

The Brake Pad Partnership is a multistakeholder effort to understand the impacts on the environment that may arise from brake pad wear debris generated in the use of passenger vehicles. Manufacturers, regulators, stormwater management agencies, and environmentalists are working together to understand the impacts that may arise from brake pad wear debris generated by passenger vehicles on the environment. BPP efforts are aimed at developing an approach for evaluating potential impacts of copper from brake pads affecting water quality in the South San Francisco Bay as an example. Brake pad manufacturers have committed to adding this evaluation approach to their existing practices for designing products that are safe for the environment while still meeting the performance requirements demanded of these important safety-related products.

## Mark Your Calendars!

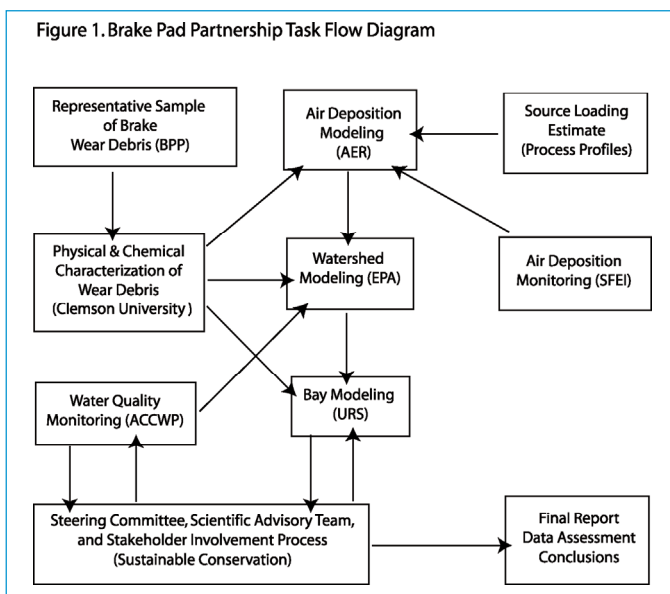
### Stakeholder Conference Scheduled

The next Stakeholder Conference is scheduled for June 22, 2005, and will be hosted by the Pacific Gas and Electric Company (PG&E) in San Francisco. If you would like to attend or receive materials from the meeting, please contact Brake Pad Partnership Project Manager Connie Liu at (415) 977-0380, ext. 336 or cliu@suscon.org.

## BPP Technical Studies Update

The Brake Pad Partnership (BPP) is conducting a set of interlinked laboratory, environmental monitoring, and environmental modeling studies to understand the fate and transport of copper from automobile brake pad wear debris in the environment. Figure 1 illustrates the relationship among the studies.

At the core of the Partnership's effort are three environmental modeling studies:



- Air Deposition Modeling—to predict how much brake pad wear debris is released and deposited in the study watershed (Castro Valley).
- Watershed Modeling—to estimate how much copper from the deposited wear debris washes into the storm drainage system and eventually reaches the waters of the South San Francisco Bay.
- Bay Modeling—to determine whether and, if so, to what extent copper from brake pad wear debris affects short- and long-term concentrations of copper in the bay.

In support of these modeling efforts, the Partnership is conducting additional studies to develop accurate input data for the models. An air deposition monitoring effort will provide data necessary for comparison of the model results with the data values as a part of the air deposition model evaluation. Stormwater monitoring data are being collected to help calibrate and validate the watershed modeling. In addition, the Partnership is conducting physical and chemical characterization analyses to determine model parameters specific to brake pad wear debris.

Since the last BPP Update in August 2004, the Partnership has made substantial progress in its work on air deposition monitoring, generation and characterization of a representative sample of brake pad wear debris, estimating the amount of copper released to the watershed from brake and nonbrake sources, water quality monitoring, and watershed modeling.

## Steering Committee

**Rodger Dabish**, TMD Friction Inc.

**Michael Endicott**, Sierra Club

**Tim Merkel, Ph.D.**, Consultant,  
Representing friction material  
manufacturers

**Kelly Moran, Ph.D.**, TDC  
Environmental, LLC, Representing  
the Bay Area Stormwater  
Management Agencies Association

**Jim Pendergast**, U.S.  
Environmental Protection Agency

**Mark Phipps, Ph.D.**, Federal  
Mogul Corporation, Chair,  
Brake Manufacturers Council-  
Product Environmental Committee  
(BMC-PEC)

**Chris Shepley, M.R.S.C.**  
Brake Parts, Inc.

**Project Manager:**

**Connie Liu**  
Sustainable Conservation

**Facilitator:**

**Sarah Connick, Ph.D.**  
Sustainable Conservation

**Technical Advisor:**

**Mark Schlautman, Ph.D.**  
Clemson University

## Air Deposition Monitoring Expanded

Don Yee and his colleagues at the San Francisco Estuary Institute (SFEI) completed the collection of wet and dry deposition samples at the end of February 2005. In addition, under the advice of the air deposition modelers, Betty Pun and Christian Seigneur of Atmospheric and Environmental Research, Inc., SFEI began measuring ambient air concentrations of benzene in November. The idea is to use benzene as a tracer of vehicle traffic, with the expectation that higher benzene levels would be found at the sampling site adjacent to the freeway off-ramp, and lower levels would be found at the reservoir site that is more remote from roads. The benzene samples are being taken at the same time and location as the dry deposition samples, and may provide the BPP with sufficient information to apportion the copper found in the dry deposition samples to vehicle and nonvehicle sources.

## Characterization of Airborne Brake Pad Wear Debris Completed

Clemson University researchers Christos Christoforou, Mark Schlautman, and colleagues completed the characterization of a representative sample of airborne brake pad wear debris and the BPP's Scientific Advisory Team conducted a stakeholder and independent expert review of their work.

The researchers found that the generation of airborne brake pad wear debris varied significantly for the three different materials that comprise the representative sample, with the material that generated the most airborne brake pad wear debris producing nearly 15 times as much wear debris as the one that generated the least. The mass mean aerodynamic diameter of the representative sample of airborne brake pad wear debris was approximately 2.7  $\mu\text{m}$ . A copy of the report can be found on the BPP's website at: <http://www.suscon.org/brakepad/pdfs/ADPSD%20Final%20Report%2001-28-05.pdf>

## Characterization of Nonairborne Brake Pad Wear Debris Underway

The generation of a representative sample of nonairborne brake pad wear debris was completed at Link Test Laboratory in November 2004. This procedure captured the brake pad wear debris that collected on the test apparatus and the surface below. Clemson University researchers are now conducting total copper, solubility, and leaching tests on this material.

## Estimating Copper Loads to the Watershed

One of the most critical inputs to the modeling effort will be the development of sound estimates of the amount of copper released in brake pad wear debris to the study watershed. The BPP contracted with Kirsten Rosselot of Process Profiles to work with the Steering Committee in carrying out this work.

In October 2004, the BPP's Scientific Advisory Team conducted a stakeholder and independent expert review of the work plan for estimating copper loads from vehicle brake sources. The review process resulted in a heightened awareness of the importance of the BPP's use of sensitivity analyses to understand how uncertainty around different pieces of information may affect the efforts' overall results. Process Profiles is now preparing the draft report, which will be available for stakeholder and independent expert review in late March 2005. The final Work Plan is now available on the Partnership's website at: <http://www.suscon.org/brakepad/pdfs/Final%20WkPln%20Estimating%20Copper.pdf>.

Process Profiles is also developing information on the estimates of copper loadings from nonbrake sources to the watershed. The draft work plan for this work was made available for stakeholder and independent expert review in mid-February 2005.

### BPP Scientific Advisory Team

Jerry Schubel, Ph.D., Aquarium of the Pacific, co-chair  
Mark Schlautman, Ph.D. Clemson University, co-chair  
John Sansalone, Ph.D., Department of Civil and Environmental Engineering, Louisiana State University

#### Characterization of Airborne Brake Pad Wear Debris:

Thomas A. Cahill, Ph.D., Department of Applied Science, University of California at Davis  
Michael Robert, Department of Civil and Environmental Engineering, University of California at Davis  
Glynis Lough, Ph.D., Environmental Chemistry and Technology Program, University of Wisconsin-Madison

#### Estimating Copper Loadings to the Watershed:

Robert A. Frosch, Ph.D., Belfer Center for Science and International Affairs, Harvard University

#### Water Quality Monitoring:

Robert Holmes, Central Valley Regional Water Quality Control Board  
Arthur J. Horowitz, U.S. Geological Survey  
William Selbig, U.S. Geological Survey

#### Watershed Modeling:

Robert Ambrose, Ph.D., National Exposure Research Laboratory, U.S. Environmental Protection Agency  
Wayne Huber, Ph.D., Department of Water Resources Engineering, Oregon State University  
Ken Schiff, Southern California Coastal Water Research Project

## Water Quality Monitoring Report Technical Review in Process

The draft results of the 2003-2004 Castro Valley Creek Water Quality Monitoring Project are now undergoing stakeholder and independent scientific review. A draft of the report and current information on the review process is available on the Partnership's website at: <http://www.suscon.org/brakepad/documents.asp>.

## Watershed Modeling Work Plan Completed

The BPP's watershed modeling effort is being conducted by Jim Carleton of the U.S. Environmental Protection Agency. In October 2004, the BPP's Scientific Advisory Team conducted a stakeholder and independent expert review of the draft work plan for watershed modeling. The process involved several teleconferences with the reviewers, Steering Committee, technical team members, and interested stakeholders. As a result of these discussions, the BPP revised and improved its watershed modeling approach. A copy of the final work plan for watershed modeling is available on the BPP's website at:

<http://www.suscon.org/brakepad/pdfs/Final%20Work%20Plan%20for%20Watershed%20Modeling%20Study.pdf>.

<b>TECHNICAL WORK PRODUCT REVIEW STATUS</b>	
<b>TECHNICAL WORK PRODUCT</b>	<b>REVIEW STATUS</b>
<b>Air Deposition Modeling (AER, Inc.)</b> Work Plan Report	Finalized January 2004 Draft report due July 13, 2005
<b>Watershed Modeling (U.S. EPA)</b> Work Plan Report	Finalized November 2004 Draft report due December 20, 2005
<b>Bay Modeling (URS Corporation)</b> Work Plan Report	Draft work plan due August 26, 2005 Draft report due August 15, 2006
<b>Characterization of Airborne Brake Pad Wear Debris (Clemson University)</b> Work Plan Report	Finalized May 2004 Finalized January 2005
<b>Chemical Characterization of Brake Pad Wear Debris (Clemson University)</b> Work Plan Report Additional work	N/A Draft report now under review TBD
<b>Loading Estimate of Copper from Brake Pads (Process Profiles)</b> Work Plan Report	Finalized Draft report due March 28, 2005
<b>Loading Estimate of Copper from Nonbrake Sources (Process Profiles)</b> Work Plan Report	Draft work plan now under review Draft report due April 22, 2005
<b>Water Quality Monitoring (Alameda Countywide Clean Water Program)</b> Work Plan Report	No work plan required Draft report now available for review
<b>Air Deposition Monitoring (SF EI)</b> Work Plan Report	Finalized January 2004 Draft report due April 4, 2005
<b>Project Management and Final Report (Sustainable Conservation)</b> Operations and Communications Plan Final Report	Finalized March 2004 Draft report anticipated December 2006

## Model Year 2003 Copper Use Data Now Available

The Brake Manufacturers Council Product Environmental Committee reported data on the use of copper in the top 25 best selling vehicles for model year 2003. The data indicate there was little change in copper used in vehicle brakes in comparison to the previous year, although copper use has increased by about 90 percent since the voluntary monitoring program began in 1998. The Copper Use Monitoring Program Results for Model Years 1998-2003 is available on the Partnership's website at: <http://www.suscon.org/brakepad/pdfs/CuUMP%20Final%20Report%2012-03-04.pdf>.

### Interested in Getting Involved in the Brake Pad Partnership?

For information on how to participate in the Brake Pad Partnership's (BPP) efforts, please subscribe to the BPP list-serve. You will receive project updates, information on the availability of draft and final reports and the opportunity to provide your input, along with information on upcoming stakeholder events. To subscribe, please send a blank e-mail to: [BPP-list-serve-subscribe@topica.com](mailto:BPP-list-serve-subscribe@topica.com). Use of the BPP list-serve is reserved exclusively for disseminating and sharing information about the BPP.

## Technical Consultants

### Air Deposition Modeling

Atmospheric and Environmental Research, Inc.

### Watershed Modeling

Office of Water, U.S. Environmental Protection Agency

### Estimation of Copper from Brake and Nonbrake Sources

Process Profiles

### Chemical and Physical Characterization of Brake Pad Wear Debris

Clemson University

### Project Contracting and Fiscal Management

San Francisco Estuary Project

### Bay Modeling

URS Corporation

### Air Deposition Monitoring

San Francisco Estuary Institute

### Stormwater Monitoring

Alameda Countywide Clean Water Program

### Project Coordination and Technical Management

Sustainable Conservation

Funding for this project has been provided in full or in part through an Agreement with the State Water Resources Control Board (SWRCB) pursuant to the Costa-Machado Water Act of 2000 (Proposition 13) and any amendments thereto for the implementation of California's Nonpoint Source Pollution Control Program. The contents of this document do not necessarily reflect the views and policies of the SWRCB, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

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