeditious. Their notification of EPA (Mike Holmes) occurred during late afternoon of Sunday, December 17, 1989. Mike Herkimer (Utah Division of Environmental Health) was notified of the spill during the morning of Monday, December 18, 1989. DWR (Larry Dalton) was also notified by the mine that Monday morning. DWR personnel proceeded to assess impacts of the spill on Monday, December 18, 1989.

DWR inspected the problem area on December 18, 19 and 20, 1989. A 0.2 mile long transect along the stream below the confluence of Pole Canyon with Grassy Trail evidenced 6 dead trout (all rainbow). This equated to 30 dead trout per mile in the 3.3 miles of impacted stream length. All dead fish were adults. They had invaded this stream reach since the kill 9 months earlier. The fish appeared to have been dead for only a day or two. No fish loss was evident upstream from the point of pollution. Intensive evaluation of the fish kill and instream habitat degradation due to the oil emulsion was planned for December 19, 1989, when the water would be clear. Severe icing and milky water on December 18, 1989, restricted evaluation to just that zone between Pole and Pasture Canyons.

DWR electro-survey of the stream on December 19, 1989, showed no fish to survive in the polluted zone. Sampling immediately above that impacted zone showed a healthy trout population of multiple age classes. It compared to the 350 fish/mile (85% rainbow and 15% brown) documented in April, 1989. Fish biomass in the polluted zone was reduced to zero compared to 126 lb/acre (54.25 kg/mile) immediately upstream in a nonimpacted area. Thus, a 100% loss in fish numbers --99 rainbow trout-- and a corresponding 100% loss of fish biomass occurred in the 3.3 mile long impact zone (Table 1).

Macroinvertebrate populations in the polluted zone were damaged, also. They were decreased in number of organisms by 62% (30 specimens/square foot) immediately below the point of pollution as compared to the 93 specimens per square foot in the adjacent nonpolluted upstream segment.

The JAYFLOC, which is believed to have been injected after the aquatic organisms died, can be dangerous due to its 0.2% by weight formaldehyde element. It is known to cause squamous cell carcinomas in rats and is suspect of carcinogenic potential in man. Spill control procedures outlined in "Material Data Safety Sheets" (HDHA-P-18052, 11-22-88) for this product recommend to prevent spilled product ". . . from entering sewers, water courses or low areas." JAYFLOC was injected into the mine water discharge at a rate of 94.6 ppm (2 gal/hr Jay floc added to 352 gal/mine water discharge).

Formaldehyde only represented 0.2% of the JAYFLOC. Thus, formaldehyde was present in the mine water discharge at 0.19 ppm. Once the discharge entered the stream, it was even more diluted. The JAYFLOC represented a 0.01% solution. The manufacturer recommends use up to 1% solution (9,460 ppm JAYFLOC).

Indefinite exposure to formaldehyde at levels less than 10 ppm is likely safe for trout. The 1% solution of Jayfloc recommended by the manufacturer represents 18.9 ppm formaldehyde. Flow in the receiving water would have to be equal to the mine water discharge at a 1% solution in order for JAYFLOC to be safe.

Utah Department of Health's Division of Environmental Health and DOGM are continuing investigation of this December oil spill/fish kill.

The mechanism for kill of the fish and macroinvertebrates during the March and December oil spills was plugging of the gills by longchain hydrocarbons from the soluble oil. Such a reaction is immediate under high concentrations of oil. The UPDES discharge limit for oil and grease is 10 mg/l. The mine's discharge was many times that level.

Texaco has tested the emulsion (5% oil: 95% water) and reported that fathead minnows perished in a static system when 1,000 ppm were reached (LC 50, 96 hr). Daphnia also perished at the same level (LC 50, 48 hr). Without question, the trout (rainbow and brown) and macroinvertebrates of Grassy Trail Creek perished at levels much lower than Texaco would recommend.

John Neuhold, Fishery Ecologist and Assistant Dean, Department of Fish and Wildlife at Utah State University, indicated that soluble fractions of Wyoming crude oil caused mortality in rainbow trout fingerlings at levels ranging from 0.15 to 217 mg/l. In the same evaluation, fathead minnows perished at 5.4 mg/l. In both tests, flow-through rather than static systems were used, and the longer the time of exposure, the higher the mortality rate. Also, the U.S. Environmental Protection Agency's Water Quality Criteria Handbook (1976)

identified mortality in benthic organisms (macroinvertebrates) as occurring between 1 and 10 mg/l. Long term exposure of aquatic organisms to soluble oils can result in mortality due to the small chain aromatic hydrocarbons, also. They ultimately inhibit enzymatic actions in the metabolic process.

Monetary value of the 1,221 fish that were killed amounted to \$1,993.95 (Table 2) and 3.3 miles of stream is uninhabited by fish. In addition, an opportunity for an unknown number of recreational fishing days was lost in 1989. This lost opportunity will persist into 1990 and longer. The substrate along 0.76 miles of stream remains damaged from the April 15, 1989 sludge spill. Spawning did not occur successfully in 1989 and will not be successful until the substrate is cleaned. Then a year or two will be required for total reestablishment of the benthic organisms, and several years (at least 3) will pass before a fish population with multiple age classes is again present.

The public in Carbon County has always been interested in coal mining and mine/environmental issues. Historically, workers at the Sunnyside mine routinely and openly advised DWR of pollution problems in Grassy Trail Creek. Often, complaints were latent to when the episode occurred. More recently, input from employees has become anonymous, but more timely, exacting and factual. In either scenario, the public has had an expectation that DWR would take action to safeguard wildlife's environment proximal to the mine.

The East Carbon Wildlife Federation planted over 10,000 willow shoots in the Grassy Trail Creek drainage during 1986. They also placed several dozen sediment traps in tributary drainages. Their interest in enhancing Grassy Trail Creek's fishery has always been intense. Use of the fishery by local people is a regular occurrence, since it is the only trout fishery nearby to the community.

Early in the week of December 17, 1989, a concerned citizen anonymously called KUTV's news desk to report this most recent oil spill/fish kill. According to Reese Stein, "They were irate" about pollution to "their stream." DWR (SERO) was contacted by Mr. Stein (telephone) early morning on

December 19, 1989. At approximately 10:00 a.m., Larry Dalton returned KUTV's call, but Mr. Stein was not in. By noon, Mr. Stein recontacted Mr. Dalton and requested to interview DWR biologists and visit the Grassy Trail Creek area on December 20, 1989. DWR's Salt Lake City Office (Ralph Miles) was advised of the KUTV/DWR interview being planned.

On December 20, 1989, Mr. Stein and his cameraman interviewed DWR biologists at SERO, at the East Carbon City Park, and at the confluence of Pole Canyon and Grassy Trail Creek. (DWR biologists were making a final inspection of the fish kill.) Mr. Stein was advised that the site at Pole Canyon was private property owned by SRS. He indicated that if it were posted "No Trespassing" he would not enter the land. However, if it was not posted, he would film the spill at that location. He also indicated that if he was confronted by the mine (SRS), he would leave. The site was not posted and access was via a county road. Mr. Stein also interviewed mine personnel on December 20, 1989. A new release resulted.

**FIGURE 1
GRASSY TRAIL CREEK FISH KILL MAP**

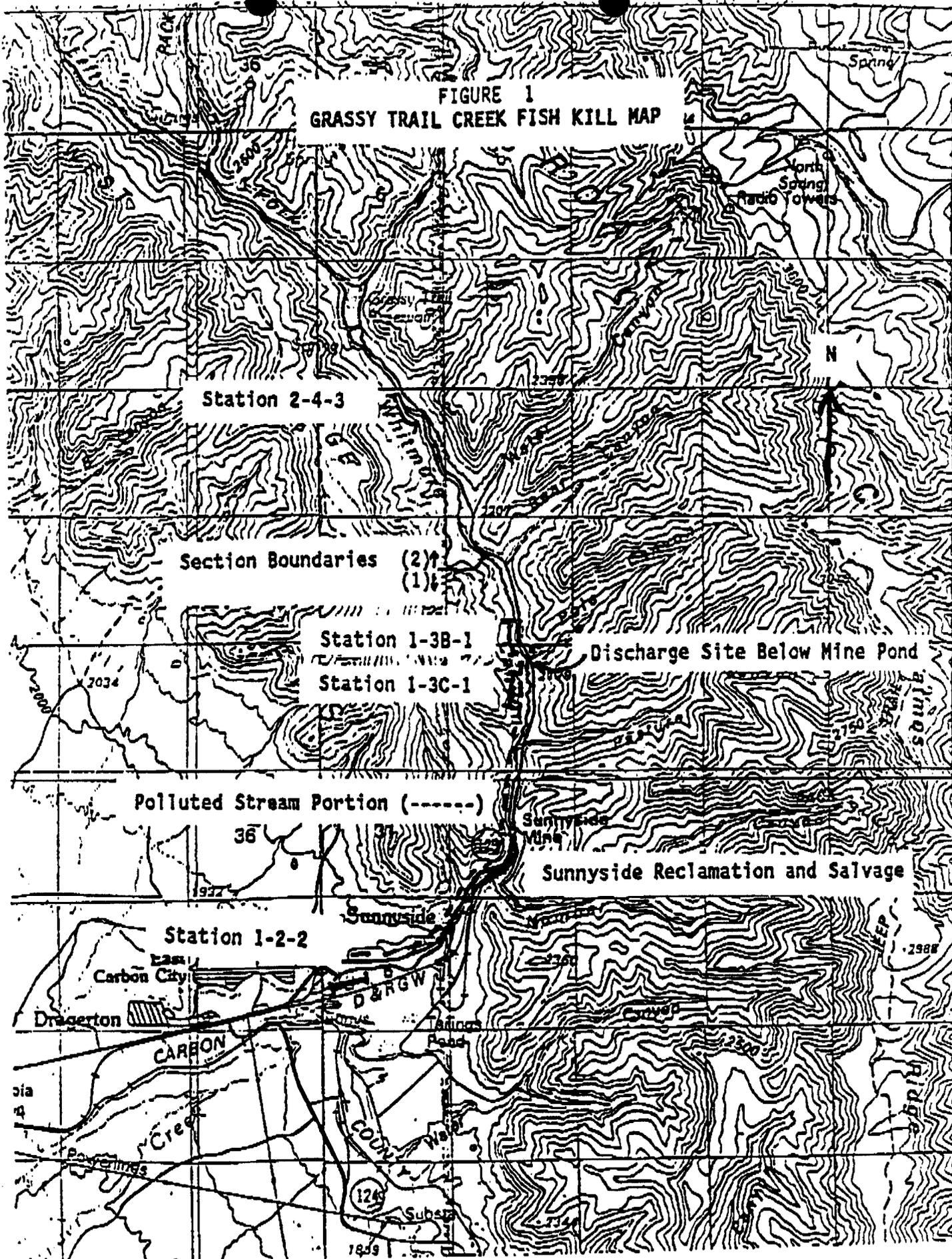


Table 1. Age and growth of trout collected with electrogear from Grassy Trail Creek, Utah, on April 7, 1989

Station	Species	Parameter	AGE					
			I	II	III	IV	V	VI (+)
1-2-2 ¹	Rbt	N						
1-3C-1 ²	Rbt	N			1		1	
		\bar{X} TL (mm)			212		230	
		\bar{X} W (g)			91		106	
		\bar{X} K			.96		.87	
1-3B-1 ³	Rbt	N		1	15	9	1	3
		\bar{X} TL (mm)		126	194	227	262	347
		\bar{X} W (g)		26	83	133	202	494
		\bar{X} K		1.30	1.12	1.13	1.12	1.17
	Brn	N		1			3*	1*
		\bar{X} TL (mm)		129			300	337
		\bar{X} W (g)		24			236	337
		\bar{X} K		1.12			0.87	0.99

*Assumed stocked as fingerling in 1984-5, respectively

1. Station 1-2-2 was not electrofished on 12-19-89, due to severe icing --emulsion oil in evidence. All fish presumed dead from emulsion oil.
2. Station 1-3C-1 was electrofished 12-19-89. No fish were found; all presumed dead due to emulsion oil spill on 12-16-89.
3. Station 1-3 B-1 electrofished on 12-19-89. A measured sample station was not sampled due to severe icing. However, random sampling showed all age classes of trout (rainbow and brown) to be present and trout were abundant.

Table 2. Monetary value of fish killed due to Sunnyside Reclamation and Salvage's pollutions of Grassy Trail Creek on March 24, and December 16, 1989. Methodology derived from "Monetary Values of Freshwater Fish and Fish Kill Counting Guidelines" (1982). Prepared by the Monetary Values of Freshwater Fish Committee and the Pollution Committee, American Fisheries Society; special publication No. 13 (ISSN 0097-0638); 40 pp.

Fish Kill		1979-80 Value	Consumer Price Index**	1989 Value (\$)
Size Class (% Total)	(Number of Fish)	(\$/Fish)/Total		
March 1989 Oil Spill/Fish Kill				
954 Rainbow Trout				
5" (3.5%)	33	0.39/\$ 12.87	56.9%	\$ 20.19
8" (52%)	497	0.67/\$332.99	56.9%	\$522.46
9" (31%)	296	0.83/\$245.68	56.9%	\$385.47
10" (3.5%)	33	1.06/\$ 34.98	56.9%	\$ 54.88
14" (10%)	95	2.06/\$195.71*	56.9%	\$307.07
168 Brown Trout				
5" (20%)	34	0.39/\$ 13.26	56.9%	\$ 20.81
12" (60%)	100	1.60/\$160.00	56.9%	\$251.04
13" (20%)	34	1.89.\$ 64.26	56.9%	\$100.82
			March Total:	\$1,662.74
December, 1989 Oil Spill/Fish Kill				
99 Rainbow Trout				
10" (16%)	15	1.06/\$ 15.90	64.8%	\$ 26.20
11" (14%)	14	1.33/\$ 18.62	64.8%	\$ 30.69
12" (28%)	28	1.60/\$ 44.80	64.8%	\$ 73.83
14" (28%)	28	2.74/\$ 76.72	64.8%	\$126.43
15" (14%)	14	3.21/\$ 44.94	64.8%	\$ 74.06
			December Total:	\$331.21
Grand Total:				\$1,993.95

*1979-80 value is \$1.89/lb since average 14" rainbow trout in December sample weighed 1.45 lb (660 grams).

*1979-80 value is \$1.89/lb since average 14" rainbow trout in March sample weighed 1.09 lb (494 grams).

*1979-80 value is \$1.89/lb since average 15" rainbow trout in december sample weighed 1.7 lb (770 grams).

**U.S. Bureau of Labor Statistics, Consumer Price Index (CPI-U). Note, the CPI for the March kill represented the increase from November 1979 to Fishery 1989, and the CPI for the December kill represented the increase from November, 1989.