

Columbia River Gorge Visibility and Air Quality Study Redesigned Technical Study Plan – 7/25/2003

Status Report on Winter Time (East End Gorge) Intensive Monitoring Activities

This report represents the first semiannual report required under the Columbia River Gorge Air Quality Grant – Grant Agreement Number X-970577-01-0 between the US Environmental Protection Agency (US EPA) and the Southwest Clean Air Agency (SWCAA). The Date of Award on the agreement is July 25, 2003; date of mailing is August 1, 2003; date of acceptance by SWCAA is August 4, 2003; and the date of initial funding is September 2, 2003. The Grant Agreement was for a project period of June 1, 2003 to December 31, 2006. Even though the funds were not readily available until September 2, 2003, project expenditures were authorized back to June 1, 2003. This report covers the period of June 1, 2003 to February 29, 2004. The six month period for the semiannual report covers the period of June 1, 2003 to November 30, 2003. This report includes activities through February 29, 2004. The next semiannual report will cover March 1, 2004 to May 30, 2004 to better fit with project activities. This will be consistent with EPA grant requirements.

Background

In May 2000 the Gorge Commission adopted an amendment to the Gorge Management Plan that call for the protection and enhancement of Columbia River Gorge Air Quality. A peer-review workshop was held March 14-15, 2001 in Cascade Locks, Oregon to solicit comments and input on development of a strategy for assessing air quality within the Gorge. A study plan was developed and issued on June 7, 2001 that provided a comprehensive program for assessing air quality in the Gorge. Due to the cost magnitude of the study plan and the lack of available funding, a scaled down study plan was requested by the Air Quality Managers. A scaled down Study Plan was developed that projected costs at approximately \$1.2 million. Funding was sought through the Oregon/Washington Congressional Delegation. Congressional funding in the amount of \$670,600 was provided in early to mid 2003. The study plan was again revised to accommodate a budget of \$670, 600. That study plan is referred to as the “Redesigned Technical Study Plan” and was issued July 25, 2003. Due to budget shortfalls in Washington State, the Department of Ecology disinvested in visibility programs statewide effective July 1, 2003. At that point the Southwest Clean Air Agency was selected as the lead agency for Gorge air quality monitoring activities and currently serves as the chair for the Technical Studies and Grant /Program Management.

The Redesigned Technical Study Plan outlined two major elements to be funded under the plan along with funding for project management. The two major elements consist of a Measurements Program and a Modeling Program. (Refer to sections I and II in Redesigned Technical Study Plan). A third component not funded under the Redesigned Technical Study Plan but integral to project activities is the Technical Advisory Committee process. No funding was initially made available to support this process however, this process is still envisioned to be performed after the Measurement and Modeling Programs are completed. The Measurements Program and Modeling Program will provide the data and serve as the basis and starting point for the Technical Advisory Committee.

In preparation to receiving and setting up the new equipment in the trailers, SWCAA and Oregon Department of Environmental Quality (ODEQ) monitoring staff visited a monitoring site at Beacon Hill in Seattle on October 27-28, 2003. This site currently is being operated by Washington Department of Ecology (WDOE) and includes an R&P sulfate and nitrate monitor identical to the units ordered for the Gorge Study. This was the first opportunity to train personnel on some of the equipment being purchased for Gorge Studies. While this was extremely insightful, it did not provide an opportunity for hands-on operation and adjustment by the Gorge Studies operators as this site is in real-time operation.

Gaseous Monitoring via Equipment in Trailers

The Redesigned Technical Study Plan calls for intensive monitoring for two distinct seasons (three months each) within the Gorge that are driven by unique seasonal meteorology. Generally this is described as a wintertime monitoring regime at the east end of the Gorge and a summertime monitoring regime at the west end of the Gorge. Grant documents were prepared and funding was provided to initiate the first seasonal intensive monitoring regime for the east end of the Gorge. Ambient monitoring equipment was ordered in August 2003 and two mobile trailers were outfitted with identical monitoring equipment.

The equipment located within each trailer includes: one Thermo chemiluminescent ambient NO_x analyzer model 42C, one Thermo pulsed fluorescence SO₂ analyzer model 43C, one R&P ambient particulate nitrate monitor model 8400N, one Rupprecht and Patashnick (R&P) ambient particulate sulfate monitor model 8400S, lease of one Sunset Laboratories semi-continuous organic carbon/elemental carbon (OC/EC) aerosol analyzer, various calibration devices, data loggers, strip chart recorders, calibration gases and one Teledyne zero air generator model M701.

The R&P sulfate and nitrate and the Sunset Laboratories OC/EC analyzers were new pieces of equipment that neither SWCAA staff nor DEQ staff had experience with. In support of setting up this equipment a one day training session was provided by R&P at cost on November 20, 2003 at the DEQ Laboratory where the equipment was being unboxed and assembled. Tim Morphy with R&P provided a very full one day "hands on class" to familiarize staff with all aspects of instrument setup, operation, calibration, repair and troubleshooting.

These trailers were deployed in the field at two locations identified as Wishram and Bonneville Dam. The first trailer was located at Bonneville Dam on December 3, 2003. The trailers were outfitted with electrical capability, shelves, climate control, etc. under contract to Oregon DEQ at the Oregon DEQ Laboratory and delivered on site without instruments installed to avoid damage during transport. Over the next two weeks each of the instruments was installed in the trailer, tested and checked, calibrated as necessary, and started in the data collection mode.

The second trailer was delivered by Oregon DEQ to the Wishram site on December 15-16, 2003. Again no instruments were in the trailer as delivered to avoid damage. All of the instruments were setup over the next week, tested, checked, calibrated as necessary and started in data collection mode.

The monitoring trailers were removed from their locations at Wishram and Bonneville Dam on March 10-11, 2004. Data collection stopped the week before.

DRUM/IAS Samplers

In addition to the monitoring equipment provided in the trailers, additional monitoring equipment was deployed in the field. This additional equipment was provided under contract with UC Davis, Dr. Steve Cliff. The equipment consisted of two DRUM samplers and two IAS samplers. The location of this equipment was as follows: one DRUM sampler was installed at the Wishram site, one IAS sampler was installed at the Towal Road site, and the second DRUM and IAS samplers were installed at the Bonneville Dam site. This equipment was placed on site and started on December 3-4, 2003. The first sample for the IAS at Bonneville was set to run on December 5, 2003 consistent with the IMPROVE network.

The DRUM samplers are called the **Davis Rotating Uniform size-cut Monitors**. This is a custom piece of equipment constructed by UC Davis – DELTA Group. The DRUM samplers were configured to collect six different size ranges of particulate matter that are separated by impaction and the use of critical orifices. The DRUM sampler runs continuously for a 6 week time period. Sample material is deposited on a continuously moving tape. This provides for high time resolution of the sample. For this intensive study period, the DRUM tape was changed at the mid point in the 3 month study period. (January 12, 2004).

The IAS sampler is an IMPROVE like particulate matter sampler that draws a single air stream and splits it into three identical air streams that deposits particulate matter on three different filter media: teflon, nylon and quartz. Each of these filter substrates utilizes a different analytical method to identify particulate matter deposited on the filter substrates. Each analysis method has unique characteristics that allow it to produce a unique data set. These are the same methods utilized for the IMPROVE samplers. This sampler runs on a one day in three schedule, identical to IMPROVE and is a 24 hour integrated sample. The first sample was collected on December 5, 2003 consistent with the sample schedule of the IMPROVE system. A sample was collected every three days thereafter. The IMPROVE filters and data that are collected as part of the national network are available for evaluation for both the Wishram and Mt Zion sites. The IAS samplers will provide additional IMPROVE like data to help spatially resolve air quality in the Gorge.

Other Monitoring Equipment

In addition to the equipment discussed above that was funded under the Gorge Study, other monitoring equipment continued to gather data during the study period. This included a digital visibility camera located at the Wishram site (looking west) (<http://www.fsvisimages.com/cori1/cori1.html>) and an urban visibility camera on Smith Tower in Vancouver (looking east) (<http://www.fsvisimages.com/vanc1/vanc1.html>). These pictures are electronically transmitted to Air Resource Specialists (ARS) under contract to the US Forest Service and the National Park Service and are posted on a web site in near real time. They are also archived by ARS for later use. IMPROVE particulate matter monitors continued to operate

at both the Wishram and Mt. Zion sites. These locations are part of a national network that operate year round and are funded separate from the Gorge studies.

Under a separate contract and funding mechanism, a network of nine nephelometers has been installed to measure visibility within and just outside the Gorge Scenic Area boundary. This project is referred to as the Haze Gradient Study. These nephelometers are located at the following sites from west to east: .Sauvie Island, Steigerwald, Mt. Zion, Strunk Road, Bonneville Dam, Memaloose State Park, Seven Mile Hill, Wishram and Towal Road.

Startup dates for the nephelometers under the Haze Gradient Study are as follows:

Sauvie Island - 11/01

Steigerwald Lake NWR - 11/02

Mt. Zion - 11/01 (for aethalometer; nephelometer and meteorological instruments were prior to this date)

Strunk Road - 3/03

Bonneville Dam - 6/02

Memaloose - 1/03 (just nephelometer, no meteorological instruments installed)

Seven-Mile Hill - 10/02

Wishram - 11/01 (for aethalometer; nephelometer and meteorological instruments were prior to this date)

Towal Road - 7/02

The original purpose of the Haze Gradient Study was to collect a minimum of one year of visibility data via the nephelometers and meteorological stations. This means having a years worth of data from all nine sites from the point of the last site being installed and operating. The last site to be installed was the Strunk Road site in March 2003. So for the purpose of running all sites concurrently for a year, the sites need to operate until at least the end of March 2004.

A SODAR is located at the Towal Road location to collect upper air meteorological data. A network of meteorological stations is also provided at each of the nephelometers monitoring sites identified above with the exception of Memaloose State Park. The installed meteorological sites are all surface observations (10 meter tower). The SODAR at Towal Road is the only piece of meteorological instrumentation that provides upper air data within or near the Gorge Scenic Area. The SODAR is provided at no cost to the Gorge Studies by Washington State University (WSU). Periodically data is collected from the SODAR and made available to WSU, UW, and WDOE for warehousing and use in other air quality model studies.

Aethalometers are also located at the Wishram and Mt. Zion monitoring sites. The aethalometer provides a real time measurement of light absorption by particles. The Anderson Electronics AE-16 aethalometers continuously collect an aerosol sample on a quartz-fiber filter and measure the amount of optically absorbing material collected throughout a 5 minute sample segment. The filter area and sample air flow rate are then used to calculate the ambient concentration of absorbing material. Since black carbon (BC) is the dominant optically absorbing material in the sub micron size range, this measurement is interpreted as the mass of BC according to calibrations based on inter-comparison with elemental carbon concentrations determined by the chemical analysis of filter samples.

Data Handling and Storage

A large amount of data is being generated as part of Gorge Air Quality Studies. The Gorge Air Quality Study is comprised of several different monitoring and measuring activities. As a result the data collection and storage activities track with the individual study elements. This is further complicated with the disinvestments of WDOE in the Washington State visibility program as of July 1, 2003.

Prior to July 1, 2003, the Haze Gradient Study was managed by WDOE. The sites were installed by WDOE and an existing telemetry system was modified to include collection and management of data generated from this Study. This included meteorological and nephelometer data.

After this date, data collection for Haze Gradient Study activities was split between SWCAA and ODEQ. Generally, sites on the Washington side of the Columbia River were maintained by SWCAA and sites on the Oregon side of the Columbia River were maintained by Oregon DEQ. All data from these sites are now manually collected, rather than being telemetered to a central location. The manual data is retrieved by SWCAA and ODEQ independently for the respective sites and forwarded to the Desert Research Institute (DRI) for review and storage. DRI is the prime contractor for the Haze Gradient Study under contract with SWCAA. Under the telemetry system established by WDOE, nephelometer and meteorological data was manipulated under the data system, formatted, quality controlled and reported in convenient to use reports. After disinvestment, this data manipulation and reporting mechanism was no longer available and raw data is now sent to DRI. There currently is no periodic reporting mechanism. It is expected that this data will be summarized in a Haze Gradient Study report to be issued at a later date by DRI under the Haze Gradient Study contract.

Data generated by gaseous or real time particulate matter equipment in the portable trailers is collected on a routine schedule, reviewed for completeness and forwarded to DRI for data warehousing and later analysis. A file naming convention has been established for easy file management. In late 2002 the Gorge Air Quality Study Plan envisioned that much of this data would be included in the WDOE telemetry data system. However, with WDOE disinvestment in visibility, all data is being manually collected and transferred to DRI. No data manipulation or reporting has been performed to date.

Air quality monitoring equipment provided under contract with UC Davis (IAS and DRUM samplers) captured samples on filter media, either a tape or individual filter substrates that have not yet been analyzed. Data generated as a result of analysis of these substrates will be analyzed and reported under the UC Davis contract.

Q/A

A Quality Assurance Project Plan was prepared for the new air quality studies funded under the Gorge Air Quality Grant. This Project Plan consists of a notebook(s) that contains procedures and instructions for each of the individual pieces of monitoring equipment. While some of this equipment such as the NO_x, SO₂, nephelometer, meteorological, aethalometer and IMPROVE

equipment is used by WDOE and existing procedures are used, other equipment such as the EC/OC equipment has manufacturer instructions and procedures that are used.

Operator logs are maintained at each site to document all aspects of operation and maintenance at these sites. Some of the sites and equipment had strip chart recorders; others did not as budget constraints did not allow for full instrumentation on all equipment. Strip charts, when available, are quality controlled and manually compared with electronic data.

Close-out audits and calibration verification procedures were conducted on each piece of equipment operated only during the intensive winter monitoring period.

Sample Analysis

There generally has been no sample/data analysis performed to date. It is expected that a major portion of data analysis will happen in conjunction with the Haze Gradient Study report, the Fog Water Study Report to be issued by the US Forest Service and the Causes of Haze in the Gorge (CoHaGo) report to be issued at the end of the Monitoring Program.

Sample analysis will be performed in batch mode for the UC Davis contract as individual samples will need to be identified and scheduled for laboratory processing similar to the existing IMPROVE system samples. A report will be issued that summarizes the results of selected analysis. Results from the DRUM sampler may be available by as early as June or July 2004, but nylon, teflon and quartz filters will be analyzed in batch mode with other samples that will take advantage of the economy of scale processing for cost purposes. Results from the first intensive monitoring period at the east end of the Gorge may be available in late 2004.

Reporting

For the period of performance covered under this report, no reports or completed studies were contemplated. The period of performance is totally bounded yet with initial air quality measurements under the Measurements Program. Even then it is only the first of two identified seasonal intensive periods. The main report to be completed from the Measurements Program is the **Causes of Haze in the Gorge (CoHaGo)** report. This report will evaluate all data collected under the Measurements Program, not just the first intensive period. Therefore, there are no reports identified as a deliverable under this section at this time.

Notable Events and Lessons Learned This Period

As with any new project, especially one that involves a large number of participants and new equipment, the amount of time and the unanticipated startup problems contribute to a steep learning curve and a subsequent reduction in the total amount of data collected for the project. Specific notes include:

- a. Only one trailer was envisioned to be outfitted with equipment at the start of the project in July 2003. That trailer would be located at the Wishram site. After further inspection of the Bonneville Dam site, it was decided to outfit a second trailer for

installation at Bonneville Dam. This ultimately required more effort on the part of ODEQ to outfit the second trailer.

b. The first trailer was sized at 6 ft by 10 ft to meet Gorge Consistency Review criteria. This provided an extremely limited space in which to install all the identified equipment. It was determined after all the equipment was purchased and received at Oregon DEQ that the one R&P EC/OC instrument would require too much space in the 6 ft by 10 ft trailer and would not fit with all the other equipment. In addition, the project plan envisioned being able to borrow a second R&P EC/OC monitor from DRI. That second unit was already committed to for a study at the Fresno Supersite. The decision was made to return the R&P EC/OC monitor and lease two Sunset Laboratories EC/OC monitors for use in the trailers. These units were considerably smaller than the R&P monitors. The cost for leasing these units was equivalent to purchasing the single R&P unit.

c. Only one day of limited training on setup and operation was provided for the R&P sulfate and nitrate monitors. This proved insufficient as this equipment is highly technical and requires almost daily maintenance to ensure proper operation. A second training event was budgeted in the project plan and was utilized in February 2004 to resolve a few problems regarding calibration and operation of the R&P equipment.

d. As the monitoring equipment was being assembled at the ODEQ Laboratory, and the types and quantities of consumables such as calibration gases were identified, a decision was made to purchase two zero air generators to reduce the cost and labor associated with providing large amounts of zero air to calibrate the monitors. This equipment was purchased and could be accommodated under the existing budget for consumables.

e. A snow storm delivered over a foot of snow in early January 2004 at the Wishram site and closed roads to several of the monitoring locations. This storm caused power interruptions and an interruption in monitoring activities. As a result, there are several days with gaps in the data set. For the IMPROVE and IAS samplers, two of the every-three-day samples were lost because the roads were closed and there was no access to the sites to replace filters. This resulted in an unforeseen cost to have the road to the Wishram site plowed to be able to deliver calibration gas and service the equipment. The cost of the plowing was small; however, no money was budgeted for this type of activity.

f. The nitrate monitor at the Wishram site experienced a failure in a flash strip that is used to measure ambient values. The manufacturer had this item on back order for almost 3 weeks. In the interim no data was collected. The flash strip was replaced and the unit returned to functioning properly.

g. Numerous error codes and calibration problems plagued the R&P sulfate and nitrate monitors. Some of these problems were the result of inexperience with operation of this type of equipment while others were actual problems with the hardware. To fully resolve these problems, an additional two days of training and onsite repair was contracted from the manufacturer to get this equipment operating properly. These malfunctions have

resulted in data gaps, the significance of which will not be fully realized until the data is analyzed by DRI as part of the COHAGO report. The cost of this onsite training/repair activity was budgeted in the original cost of the equipment.

h. As a result of power interruptions at the Wishram site in mid to late January 2004. Two circuit breakers associated with the DRUM sampler were tripped. The first and obvious breaker was reset and was assumed to restore the DRUM analyzer to service. The second breaker was internal to a power strip and was not obvious. Because the DRUM sampler operates very slowly (e.g. sample speed one inch per month) it was not obvious that the equipment was not operating. Therefore, it was not discovered to be nonoperational until the end of the study period when the equipment was removed. This resulted in about 35 days of lost data from that equipment

i. Winter storm conditions hampered the Fog/Cloud Water Deposition study by the Forest Service as well. The storm brought driving rains that moved more horizontally than vertically at times. This resulted in some of the sample locations being contaminated with rain water. In addition, some of the equipment was coated with ice and snow which prevented optimum collection conditions and in a few locations, the sampling equipment was vandalized. Early sample results indicate one or more periods of high acidity in the samples collected. Additional results will be available after more samples are analyzed and a report is prepared.

j. As a result of disinvestment by WDOE, additional time and resources were consumed in collecting, managing and transmitting data collected to DRI. Because all data had to be manually collected, downloaded, formatted, renamed and transmitted, additional time was needed to properly manage this activity. Such a large amount of time was not budgeted for this activity.

Even with the events noted above, a large amount of data was collected during the first winter intensive monitoring period. Initial observations suggest that there were one or more events where high ambient values of the monitored parameters were recorded. As the data from each of the monitoring activities is revealed, it is expected that there will be sufficient data to draw conclusions about the events. These conclusions will not be available until the development of the COHAGO report to be prepared by DRI. Data from specific equipment will be available at different times that may be able to be shared. However, it is cautioned that this individual data should not be used by itself to draw any conclusions until all of the data can be compiled and evaluated. It may be possible to draw incorrect conclusions from just a portion of the data. This monitoring period is considered to be a success.

Comparison to Redesign Study Plan Attachment A

Attachment A to the Redesign Study Plan summarizes each of the tasks that are envisioned to be performed under the original Congressional funding and those projects that could be leveraged or otherwise useful in assessing air quality in the Columbia River Gorge. This Attachment has been included in this report with two additional columns added on the right hand side. These two columns are identified as “Approximate dollars spent this quarter” and “Activity this quarter”.

This provides a very short synopsis of where the project stands as of the end of February 2004. The dollar amounts presented are rough numbers. The more detailed numbers are provided in the cost summary attachment to this report. A few pictures are also included after the Attachment A showing instrument installations.

Attachment A Redesigned Technical Study at a Glance

(Note: Shaded items are already funded or completed)

Measurement or Task	What it tells us	Cost (In thousands)	Approximate dollars spent this quarter	Activity this quarter
A. Ambient monitoring and assessment: Characterization of air quality, chemical processes and basic meteorology				
1. Speciated PM _{2.5} (24 hr avg., 1 day in 3), continuous dry light scatter and surface meteorology within the Scenic Area (Mt Zion and Wishram – ongoing)	General spatial and temporal characteristics of light scatter and haze producing aerosols within the Scenic Area. Supports CoHaGo and model evaluation. Tracks long-term trends.	\$164	N/A	Continuing part of national network
2. Continuous ambient nephelometers (light scatter) at Mt. Zion and Wishram – ongoing	Comparison of dry and ambient light scattering to assess water growth effects. Supports CoHaGo and model evaluation	\$48	N/A	Continuing part of national network
3. Continuous aethalometers (light absorption) at Mt. Zion and Wishram, Mt. Zion - ongoing	High time resolution light absorption-impact of local sources. See Portland material moving through. Supports CoHaGo and model evaluation.	\$42	N/A	Continuing part of national network
4. Haze Gradient Study - Additional heated nephelometers with surface meteorology horizontally along the Scenic Area and vertically in two Scenic Area locations.	Horizontal light scatter gradient along Scenic Area, see material moving through Scenic Area. Vertical mixing/light scatter gradients. Meteorology and transport mechanics into and within the Scenic Area. Supports CoHaGo and model evaluation.	\$223	N/A	
5. Ozone monitoring at Wishram	Assessment of ozone levels and risk to environment in eastern Scenic Area	\$31	N/A	Not operated out of ozone season
6. Continuous SO ₄ , NO ₃ and OC/EC analyzers for each seasonal intensive. At Mt. Zion and Bonneville Dam (summer/early fall) and Wishram and Memaloose (late fall/winter).	Local versus regional contribution to haze, diurnal dynamics, and possibly identify specific sources. High-resolution temporal dynamics of the 3 major constituents of haze in the Scenic Area. Supports CoHaGo and model evaluation.	\$167 equipment (Assumes using 1 loaner OC/EC) \$30 consumables	\$126,310 for R&P – Sunset EC/OC not billed yet	Sulfate and nitrate equipment purchased from R&P– EC/OC equipment (2 units) leased from Sunset Lab– operated at Wishram and Bonneville Dam
7. Continuous NO _x and SO ₂ for each seasonal intensive. At Mt. Zion and Bonneville Dam (summer/early fall) and at Wishram and Memaloose (late fall/winter).	Local versus regional pre-cursors to haze, plus diurnal dynamics. Supports CoHaGo and model evaluation.	\$48 equip \$2 consumables	\$41,448 for equipment	NO _x and SO ₂ equipment purchased from Thermo – operated at Wishram and Bonneville Dam
8. 2 DRUM samplers per seasonal intensive. At Mt. Zion and Bonneville Dam (summer/early fall) and Wishram and Memaloose (late fall/winter).	High time resolution species and species gradient. Supports CoHaGo and model evaluation.	\$50	Not billed yet	Contract with UC Davis – leased basis – operated at Wishram and Bonneville Dam
9. Portable short-term IMPROVE-like speciated PM _{2.5} . Two locations each seasonal intensive. 1 outside Scenic Area (west of Scenic Area for summer intensive and east of Scenic Area for winter intensive) and 1 mid-Scenic Area. (10 sample days analyzed per each intensive)	Speciated information and gradient for regional transport into and through the Scenic Area. Supports CoHaGo and model evaluation.	\$15	Not billed yet	Contract with UC Davis – leased basis – operated at Towal Road and Bonneville Dam

10. Organic speciation of IMPROVE samples of interest using GC-MS (10 days at each site, Mt. Zion and Wishram)	Apportion organic aerosol to key source types. Supports CoHaGo and model evaluation.	\$10	N/A	No contract awarded yet
11. Analyze for NH ₄ ⁺ , Na ⁺ , K ⁺ on IMPROVE samples for 1 year at each site (Mt. Zion and Wishram)	Determine if atmosphere is ammonia limited. Supports CoHaGo and model evaluation.	\$8	N/A	No contract awarded yet
12. Miscellaneous supplies, lease extensions and additional site development	Extending measurement period with new measurements will entail extending leases. New equipment will require additional site development like power and space.	\$8	\$2,633	Lease extension at 7 Mile and power
13. Site operation for new measurements described in items 6 – 9.	Note: assumes USFS, SWCAA and ODEQ will continue to absorb operation of existing measurements in items 1 – 5 and 14.	\$60 (split between SWCAA and ODEQ)	\$40,123	Setup and operation of two trailers with monitoring equipment – data collection
14. Fog/cloud water deposition sampling and chemical analysis in eastern Scenic Area – winter seasonal	Independent Forest Service study to sample and analyze chemistry of fog and cloud water that may be affecting ecosystem and Native American cultural resources. Data should be available for use in Redesign Study and CoHaGo.	\$54	Not reported yet by Forest Service	Not reported yet by Forest Service – first year study completed
B. Enhanced Meteorology: Characterization of physical processes				
15. SODAR at 1 site, 1 year	Vertical wind/temperature profiles. Supports CoHaGo and model evaluation.	\$50	N/A	SODAR continued to operate through period – data collected weekly
16. Analysis of existing west and east end SODAR measurements to determine best placement of mid-Scenic Area SODAR		\$3	No activity	No analysis of data
C. Emissions Inventory				
17. Refine emission inventory for use in predictive model for Scenic Area.	Supports model evaluation and model inputs.	\$14	No activity	No activity – to be performed later
D. Causes of Haze Assessment (CoHaGo)				
18. CoHaGo assessment.	Analysis of measurement data and develop a conceptual understanding of the causes of haze in the Scenic Area.	\$75	No activity billed	No activity other than data warehousing
E. Modeling Studies				
19. Initial CMB modeling	Help identify general source categories contributing to impacts. Supports CoHaGo.	\$25	N/A	Study completed prior to intensive study
20. Initial ISOPART modeling	Help identify chemical processes and evaluate emission inventory. Supports CoHaGo and model evaluation.	\$25	N/A	Study completed prior to intensive study
21. Calpuff "footprint" modeling using MM5 data	Help identify potential source regions. Supports CoHaGo.	\$25	N/A	Study completed prior to intensive study
22. Modeling of base case current (2004) and future year (2018). (Assumes model performance evaluation and limited refinement of model is done under other projects with no cost to Scenic Area grant)	Future air quality levels under current control strategies. Determine whether additional control strategies are necessary. (Additional control strategy modeling not included in this study plan)	\$110	No activity	No activity – to be performed later

F. Project Management and Reporting				
23. Project management and reporting (SWCAA)	Provide management and oversight of overall project. Prepare and manage sub-contracts for modeling, data analysis and assessment. Purchase equipment. Arrange and host meetings to update Gorge Commission and public. Provide an overall final report synthesizing reports from sub-contractors.	\$70.6	\$14,052	ODEQ contract DRI Haze Gradient Contract UC Davis contract 7-Mile Lease extension Sunset Lab contract Purchase Equipment R&P Purchase Equipment Thermo Purchase equipment Teledyne QA Project Plan
	Total Cost	\$1,357.6		
	Already Funded	687.0		
	Cost of new measurements, modeling, EI development, data analysis and assessment and project management and reporting	670.6		
	Congressional Grant	670.6		
	Balance Needed	None		



IAS/DRUM sampler in foreground with monitoring trailer at Bonneville Dam – meteorological station and nephelometer in building behind trailer.



Sulfate and nitrate pulse generators on left with NO_x and SO₂ monitors in blue rack in trailer at Bonneville Dam



Sulfate pulse generator on right with zero air gas generator, sulfate, and nitrate analyzers in stack of three and the EC/OC analyzer on far left (black boxes) in trailer at Bonneville Dam



Installation of IAS sampler at Towal Road – Dr. Steve Cliff on left and Jackie Brown on right



Towal road shelter (nephelometers and meteorological station) with IAS sampler in front of door on shelter and SODAR on right in front of pickup – IAS installed December 3, 2003. White shed on left was for former fluoride monitors.



Tim Morphy – R&P on left in background during training at DEQ Laboratory November 20, 2003



Jackie Brown – SWCAA performing maintenance on equipment at Wishram – December 3, 2003

Attachments

- Purchase orders
- List of Equipment in Gorge
- Cost Accounting
- DEQ Contract
- UC Davis Contract
- Haze Gradient Contract
- Sunset Laboratories Contract
- Newspaper article