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May 13, 1998

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DOE OVERSIGHT BUREAU

Mat Johansen, DOE/AIP/POC
U.S. Department of Energy
Los Alamos Area Office
528 35th Street - MS: A316
Los Alamos, NM 87544

Re: Transmittal of Draft Data and Preliminary Assessment of Upper Cañon de Valle and Upper Sandia Canyon, Benthic Macroinvertebrate Communities

Dear Mr. Johansen:

The Department of Energy Oversight Bureau (DOE OB) has recently received macroinvertebrate taxonomic data from samples collected in Upper Cañon de Valle (below MDA P) and Upper Sandia Canyon. The Upper Cañon de Valle samples were collected in May of 1997 and the Upper Sandia Canyon samples were collected in March of 1996. The DOE OB has committed to release data as early as possible to potential user groups at DOE facilities. In this spirit, the DOE OB is submitting this DRAFT data and DRAFT preliminary assessment to the Environmental Risk Assessment Team (Elizabeth Kelly) in the hope that it will provide the team insight on the current (1997, 1996) ecological integrity of Upper Cañon de Valle and Upper Sandia Canyon aquatic communities.

Taxonomic lists for each canyon, calculations of community metrics, comparisons to a reference station and inputs to the computer program used to calculate community metrics are included as attachments.

It is hoped that this information will be useful in the development of General and Specific Assessment Endpoints for the Los Alamos National Laboratory. The DOE OB is in the process of compiling all available data on water quality, macroinvertebrate assessments, and habitat assessments for these canyons to be published in a report in 1998.

Sincerely,

Stephen Yanicak

Steve Yanicak, LANL POC
DOE Oversight Bureau

SY:rfs

cc w/o enclosures:
John Parker, NMED, Chief, DOE OB
Tim Michael, NMED, Program Manager, DOE OB

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Steve Rae, LANL, ESH-18, MS K497
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Three quantitative macroinvertebrate samples were collected from one station below MDAP in Upper Cañon de Valle on May 5, 1997 and four stations in Upper Sandia Canyon in March and April of 1996. These samples were sorted in their entirety and submitted to Dr. Gerald Z. Jacobi for enumeration and identification, with the exception of Chironomidae, to the lowest practical taxonomic level. Taxonomic data were entered into a computer program (BASICA, developed by M. D. and G. Z. Jacobi), which calculated the community metrics. Further identification of the Chironomidae to genus level is currently underway.

Eleven metrics were selected as indices of comparison because individual taxa as well as total communities respond to stress (flow regime, sediment loading, organic and toxic pollutants, thermal variation, etc.) in different ways. The selected metrics, which encompass a wide range of benthic macroinvertebrate sensitivity to environmental perturbation, included:

1. Standing crop (macroinvertebrate density, No/m^2);
2. Taxa richness (number of taxa per study location);
3. CTQ_d value from the BCI methodology of Winget and Mangum (1979) was used as the basic tolerance metric for inorganic perturbations. Individual taxa tolerances in Upper Cañon de Valle ranged from 6 to 108 (determined by Winget and Mangum); values less than 60 indicate sensitive organisms, whereas values near 100 indicate more tolerant organisms. A CTQ_d value for the community of benthic macroinvertebrates was calculated by multiplying taxon tolerances by the number of organisms in that taxon (log base 10) divided by the total number of organisms in the sample. The resultant value was the CTQ_d for the community at that site.
4. HBI - Hilsenhoff's biotic condition index (1988) was used as the basic tolerance metric for organic perturbations. The HBI is calculated by multiplying the number in each family or genus by the tolerance value for that taxa, summing the products, and dividing by the total number of organisms in the sample;
5. EPT Index (the total number of Ephemeroptera, Plecoptera, and Trichoptera taxa present);
6. EPT/EPT + Chironomidae (total number of organisms in Ephemeroptera, Plecoptera, and Trichoptera divided by the EPT +Chironomidae);
7. Community loss (the number of taxa at a reference location minus the number of common taxa/the number of taxa at the comparison location) which is related to similarity between sample locations);
8. Percent dominant taxon (the taxon which contained the greatest number of organisms at each study location);
9. Shannon-Weaver Diversity index (d) which reflects the number of specimens in the various taxa and the richness of the taxa;
10. Scrapers/scrapers + filtering collectors feeding groups; and
11. Shredders/total number of organisms in the sample.

Upper Pajarito Canyon was used as the reference station to compare the Upper Cañon de Valle and Upper Sandia Canyon macroinvertebrate community (Ford-Schmid, 1996). The Upper Cañon de Valle habitat score used in this comparison was from a May, 1996 assessment and may not accurately represent May, 1997 conditions. The Upper Sandia Canyon habitat scores were tabulated at the time of sample collection.

This preliminary Biological Condition score (78% of reference site) indicates that Upper Cañon de Valle is Slightly Impaired, though it's score is very near the Non-Impaired range. On the other hand, Upper Sandia Canyon's Biological Conditions scores ranged from 21% to 59% of reference site, indicating Slightly Impaired to Moderately Impaired. The lowest score (located in the wetlands) may be considered Severely Impaired when professional judgement is used in evaluating the sites habitat assessment and physicochemical data.

These criteria (Table 1) were used to assign scores for characterizing macroinvertebrate communities at these locations.

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Table 1 (Metric scoring criteria

	Scoring Criteria			
Score:	6	4	2	0
Standing Crop(No/m2)[a]	50-149%	35-49% or 150-199%	20-345% or 200-249%	<20% or >250%
No. of Taxa [a]	>80%	60-79%	40-59%	<40%
CTQ_d [b]	>85%	70-84%	50-69%	<50%
HBI[b]	>85%	70-84%	50-69%	<50%
EPT Index [a]	>90%	80-89%	70-79%	<70%
EPT/EPT+Chironomidae[a]	>75%	50-74%	25-49%	<250%
Community Loss[c]	<0.5	0.5-1.4	1.5-3.9	>4.0
Dominant Taxon[d]	<20%	20-29%	30-39%	>40%
Diversity[d]	>3.0	2.00-2.99	1.00-1.99	<1.00
Sc./Sc. + Fl. Cl.[a]	>50%	35-49%	20-34%	<20%
Shredders/Total[a]	>50%	35-49%	20-34%	<20%

(a) score is a ratio of study site to reference site x 100.
(b) score is a ratio of reference site to study site x 100.
c range of values obtained-comparison to reference station.
(d) actual % composition for study and reference station.

The total score is divided into the score for the reference site resulting in a percent comparability to the reference score. The percent comparability to the reference score is then rated using the table below from Garn & Jacobi, (1996).

The bioassessment rating guide after Plafkin and others (1989), describing the biological condition categories used in this preliminary assessment, are as follows:

[%, percent; >, greater than: <, less than]

Percent Comparability to reference score	Biological-condition category	Attributes
> 83%	Nonimpaired	Comparable to the best situation to be expected within an ecoregion. Balanced trophic structure. Optimum community structure (composition and dominance) for stream size and habitat quality.
[1]54-79%	Slightly impaired	Community structure less than expected. Composition (species richness) lower than expected due to loss of some intolerant forms. Percent contribution of tolerant forms increases.
[1]21-49%	Moderately impaired	Fewer species due to loss of most intolerant forms. Reduction in EPT index.
[1]<17%	Severely impaired	Few species present. If high densities of organisms, then dominated by one or two taxa.

[1]Percentage values obtained that are intermediate to the indicated ranges will require subjective judgment as to the correct placement. Use of the habitat assessment and physicochemical data may be necessary to aid in the decision process.

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REFERENCES

Ford-Schmid, Ralph, 1996. Reference conditions for Los Alamos National Laboratory streams using benthic macroinvertebrate assessment in Upper Pajarito Canyon. New Mexico Geological Society Guidebook, 47th Field Conference, Jemez Mountains Region, 1966 pp. 441-447

Garn, H.S., and G. Z. Jacobi, 1996. Water quality and benthic macroinvertebrate bioassessment of Gallinas Creek, San Miguel County, New Mexico, 1987-90. U. S. Geological Survey; Water-Resources Investigations Report 96-4011, 57 p.

Plafkin, J.L., Barbour, M.T., Porter, K.D., Gross, S.K., and Huges, R.M., 1989, Rapid Bioassessment Protocols for use in streams and rivers–Benthic macroinvertebrates and fish: Office of Water, EPA/444/4-89-001, Washington, D.C., U.S. Environmental Protection Agency, 160 p.

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