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DWH

STATE OF UTAH
NATURAL RESOURCES
Oil, Gas & Mining

Norman H. Bangerter, Governor
Dee C. Hansen, Executive Director
Dianne R. Nielson, Ph.D., Division Director

355 W. North Temple • 3 Triad Center • Suite 350 • Salt Lake City, UT 84180-1203 • 801-538-5340

May 20, 1985

Ms. Nancy Groves
Purchasing Agent
Division of Purchasing
147 State Capitol
Salt Lake City, Utah 84114

Dear Ms. Groves:

RE: Justification for Selection of Consultant for Contract Work, Small Operator Assistance Program (SOAP), Requisition No. 587504, Summit Coal Company, PRO/043/008, Summit County, Utah

On May 15, 1985, the Division of Oil, Gas and Mining made a selection of the consultant to do the tasks outlined in the Request for Proposal under Requisition No. 587504 for the Small Operator's Assistance Program. Earthfax Engineering, Inc., was chosen from a group of nine applicants.

The two firms having the most technically adequate and most cost-effective bids were invited to a personal interview with five members of the technical mining staff at the Division. The other firm involved in the interview process was J. F. Sato and Associates, Inc., who came in at a low bid of $35,358.00 (without the optional drilling cost). Even though Earthfax submitted the second lowest bid ($36,960.00 without drilling costs), Earthfax was chosen for the SOAP contract for several reasons.

The Company has had extensive experience handling similar technical situations in the coal mining industry in Utah. The personnel of Earthfax have the best expertise needed to collect good baseline hydrologic data using cost-effective, state-of-the-art techniques and instrumentation. The firm has also worked a recent SOAP project in the state of Washington. The references contacted have excellent recommendations for the

firm. Finally, the bid was one of the lowest because the firm is very small and, therefore, probably lacks the overhead that larger consulting firms may have. No other firm evaluated was rated so high on the combination of the above factors.

Please find enclosed a copy of Earthfax's proposal. Should you have questions, please contact me.

Sincerely,

Dave Hooper
Reclamation Hydrologist

btb
Enclosure
cc: Lowell Braxton
Wayne Hedberg
0338R-42 & 43

85-5323

CONTRACTUAL AGREEMENT

SUMMIT COAL COMPANY

BOYER MINE

ACT/043/008, SUMMIT COUNTY, UTAH

UTAH DIVISION OF OIL, GAS AND MINING

REQUISITION NUMBER 587504

MAY 1985

UTAH DIVISION OF OIL, GAS AND MINING
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
(801) 538-5340

OAP Operations

5804- NM136

TABLE OF CONTENTS

CONTRACT NUMBER _____

ENGINEERING AGREEMENT

This contractual agreement is made and is effective as of this 24th day of May, 1985, by and between the Utah State Division of Oil, Gas and Mining, hereinafter "OWNER," and EarthFax Engineering, Inc., hereinafter "CONSULTANT."

1.1 This contract, hereinafter the "AGREEMENT," includes the following attachments made part of this AGREEMENT:

Form of Bid	Exhibit A
Schedule of Prices	Exhibit B
Scheduling Requirements	Exhibit C
Scope of Work and Specifications	Exhibit D
Services and Facilities Provided by OWNER	Exhibit E
Amendments to the AGREEMENT	Exhibit F

1.2 The work and services to be performed by the CONSULTANT under this Agreement is hereinafter referred to as the "WORK."

1.3 Except for things enumerated in Exhibit E, and as may be specified elsewhere in the AGREEMENT, CONSULTANT shall supply all labor and supervision, supplies, materials, tools, machinery and services necessary to perform the WORK.

ARTICLE II - OWNER'S AND CONSULTANT'S REPRESENTATIVES

2.1 OWNER's Representative hereinafter "REPRESENTATIVE" for the administration of this AGREEMENT is the person designated hereunder. CONSULTANT shall be notified if a new person is assigned the REPRESENTATIVE.

2.2 CONSULTANT's Respresentative hereinafter "CONTRACTOR" for the administration of this AGREEMENT is the person designated hereunder. The REPRESENTATIVE shall be notified if a new person is assigned the CONTRACTOR.

2.3 Any change or notice shall be made by written notice to CONTRACTOR. For the purpose of this Agreement, OWNER's REPRESENTATIVE is the person to whom CONSULTANT shall:

(a) refer all questions;
(b) give all notices;
(c) submit all requests for approvals and authorizations, and;
(d) submit all progress reports as required;
(e) submit all invoices.

2.4 Any notice given under this Agreement by either party is sufficient if given in writing by certified mail, return receipt requested, directed as follows:

Dave Hooper, Reclamation Hydrologist
(Owner's REPRESENTATIVE)

UTAH DIVISION OF OIL, GAS AND MINING
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
(801) 538-5340

Randolph B. Gziner, Project Manager
(Consultant Representative, CONTRACTOR)
EarthFax Engineering, ~~Consulting Engineers~~, Inc.
6542 South 670 West
Murray, Utah 84123
(801) 266-7471

ARTICLE III - SUBCONTRACTORS

3.1 There shall be no contractual relationship between OWNER and any subcontractor with respect to the WORK performed under the AGREEMENT. CONSULTANT shall be as fully responsible to OWNER for the acts and omissions of any subcontractor as CONSULTANT is for its own acts and omissions.

3.2 OWNER and CONSULTANT each binds himself, his successors, executors, administrators, and assigns to the other party of the AGREEMENT, and to the successors, executors, administrators, and assigns of such other party in respect to all of the covenants of the AGREEMENT. Neither the CONSULTANT nor OWNER shall assign, sublet or transfer his interest in this AGREEMENT without the written consent of the other.

ARTICLE IV - TERMS OF PAYMENT

4.1 OWNER shall promptly pay for services performed by the CONSULTANT as described herein.

4.2 OWNER shall reimburse CONSULTANT for services invoiced. All invoices must be a detailed and an auditable record which only include services performed to complete the WORK or ADDITIONAL WORK made part of the AGREEMENT. The CONSULTANT agrees to maintain an accounting system adequate to allocate costs in accordance with generally accepted accounting principles. Invoices for reimbursement of expenditures under the AGREEMENT must be filed promptly with the REPRESENTATIVE, by the tenth day of the month following the month in which services have been performed.

4.3 The OWNER shall pay for services in accordance with UNIT COST PRICES as set forth in Exhibit B and for only those services as set forth and required for completion of the WORK. The CONSULTANT agrees to complete all of the WORK pursuant to this Contractual AGREEMENT for a sum not to exceed $ 36,960.00 as set forth in Exhibit B, the AGREEMENT.

4.4 The OWNER shall withhold from payment an amount not to exceed 15 percent of the total cost of services for the WORK until all services and products pursuant to the AGREEMENT are delivered and completed by the CONSULTANT and the OWNER has accepted and approved said products and services.

ARTICLE V - TERMINATION OF AGREEMENT

5.1 The parties agree that the AGREEMENT may be terminated under the following conditions:

a. If, through any cause, CONSULTANT shall fail to fulfill in a timely and proper manner any of the obligations under the AGREEMENT, or if CONSULTANT shall violate any of the covenants, agreements, or stipulations of this AGREEMENT, the OWNER shall thereupon have the right to terminate the AGREEMENT by giving written notice to CONSULTANT of such termination and specifying the effective date thereof.

b. The OWNER may terminate the AGREEMENT upon thirty days (30) written notice to CONSULTANT in the event the state of Utah fails to appropriate sufficient funds to OWNER to meet its obligations under this AGREEMENT. In such event, CONSULTANT shall be entitled to receive just and equitable compensation for any satisfactory WORK completed up to the time of termination.

ARTICLE VI - INDEMNITY AND INSURANCE

6.1 CONSULTANT agrees to indemnify and hold harmless the state of Utah, OWNER, and their officers, agents, employees from and against any and all losses, damages, injury, liability and claims therefore, including claims for personal injury or death, damages to personal property and liens of workmen and materialmen, howsoever caused, resulting from negligent acts and omissions in the performance of the AGREEMENT by the CONSULTANT, its agents or employees. CONSULTANT agrees to be insured against such actions as described above and shall provide verification of such insurance to OWNER upon written request.

6.2 CONSULTANT shall be insured against loss or damage to reports, drawings, specifications, and other valuable documents associated with the project during their course of preparation, use and until completion of the WORK as set forth in this Agreement.

ARTICLE VII - INDEPENDENT CONTRACTOR

7.1 CONSULTANT shall be an independent Contractor, and as such shall have no authorization, express or implied, to bind the OWNER to any agreement, settlement, liability or understanding whatsoever and not to perform any acts as agent for the OWNER except as herein expressly set forth.

ARTICLE VIII - TIME OF COMPLETION

8.1 The WORK under this AGREEMENT shall be commenced upon notice to do so and shall be completed within 415 calendar days after date of said notice to proceed. CONSULTANT also agrees to pay liquidated damages in accordance with the Article IX if CONSULTANT's delay makes the damages applicable.

ARTICLE IX - LIQUIDATED DAMAGES

9.1 This AGREEMENT has been awarded in part on the CONSULTANT's stated ability to perform the WORK in a timely manner. Performance of the WORK as indicated in Exhibit C - Scheduling Requirements, is influenced by and subject to the OWNER's ability to provide information and materials to the CONSULTANT within the times indicated in Exhibit E - Services and Facilities Provided by OWNER.

9.2 Should the CONSULTANT fail to complete the WORK within the time agreed upon in CONSULTANT's proposal, or within such additional time as may have been allowed by extension, there shall be deducted from any moneys due or that may become due the CONSULTANT the sum of $200.00 per day, for each and every calendar day beyond the agreed or extended completion day, that the WORK remains uncompleted. Such sum is fixed and agreed upon by the OWNER and the CONSULTANT as liquidated damages due the OWNER by reason of the inconvenience and added costs of administration, engineering and supervision resulting from the CONSULTANT's default, and not as a penalty.

9.3 Permitting the CONSULTANT to continue and finish the WORK or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, shall in no way operate as a waiver on the part of the OWNER of any of his rights under the contract.

ARTICLE X - WARRANTY OF SERVICES

10.1 Professional services to be performed in conjunction with the WORK with regard to findings and recommendations made by the CONSULTANT shall be in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied.

10.2 Technical or engineering related questions encountered within the WORK may require further information from the CONSULTANT during the construction processes in implementing the products provided by the CONSULTANT. It is expected that the CONSULTANT will help to alleviate and resolve any conflicting, missing, or unsubstantiated information found within the final Bid Specifications or the Engineering Report.

ARTICLE XI- MISCELLANEOUS

11.1 CONSULTANT shall, in performing the terms granted by this Engineering AGREEMENT, comply with the provisions of all valid state laws, rules and regulations and in particular with Regulation III, Section 1, passed by the Industrial Commission of Utah on June 9, 1965, which implements the Utah Anti-Discrimination Act of 1965.

11.2 CONSULTANT shall not have the right to assign or sublease this Contractual AGREEMENT in whole or in part without the prior written consent of the OWNER.

11.3 This AGREEMENT shall be governed by and interpreted under the laws of the State of Utah.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement on the day and year first above written.

FOR THE CONSULTANT:

ATTEST:

Secretary of Corporation
Or Witness

CONSULTANT:

BY: Richard B. White

TITLE: President

TAXPAYER ID #: 87-0391347 (Federal)

FOR THE OWNER:

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES

APPROVED FOR AVAILABILITY OF FUNDS:
DIVISION OF OIL, GAS & MINING

Lowell P. Braxton, Administrator

Dianne R. Nielson, Director

Carl Roberts, Budget/Accounting

APPROVED AS TO FORM:
ATTORNEY GENERAL'S OFFICE

BY:
Assistant Attorney General

APPROVED FOR EXPENDITURE:
UTAH STATE DEPARTMENT OF FINANCE

For: Director of Finance 23 May 85

CONSULTANT (Firm Name) EarthFax Engineering, Inc.

EXCEPTIONS TO TERMS AND CONDITIONS OF ENGINEERING AGREEMENT

If CONSULTANT takes exception to any part of the Engineering Agreement, state so here, if no exceptions are taken, state "None":

The bid prices and schedules shown in this proposal do not include the construction, subsequent testing, and associated analyses of an on-site monitoring well. Appendix A of this contract discusses methodologies that will be used to construct and test this well if the decision is made to do so. An estimate of the cost of this well is also included in Appendix A of this contract but is not considered binding on this contract at present.

EXHIBIT A - FORM OF BID

A.1 FIXED NOT-TO-EXCEED PRICE BID

A.1.1 The WORK shall be performed using UNIT COST PRICES as defined in Section A.2. Utah State Procurement Regulations allow for a Fixed-Price Contract with price adjustments, when conditions for such adjustments are specified in the Contract. The FIXED NOT-TO-EXCEED PRICE BID shall be a maximum price for the WORK and only adjusted under the following conditions: (1) when the final invoiced amount from the CONSULTANT is less than the FIXED NOT-TO-EXCEED PRICE bid, the difference will result in savings to the OWNER. The form of payment is based on cost reimbursement of UNIT COST PRICES set forth in Section A.2; (2) when ADDITIONAL WORK, as allowed in Section A.3, is required, the FIXED NOT-TO-EXCEED PRICE may be increased.

A.1.2 CONSULTANT shall show a breakdown of costs as shown in Exhibit B, Schedule of Prices, for the WORK. The total of these UNIT COST PRICES pursuant to A.2 shall establish a FIXED NOT-TO-EXCEED PRICE BID which shall become binding in this AGREEMENT.

A.1.3 The CONSULTANT's proposal shall become attached to and part of this AGREEMENT and the WORK. Omissions or errors in the CONSULTANT's proposal shall not release the CONSULTANT from the WORK as specified elsewhere in the AGREEMENT. Changes in AGREEMENT, WORK, costs, or alternatives offered in the CONSULTANT's proposal shall not supersede or be included unless approved by the OWNER herein or in accordance with Exhibit F.

A.1.4 CONSULTANT and OWNER agree that the FIXED NOT-TO-EXCEED PRICE is the maximum amount to be invoiced or to be paid to the CONSULTANT for the WORK. In specific instances, CONSULTANT and OWNER may further negotiate the Fixed-Price based on ADDITIONAL WORK pursuant to Section A.3.

A.2 FIXED - UNIT COST PRICES

A.2.1 CONSULTANT shall show a breakdown of costs as shown in Exhibit B, Schedule of Prices, that define UNIT COST PRICES which are part of this Agreement.

A.2.2 CONSULTANT agrees to perform the WORK as described in this Agreement and shall be paid by OWNER for said WORK the UNIT COST PRICES as shown in Exhibit B, Schedule of Prices.

A.3 FIXED - PRICE AMOUNT FOR ADDITIONAL WORK

A.3.1 ADDITIONAL WORK is defined herein as WORK authorized by a change order pursuant to Exhibit F beyond the defined WORK (Scope of Work) contained in this agreement.

A.3.2 CONSULTANT agrees to perform ADDITIONAL WORK beyond the defined Scope of Work included in this AGREEMENT if required and approved by the OWNER. ADDITIONAL WORK may be required should the project expand or during the process of engineering, bidding or construction, unanticipated problems arise which must be resolved for completion of the products intended by the WORK or construction.

A.3.3 The CONSULTANT shall not invoice or be paid by the OWNER for additional work performed prior to amending the CONTRACT pursuant to Exhibit F (Amendments to the Agreement) and establishment of an amended FIXED NOT-TO-EXCEED PRICE amount including the ADDITIONAL WORK. An amount shall be established and approved by the OWNER and the CONSULTANT and shall be included in the FIXED NOT-TO-EXCEED PRICE amount prior to undertaking such work.

A.3.4 The FIXED NOT-TO-EXCEED PRICE amount shall be established at the UNIT COST PRICES set forth in Exhibit B, Schedule of Prices and post cost summary sheets.

EXHIBIT B - SCHEDULE OF PRICES AND COST SUMMARY SHEETS

B.1 FIXED NOT-TO-EXCEED PRICE AMOUNT

B.1.1 CONSULTANT hereby agrees to perform WORK as described in this Agreement and the OWNER agrees to pay CONSULTANT in the amount not to exceed $36,960.00 for said WORK, as a Fixed-Price amount.

B.1.2 OWNER shall pay amounts invoiced only at UNIT COST PRICES submitted by the CONSULTANT on a regular basis as described in Article IV of this AGREEMENT.

B.2 UNIT COST PRICES

B.2.1 CONSULTANT shall complete the following cost summaries.

B.2.2 These prices shall become attached to and part of this agreement and shall be considered UNIT COST PRICES for each line item and the FIXED NOT-TO-EXCEED PRICE for the total sum of all items contained in the WORK.

B.2.3 In the event of a change in Scope of WORK, ADDITIONAL WORK or in termination of the WORK, UNIT COST PRICES shall be used to determine adjustments to the FIXED NOT-TO-EXCEED PRICE amount.

B.3 COST SUMMARIES

The following cost summaries shall be completed by the CONSULTANT and made binding as part of the AGREEMENT upon execution.

CONSULTANT (Firm Name) EarthFax Engineering, Inc.

B.3.1. TOTAL FIXED-PRICE COST ESTIMATE

WORK as described in the task description to complete the baseline data collection and analysis, probable hydrologic consequences report and statement of chemical and physical characteristics of the overburden.

Total FIXED NOT-TO-EXCEED PRICE Amount

$ 36,960.00

CONSULTANT (Firm Name) EarthFax Engineering, Inc.

B.3.2 BREAKDOWN OF ESTIMATED COSTS BY TASKS

Task D.1.1. Surface Water Baseline Information

Estimated cost of Task D.1.1., as described in WORK.

Cost Estimate $ 11,580.00

Task D.1.2. Ground Water Baseline Information

Estimated cost of Task D.1.2., as described in WORK.

Cost Estimate $ 7,040.00

Task D.1.3. Overburden, Coal Strata and Underburden Information

Estimated cost of Task D.1.3., as described in WORK.

Cost Estimate $ 2,040.00

Tasks D.1.4. and D.1.5. Results and Conclusions and Reports

Estimated cost of Tasks D.1.4., and D.1.5., as described in WORK.

Cost Estimate $ 16,300.00

Consultants breakdown and interpretation of WORK to be accomplished for all tasks stated above are shown in the CONSULTANT's Proposal, Appendix A.

CONSULTANT (Firm Name) EarthFax Engineering, Inc.

B.3.3 UNIT COST ESTIMATES FOR MANPOWER

CONSULTANT's UNIT COST PRICE for manpower used in this the Fixed-Price Cost:

	DESCRIPTION NAME - TITLE	% TIME ON PROJ.	QTY.	$/UNIT	$ESTIMATE
1.	R.B. Gainer - Prin. Eng. Geo.	40	330	30.00/hr	9,900.00
2.	R.B. White - Prin. Hydro.	60	490	30.00/hr	14,700.00
3.					

	DESCRIPTION NAME - TITLE	% TIME ON PROJ.	QTY.	$/UNIT	$ESTIMATE
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
					=========
	TOTAL COST ESTIMATE FOR MANPOWER USED				24,600.00

Comments:

CONSULTANT (Firm Name) EarthFax Engineering, Inc.

B.3.4 UNIT COST ESTIMATES FOR MISCELLANEOUS SERVICES

CONSULTANT's UNIT COST PRICE's for miscellaneous services, materials, equipment, and so forth used in the Fixed-Price cost estimate:

	DESCRIPTION	QUANTITY	UNIT	$/UNIT	$ESTIMATE
1.	Mileage	2600	mi	$0.25	650.00
2.	Per diem	22	days	10.00	220.00

	DESCRIPTION	QUANTITY	UNIT	$/UNIT	$ESTIMATE
3.	Printing	10,000	pg.	0.05	500.00
4.	Graphics (subcontract)	100	hr	12.00	1200.00
5.	Crest-stage gages / Single-stage sed. samplers	4	ea.	20.00	80.00
6.	Gaging stations	2	ea.	160.00	320.00
7.	Water-level recorders (rental)	2	ea.	600.00	1200.00
8.	Water samples	28	ea.	235.00	6580.00
9.	Overburden/underburden chem. anal.	6	ea.	115.00	690.00
10.	Overburden/underburden phys. anal.	6	ea.	30.00	180.00
11.	Coal analyses	3	ea.	40.00	120.00
12.	Channel bank material phys. anal.	6	ea.	20.00	120.00
13.	Channel bed phys. anal.	6	ea.	50.00	300.00
14.	Misc. (telephone, postage, publication purchase, etc.)	1	lot	200.00	200.00
15.					
					=========
	TOTAL COST ESTIMATE FOR MISCELLANEOUS ITEMS				12,360.00

Comments:

CONSULTANT (Firm Name) EarthFax Engineering, Inc.

EXHIBIT C - SCHEDULING REQUIREMENTS

C.1 SCHEDULE OF ENGINEERING WORK

C.1.1 CONSULTANT shows on the atttached sheet in calender form, on a weekly schedule, the activities required for the WORK described in this AGREEMENT for each activity based on actual start date for the work on May 24, 1985.

C.1.2 Constraints and float allowed for in the calendar are identified and explained for the schedule. Considerations for weather, access and normal delays are accounted for in these constraints.

CONSULTANT (Firm Name) EarthFax Engineering, Inc.

C.2 SCHEDULE OF ENGINEERING WORK

CONSULTANT shows below in calendar form, on a weekly schedule, the activities required for the WORK and the target completion date of the WORK, based on actual start date for the work on May 24, 1985:

ESTIMATED TARGET DATE FOR COMPLETION July 14, 1986

Explanation of schedule and calendar shown here or specify as attached:

See schedule on page 15 of Appendix A

EXHIBIT D - SCOPE OF WORK

D.1. TASK DESCRIPTION

The following narrative outlines the information to be collected and the work tasks to be performed by the CONSULTANT. This work plan summarizes only the minimum standards that are to be met to fully characterize the hydrologic and geologic studies needed to fulfill the goals of the Utah Small Operator's Assistance Program (SOAP).

D.1.1 SURFACE WATER BASELINE INFORMATION

Determine characteristics of the local watersheds and and subwatersheds. Information for each watershed should include:

--description of general site conditions;

--physical location(s), elevation range and average slope;

--vegetation and soils information that determines the patterns of rainfall-runoff characteristics of the area.

Locate on a map (1" - 1,000') and include a brief description of all natural streams, channels, man-made diversions, lakes, reservoirs and impoundments in the permit area and within one square mile of the boundaries of the permit area. Such information should include:

--classification of stream channels (perennial, intermittent, ephemeral);

--channel length and general configuration;

--if intermittent or perennial, an estimate of average annual flow;

--area and capacity of existing reservoirs, lakes and impoundments;

--use of all waters and tabulation of all water rights.

Research and compile all existing publications and information pertaining to historical flow records and general climatological data. Included at a minimum should be:

--average annual high, low and mean flows of significant drainages in and around the permit area;

--historical extremes of said drainages;

--average monthly tabulations of precipitation, potential evapotranspiration and temperature.

Estimate erosion potential and resulting sediment yield from the disturbed and undisturbed areas of the proposed mine site.

Construct and maintain instrumentation necessary to collect sufficient baseline surface water data to satisfy the OWNER's guidelines. The potential monitoring stations are located on the accompanying map. Variations of the monitoring locations can be granted upon the OWNER's consultation.

The surface water monitoring guidelines are as follows:

--The data collection period shall be for one year;

--A recording rain gage shall be installed onsite and records kept of all runoff-producing rainfall events;

--Flows shall be measured monthly on Chalk Creek sites and on sites on the intermittent stream bisecting the permit site until flows cease. The ephemeral channels shall be measured as flows occur;

--Water quality data shall include sampling on Chalk Creek quarterly with two samplings encompassing approximate high and low flow periods. The intermittent ephemeral should be sampled every other month during flow periods. The ephemeral channels should be sampled at least twice during the year. Field measurements shall be taken during each sampling time;

--Laboratory parameters that are to be measured are listed in Table 1;

--Field parameters that are to be measured are also listed in Table 1.

In addition, a detailed physical description of Chalk Creek and the intermittent stream shall include:

--stream gradient profiles;

--an evaluation of geologic, geomorphic and hydrologic characteristics;

--description of stream bed, bank materials and riparian vegetation;

--calculation of the 10-year and 100-year return period flows for each channel;

--at least three cross-sectional diagrams for each channel showing stream configurations for the 10-year and 100-year return period flows. The locations of the cross-sections should represent stream sections that could potentially be affected by mining. Show locations of all cross-sections on a base map.

The CONSULTANT shall include narratives describing data collection dates, methods, instrumentation and reporting. All calculations and use of hydrologic empirical methodology should be outlined. Data summaries should be organized and presented in a concise manner.

Maps should be included that depict at a minimum:

--regional geography including permit area (1" - 2,000');

--local watersheds and subwatersheds (1" - 2,000');

--locations of all surface water bodies and points of diversion corresponding to water rights within one square mile of boundaries of permit area (1" - 2,000');

--locations of all monitoring sites and rain gage(s) (1" - 500').

D.1.2. GROUND WATER BASELINE INFORMATION

Describe general characteristics of the ground water regime in the region encompassing the mine site. Research and reference publications pertaining to local ground water conditions. Description particulars shall include:

--map(s) and narrative describing possible aquifer boundaries, faults, geologic structures relating to ground water occurrence;

--specific formations that are known to be or potentially can be water-bearing strata.

Inventory and describe all major seeps and springs in the proposed permit area and within a radius of one mile of the boundaries of the permit area.

--Inventory shall be done during the fall and spring seasons;

--Locate springs and seeps on a map of minimum 1" = 2,000' scale; indicate spring/fall occurrence and describe variation of flows during the two seasons. Indicate water rights and corresponding points of diversion.

Locate on a map of minimum 1" = 2,000' scale and describe all active and inactive wells within a radius of one mile of boundaries of permit area. Description should include:

--total depth, casing size, static water level, perforation levels, average flow, use of water and water rights;

--well logs (if available) for each well;

--information on oil well drilling operations in area.

Construct and maintain instrumentation necessary to collect sufficient baseline ground water data to satisfy the OWNER's guidelines. The potential monitoring points are located on the accompanying map. Variations of the monitoring locations can be granted upon the OWNER's consultation. It may be necessary to drill a monitoring hole in the west portion of the permit area in order to better characterize site-specific conditions. The CONSULTANT will be responsible for constructing a properly functioning ground water monitoring station. Prior to construction, specifications must be approved by the OWNER. The CONSULTANT's bid should reflect additional monitoring hole construction. The ground water monitoring guidelines are as follows:

--Data collection period shall be for one year;

--Ground water levels shall be measured monthly as weather and snow cover permits;

--Water quality samples shall be collected quarterly with two samples encompassing approximate high and low water table elevations. Field measurements shall be taken during each sampling time;

--Laboratory parameters that are to be measured are listed in Table 2;

--Field parameters that are to be measured are listed in Table 2.

Locate on a map of minimum 1" = 2,000' scale and describe for each ground water monitoring point:

--Diameter, total depth perforated (screened) intervals, static water levels, water rights, use and lithology of aquifer(s) supplying water to well.

The CONSULTANT shall include narratives describing data collection dates, methods, instrumentation and reporting. All calculations and use of hyrologic empirical methodology should be outlined. Data summaries should be organized and presented in a concise manner.

D.1.3 OVERBURDEN, COAL STRATA AND UNDERBURDEN INFORMATION

Core samples from the four borehole locations are available from the mine operator through the OWNER.

Include a site-specific description of geology within the permit area. A brief description of a regional geologic aspects may be necessary.

Borehole information shall include:

--map of suitable scale showing locations and datum elevation of holes. Include extent of old underground workings;

--submittal of borehole logs depicting lithology down to and including a minimum of 10 feet of stratum immediately below the lowest coal seam to be mined;

--identification and estimate of thickness of major strata and coal seam(s) within a resolution of 0.5 feet.

Chemical and physical analysis on core samples from each borehole shall include:

--representative samples from 20 feet of overburden, the coal stratum and at least 10 feet of underlying strata;

--analysis to determine potential acid- or toxic-forming sections and physical aspects of the overburden and underlying strata. Sampling parameters to determine these effects are summarized in Table 3;

--analysis to determine potential acid- or toxic-forming sections and physical aspects of the coal stratum to be mined should include pyritic sulfur tests, acid-base potential and determination of clay content;

--sample procedures will be defined in the briefing session.

The CONSULTANT shall include data summaries that are organized and presented in a concise manner.

D.1.4. RESULTS AND CONCLUSIONS

Results of analysis of surface water data should include at a minimum:

--site-specific peak flow and low flow determination for Chalk Creek and the intermittent channel;

--monthly graphical representation of average flows for Chalk Creek and the intermittent channel;

--correlation of all runoff events to corresponding precipitation amounts for all channels;

--chemical analysis for flows from all channels. Graphs should be included that depict seasonal variations in concentrations of all chemical constitutents at each sampling site;

--annual soil loss from undisturbed and typical disturbed areas should be estimated using actual soil data and acceptable methodologies.

Results of analysis of ground water data should include at a minimum:

--site-specific high and low water level determination for all monitoring sites;

--monthly graphical representation of average water levels for all monitoring sites;

--chemical analysis for samples from all monitoring sites. Graphs should be included that depict seasonal variation of concentrations of all chemical constituents at each sampling site;

--determination through pump tests, slug tests, etc., hydraulic conductivity, transmissivity, and storage coefficients/specific yields and average specific capacity (submit actual data resulting from tests);

--determination, to the extent possible, direction of ground water flow, recharge and potentiometric surface of the local aquifer(s).

Using available data, derive Water Budget for proposed permit area (may include surrounding areas).

Determination of Probable Hyrologic Impacts of mining at the proposed area and Statement of the Conditions of the overburden should include at a minimum:

--surface water impacts;

--ground water impacts;

--changes in hydrologic balance;

--overburden impacts to area;

--final conclusions reached as a result of investigation.

Suggest mitigative actions for the mine site:

--possible sediment pond location(s);

--possible sites for compliance water monitoring.

D.1.5. REPORTS

The CONSULTANT must submit a monthly narrative summary to the OWNER's REPRESENTATIVE. The summary must include an updated report of work tasks accomplished, copies of technical results, a compendium of field data collected, a summary of certified laboratory results, identification of any problems encountered at the mine permit area and an estimate of cumulative expenditures by the CONSULTANT to date. The report is to be furnished to the OWNER's REPRESENTATIVE by the 15th of the following month. The CONSULTANT shall designate its primary contact for coordination with the OWNER when this contract is initiated.

Significant findings that would affect the development of the Summit Coal Company mine plan should be reported as soon as possible.

A draft report compiled in the format designated in D.1, "Task Description" (any order is acceptable) must be submitted to the the OWNER's REPRESENTATIVE within 240 days of receipt from effective date of contract. Results and conclusions do not have to be submitted at this time as data collection may not be complete enough to make adequate conclusions.

The OWNER will review the document for technical and physical deficiencies and return the report to the CONSULTANT within thirty (30) days accompanied by a detailed critique of inadequacies. The CONSULTANT then has thirty (30) days to address and correct the inadequacies and return the draft report to the OWNER.

The CONSULTANT shall submit a complete draft report by the 365th day of the effective date of the contract; the OWNER shall review the report and return the document to the CONSULTANT within a thirty (30) day period. A final copy of the report must be submitted by the CONSULTANT to the OWNER by day 415.

Upon approval of the final report by the OWNER, the CONSULTANT must submit eight (8) copies of the final report before the contract is terminated.

D.2. SPECIAL INSTRUCTIONS

1. During the period of this task order, the CONSULTANT shall not contact the mine operator or OSM directly; all requests to the mine operator or OSM will be made through the OWNER. The CONSULTANT will not release the data collected, the determination, the statement or the results of any analyses without written consent of the OWNER.

2. All conclusions must be supported by references, data and other sources of information. If a conclusion is based on the knowledge and experience of the professional staff, this shall be stated in the analysis.

3. The CONSULTANT will not be held accountable for delays caused by the regulatory authority.

4. A briefing session will be held in the OWNER's office in Salt Lake City at the onset of this work. A site visit at the mine will be required also, following the briefing session.

TABLE 1

SURFACE WATER BASELINE WATER QUALITY PARAMETERS

Field Measurements:

- Flow
- pH
- Specific Conductivity (umhos/cm)
- Temperature (C^o)
- Dissolved Oxygen (ppm)

Laboratory Measurements: (mg/l)

- Settleable Solids
- Total Suspended Solids
- Total Dissolved Solids
- Total Hardness (as $CaCO_3$)
- Aluminum (Al)
- Arsenic (As)
- Barium (Ba)
- Boron (B)
- Carbonate (CO_3^{-2})
- Bicarbonate (HCO_3^-)
- Cadmium (Cd)
- Calcium (Ca)
- Chloride (Cl^-)
- Chromium (Cr)
- Copper (Cu)
- Fluoride (F^-)
- Dissolved Iron (Fe)
- Lead (Pb)
- Magnesium (Mg)
- Manganese (Mn)
- Mercury (Hg)
- Molybdenum (Mo)
- Nickel (Ni)
- Nitrogen: Ammonia (NH_3)
- Nitrate (NO_3^-)
- Nitrite (NO_2)
- Potassium (K)
- Phosphate (PO_4^{-3})
- Selenium (Se)
- Sodium (Na)
- Sulfate (SO_4^{-2})
- Sulfide (S^-)
- Zinc (Zn)
- Oil and Grease
- Cation-Anion Balance

TABLE 2

GROUND WATER BASELINE WATER QUALITY PARAMETERS

Field Measurements:

- Water Levels
- pH
- Specific Conductivity (umhos/cm)
- Temperature (C^{o})

Laboratory Measurements: (mg/l)

- Total Dissolved Solids
- Total Hardness (as $CaCO_3$)
- Aluminum (Al)
- Arsenic (As)
- Barium (Ba)
- Boron (B)
- Carbonate (CO_3^{-2})
- Bicarbonate (HCO_3^{-})
- Cadmium (Cd)
- Calcium (Ca)
- Chloride (CL^{-})
- Chromium (Cr)
- Copper (Cu)
- Fluoride (F^{-})
- Dissolved Iron (Fe)
- Lead (Pb)
- Magnesium (Mg)
- Manganese (Mn)
- Mercury (Hg)
- Molybdenum (Mo)
- Nickel (Ni)
- Nitrogen: Ammonia (NH_3)
- Nitrate (NO_3^{-})
- Nitrite (NO_2)
- Potassium (K)
- Phosphate (PO_4^{-3})
- Selenium (Se)
- Sodium (Na)
- Sulfate (SO_4^{-2})
- Sulfide (S^{-})
- Zinc (Zn)
- Cation-Anion Balance

TABLE 3

OVERBURDEN ANALYSES PARAMETERS

Parameter	Reported As
- pH	Hydrogen ion activity
- Conductivity	mmhos/cm at 25°C
- Saturation	Percent
- Particle Size Analysis	Percent clay, silt, sand and very fine sand
- Texture	USDA textural class
- Soluble Ca, Mg and Na	meq/l
- Sodium absorbtion ratio	SAR calculated from soluble Ca, Mg and Na concentrations
- Carbonates	Percent
- Selenium	ppm to a lower detection limit of 0.1
- Boron	ppm
- Nitrate-Nitrogen	ppm
- Molybdenum	ppm to a lower detection limit of 0.1
- Mercury	ppm
- Acid Potential	meq H/100g or percent sulfur
- Neutralization Potential	percent $CaCO_3$ or tons $CaCO_3$/ 1,000 tons material
- Acid-base Potential	tons $CaCO_3$/1,000 tons material
- Arsenic	ppm

EXHIBIT E - SERVICES AND FACILITIES PROVIDED BY DOGM

E.1 The OWNER shall provide to the extent possible, all information that has been gathered in the preliminary study for the Project. Specifically, the following items will be furnished to the CONSULTANT or made available for the CONSULTANT's use:

E.2 Any site-specific information that OWNER has which would be helpful to the Consultant in accomplishing the Work.

E.3 The OWNER will provide Hydrologists or Geologists as needed for field consultation and guidance during the term of this AGREEMENT.

EXHIBIT F - AMENDMENTS TO THE AGREEMENT

F.1 Parts of all of the CONSULTANT's Proposal shall become attached to and part of this AGREEMENT and the WORK (see Appendix A). Omissions or errors in the CONSULTANT's Proposal shall not release the CONSULTANT from the WORK as specified elsewhere in the AGREEMENT. Changes in AGREEMENT, WORK, costs, or alternatives offered in the CONSULTANT's Proposal shall not supercede or be included unless approved by the OWNER.

F.2 The negotiated scope of work, costs and alternatives agreed on by the OWNER and the CONSULTANT shall become attached to and part of this AGREEMENT.

F.3 The OWNER shall require amendments to the AGREEMENT to be in the form of a change order, signed by both parties and similar in form to the change order shown on the following page.

F.4 Change orders shall become attached to and part of the AGREEMENT under the terms of the AGREEMENT with changes as stipulated on the change order and shall not release the CONSULTANT from any other terms or conditions that apply and are a part of the AGREEMENT.

CONTRACT CHANGE ORDER

UTAH DIVISION OF OIL, GAS AND MINING
355 West North Temple, 3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

To:_____ Date:_____
Address:_____ Contract No. _____
_____ Activity # _____
_____ Organization #_____

Project Name:_____ Change Order No._____

You are hereby requested to comply with the following changes from the contract plans and specifications:

ITEM NO.	DESCRIPTION OF CHANGES QUANTITIES, UNIT PRICES, SCHEDULE, ETC.	DECREASE	INCREASE

THE SUM OF $_____ IS HEREBY ADDED TO (DEDUCTED FROM) THE TOTAL CONTRACT PRICE, AND THE TOTAL ADJUSTED CONTRACT PRICE TO DATE THEREBY IS $_____.

THE TIME FOR COMPLETION IN THE CONTRACT IS [UNCHANGED, INCREASED, DECREASED] BY ____ CALENDAR DAYS. CONTRACT SHALL EXPIRE ON _____ __, 19__.

THIS DOCUMENT SHALL BECOME ATTACHED TO AND BECOME AN AMENDMENT TO THE CONTRACT AND ALL PROVISIONS OF THE CONTRACT WILL APPLY HERETO.

Approved by Contract Rep:_____ Date:_____

Approved by Admin, MRDRP:_____ Date:_____

Approved by Asst Atty Genl:_____ Date_____

Accepted by Contractor:_____ Date:_____

Approved by DOGM Budget Officer:_____ Date:_____

Approved by Director:_____ Date:_____

Approved by Divn of Finance:_____ Date:_____

APPENDIX A

PROPOSAL TO PROVIDE SMALL OPERATOR ASSISTANCE PROGRAM SERVICES FOR THE BOYER MINE, SUMMIT COAL COMPANY

Submitted to

UTAH DIVISION OF PURCHASING
Salt Lake City, Utah

Submitted by

EARTHFAX ENGINEERING, INC.
Salt Lake City, Utah

April 30, 1985

TABLE OF CONTENTS

PROPOSAL TO PROVIDE SMALL OPERATOR ASSISTANCE PROGRAM SERVICES FOR THE BOYER MINE, SUMMIT COAL COMPANY

1.0 INTRODUCTION

Summit Coal Company has proposed to develop an underground coal mining operation (the Boyer Mine) on a small tract of land located in Summit County, Utah approximately one mile east of the town of Upton. To aid in the collection of the hydrologic and overburden data necessary to obtain a permit to mine coal, Summit Coal Company applied to the Utah Division of Oil, Gas, and Mining (DOGM) under the Small Operator Assistance Program (SOAP) for aid and technical assistance.

EarthFax Engineering, Inc. is pleased to submit this proposal to the Utah Division of Purchasing to provide the necessary services to complete the Summit Coal Company SOAP project. The services to be provided by EarthFax will include installation of hydrologic monitoring stations, review of literature and other data sources, collection of field hydrologic and geologic data, and preparation of a report describing local hydrologic and geologic conditions as required in the Request for Proposal dated April 3, 1985. The objectives of this project are to meet the needs of regulations promulgated by DOGM with respect to a determination of the probable hydrologic consequences of mining and reclamation (UMC 795.16[b][1]) and a statement of the physical and chemical nature of the overburden, coal, and underburden (UMC 795.16[b][2]).

This proposal is divided into five sections, including this introduction. Section 2.0 presents the technical approach for the project, followed by a discussion of related experience in Section 3.0. Qualifications of key personnel to be involved in the project are provided in Section 4.0. Section 5.0 presents cost information for the project.

2.0 TECHNICAL APPROACH

The Summit Coal Company SOAP project is designed to gather the necessary data to assess the potential hydrologic and geologic impacts of proposed coal mining activities at the Boyer Mine. A general discussion of local hydrogeologic conditions is presented here to aid in understanding the technical approach to the project presented subsequently in this section.

The project area lies between the Wasatch Mountains to the west and the Uinta Mountains to the east. The area has been structurally affected by the large orogenic activities which created both ranges of mountains. Numerous folds, faults, anticlines, and synclines are evident and have been mapped throughout the area. Of particular note is the Dry Canyon Anticline whose north-south axis lies within a few hundred feet of the eastern edge of the permit boundary (Trexler, 1966).

The permit area is located on the west dipping limb of the Dry Canyon Anticline where a small window of the Frontier Formation has been exposed by uplift and subsequent erosion. This west dipping limb (15° west) which joins the Dry Canyon Anticline with the Clark Canyon syncline to the west has been fractured and faulted. An unnamed, high-angle fault appears to cross through the permit area (Trexler, 1966). If the fault is present within the permit boundary, and creates an offset within the Chalk Creek Member of the Frontier Formation, it could have a direct effect on the groundwater quality and movement into or away from the permit area.

Precipitation at the site averages about 20 inches, approximately 60 percent of which occurs during the period of October through April (Thompson, 1983). Temporally, streamflow in the area is subject to wide variations, with peak runoff normally occurring between the middle of April and the middle of June (Gates et al., 1984). Drainage from the site is to Chalk Creek, a perennial tributary of the Weber River.

2.1 Hydrologic Investigation

2.1.1 Literature and Data Search. Immediately following contract award, an information search will be conducted by EarthFax personnel to identify published and unpublished sources of data and literature describing hydrologic conditions in the permit and adjacent areas. This search will include a detailed review of plans and analyses that have been previously submitted to DOGM by Summit Coal Company for the Boyer Mine.

A library search will be conducted to obtain available published data and supplement the inhouse library maintained by EarthFax regarding hydrologic conditions in the region. In addition, selected agencies will be contacted to obtain unpublished data and reports. These agencies will include the U.S. Geological Survey, U.S. Bureau of Reclamation, U.S. Soil Conservation Service, Utah Division of Water Rights, Utah Division of Water Resources, Utah Water Research Laboratory, Utah Geological and Mineral Survey, and the Summit County Planning Office.

Maps will be obtained to identify drainage-basin characteristics in the permit and adjacent areas (area, slope, elevation range, etc.) and to locate surface-water bodies (streams, diversions, lakes, reservoirs, etc.) within one mile of the permit boundary. Water bodies will be identified by name (if available) and classified based on a field investigation according to their general hydrologic regime (i.e., perennial, intermittent, or ephemeral).

Water-quantity and -quality data previously collected in the region will be assembled. Monthly means and extremes will be determined from the available records. These data will aid in defining baseline surface-water conditions and in interpreting data collected during the site-specific field investigation. Empirical models of runoff and sediment yield will also be reviewed to determine their applicability for the permit area.

Previously collected climatological data will be assembled from representative stations near the proposed mine. Data to be reviewed will include normal annual and monthly temperature, precipitation, and evaporation, if available.

Records of water wells and water rights (surface and groundwater) will be obtained from the Utah Division of Water Rights for the area within one mile of the permit boundary. Data to be collected for water wells identified during this inventory will include construction details (casing depth and type, location of screened or open interval, date drilled, etc.), yield, static water level, owner, water-quality data, and results of any pumping tests. Water rights information to be gathered will include source type (well, spring, stream, etc.), point of use, quantity of use, period of use, and owner. Information will also be obtained on oil well drilling operations in the area. Permission will be sought from the owners of local water wells to obtain data during the course of the project.

The information obtained from the literature and data search will be used to supplement the site-specific data and establish baseline hydrologic conditions in the vicinity of the permit area. This information will also allow better interpretation of data collected during the site-specific field investigation.

2.1.2 Field Investigation. As soon as possible after contract award, a field trip will be made to the site to begin data collection. Timing of this field trip is important in order to allow collection of surface-water data during the spring runoff season.

During this initial field trip, a recording rain gage will be installed to determine local precipitation depths, durations, and timing. The gage operates with a 31-day chart that will be changed during each subsequent monthly field trip. The gage is an 8-inch standard gage and will be installed according to accepted practices (Brakensiek et al., 1979) in a location that will be reasonably protected from vandalism and local surface activities.

Stream gaging stations will be established during the initial field trip, with locations chosen in consultation with representatives of DOGM. Stations on three ephemeral channels will each consist of a crest-stage gage (Buchanan and Somers, 1968) and three single-stage sediment samplers (Guy and Norman, 1970). These devices will allow the inexpensive collection of streamflow and water-quality data during periods not coinciding with field trips. The precipitation gage will provide information regarding the timing and depth of the precipitation event that caused runoff, the crest-stage gage will indicate the peak flow depth of the runoff event (which will be converted to a peak rate using slope-area methods), and the single-stage samplers will collect sediment and water-quality samples during the event. This type of surface-water monitoring system has been used successfully by EarthFax at other mine sites.

Two stations (one upstream and one downstream from the permit area) will be installed on the intermittent channel that crosses the southeast corner of the site. The upstream station on this channel will consist of a crest-stage gage and three single-stage sediment samplers as indicated for the ephemeral channels. The downstream station will consist of a water-level recorder installed in a stilling well with intake tubes that lead to the channel bottom. Installation of the stilling well and intakes will be in accordance with accepted standards (Buchanan and Somers, 1968). A 31-day automatic recorder will be used to collect water-level data.

Two stations will also be established on Chalk Creek (one upstream and one downstream from the permit area). The upstream station will consist of a sampling and measuring location only, with no instrumentation being installed. A recording gaging station will be installed at the downstream location in a manner similar to that installed on the intermittent channel.

Channel cross sections will be surveyed at each of the monitoring stations and channel hydraulic conditions will be estimated to aid in interpreting the crest-stage data (i.e.,

conversion of peak depths to peak flows using slope-area methods). Additional cross sections will be surveyed on Chalk Creek and the intermittent channel (for a total of three cross sections each within the permit and adjacent areas on each channel) to better define channel morphologic conditions.

Stream gradient profiles will be determined from topographic maps. The area and capacity of existing reservoirs, lakes, and impoundments within one mile of the permit area will also be determined from field measurements.

A general examination of channel stability, morphology, and sediment deposition will be made. Samples of the channel bank and bed materials will be collected at three locations along the intermittent channel and Chalk Creek for size-fraction analyses to aid in quantifying local conditions. A general description of riparian vegetation will also be prepared based on field observations.

During the initial field trip, an inventory will be conducted to locate all seeps and springs within one mile of the permit boundary. Field water-quality data will be collected from each seep or spring (pH, specific conductance, and temperature) and the flow rate will be determined. In addition, geologic controls of spring discharge will be examined. The seep and spring inventory will be repeated during the October field trip to determine temporal variations at the site.

If deemed necessary by DOGM, a monitoring well will be constructed in the western portion of the permit area to better characterize local groundwater conditions. Drilling for water supplies in support of oil field operations in the vicinity of the site has indicated that yields in excess of 200 gallons per minute are not uncommon for 1000-foot wells in the region. Hence, at the depths anticipated for a monitoring well at the site (assumed to be 750 feet), a casing diameter of at least 7 inches will be required to accomodate a pump with sufficient capacity to conduct a meaningful pumping test.

If required, a monitoring well at the site will be rotary drilled to an assumed depth of 750 feet at a diameter of 11 inches. During drilling, cuttings from the hole will be logged to indicate rock type, texture, cementing agents, presence of voids and fractures, staining, lithofacies changes, thickness, presence of water-bearing zones, etc.

Because of the assumed depth, the hole will be cased with 7-inch diameter steel casing and screen. It is assumed that three intervals in the well will be screened (one corresponding to the overburden, one adjacent to the coal, and one within the underburden). Wire-wound, continuous-slot screen (80 slot) will be utilized to ensure that the well has good hydraulic

characteristics. The annulus between the borehole wall and the screens will be backfilled with 4- to 8-mesh rounded gravel, with a bentonite seal above and below each screened section. Run-of-pit gravel will be used to fill the annulus between screened sections and above the upper screen to a depth 20 feet from the surface.

The upper 20 feet of the annulus will be sealed with a neat-cement grout to prevent future washout around the casing. A cap will be placed on the portion of the casing extending above the ground surface to protect the well. Following construction, the monitoring well will be developed by pumping or surging to correct any damage to or clogging of the water-bearing formations that may occur as a side effect of drilling.

Monthly field trips (initial and 11 subsequent) will be made to the site to collect streamflow measurements, change charts on the rain gage and water-level recorders, and measure groundwater levels in local wells. General site conditions will be observed and repairs will be made as necessary to instrumentation during these field visits.

During the first, fourth, seventh, and tenth monthly field trips (i.e., on a quarterly basis during the project duration), water-quality samples will be collected from the two Chalk Creek stations and the local wells that are included in the investigation. To the extent possible, the samples from Chalk Creek will be collected at times that reflect approximate high- and low-flow periods. The intermittent and ephemeral channels will be sampled as flow occurs (either in the form of grab samples or by the single-stage sediment samplers). All samples will be analyzed in the field for pH, specific conductance, dissolved oxygen (surface water), and temperature. Each sample will be preserved in accordance with guidelines established by the U.S. Geological Survey (1977). Samples will then be delivered to a Utah-certified laboratory for analyses according to the list contained in Table 2-1.

Aquifer tests will be conducted in existing wells in the vicinity of the mine to determine local groundwater hydraulic conditions. It is currently anticipated that pumping tests (step-drawdown and constant rate) will be conducted in one existing well, with slug-discharge tests being conducted in two additional wells in the area. Selection of the wells for specific tests will be made in consultation with representatives of DOGM.

A step-drawdown test will be conducted in the candidate well to determine the pumping rate for the constant-rate test. The test will be conducted at three increasing pumping rates, with the specific rates depending on the selected well. Each pumping rate will be held constant for a period of approximately 90 minutes, during which drawdown data will be collected at

Table 2-1. Laboratory analyses for water samples.

Settleable solids[a]	Magnesium
Total suspended solids[a]	Manganese
Total dissolved solids	Mercury
Total hardness (as $CaCO_3$)	Molybdenum
Aluminum	Nickel
Arsenic	Ammonia-nitrogen
Barium	Nitrate-nitrogen
Boron	Nitrite-nitrogen
Carbonate	Potassium
Bicarbonate	Phosphate
Cadmium	Selenium
Calcium	Sodium
Chloride	Sulfate
Chromium	Sulfide
Copper	Zinc
Fluoride	Oil and grease[a]
Iron, dissolved	Cation-anion balance
Lead	

standardly accepted intervals (see U.S. Bureau of Reclamation, 1977). Discharge measurements will be collected volumetrically or with an orifice gage. Water-level data will be collected with an electric water-level indicator.

The step-drawdown data will be plotted as drawdown versus time and a stabilized drawdown will be determined for each pumping rate. This stabilized drawdown will then be plotted against discharge rate to determine the pumping rate at which the constant-rate test can be conducted (based on the depth of the well, the static water level, and the maximum available drawdown).

The constant-rate drawdown test will be conducted after allowing the water level to stabilize from the step-drawdown test. During the constant-rate test, water-level and discharge measurements will be collected at standardly accepted intervals (U.S. Bureau of Reclamation, 1977) using methods outlined for the step-drawdown test.

It is anticipated that the constant-rate test will proceed for a period of 8 hours to allow the system to be adequately stressed during testing. At the end of the drawdown test, the pump will be shut down and water-level recovery measurements will be collected at the same frequency as drawdown measurements were collected. Recovery measurements will continue until the recovery curve is predictable over at least one log cycle of time.

In addition to the pumping tests, slug-discharge tests will be conducted in two additional wells selected in consultation with DOGM. These tests will be conducted by withdrawing a known volume of water from the wells and rapidly measuring the water-level recovery until the water-level stabilizes. These data will allow variations in the hydraulic properties of the tested aquifers to be estimated.

If the decision is made to construct an onsite monitoring well, pumping tests (step-drawdown and constant-rate) will also be conducted in this well. To conserve time, the step-drawdown test will be conducted on the well as a whole rather than on the individual zones. From this information and the driller's log, discharge rates from the separate zones will be established. These zones will then be isolated with a packer system and a constant-rate test will be conducted in each zone with the pump intake being located between the packers. The constant-rate tests will be conducted as outlined above for the existing well in the area.

2.1.3 Data Analyses and Impact Assessment. All data collected during the literature/data search and field investigations will be compiled and displayed as appropriate in figures, tables, and maps. Information to be compiled will include locations

of surface-water bodies, water-rights data, cross sections and longitudinal profiles of the major stream channels of concern, and the results of all field and laboratory analyses. Maps will be prepared at the scales identified in the Request for Proposal. All raw data (water-quality data, pumping-test results, etc.) will be included either in the main body of the final report or in an appendix.

Climatologic data will be tabulated for the adjacent weather stations and the rain gage installed at the site. Based on these data, a water budget will be prepared for the permit and adjacent areas using a water-balance methodology such as that developed by Thornthwaite and Mather (1957).

Data collected from the streamflow monitoring network at the site will be analyzed to determine seasonal variations in surface-water quality and quantity. Instantaneous flow measurements collected at the upstream and downstream Chalk Creek stations will be analyzed to determine if a statistically significant difference exists in flows between the two stations. If the difference is significant, the relation between the two stations will be determined by regression analysis. This relation will be used to define flow conditions that occurred at the upstream station during the investigation.

Average annual sediment yields from the site will be estimated using the Universal Soil Loss Equation (Barfield et al., 1981) and the PSIAC method (Shown, 1970). Both baseline and disturbed conditions will be examined. Using tnese data, possible sediment-pond locations will be delineated and shown on a map.

Stage-discharge relations for important channels in the permit and adjacent areas will be determined from the channel cross sections and channel hydraulic conditions. The 10- and 100-year return period flows will be determined for Chalk Creek and the intermittent channel using a rainfall-runoff model or empirical methods (such as developed by Fields, 1975). The depth of flow during these runoff events will be shown graphically on the appropriate channel cross sections.

Based on available well logs and new drilling activities (if required), the locations of aquifers and aquitards relative to a generalized stratigraphic cross section will be delineated. Water-level data collected during the field investigation will be analyzed to determine seasonal fluctuations (in comparison with rainfall and runoff data). The direction of groundwater movement will be estimated by developing a potentiometric-surface map is sufficient data are available.

Surface and groundwater quality data collected from the permit and adjacent areas will be examined to determine baseline chemical conditions. Comparisons will be made with Federal and State water quality standards to determine applicable future

uses of the water. Seasonal fluctuations in water quality will also be displayed graphically. Based on the data, long-term compliance monitoring station locations will be recommended.

Field groundwater hydraulic data collected during the slug or pumping tests will be analyzed using methods appropriate to local conditions and the particular test (Cooper et al., 1967 for slug tests in confined aquifers; Bouwer and Rice, 1976 for slug tests in unconfined aquifers; Walton, 1970 or others for pumping tests).

An assessment of possible drawdown effects and diminuation of downgradient water supplies due to seepage of groundwater into the underground mine workings will be made using the field groundwater-hydraulics data. If adequate pumping tests or slug tests cannot be conducted at the site, regional information (such as that found in Gates et al., 1984 or from local well logs) will be used to estimate local hydraulic conditions. Potential inflows to the mine workings and drawdown effects will be calculated analytically using models provided by Freeze and Cherry (1979) and others for inflow to tunnels.

2.2 Geologic Investigation

2.2.1 Literature and Data Search. EarthFax will conduct a detailed literature search to obtain existing geologic data pertaining to the permit and adjacent areas immediately following contract award. A previous review of information on file with DOGM in Salt Lake City and discussions with local drillers, indicates that a significant amount of applicable data are available.

Stratigraphic and lithologic data exist and will be obtained (when available) from both Summit Coal Company, local drilling companies, the Utah Geological and Mineral Survey, the Utah Division of Water Rights, the U.S. Geological Survey, and DOGM. These data are available in the form of well logs, analyses of core samples, published geologic reports, open-file reports, geologic maps, cross-sections and profiles, mine permit applications, and Environmental Impact Statements.

Data obtained from the previously mentioned sources will be compiled into baseline maps, cross-sections, profiles, and tables to gain an understanding of the physical and chemical characteristics of the overburden, coal, and underburden. These data will include the stratigraphic and structural features of the bedrock as well as the spatial extent, thickness, and depth of the geologic units within the permit area. These preliminary compilations will be made prior to field studies and sampling to aid in the geologic evaluation of the area.

2.2.2 Field Investigation. An EarthFax engineering geologist will complete a detailed geologic map (1:6000 scale) of the permit area. Exposed bedrock outcrops will be delineated on a map and and described. The description will include:

- Typical rock name
- Texture
- Weathering
- Color (Munsell)
- Rock hardness
- Mineralogy
- Cementing material
- Bedding/depositional features
- Voids and fractures
- Staining
- Lithofacies changes
- Thickness
- Strike and dip

In addition, the geomorphic features, faults, structure, locations and dimensions of previously mined areas, subcrop and outcrop lines, existing borehole locations, and any geologic hazards at the site will be identified in the field and delineated on a geologic map of the site. All available core from the site will be logged and described as defined above. A geologic report describing the geology of the permit area and general regional geologic characteristics of the area will be prepared.

2.2.3 Sampling and Laboratory Analyses. The existing core which was obtained and stored from previous geologic investigations at the site will be sampled and described. Based on data obtained from DOGM, it appears that representative samples can be obtained from the stored core for laboratory analyses. It is our understanding that sufficient core is available from at least three drillholes to allow sampling of the core for both the coal seam and eight feet of underburden in each of the holes. However, only one of the drillholes has a sufficient length of overburden core available to allow sampling. In the absence of additional overburden core, fresh samples will be collected in the field. To accomplish this task, either backhoe test pits or fresh cutslopes from facilities construction activities will be used to access the bedrock. Surface samples will be collected as two separate, 20-foot long channel samples from fresh, unweathered bedrock.

All samples will be submitted to a Utah-certified laboratory for analyses. Overburden and underburden samples will be analyzed for the parameters contained in Table 2-2. Analyses of the coal strata will be limited to pyritic sulfur, acid-base potential, and clay content.

The purpose of laboratory analyses of the overburden, coal, and underburden will be to identify acid-forming or toxic-forming horizons that may cause future concerns. All sample collection

Table 2-2. Parameters for which overburden and underburden samples will be analyzed.

Parameter	Reported as
pH	Hydrogen ion activity
Conductivity	mmhos/cm at 25°C
Saturation	Percent
Particle size analysis	Percent clay, silt, sand, and very fine sand (Hydrometer)
Texture	USDA textural class
Soluble Ca, Mg, and Na	meq/l
Sodium absorption ratio	Calculated from soluble Na, Mg, and Ca conc.
Carbonates	Percent
Selenium	ppm to a lower detection limit of .01
Boron	ppm
Nitrate-Nitrogen	ppm
Molybdenum	ppm to a lower detection limit of 0.1
Mercury	ppm
Acid Potential	meq H/100g or percent S
Neutralization Potential	percent $CaCO_3$ or tons $CaCO_3$/1,000 tons material
Acid-base potential	tons $CaCO_3$/1,000 tons material
Arsenic	ppm

and analyses will be conducted utilizing approved methods as developed by the U.S. Environmental Protection Agency, American Society for Testing and Materials, American Society of Agronomy, and other approved methods if so requested by DOGM.

2.2.4 Data Analyses and Impact Assessment. All data gathered from the literature search, field investigations, and laboratory analyses will be analyzed to determine local geologic conditions and potential impacts associated with mining in the permit area. The geologic data will be assembled and analyzed to differentiate the strata (overburden, coal, and underburden) that contain acid-forming or toxic materials and those that act as aquifers. The physical and chemical characteristics of the overburden, coal, and underburden will be evaluated to determine the impacts from mining wastes or spoils which could cause negative environmental impacts. The analyses will address how these parameters affect the vegetation, reclamation, surface water, and groundwater.

A final detailed site-specific surface geology map will be prepared. The site map will use existing baseline maps corrected to depict site-specific conditions. The map will delineate the surface geology, strike and dip of bedrock units, subcrop and outcrop lines, locations and dimensions of previous mines, faults, and other structural features. This map will be prepared at a scale of 1:6000.

2.3 Coordination and Deliverables

2.3.1 Briefing Session and Site Visit. Immediately following contract award, EarthFax personnel will meet with DOGM in Salt Lake City to review the requirements of the project, obtain data and information from DOGM files concerning the Boyer Mine, and to discuss additional data sources. Following this session, a site visit will be conducted with DOGM personnel. To conserve time at the beginning of the project (with the need to obtain field data quickly during the spring runoff season) it is proposed that this site visit coincide with the initial field trip.

2.3.2 Monthly Progress Reports. Monthly progress reports will be submitted to the DOGM Lead Reviewer by the 15th of each following month. These letter reports will outline tasks accomplished since the last report, present copies of field and laboratory data, discuss problems encountered in the field, and provide an estimate of cumulative expenditures to that date. Significant findings that may influence the development of the mine plan will be reported to DOGM as soon as possible. At no time during the course of the contract will EarthFax personnel contact the mine operator or the U.S. Office of Surface Mining directly concerning the project without prior approval of DOGM.

2.3.3 Draft Report. A draft report will be submitted to the DOGM lead reviewer within 240 days of the effective date of the contract. This report will outline the general regional conditions, methodologies, data collected to that date, and the results of analyses that are completed to that date. It is anticipated that much of the geologic section of the final report will be finalized by the date of the draft report. However, results and conclusions concerning the hydrologic investigation will not be complete due to ongoing field work. Comments received by DOGM will be incorporated and the draft will be resubmitted within 30 days of receipt of comments.

2.3.4 Final Report. A draft of the complete report will be submitted within 365 days of the effective date of the contract. This draft will contain all data, results of analyses, references, and conclusions pertaining to the project. Following receipt of comments from DOGM, eight copies of the final report will be submitted to DOGM by day 415 of the contract.

2.4 Project Schedule

The proposed schedule for the Summit Coal Company SOAP project is provided in Figure 2-1. This schedule assumes that weatner and site-access conditions will be conducive to field work and that review periods will proceed in a timely manner. Should significant changes occur over which EarthFax has no control, accompanying changes in the schedule may be necessary.

2.5 References Cited in Section 2.0

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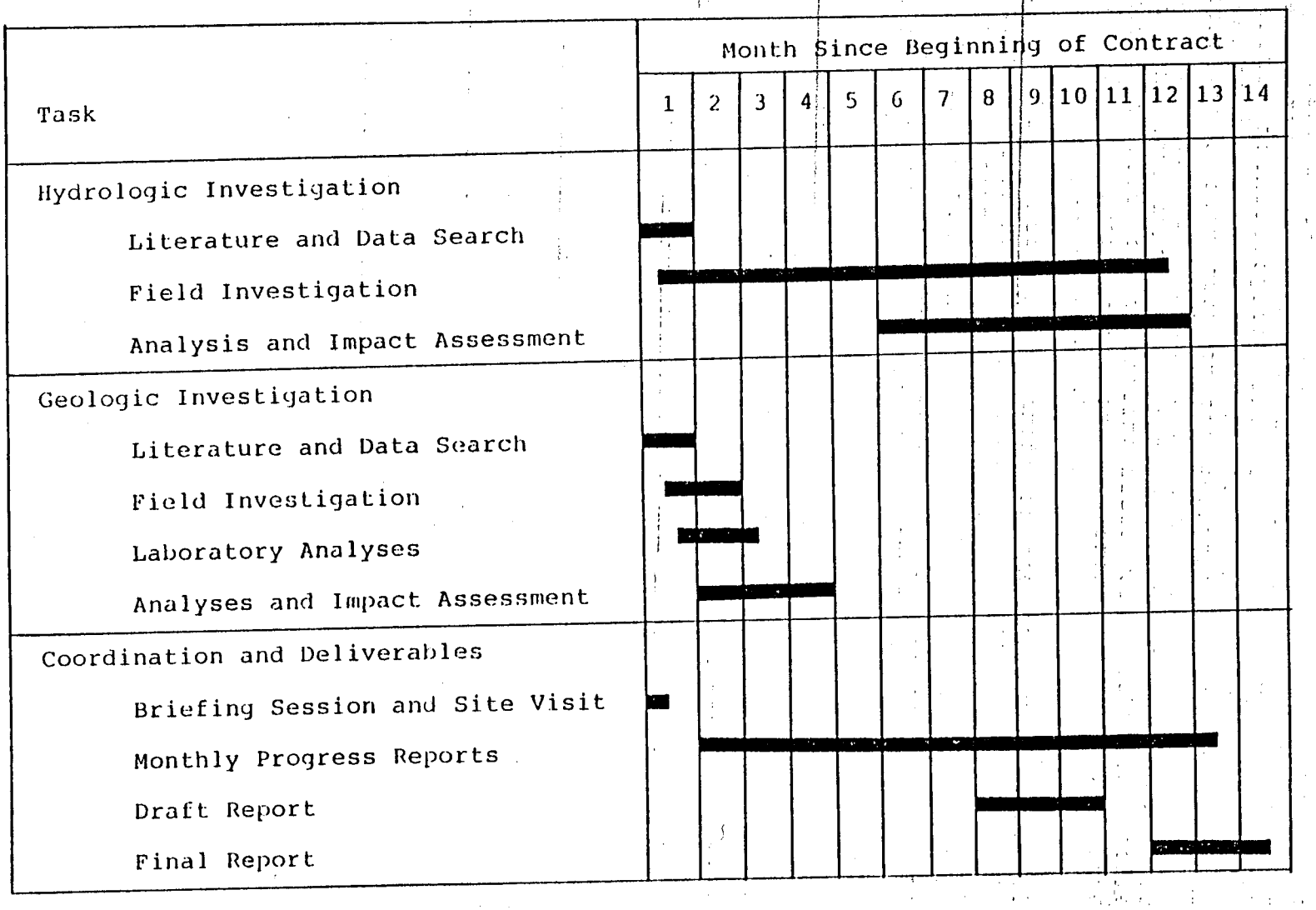
Figure 2-1. Proposed project schedule.



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Walton, W.C. 1970. Groundwater Resource Evaluation. McGraw-Hill Book Company. New York City, New York.

3.0 RELATED EXPERIENCE

EarthFax personnel have had significant experience analyzing the hydrologic, soil, and geologic aspects of coal mining and other operations. The experience of the company with Utah coal mining permit baseline studies in general and SOAP investigations in particular will be a valuable asset to the Summit Coal Company SOAP project.

As indicated by the scope of the projects listed below, EarthFax meets the criteria specified in UMC 795.17 for qualified SOAP investigators. Representative projects include:

Hydrologic Characterization of Four Coal Mines. Existing hydrologic conditions have been determined at four coal mines in the interior western United States. Included in the separate projects were two surface mines in Wyoming (one existing and one proposed), one proposed underground mine in Colorado, and one proposed underground mine in Utah. Several monitoring wells and stream-gaging stations were installed for the collection of water-quantity and -quality data. Field trips were made to each site at least monthly for data collection. Utilizing the site-specific and regional data, existing conditions were established and future hydrologic consequences of mining were projected. Reports were prepared for submission to State and Federal regulatory agencies to satisfy permitting requirements.

Hydrologic and Geologic Characterization of a Coal Mine in Washington. EarthFax conducted a hydrologic investigation at the site of an existing surface coal mine in western Washington under the Small Operator Assistance Program (SOAP) of the U.S. Office of Surface Mining. Monitoring wells, stream-gaging stations, and a rain gage were installed for the collection of site-specific data. Data were also collected from private wells in the area to aid in determining potential impacts from mining. Existing runoff- and sediment-control plans were reviewed for adequacy in light of Federal coal mining regulations. Test pits, drill holes, cut slopes, and rock outcrops were utilized to obtain detailed geologic and geochemical data for the area. Samples were collected from significant lithologic units and submitted for laboratory analyses. Data obtained from the test results were utilized to determine the presence of toxic or hazardous materials, the stability of spoil piles, and required reclamation measures. A comprehensive report was prepared describing existing hydrologic and geologic conditions at the site and the potential impacts from continued mining. This project was completed by the currently existing staff of EarthFax.

Surface-Runoff and Sediment-Control Facility Design. Numerous surface-runoff and sediment-control facilities have been designed for surface and underground coal mines in Utah, Wyoming, Colorado, and Washington. Facilities have included sedimentation ponds, diversion channels, riprapped channels, check dams, and culverts. State-of-the-art models such as DEPOSITS and SEDIMOT II have been used to aid in design. Design considerations have included subcritical versus supercritical flow, avoidance of maximum permissible velocities, cost-effective erosion control, water-surface profile analyses, and selection of the appropriate design storm.

Hydrologic Investigations at UMTRAP Sites. Detailed surface and groundwater investigations were conducted at nine inactive sites associated with the Uranium Mill Tailings Remedial Action Program (UMTRAP) of the U.S. Department of Energy. The project involved the construction of nearly 40 monitoring wells, collection of water-level data, performance of pumping and slug-discharge tests to determine groundwater hydraulics, performance of surface geophysical surveys to determine stratigraphic changes within alluvium and bedrock anomalies below alluvium, and the collection of several soil and water samples for analyses to determine physical, chemical, and radiologic parameters. All data were analyzed to provide a characterization of existing surface and groundwater conditions (quantity and quality) and an estimation of the impacts of proposed remedial actions. Detailed reports were prepared for each individual site.

Hydrologic Investigations at an Active Uranium Mill. Groundwater conditions were investigated by EarthFax at an existing uranium mill in southeastern Utah to aid in the development of a remedial-action program to control groundwater contamination at the site. Fracture systems were identified using very-low-frequency electromagnetic geophysical methods. Long-term pumping tests were conducted to define the anisotropic nature of the contaminated aquifer. Seepage rates from the tailings ponds were determined and the fractured aquifer was modeled to determine the rate and direction of groundwater movement at the site. Flood-control plans were also developed to comply with regulations promulgated by the U.S. Nuclear Regulatory Commission for both the operational and abandonement periods. Design flows were determined based on the probable maximum precipitation event, flows were routed through existing ponds, and diversions were designed to bypass the mill site and tailings ponds.

Coal Refuse Quality Investigation. Field investigations were conducted at an active coal mine in Utah to determine the quantity and quality of potentially toxic materials in coal refuse. Representative samples were collected and tested in a Utah-certified laboratory and the test results were assessed. Remedial-action plans were developed which provided for the safe disposal of the coal waste. These plans were accepted by both State and Federal regulatory agencies in the permit approval process.

and submitted to regulatory agencies for approval. Impacts of mining activities on these resources have also been predicted and mitigation measures have been designed. In addition, reclamation plans have been developed, including programs for identifying, handling, storing, and redistributing topsoil. EarthFax professionals have also managed multi-disciplinary teams to prepare entire permit documents for coal mines.

4.0 PERSONNEL QUALIFICATIONS

4.1 EarthFax Personnel

EarthFax personnel to be involved in the Summit Coal Company SOAP project are listed below. Expanded resumes of these individuals are provided in Appendix A. Additional support personnel will be utilized as necessary.

Randolph B. Gainer - Project Manager, Principal Engineering Geologist. Mr. Gainer has had over 11 years of experience conducting geologic investigations for coal mines (including a SOAP investigation in Washington) and other major construction operations. He has conducted numerous sampling programs to determine rock and soil properties (physical and chemical) related to the presence of hazardous materials, slope stability, topsoil suitability, and borrow suitability. He will provide overall management of the SOAP project, serving as the primary contact for coordination of activities between DOGM and EarthFax. He will also be responsible for all field and office evaluations regarding geolgic conditions at the site.

Richard B. White - Principal Hydrologist. Mr. White has been involved in numerous hydrologic baseline and impact evaluations for surface and underground coal mining operations in Utah, Wyoming, Colorado, and Washington (under SOAP). He has supervised the construction of several wells, has performed field and laboratory analyses of water samples, has conducted field tests of surface and groundwater systems, and has modeled hydrologic systems to determine impacts resulting from land-use changes. He has designed several runoff- and sediment-control facilities for coal mining operations. Mr. White is a Registered Professional Engineer (Utah No. 7102), Registered Professional Hydrologist (AIH No. 328), and a Certified Professional Soil Erosion and Sediment Control Specialist (ARCPACS No. 117). He will be responsible for all field and office hydrologic investigations and analyses.

4.2 Subcontractors

Subcontractors will be utilized primarily for laboratory analyses and for drilling (if required). Major subcontractors include Chemical and Mineralogical Services, Inc. of Salt Lake City (a Utah-certified laboratory that will provide analyses of rock and water samples) and Dave's Drilling of Heber City (providing drilling services and pumping equipment for the pumping tests).

5.0 PROPOSED COST

The proposed cost to provide the services described in this proposal is outlined in Table 5-1. Costs in this table are broken out by major task. The cost provided in this table can be considered a fixed price.

The cost contained in Table 5-1 assumes that the project will be completed during the 12-month period outline in the Request for Proposal, with a starting date in the immediate future. It is also assumed that conditions beyond the control of EarthFax will not alter the scope or schedule of the project. Should such changes occur, accompanying changes in the cost may be necessary.

At the request of DOGM, a cost estimate is also provided for the optional moitoring well that may be drilled at the site as part of this project. This cost estimate is provided in Table 5-2. Also included in Table 5-2 are costs associated with the testing of this well if it is constructed. Assumptions associated with this monitoring well are outlined in Section 2.1.2 of this proposal.

It is currently anticipated that monthly invoices will be sent to the Utan Division of Purchasing for work completed during the course of the project. However, other arrangements can be made if desired.

Table 5.1. Proposed cost for the Summit Coal Company SOAP project.

Labor:	
Field work, monthly reports	$10,200
Analyses, draft and final report	14,400
Expenses:	
Mileage, per diem	370
Report costs (printing, graphics, miscellaneous)	1,900
Field equipment (purchase and rental)	1,600
Laboratory analyses	
Water	6,580
Rock, coal, soil	1,410
Total:	$36,960

Table 5-2. Proposed cost for monitoring well if required onsite.

Drilling:	
Drilling and casing	$17,640
Screen (GALVANIZED)	1,200
Gravel pack, bentonite seals, cement surface seal	1,180
Supervision (EarthFax)	1,800
Pumping Tests:	
Pumping equipment	5,640
Engineering (data collection and analyses)	3,000
Total:	$30,460

APPENDIX A

Resumes

RANDOLPH B. GAINER

Education: BS, Geology, 1973
West Virginia University

Memberships: Association of Engineering Geologists
Sigma Gamma Epsilon

Experience:

EarthFax Engineering, Inc.
Salt Lake City, Utah
Principal Engineering Geologist, 1983-Present

Responsible for engineering geology, field geology, soils, land-use, and reclamation investigations. Responsibilities include the design of earthen structures, delineation of borrow sources, foundation investigations, slope-stability analyses, reclamation suitability of soils, remedial action and reclamation plans, and geophysical investigations.

Reviewed the environmental assessment for the proposed Davis Canyon high-level nuclear-waste repository under contract with the State of Utah. This review centered on the adequacy of plans for storage and disposal of salt to be encountered during development of the repository. Provided comments to the State for submission to the U.S. Department of Energy.

Conducted field investigations to delineate soil types in areas of existing and proposed disturbance at three coal mines in central Utah. Developed recommendations for the application of soil nutrients and amendements. Developed reclamation plans for topsoil borrow areas, potentially hazardous and/or toxic waste materials, mine facilities, and alluvial valley floors.

Conducted a geologic and soil baseline study at an active surface coal mine in western Washington. The project involved sampling, stratigraphic mapping, and delineation of joint and fracture patterns.

Conducted resistivity and very-low-frequency electromagnetic surveys at the site of an active uranium mill in Utah. Analyzed the geophysical and existing drillhole data to determine lithologic boundaries, geologic structures, and bedrock fracturing. Prepared geologic cross sections, structural contour maps, and remedial-action plans to control groundwater contamination for submission to the U.S. Nuclear Regulatory Commission.

Analyzed an oil and gas field in Texas to determine potential natural-gas reserves. Evaluated geophysical

borehole logs of the well field (gamma, spontaneous potential, conductivity, resistivity, caliper, and micro-inverse) and examined engineering geology aspects of a potential distribution pipeline through several soils types and varying landforms.

Ford, Bacon & Davis, Inc.
Salt Lake City, Utah
Engineering Geologist, 1982-1983

Prepared permit-application documents relating to soils and land-use for a proposed underground coal mine in Utah. Developed descriptions of soil series, taxonomic units, quantities and qualities in order to develop reclamation plans for the mine. Determined soil depths, distribution plans, and protection measures for the reclamation plan.

Maintained lead responsibility for obtaining geotechnical, and pedogenic data at the sites of 17 inactive uranium-mill tailings piles in the southern and western United States. Developed remedial action plans for disposal or containment of the tailings. Identified available cover materials for use in stabilizing the tailings and reclaiming the sites.

Conducted surface geophysical investigations at the sites of potential coal developments and inactive uranium-mill tailings piles to determine foundation conditions and delineate faulting. Methods included seismic refraction, electrical resistivity, and very-low frequency electromagnetic surveys.

Completed all lead work necessary for obtaining water rights, dam construction, stream alteration, and right-of-way permits for a proposed insitu oil-shale operation in Utah.

U.S. Soil Conservation Service
Clinton, Tennessee
District Conservationist, 1981-1982

Directed and supervised a district office and staff to provide technical assistance to land owners on soil and water conservation problems. Developed land-use plans, engineering designs, layouts, and directed the installation of reclamation plans and conservation practices (dams, grassed waterways, slope stabilization, diversions, terraces, revegetation, etc.). Inspected, planned, and supervised installation of reclamation measures on abandoned mine lands.

Supervised data gathering and planning for the establishment of a demonstration project at an abandoned surface coal mine. Overburden materials were examined to locate suitable topsoils and supplemental plant growth media for revegetation. Delineated suitable backfill materials to eliminate the existing highwall. Developed runoff- and sediment-control plans to minimize erosion and the production of acid mine drainage. Examined hydrologic, geologic, and pedogenic factors affecting slope stability.

U.S. Soil Conservation Service
Salt Lake City, Utah
State Geologist, 1977-1981

Directed engineering geology programs associated with the construction and maintenance of large earthfill dams. Supervised and conducted foundation investigations, seismic-hazard studies, and geotechnical testing. Directed grouting operations, piezometer installations, and data collection. Conducted safety inspections and studies on existing and proposed dams. Chaired a deficiency study team which investigated dam failures.

U.S. Soil Conservation Service
Morgantown, West Virginia
Watershed Planning Geologist, 1974-1977

Directed engineering geology and sedimentation studies in selected watersheds to evaluate site conditions for proposed earthfill flood-control dams. Developed major portions of work plans and environmental impact studies. Delineated the extent, value, and quantity of mineral deposits underlying proposed dam and reservoir areas. Identified the quantity and quality of groundwater, including identification of recharge zones. Conducted stream bedload movement studies and detailed foundation investigations of potential and proposed dams sites.

West Virginia Department of Natural Resources
Elkins, West Virginia
Geologist, 1974

Conducted safety, engineering geology, and hydrologic studies and analyzed supporting documentation on existing and proposed coal refuse piles and earthfill dams. Performed field inspections, approved plans, and enforced State and Federal regulations regarding coal refuse disposal and dam safety. Planned revegetation and stabilization measures for hazardous coal refuse banks and dams.

RICHARD B. WHITE

Education: MS, Civil and Environmental Engineering, 1977
Utah State University

BS, Watershed Science, 1976
Utah State University

Memberships: American Institute of Hydrology
National Water Well Association
Association of Engineering Geologists
ASCE Task Committee on Quantifying the Hydrologic Effects of Land-Use Changes

Experience:

EarthFax Engineering, Inc.
Salt Lake City, Utah
Principal Hydrologist, 1983-present

Responsible for investigations and designs involving both surface and groundwater systems, with expertise in the areas of water quality, surface and groundwater hydraulics, groundwater contamination, rainfall-runoff phenomena, hydrologic impacts of land development, water supply development, and hydraulic engineering.

Reviewed the environmental assessment for the proposed Davis Canyon high-level nuclear-waste repository under contract with the State of Utah for adequacy in addressing the surface-water impacts of repository activities. Provided comments to the State for submission to the U.S. Department of Energy.

Investigated groundwater conditions at the site of an existing underground coal mine in Utah. Determined potential impacts of subsidence on local hydrologic conditions. Designed surface-runoff and sediment-control facilities for the site.

Examined groundwater contamination at an active uranium-mill tailings disposal site in Utah. Conducted surface geophysical surveys to delineate the extent of contamination in unmonitored areas and to locate major water-bearing fractures. Supervised pumping tests and analyzed the data to determine anisotropic groundwater hydraulics. Modeled the site to determine the rate and extent of contaminant migration. Designed a remedial-action plan to provide off-site control of contaminant migration.

Designed a water-supply and -distribution system for a proposed 300-lot summer-home development in Utah. Conducted surface geophysical surveys to delineate water-bearing fractures in the area. Supervised drill-

ing activities and performed pumping tests to determine the long-term yield of a water-supply well.

Conducted a hydrologic inventory of an existing surface coal mine in Washington. Established surface and groundwater monitoring stations, collected field data, performed pumping tests, and analyzed all data to determine potential hydrologic impacts due to mining at the site.

Currently conducting a groundwater-contamination investigation at the site of a hazardous-waste generator in Utah. Waste products include explosives and miscellaneous organic and inorganic chemicals.

Ford, Bacon, and Davis, Inc.
Salt Lake City, Utah
Senior Hydrologist, 1979-1983

Supervised data collection and analyses to evaluate the migration of chemical and radioactive contaminants from several inactive uranium-mill tailings piles in the Western United States to the hydrologic environment. Supervised drilling and monitoring-well construction. Collected soil and water samples for analyses. Performed pumping and other field tests to determine groundwater hydraulics. Analyzed all data to determine existing conditions and probable impacts of implementing proposed remedial actions. Prepared a detailed report for each individual site.

Developed cost estimates for restoration of groundwater quality at a uranium solution mine in Texas. Responsible for hydrologic and water-quality analyses to determine the time required for restoration to be complete.

Conducted hydrologic evaluations at several sites in the eastern and western United States to assess the effects of past processing and storage of radioactive materials on the quality of surface and groundwater.

Designed an instrumentation network to monitor moisture and contaminant migration in the unsaturated zone at the site of a proposed low-level high specific-activity radioactive waste disposal facility at the Nevada Test Site in southern Nevada.

Developed a conceptual design of a wellfield capable of producing several thousand gallons-per-minute of brine in Nevada for the production of industrial salts.

Conducted a hydrologic baseline and impact investigation of an existing surface coal mine in Wyoming. Designed runoff- and sediment-control facilities for a proposed underground coal mine in Colorado. Designed and supervised construction and of a wellfield to supply over 300 gallons-per-minute of water at the mine.

Vaughn Hansen Associates, Inc.
Salt Lake City, Utah
Hydrologist, 1977-1979

Performed in-depth hydrologic investigations of areas to be affected by several existing and proposed surface and underground coal mines in Colorado, Utah, and Wyoming. Assessments were made of existing hydrologic conditions (surface and groundwater quantity and quality), probable hydrologic impacts resulting from mining, and mitigating measures to minimize impacts. Results of the investigations were submitted to State and Federal agencies for permit approval.

Developed runoff- and sediment-control plans for surface facilities associated with several coal mines in Colorado, Utah, and Wyoming. Designed the necessary improvements (e.g., sedimentation ponds, diversions, riprapped channels, culverts, etc.). Designs were submitted to State and Federal agencies for approval.

Conducted hydrologic analyses to determine the adequacy of existing and proposed water supplies for use at coal-fired power plants in Utah. Examined alternative surface and groundwater sources to supplement existing supplies.

Evaluated the impact of water use at power plants on the quantity and quality of water available for downstream agricultural and other uses. Suggested mitigating measures where appropriate.

Certifications, Registration:

Certified Professional Soil Erosion and Sediment Control Specialist (ARCPACS No. 117)
Registered Professional Hydrologist (AIH No. 328)
Registered Professional Engineer (Utah)

COAL EXPERIENCE OF
EARTHFAX PERSONNEL

Company and Location	Year Completed	Project Description
Various West Virginia	1974	Coal refuse/waste rock stability investigations
Swisher Coal Company Huntington, Utah	1977	Hydrologic impact study
U.S. Fuel Company Hiawatha, Utah	1978	Runoff- and sediment-control plans
Valley Camp of Utah Scofield, Utah	1978	General audit of compliance with OSM regulations
Energy Development Co. Hanna, Wyoming	1979	Hydrologic baseline investigation and design
Soldier Creek Coal Co. Wellington, Utah	1979	Runoff- and sediment-control design
Coastal States Energy Co. Scofield, Utah	1979	Hydrologic baseline investigation
Western Fuels Utah Rangely, Colorado	1979	Hydrologic baseline investigation
NERCO Glenrock, Wyoming	1980	Hydrologic baseline investigation
Western Fuels Utah Rangely, Colorado	1981	Water-supply development, hydrologic design
US SCS Clinton, Tennessee	1981	Abandoned coal mine reclamation
Wyoming Fuel Co. Mt. Pleasant, Utah	1982	Fault delineation using geophysical methods
West Appa Coal Co. Huntington, Utah	1983	Soils, land use, and reclamation
U.S. Fuel Company Hiawatha, Utah	1984	Hydrology, soils, reclamation plans
Soldier Creek Coal Co. Wellington, Utah	1984	Baseline soils investigation, reclamation plan design
Palmer Coking Coal Co. Black Diamond, Washington	1984	SOAP investigation (geology and hydrology)

STATE OF UTAH
NATURAL RESOURCES
Oil, Gas & Mining

Scott M. Matheson, Governor
Temple A. Reynolds, Executive Director
Dr. G. A. (Jim) Shirazi, Division Director

4241 State Office Building • Salt Lake City, UT 84114 • 801-533-5771

March 5, 1984

Mr. Robert H. Hagen, Director
Albuquerque Field Office
Office of Surface Mining
219 Central Avenue, NW
Albuquerque, New Mexico 87102

Dear Mr. Hagen:

Re: SOAP Program

On February 28, 1984, I spoke with Mr. Frank Attencio, of your office, relative to the Small Operator Assistance Program and how it is being implemented in Utah. Frank indicated to me that we have a total of $60,000 in grant monies available for Small Operator Assistance. This letter is our request to you for technical and administrative assistance in utilizing these monies by June, 1984.

As you know, the amount of administrative money denoted for the Division of Oil, Gas and Mining use in SOAP is limited, so we are asking for your assistance. Two operators have filed SOAP applications with the Division for assistance in developing their properties. We would like to provide these operators with the most well-informed response possible, thus we are seeking guidance, training, and advice from your office in administering SOAP.

Your expeditious response will be most appreciated.

Sincerely,

Ronald W. Daniels
Associate Director

RWD/jb
cc: Jim Smith, DOGM
D. Wayne Hedberg, DOGM