

Colorado Department of Health

Review and Comment

Standard Operating Procedures (SOP's), February, 1991

Because of the length and complexities of this document, the Division has taken a different approach in commenting on and approving the SOP's. Many of the SOP's were much improved over the initial version that we received in August of 1990. If the Division felt only minor changes or clarifications would further improve one of these SOP's, we have recommended approval, but have suggested changes that we think would improve the effectiveness and implementability of the SOP. If a particular SOP has a need for additional text or clarification, we have recommended conditional approval pending the incorporation of the needed changes. In a few cases, the Division felt that an SOP, as written, was very deficient in the direction and guidance it provides for a particular procedure. In that case, we have recommended that approval be withheld.

Comments on each volume of the SOP's follow. At the beginning of comments for each SOP will be either the word **Approval Recommended**, **Conditional Approval Recommended**, or **NO Approval Recommended** indicating how the comments to that SOP should be treated. In addition, general comments have been inserted at the beginning if they apply to all SOP's, at the front of each volume's section if they apply to that volume, and as the first comments to an SOP if they are specific to the procedure described therein.

General Comments Pertaining to ALL SOP's

- 1) For each SOP that has blank forms, please provide both the blank form and a version of the form that has been completed. The completed form can act as a "go-by" to reduce confusion in the field and avoid incorrectly completed forms.
- 2) Volume 1 needs to include (not as a SOP) the frequency and the method that will be used to change, update, add to, and subtract from the site-wide SOP's. In addition, please add a discussion of the use and development of SOPA's. It should be clear in these discussions that the SOP's are not 'final' with the

approval of these volumes. The SOP's will be revised and updated regularly and are, by necessity, living documents.

3) Many of the field procedures described in these SOP's differ to some degree from procedures observed by Division personnel to be in use at RFP. The Division assumes that this is intentional and that these new procedures superceed the old ones. Therefore, regulatory over-site and inspections will be based on what appears in these documents.

VOLUME 1: Field Operations

General Comment: Conditional approval has been recommended for all SOP's concerning the disposal of liquid on the ground. The Division does not believe this is a prudent action unless and until the liquid has been characterized. Therefore, we would like to propose the following alternative. Most of the liquid that has been proposed for ground disposal is water generated while sampling groundwater monitoring wells. Because this water is associated with a discreet sample that will be analyzed anyway, it should all be containerized until sampling results are returned. If analysis shows no contamination exceeding background or other standard (i.e. drinking water standards, etc.), disposal on the ground would be allowed. If analysis shows higher levels of contamination, the water would be treated like other contaminated water at the MDF. This same procedure would apply to drilling fluids and wash waters, even though these are currently not sampled and analyzed like the water discussed above. This procedure will, as a result, add a sample for analysis for each new well's drilling fluid and certain wash waters before it can be put on the ground.

SOP 1.1: NO Approval Recommended

General Comment: The title of this SOP is misleading as only a small part of it discusses dust "control." A better title would be "Air Monitoring and Dust Control."

Section 4.1: The Source References should contain the Colorado Air Quality Control Commission's (AQCC) Regulation No. 1, Section III., D. (fugitive particulates) as part of requirements to be met.

Section 5.3: Please provide "Internal Reference 3.2.2." The Division was unable to locate this reference.

Section 5.5: Emission permits from the Colorado Air Pollution Control Division (APCD) and/or APENS may be required under AQCC Regulation No. 3 for this type of activity.

Section 5.6: Methods of calibration for air samplers is not part of the text and should be included. Please provide the calibration procedures for any samplers presumed to be used in environmental restoration activities at RFP.

Section 5.7: Please remove the acronym "UNC OHS" from the text and replace it with the full title.

Section 5.8: The text says that all equipment will be inspected prior to the start of work. Please describe what it is being

inspected for and the procedures involved in an inspection.

Section 5.10: Please clarify which ER SOP is being referred to in this section.

Section 6.1: Please develop specific guidelines for the placement of the anemometers around the work site (such as - anemometers will be placed, when possible, to the north or south of the work site to avoid interference by any activity at the site of the prevailing wind direction, etc.).

Section 6.1: Please develop specific guidelines for the placement around a work site of the Hi-Vol and Lo-Vol samplers and any other monitors that will be used in the implementation of this SOP.

Section 7.3: Again, Internal Reference 3.2.2 was nowhere to be found. Please put it in the text or describe where it resides.

Section 7.4: This section makes no effort to match prior documents that describe similar procedures (881 Hillside work procedures for construction and drilling, the 881 Hillside QAPjP, and the Interim Plan for the Prevention of Contaminant Dispersion (IPPCD)). Please re-write sections 7.4.1 and 7.4.2 so that the 15 minute averaging of wind speed is incorporated as well as clear and concise guidelines for work resumption. Also, add section 7.4.3 that will satisfy the IAG requirement that any time visible particulate emissions leave the respective site(s), work will cease until such emissions have ended.

Section 7.5: Please include the types of moisture meters that will be used as well as any calibration and operational procedures associated with each.

Section 7.5.1: Please include a list of the methods that will be used for wetting, guidelines for the use of each method, and whether or not additives will be used in the liquid.

Section 7.5.1: Please describe how field personnel will make the determination that analytical soil samples will not be affected by wetting the soil to prevent dust.

Section 7.6: This entire section is worthless. No method is described to measure the airborne dust concentrations and the text implies that this unknown method will be used only if visible dust is observed. In gusting conditions, dust will be long gone by the time someone turns on the monitors. Monitoring airborne dust concentrations, visible or invisible, is the whole point of this SOP and monitoring will be done on a continuous 24 hr/day basis. Please expand the text to include the method that will be used to detect the airborne dust as well as how long the samplers will be operating each day. Also, include the samplers sensitivity to particle size (PM10?).

Sections 7.7 and 7.8: Weekly and bi-weekly filter changes on the Lo-Vol and Hi-Vol samplers may not be enough. There can be rapid build-up if the activity is heavy and frequent checks would be better. Another problem that may exist is short intense activity (2 to 4 days) that a two week check interval would average in with other activities. The resulting contamination problems would become masked and difficult to track. Please expand the text to address these concerns (sampling frequency, activity specific sampling procedures) as well as develop a schedule for how many hours a day the samplers will be turned on.

Section 8.0: This section should be combined with a check list or form that would be completed for verification of air monitoring. As written, it seems out of place.

SOP 1.2: Approval Recommended

Section 6.1: Please describe more fully 'verification of the datasheets and authenticated procedures'. Although the references may address this issue, it is still appropriate to provide a basic discussion within this SOP.

SOP 1.3: Approval Recommended

Section 5.5.4: Please add a fourth item stating that the glass tubing will be discarded after use.

Section 5.6.1: This section does not accurately describe the method presently used in the field to decontaminate the well sounders. This should be clarified.

Section 5.6.2: Item 2 should specify how much water will be pumped through the pump to clean it, or how long water will be pumped before the pump is deemed clean.

SOP 1.4: Approval Recommended

Section 6.2: In the fourth bullet of the second paragraph on page 9, the preceding item calls for tap water rinse. Is the triple rinse to be with distilled water?

Section 6.5: Please change the heading of this section to Main Decontamination Facility so that it is consistent with the other SOP's.

Section 6.5.2: Because the wash area is not well defined, more text needs to be added that explains whether decontamination activities will occur in an open area or within an enclosed area; if it is open, whether there will be wind speed restrictions and

how those will be monitored; and whether decontamination will occur on a graveled or concrete surface. Even though these items are illustrated in the construction document for the Decon Pad, please add them here.

SOP 1.5: Conditional Approval Recommended

Section 6.0: The second paragraph of this section indicates that each work area will be characterized by EG&G prior to any field activity. Please describe exactly how this characterization will be carried out. This description should include the steps involved as well as define who will do the characterization and how it will be communicated to field personnel. Unless and until the field crews know the final characterization and, therefore, how to proceed, many cases of wrongly disposed water will result. Any changes to the characterization of a site must be approved by the regulatory agencies.

Section 6.0: A fifth bullet needs to be added to the four that are presented in the second paragraph. This bullet should say "All other areas that have not specifically been characterized as 'not potentially contaminated.'" This will make this section consistent with SOP 1.10. Also, since there are no groundwater monitoring wells listed in SOP 1.10 as specifically being characterized as 'not potentially contaminated,' the Division assumes that all groundwater is being considered potentially contaminated. This precludes the disposal of any water on the ground under 'not contaminated' protocols leaving the only avenue of ground disposal as 'potentially contaminated' but having no field detections.

Even so, disposal of water on the ground in any case is unacceptable. Field instrumentation is not capable of detecting any type of metals contamination and the detection of contaminant levels at or near the ARAR for certain volatiles, semi-volatiles, and radionuclides will be very difficult. Even detecting levels above background will be difficult and necessitate a knowledge of the respective background values by the field crews (this is impossible because final background values have yet to be determined for many of the contaminants at RFP). It would be much simpler and cleaner to either transport all purge and development water to the MDF or containerize it at the well site pending the sample analysis results.

Section 6.0: The handling of purge and development water is incomplete. Reference is made on the equipment list, Sec. 5.1, to plastic sheeting around the wellhead. However, what temporary containment will be provided to prevent runoff from inclined surfaces or to contain fluid discharged under pressure from the drill stem or auger (i.e. a plugged bit)?

Section 7.0: This section appears to conflict with SOP 1.3, Sect.

5.6.1, 5.6.2, and perhaps other sections, which require decontamination. Given the level of effort to decontaminate other equipment and instruments, it seems inconsistent not to clean the monitoring well equipment prior to reuse. Can field instruments unequivocally ensure that the equipment is below background (yet to be adequately defined)? Would this not require field personnel to spend more time checking for contamination than it would to simply clean the equipment?

SOP 1.6: Approval Recommended

SOP 1.7: Conditional Approval Recommended

Section 6.0: The fifth bullet referenced above in section 6.0, SOP 1.5 needs to be added to this section.

Section 6.1.2: This section apparently only addresses wash water generated at well or boring locations and does not mention wash water generated in the decontamination of equipment used to sample surface water, sediment, or soils. These items and the water generated in washing them need to be addressed in this section.

Once again, it is the Division's position that none of this water should be disposed of on the ground. Please see the comment to section 6.0, SOP 1.5 above.

SOP 1.8: Conditional Approval Recommended

Section 6.0: The fifth bullet referenced above in section 6.0, SOP 1.5 needs to be added to this section.

Section 6.1: In the third bullet of this section, there is no indication that taking a 20 cm drive sample is part of the SOP for drilling activities discussed in SOP 3.2, Sect. 5.3.2. Since SOP 1.8 discusses the handling of the drilling fluids and cuttings and SOP 3.2 "Drilling Procedures Using... Augers" a discussion of the 20 cm drive sample should be included in SOP 3.2. Please implement this addition in SOP 3.2.

Section 6.1: In the fourth bullet, please explain how field personnel will know what levels are above background (surely it is not intended that they interpret the Background Geochemical Characterization Report (BGCR)). The BGCR currently shows negative numbers for several RAD analyses which, by default, would require drumming of all cuttings and water. Please address this issue. (See comment to SOP 1.5, section 6.0 above.)

Section 6.2: In the first paragraph of this section, the text says that as cuttings are generated, they will be wetted with distilled

water. Please clarify exactly how often during the drilling operation this will occur.

In the second paragraph, the text states that a field radiation monitor will be used routinely to confirm the absence of hazardous or radioactive materials. Please define "routinely" and change the text to read "confirm the presence or absence of hazardous and/or radioactive materials."

Section 6.3: The first sentence in this section references "screenings." Please define and explain a "screening."

Section 6.4.2: Disposal of drilling fluids on the ground is unacceptable. Please see the comment to section 6.0, SOP 1.5 above.

Section 6.5.1.2: No mention is made here about "potentially contaminated" and "not potentially contaminated" areas. Wells drilled to bedrock in all potentially contaminated areas should have their cuttings treated just like an alluvial well in the same area. The bedrock is still not well understood and until such time as it is, distinction between bedrock and alluvial cuttings is not merited.

Figure 1.8-1: The word "alluvial" should be scratched for the title of this figure.

Section 6.5.2: Disposal of drilling fluids on the ground is unacceptable. Please see the comment to section 6.0, SOP 1.5 above.

SOP 1.9: Approval Recommended

SOP 1.10: Conditional Approval Recommended

General Comment: Somewhere in this SOP, there should be a discussion of how the wastes (both solid and liquid) that are generated on the MDF will be handled.

Section 6.0: At the bottom of the second paragraph, the text states "Unless specified in the individual project work plans, all other areas will be considered potentially contaminated." As indicated several times above, this statement would carry more weight if it was converted to a fifth bullet adding to the four already in place in this section. Please do this. The text also states that other surface sampling stations will be added to the list as they become verified as background stations. Part of the verification process should include approval of the regulatory agencies.

Section 6.1: A flow chart similar to Figure 1.8-1 or Figure 1.10-1 following liquids through the process would be a very good idea.

The last two paragraphs of this section, as they concern previous comments, need to be changed. The disposal of any liquids on the ground is unacceptable.

Section 6.3.2: Per section 6.1, p. 12, White Drums would be used to contain "suspected" mixed or radioactive waste. Gray Drums, p.11, would be used for solid wastes where field instruments did not render "verified positive detections" but which are awaiting "chemical analysis". Therefore, why would gray drums be filled "with solid wastes suspected of containing radioactive and/or hazardous substances"? Should not this material be placed in white drums as specified? Are there different degrees of being "suspect", one based on a lack of detection and the other on the worksite's status as potentially contaminated? It is not clear when to use gray vs. white. The problem centers around "suspect"; perhaps "possibly contaminated" would be appropriate for gray drummed waste where field readings were negative in a potentially contaminated area. This problem needs to be addressed to avoid field personnel confusion.

SOP 1.11: Approval Recommended

SOP 1.12: Conditional Approval Recommended

General Comment: The following SOP requirements have been identified by the Division's RFP permit writer. Please include provisions to address these requirements.

The requirements in the following list can be filled by inclusion into this SOP, Section 5.3.1, of daily inspection checklists in the Standard Operating Procedures, February 1991, Section 12, Part 5.3.1. "Equipment Decontamination Pad".

- a. Provide a leak detection system that is designed and operated so that it will detect the failure of either the primary or secondary containment structure or the presence of any release of hazardous waste or accumulated liquid in the secondary containment system within 24 hours. Section 265.193 (c)(3). The six inch "monitoring/access" pipe placed at the lowest point in the secondary containment system will fill this requirement if the monitoring pipe is inspected daily for leaks.
- b. Section 265.193 (f)(1)(2)(3) and (4) Ancillary equipment, aboveground piping, joints, pumps etc must be inspected daily for leaks.

- c. Section 265.195 (a) and (b) The owner or operator must develop and follow a schedule and procedure for inspecting overfill controls daily and must inspect at least once each operating day the leak detection system, the construction materials, and area immediately surrounding the externally accessible portion of the tank system, including the secondary containment system, and document in the operating record of the facility an inspection of the above items.

Section 6.0: At some point in this section, please explain who will be supervising the MDF. Will EG&G have a representative on-site whenever the MDF is in use ensuring that proper procedures are used or will the subcontractors be responsible for self-policing?

Section 6.5.3: Clarification needs to be added to the discussion of the dilution of waste waters to less than 1 ppm. If this is being done to meet specifications for evaporation in evaporators that have already been given interim status under hazardous waste regulations, then it is permitted. If, however, it is being done as treatment of waste to meet certain disposal criteria, then it is NOT allowed.

SOP 1.13: Approval Recommended

SOP 1.14: Conditional Approval Recommended

Section 7.0 Forms used for the collection of data from alluvial or bedrock boreholes should record the core run number, the depth increment cored, the thickness/increment cut, and the total recovery of core whether from a given or subsequent run (i.e. core lost then recovered on the subsequent run). Also, the portion of core in the barrel or spoon should be recorded whenever the amount recovered is less than the amount cut. Professional experience and judgement should be exercised in determining where loss(es) occurred, whether from the top, bottom or middle and regardless of the observed position of the recovered core. Nevertheless, recording the position of the core, as it was recovered, may aid adjustments based on the subsequent core run. Please change the sample form to address these critical issues. (See also comments to SOP 3.1)

SOP 1.15: Approval Recommended

Section 5.1: In the first paragraph of this section the figure 15.4 is given as the ionization energy reference. Please attach the units to this figure.

SQP 1.16: Approval Recommended

Section 6.1: The sediment sampling stations listed as background, if based on the Background Geochemical Characterization Report, are subject to revision based upon the Division's concerns on the establishment of sites that are too close to the plant. Therefore, the SOP may need to be revised at a future date.

The sentence following the list of samples, page 7, suggests that only the specific sites listed are background and does not allow for background "areas". This should be clarified otherwise, essentially the entire area is non-background.

Section 6.2.1: Reference is made in this section to ROI 3.1. Please state where this guidance is located or state it in it's entirety if it is short enough.

VOLUME 2: Groundwater

General Comment: Although well abandonment evaluation procedures are briefly discussed in this volume, no specific guidelines are provided to determine whether or not a well should be abandoned. For example: "excessive siltation" and inability to remove fines from a well are given as reasons to redevelop or abandon it, but other factors, such as the number of times a well is found to be excessively silty, or the amount of silt found in the ground water while sampling, are not specified. Guidelines for evaluating wells for redevelopment or abandonment should be included in SOP 2.2, 3.11, or a new SOP.

SOP 2.1: NO Approval Recommended

Section 2.0: The paragraph that gives details on accuracy and measuring points does not belong here. This information should be given in section 5.0, or section 7.0.

Section 3.0: This section's last paragraph already appears in Section 2.0 and should be deleted from here.

Section 5.0: In the first paragraph of this section is a reference to attaining an accuracy of 0.05 foot. It is unclear why this is mentioned since measuring to the nearest 0.01 foot will obviously be a better measurement. Even so, it is difficult to understand why accuracy of this magnitude is required. We cannot think of any use for measurements to the nearest 0.01 foot. Even using data to the nearest 0.1 foot will be unusual. Please justify the need for this much accuracy.

Section 5.0: This section does not explain what methods will be used to take water level measurements. The methods are listed under section 5.3. Section 5.0 should be re-named "General Procedures."

Section 5.1: The first and third paragraphs of this section say very similar things and should be combined.

The second paragraph should be deleted. It is very confusing as written, and is not important to field crews. As long as field crews measure the depth to water and the total depth of the well correctly, later analysis of the data can compare these values to elevation values and past piezometric levels.

The last sentence of this section refers to the reference point (RP) and calls this an arbitrary datum. Please clarify what the RP

is, what it is used for, and why it is an arbitrary datum.

This section does not provide information on the types of measuring points a sampler may encounter. Also, no information is given on what the facility will use as a standard measuring point. The SOP should include descriptions of the different sampling points as a guide to the sampler.

Section 5.2.1: LNAPLs and DNAPLs (paragraph 3) will not be detectable unless the well casing is slotted at the depth level of the contaminate, thereby allowing flow into the well. Therefore, the absence of LNAPLs and DNAPLs in wells, unless properly constructed to monitor for such layers, will not support a lack of such contamination. This issue must be addressed in SOP 3.6 and then discussed and referenced in this section.

Paragraph four of this section states "measurements from three consecutive readings must not differ more than ± 0.05 foot." If these readings do differ, are the samplers to continue measurements until three consecutive readings within tolerance are obtained?

This section should include a requirement to check the interface probe for serviceability before it is used at a different well.

Section 5.3.1: This section should include a requirement to check the water level probe for serviceability before it is used at a different well.

Section 6.0: Both paragraphs in this section can be deleted and replaced with the pertinent sections from SOP 1.3.

Section 7.0: Please explain whether the phrase "frequency of measurements" refers to the number of times a well is measured during a given sampling event or to the number of times a well is measured during a calendar year.

SOP 2.2: Conditional Approval Recommended

Section 5.2.1: The first sentence of the third paragraph of this section needs more explanation. Please describe more completely what the procedure will be for the removal of fines including how the bailer or pump be handled so that fines will be mobilized and removed from the well-bore.

The PIDs and FIDS referred to in the third paragraph are discussed in SOP 1.15, not SOP 1.5. Please revise.

Section 5.2.1.1: The fifth bullet in this section says that any additional sediment will be removed one week after the initial development of the well. Please describe how this will be done

with a specific procedure.

Section 5.2.2.1: Specific parameters should be included in this section that define criteria for well re-development (such as amount of well siltation). Also, if the sediment cannot be removed, specific guidelines need to be developed that describe when a well can no longer be used and should be abandoned.

SOP 2.3: Approval Recommended

Section 5.0: Has it been determined that the RFP potable water that may be used in well testing is compatible with alluvial and bedrock formations? There needs to be an assurance that using this water will not damage the formation.

Section 5.2: It is understood by the Division that single packer tests against the bottom of the hole will be run as routine procedure whenever practicable and double packer tests will only be used when necessary. This is not mentioned in this SOP and the procedure for a single packer test has not been included. Please rectify this deficiency.

SOP 2.4: Approval Recommended

SOP 2.5: Approval Recommended

SOP 2.6: Conditional Approval Recommended

Section 2.0: In the first paragraph, there is a sentence that states, "All monitoring wells currently sampled on a quarterly basis and all new wells which will be installed in 1991 (emphasis made by reviewer) will be sampled following these procedures." The Division assumes that these same procedures will apply to wells drilled after 1991. The text needs to be revised to make this clear.

Section 5.4: Several procedures described in this section differ slightly from procedures that Division personnel have observed being used by RFP contract samplers. In fact, slightly different procedures have been used by different sampling teams. Please clarify the exact procedures to be used so that all field personnel can be consistent.

Section 5.6: As with the previous comment, this section does not accurately describe methods being used by field crews. Nor does it definitively describe what procedure should be used. Please make this section more complete.

Section 5.7: On page 4, bullet item 3, it states that nitrate levels will be used as a basis for purge water disposal to the ground. SOP 1.5 addresses the handling of purge and development water and it should be referenced here. Nitrate levels, particularly at "other selected sites" is an unacceptable standard. Delete all references to nitrates.

Section 5.8.1.3: Bullet item one should specify that the compressor be located 15 feet "downwind" from the well.

VOLUME 3: Geotechnical

SOP 3.1: NO Approval Recommended

General Comments:

1) Although the Division's earlier comments clearly stated that the SOPs were insufficiently detailed for use as field guidance documents, this SOP has been only slightly revised. Consequently, the detail needed to ensure consistent logging of geologic data, core handling, sample selection, etc. is yet to be provided. Field operations covered by this SOP should not proceed until RFP provides a fully detailed approach to ensure the proper and complete collection of data and core/sample preservation.

The SOPs of Volume IV, Surface Water, generally depict the degree of detail appropriate to this task. Many of the specific comments for this SOP address these shortcomings; however, RFP should "run through" the events procedures of a typical borehole and record all procedures in a total and complete manner. The Division hesitates to perscribe specifics within an SOP, preferring instead to defer to geologists with specific RFP work site experience. However, specifics are what we expect.

2) The SOP should specify the minimum number of geologists or alternate personnel required to properly gather geologic data, take samples, and concurrently monitor cuttings/core for VOCs and RADs etc. Document the number needed by analyzing the work load and time factors for a typical drilling assignment.

Specific Comments:

Section 2.0: On page 5, the actual procedures should be discussed in sufficient detail, not merely by reference to Compton's. Even if appropriate to RFP, it is insufficient to refer the field geologist to Compton's and assume that different individuals will apply techniques in the same manner. This leaves too much discretion to the individual and will promote inconsistency.

Section 3.1: In paragraph 4, page 5, will the lithologic descriptions of new boreholes reference the comparable lithology of the core reference set as the basic rock type? Figure 3.1-8 shows nothing to suggest that the reference set was used or how it would be used.

Section 5.1.2.1: In Section 6.1, Logging Equipment, Wentworth or Armstrat grain size charts are listed. However, the discussion in

paragraph 5, page 8, does not discuss Armstrat. Discuss Armstrat and/or specify which chart and technique should be used. Then continue to use one chart only:

Section 5.1.2.1: On page 11, this section alludes to grain size determined by sieve analysis. However, there are no procedures, not even by reference to another SOP, on how samples will be taken or segregated for testing by the field geologist. Is the geologist supposed to decide this for himself?

Section 5.2: On page 16, once again, referencing Compton's is inadequate. Pertinent material should be incorporated in the SOP. Otherwise, field personnel will use their prior experience and discretion to set procedures.

Section 5.2.12: It would be useful to include an example of a lithologic description in this section so that those who will use this SOP will have a go-by.

Section 6.0: This section (page 27) does not adequately contain the procedures it is said to contain. RFP must seek to envision the full range of procedures, as they would occur, and record them in this section.

Section 6.1: Will logging be done to the nearest tenth of a foot? Are there times when logging to the nearest 0.01 foot may be appropriate for thin lithologies, such as volcanic ash, with "micro-marker" significance? The list still indicates a measuring tape graduated in tenths of a foot and tenths of inches. Tenths of inches are difficult to place into a data base; hundredths of feet, however, are appropriate. Clarify and justify the use of tenths of inches or eliminate the reference.

A camera and Kodak color patch should be added to the equipment list unless a separate list is proposed for Section 6.3.4. (Also see comment on Section 6.3.4).

How will the core reference set and alluvial reference set be transported to the field? Please add some text explaining how this will be done.

Section 6.2: Referencing page 29, the actual procedures for recording core depth in the boxes, and possibly on core, must be discussed. For example, will core be consistently broken and boxed on whole foot or two foot increments and placed in "depth labeled" trays (wooden blocks can be moved or lost). Will lithologic breaks be marked for future reference and verification? A figure would greatly improve a discussion and provide consistency.

Please add some text explaining exactly how core will be put into the core boxes. Different geologists and different companies have differing ways of doing this and a standard RFP method needs to be

put into place. Perhaps a separate Sop would be appropriate to describe this procedure.

Section 6.3.2: Referencing page 30, core should be measured, and preferably described, in a split core barrel or tube. Measuring the core after removal from the barrel or tube will result in footage errors. Also, how will core loss be determined, i.e. from top, bottom or in between? How much core loss will be tolerated before a re-core is required?

Section 6.3.3: Referencing page 30, lithologic intervals should be based upon, and measured from, a stationary engineer's tape relative to depth. Sliding a tape along the core and measuring unit thickness, rather than depth, will result in rounding errors and a total thickness different than the recovery length.

Also, how will logging consistency be reasonably assured, i.e., "lumpers vs. splitters"? Procedures must be established to direct field geologists toward consistent logging habits. For example, would a 0.4' thick sand lens within a 5 foot thick claystone interval be individually described or would the description read "claystone with SS interbed". This cannot be left to chance!!

The example log depicts inconsistent logging. For example on page 31, a 'bottom of interval' is given as 5.5', but 5.7' is supposedly boxed. Also, from 6.2'-10.3' is an interval of 4.1' with 3.8' in the box; where is the missing 0.3'? Was it lost or removed as a sample? The status of the 0.3' interval must be reported! Similar inconsistencies occur on page 32.

In addition, the example log sheet, how to fill it out, and what the column headings mean is never explained in the text. Please add appropriate text.

Section 6.3.4: More specific procedures for providing consistent core photography need to be developed. The core should be field photographed in the core barrel/sample tube with a engineer's tape, and depths, clearly visible and legible. After boxing, the core should be photographed under controlled lighting conditions, both wet and dry, with all pertinent information displayed. Consult an experienced photographer!

Section 6.3.5: Fully describe the sampling process, including rationale.

Section 7.0: Why was the previous Section 7.0, QA/QC, removed from the revised document?

SOP 3.2: Approval Recommended

Section 5.2: Referencing page 8, what measures will be taken to

determine the static water level in low permeability sediments?
Will operations be delayed?

Section 5.3.1: Sampling will be done in two foot increments per Section 5.0, page 4, paragraph 2. Referencing page 8, paragraph 2, will compositing, as described here, entail mixing the 1'9" of sample available after VOC sampling or will it entail combining two or more sample increments?

Section 5.3.2: Please refer to the comments on SOP 1.8, Section 6.1 pertaining to a discussion of a 20 cm drive sample beginning at ground level. Indicate the procedures of SOP 1.8, Section 6.1 in SOP 3.2.

Section 6.0: Referencing page 11, what has been or will be done to ensure that vegetable oil used as a drill stem lubricant will not introduce contaminants?

SOP 3.3: Approval Recommended

Section 6.0: Add back the QA/QC statement included as Section 6.0 of the original document.

SOP 3.4: Conditional Approval Recommended

Section 5.1: Referencing page 3, when water is required to clean cuttings from the borehole, provision should be made to allow for the use of an air-mist^{er} approach. This will minimize the introduction of water and diminish the volume of drill water subject to disposal. Other benefits include a decreased tendency for swelling of claystone resulting in bridged holes or expanded/distorted core. This should not be required but be available as an option where hole conditions permit.

Section 5.3.1.1: Referencing page 7, how will water spilling over the side of the portable pit be contained? How will water blown from the borehole be contained? Temporary containment is essential and a plan is necessary! If addressed in a Field Operations SOP, reference the SOP.

Section 5.3.1.2: Referencing page 7, please provide specifications for the air filtration system for review and approval.

SOP 3.5: Approval Recommended

Section 5.2: In procedure 3.4, Section 5.3.1.1 it is stated that excavated sumps or pits (lined or unlined) will not be used. This section, page 7, paragraph 1, indicates the possibility of pits or sumps being constructed for containment of water discharges (but

not circulation?). Perhaps 5.3.1:1 should be revised to indicate that deep holes may require pits subject to appropriate SOPs.

SOP 3.6: Approval Recommended

SOP 3.7: Approval Recommended

Section 5.2.2: Since the vertical surface must be peeled prior to sampling, page 5, it should be peeled prior to logging in the event the surface has been distorted in the excavation process.

SOP 3.8: Conditional Approval Recommended

General Comment: Please add the entire CDH soil sample collection operating procedures as an appendix.

Section 5.2.1: Please add guidelines to this section that explain sample site selection and sample distribution within a selected sector. CDH sampling protocol specifically indicates that 25 sample sites will be chosen within each sector.

Section 5.2.2: The 10 mesh sieve discussed in the last paragraph of page 12 of this SOP should be added to the equipment list.

On page 11 of the text, the first bullet indicates that site selection will depend on the fact that the site has been undisturbed for the "time interval of interest." Please define this time interval more precisely.

Section 6.2: Referencing page 15, where is the procedure for collecting the sample (between items 3 & 4). Vague, if not incomplete.

SOP 3.9: Approval Recommended

Section 5.3.2 Figures 3.9-1 and 3.9.2 have the drawings reversed. Figure 3.9-1 shows the drawing for a Petrex tube while Figure 3.9-2 shows the soil gas sampling probe.

SOP 3.10: Conditional Approval Recommended

Section 6.0: Referencing page 10, The Rules and Regulations of the Colorado Division of Water Resources requires a "Notice of Intent to Construct" for water or observation wells or a permit for wells to be maintained for more than one year. Clearance for drilling must also include these notices or permits in the administrative

process and applies to federal facilities per the Division of Water Resources. Note SOP 3.11 acknowledgement of need to submit Well Abandonment Form to Water Resources, page 12.

SOP 3.11: Approval Recommended

Section 9.0: The last sentence, on page 11, should read "The following information will be recorded in a log book." See page 12.

VOLUME 4: Surface Water

General Comment:

Although there are references (example: SOP 4.3, Section 7.0) to duplicates, matrix spikes, matrix duplicates, field blanks, trip blanks, equipment rinsate, etc. and discussion about these samples at various locations in the document, the sample collection procedures and the purpose of each of these samples should be described more clearly and perhaps earlier in the document.

SOP 4.1: Approval Recommended

Section 5.2: On page 4, paragraph 5, SOP 4.2 should be referenced. It should be stated that the proper sequence of field testing and sampling covered by the three SOPs is addressed in Sect. 5.3.

SOP 4.2: Approval Recommended

Section 4.1: The reference to "Field Guidelines for Collection . . . of Water Samples" is incomplete. This is a USGS publication.

Section 5.3: On page 7, reference should be made to instructions provided by the ampul manufacturer or proper procedures should be described if not specific to each manufacturer.

SOP 4.3: Approval Recommended

Section 4.3: Regarding the reference on page 3 to SOP's published by EPA region IV, a comparable document exists for Region VIII. Please use the EPA Region VIII version published in January, 1988.

SOP 4.4: Approval Recommended

Section 5.0: Flumes should be installed whenever possible.

Section 5.4: On page 7, reference the manufacture's calibration instructions or, preferably, provide specific procedures.

Section 5.5: On page 9, provide proper procedures to prevent contamination or dilution of the buffer solution.

Section 5.12: A Marsh McBirney type meter, rather than a pygmy or

Price meter is recommended.

SOP 4.5: Approval Recommended

Section 4.2: On page 3, SOP 1.14, Field Data Management, should be listed and should be specifically referred to in Sect. 5.3, Page 6, Paragraph 2.

SOP 4.6: Approval Recommended

Section 7.0: This section refers to sampling sites being part of either "potentially contaminated" or "not potentially contaminated" sites. Please add text explaining where one would go to find out if a site is "potentially contaminated" or not.

SOP 4.7: Approval Recommended

SOP 4.8: Approval Recommended

Section 5.4.1: On page 10, EG&G personnel are to be notified of the "difference between maximum and minimum temperature measurements if the profile is greater than 5 degrees C." Stratification is defined as greater than 1 degree C temperature change over a one meter depth. Please justify through documentation the 5 degree criteria or change the requirement to 1 degree C per meter.

SOP 4.9: Approval Recommended

VOLUME 5: Ecology

General Comments:

- 1) Standard operating procedures for aquatic toxicity with *Cenodaphnia* and fathead minnows need to be developed. A good starting point for these SOP's would be EPA guidance for acute and chronic testing.
- 2) These SOP's would be greatly enhanced by the addition of the laboratory procedures used for sample processing and analysis. This could be done within the existing SOP's or as separate SOP's.

Specific Comments:

SOP 5.1: Approval Recommended

Section 2.0: This section needs to be expanded to include the endpoints and the indices sought.

Section 4.0: The first reference in this list should be updated. A 1989 version (17th Edition) is available.

Section 6.1: The third paragraph of this section should be combined with the first paragraph.

This section should also mention measurement of the nutrients present in the water.

Section 6.2.1: In the first paragraph of this section, the sentence "Stream current velocities should be matched within 100% of the study site current" needs to be re-stated or explained.

Section 6.2.4: It is unclear if the bullets presented in this section are meant to be the endpoints or indices that are desired. If they are, others might be: a) taxonomic composition, b) community structure, and c) standing crop.

In the chlorophyll-a section, will analysis be corrected or uncorrected for pheophytin? This should be clarified. Also ethanol is a better extractant for this process (see Sartory and Grobbelaar, 1986, *Hydrobiologia* 114: pp. 177-187).

Section 6.2.5: How will total irradiance be measured? Please clarify the method and give the reference.

Another parameter that should be measured in the field is Total

Phosphorus.

Form 5.0A: In order to fill this form out correctly, knowledge of methodology is necessary. Please expand the form to include the methods used or expand the text of the SOP to include the methods used. The SOP's cannot assume that the users of the SOP already have training to complete the procedures. If necessary, add these methods as an appendix. Possible sources for these methods are Platts, et al, 1983, Methods for Evaluating Stream Riparian and Biotic Conditions, U.S. Forest Service, and U.S. EPA (EPA/444/4-89-001), May, 1989, Rapid Bioassessment Protocols for use in Streams and Rivers.

SOP 5.2: Approval Recommended

General Comment: Procedures for laboratory processing of macroinvertebrates needs to be included somewhere in the text.

Section 2.0: In collecting benthic macroinvertebrates, clarification needs to be added to the text to make clear whether these will be collected based on field identification or laboratory identification.

For your information, CDH uses a 0.500 mm net for collection purposes.

Benthic macroinvertebrates, in addition to responding to organic and inorganic contamination, also respond to habitat degradation.

Section 4.0: The first bulleted item can be deleted as it is not used often enough to warrant listing.

Please review the sixth bulleted item. Why is it included?

Please add the following references to the list: a) Rapid Bioassessment Protocols for use in Streams and Rivers, Benthic Macroinvertebrates and Fish, U.S. EPA, EPA/444/4-89-001, May, 1989 and b) Methods for Evaluating Stream, Riparian, and Biotic Conditions, U.S. Forest Service, Platts, et al, 1983.

Section 5.0: Please add a kick-net with a 0.500 mm mesh to the list of equipment. Also, please explain how Formalin will be disposed of at the laboratory. Ethanol would be a safer alternative.

Section 6.1: Please include, as part of the discussion of techniques and tools, the kick-net.

Section 6.2.1: Are the April-May and September-October sampling periods determined by data quality objectives? If so, this needs to be stated. If not, please explain how these time frames were

determined.

Section 6.2.3: An 80% solution of ethanol will work equally as well as a 10% solution of Formalin and will not pose the hazard and disposal problems that Formalin has.

Section 6.2.4: Please explain whether the sediment sample will be taken before or after biota samples. Also, further explain how the exact spot for the samples will be determined (ie, next to surber, etc.).

Section 6.3.2: A kick-net or a dip-net would be effective samplers and need to be discussed..

Section 6.3.3: Please see previous comments regarding Formalin.

Section 6.4: The section should explain what types of preservatives will be used in collecting tissue samples. The Division recommends that no preservative but ice or refrigeration be used.

SOP 5.3: Approval Recommended

Title: The title of this SOP should specify zooplankton and phytoplankton.

General Comment: Laboratory procedures need to be specified somewhere in this SOP or a separate SOP.

Section 2.0: Copepods need to be added to the list of organisms in paragraph two of this section.

Section 4.0: The reference mentioned in the fifth bullet of this section has a more recent version (1984) than is referenced.

The seventh bullet needs to specify the Edition number.

Section 5.0: Please add Lugols solution to the list of equipment.

Section 6.1: In the third paragraph of this section, other physicochemical properties of the water that need to be known are the nutrient levels. Please add this to the list.

Section 6.2.1: In sampling phytoplankton, use of a closing sampler is necessary, especially if chlorophyll-a is to be measured.

Section 6.2.2: Preservation of algal samples for identification and enumeration can be with Lugols solution. Please explain how soon the samples will be filtered for chlorophyll-a. This should take place immediately or as soon as possible.

Section 6.2.3: Please add sechi disc depth to the list of water quality measurements that will be taken.

SOP 5.4: Approval Recommended

Section 3.0: A state collecting permit may be required before fish can be collected. Please expand the text to indicate this possibility.

Section 4.0: Please add the following references to the reference list: a) Assessing Human Health Risks from Chemically Contaminated Fish and Shellfish, A Guidance Manual, U.S. EPA, EPA-503/8-89-002 and b) Colorado's Little Fish: A Guide to the Minnows and Other Lesser Known Fishes in the State of Colorado, John Woodling, Colo. Div. of Wildlife, 1985.

Section 6.2.2: Backpack shockers will be much more effective in small shallow streams than minnow seines.

Please add text explaining how fish in the deeper ponds will be sampled (gill nets, hook and line, or boat mounted electroshock).

Section 6.2.4: When fish are placed in the clean teflon bags, the text needs to state if they are dead or alive. Also, the text should explain if the fish are to be frozen immediately (dry ice) or kept cool (blue ice). All samples should be handled the same way.

Form 5.4A: Is this form meant to be filled out for each fish or for each site?

Form 5.4B: How will age be determined in the field? Text explaining this should be added to the SOP.

SOP's 5.5 through 5.10: Approval Recommended

VOLUME 6: Air

General Comments:

1) As presented, the SOP's in this volume, with the exception of SOP 6.12, have nothing to do with environmental restoration (ER) activities. As this set of SOP's were generated as a partial fulfillment of requirements set forth under the IAG, SOP's dealing with procedures other than ER procedures are out of place and need to be removed.

2) It is the Division's understanding that SOP's for "Air" issues were to address (at a minimum) monitoring procedures and monitoring instrumentation for airborne contamination resulting from:

- investigative procedures including, but not limited to, sampling and vehicle and equipment movement.
- intrusive procedures including, but not limited to, drilling, boring, excavating, and sampling.
- treatment of hazardous, radioactive, or mixed wastes.
- windblown dust from existing contaminated sites, whether known or unknown.

In addition, as is indicated in the comments to SOP 1.1, procedures need to be developed for the selection of air sampling and monitoring sites. Also, control samples, sample comparison with standards (guidance or regulatory), and methods of comparison also need to be addressed. SOP's relevant to all of the above issues must be included in sufficient detail to allow field personnel to implement RFI/RI workplans and IM/IRA plans and get consistent, quality data. These SOP's should also dovetail with the Plan for the Prevention of Contaminant Dispersion (PPCD) and the Interim PPCD as well as the site-wide and site-specific Health and Safety Plans.

SOP 1.1 should probably be split into an SOP covering dust control only, and another series of SOP's covering air monitoring procedures. The air monitoring SOP's could be moved into Volume 6, while the dust control could remain in Volume 1.

Specific Comments:

SOP 6.1: Not Applicable to ER Activities: Please Remove

SOP 6.2: Not Applicable to ER Activities: Please Remove

SOP 6.3: Not Applicable to ER Activities: Please Remove

SOP 6.4: Not Applicable to ER Activities: Please Remove

SOP 6.5: Not Applicable to ER Activities: Please Remove

SOP 6.6: Not Applicable to ER Activities: Please Remove

SOP 6.7: Not Applicable to ER Activities: Please Remove

SOP's 6.8 thru 6.11: MISSING: Not Submitted

Reference to these SOP's should be removed unless they represent planned SOP's. If that is the case, these completed SOP's should be submitted no later than June 1, 1991.

SOP 6.12: Approval Recommended

General Comment: Information provided in the text should include a complete shelter description with design specifications and a drawing of the shelter. Some shelters used in the past have been unacceptable.

Section 3.1: Please clarify exactly when and how often inspections will be performed. Also state who schedules these inspections and who has responsibility to see that they are carried out.

Section 5.2: It is assumed, since the text does not cover this, that recalibration will be actually done off-site by non-RFP personnel. Please clarify this in the text. If this assumption is correct, add text explaining this. If the assumption is not correct and recalibration will be done on-site, please add a complete description of the recalibration procedure.

Colorado Department of Health

Review and Comment

Quality Assurance Project Plan (QAPjP), February, 1991

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General Comments:

None

Specific Comments:

Section 2.6: The first paragraph of this section refers to written reports that will be submitted to management. Please clarify who prepares these reports and how often they are prepared.

In the second paragraph, reference is again made to these reports. Within the Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, QAMS-005/80, December 29, 1980 (hereafter called 'the guidance document'), it is stated that these reports must specifically address data accuracy, precision, and completeness. Please add statements to that effect in this section of the text.

Section 3.3.6: While this may not be the correct section to address this item, the guidance document states that the 'Data Reduction, Validation, and Reporting Section' of this document must address how to identify and treat outliers. Text explaining this was not located and needs to be added if it is not included presently.

Section 8.3.2: The guidance document (sec 5.7 (B)) asks for quite a bit more regarding sample custody in laboratory operations than was found in the text of the QAPjP. Please add text clarifying the identification of the sample custodian at the laboratory and what his/her duties will be in C-O-C and data transfer procedures. Also, please explain the sample custody log that will be used by the various contract labs and the procedures that will be used for sample handling, storage, and dispersment for analysis within the labs.

Section 16.3.1: The second paragraph of this section needs to be more specific. The guidance document states that one of the

initiating criteria for a corrective action is that "the predetermined limits for data acceptability beyond which corrective action is required" have been exceeded. Please state what these data useability limits are or where they will be found. Also, the Division suggests that the first sentence of the second paragraph be re-written to say ". . . results could have a significant impact on data quality and useability."

Section 16.3.2: The fifth bullet presented in this section may result in a change to an SOP. Please describe, in detail, how any change to an SOP will be handled.

Section 17.0: This is a very good section. Please cross-reference applicable SOP's into the text. This will make this section very useful and user friendly.

Section 18.3.1.4: Please expand the descriptions of systems and performance audits to more closely fulfill the requirements of the guidance document. Give an example of or list out the various systems that will be audited and define when the audit will occur. Treat performance audits the same way. Either give an example or list out the types and frequency of performance audits.