

Agenda
South River Science Team
Expert Panel Meeting
November 9 – 10, 2004

1. Results since last expert panel meeting.

Time	Item	Responsible	Comments
Tuesday, November 9, 2004			
9:00	Introductions, Welcome	Don, Ralph	
9:10	Plant site stormwater	Mike Sherrier	
9:25	Atmospheric	Dean Cocking	
9:40	Water column	Ralph Turner, Dick Jensen	
10:00	Floodplain Soils	Annette Guiseppi-Elie	
10:20	Bioavailability	Rob Mason, Erin Mack	
10:45	Break		
11:00	Fish diet	Don Orth	
11:20	Clams	Tom Benzing, Doug Graber-Neufeld	
11:40	Food crops	Bill Berti, Dean Cocking	
12:00	Lunch		
12:30	Outreach	Mike Liberati	Working Lunch
12:45	Publications	Ralph Stahl	

2. Plans for new work in 2005 – 2006

Time	Item	Responsible	Comments
1:00	Water column	Ralph Turner, Dick Jensen	
1:20	Flux chambers	Rich Landis	
1:40	South River TMDL	DEQ, USGS	
2:05	Bioavailability	Rob Mason	
2:25	Geomorphology	Jim Pizzuto	
2:45	Modeling	Nancy Grosso	
3:05	Break		
3:15	Sediment procedures	Ted Turner	
3:25	Proposal - Hg studies in South R. floodplain and stream habitats	Marcella Kelly	
3:40	Fish bioaccumulation	Don Orth	
4:00	Fish tissue sampling 2004	Billy Van Wart	
4:20	Clams	Tom, Doug	
4:40	Birds - proposal	Dan Cristol	
5:00	Adjourn for the day		
6:00	Group Dinner		

Wednesday, November 10, 2004			
9:00	Welcome, Recap	Don, Ralph	
9:15	Birds	Ralph, John	
9:30	Crops	Bill, Dean	
9:45	Creel, angler survey	Steve Reeser	
10:00	Outreach	Mike Liberati	
10:15	Break		
10:30	Update the CSM	Ralph	
11:30	Lunch		
12:30	What are we missing ?	Don , Ralph	
1:00	Open discussion	Don, Ralph	
2:00	Closing remarks	Don, Ralph	
3:00	Adjourn		

DAY ONE - November 9, 2004

Welcome and introductions. Don Kain

- Self-introductions were made by all. Attendee list can be found in Attachment 1, page 12.
- Ralph Stahl noted that regardless of potential for upcoming litigation w/ NRDC and Sierra Club, DuPont would continue to commit time and resources to the SRST.
- Number of represented organizations now involved in the SRST has increased approx. 3-4x since inception in 2001

Stormwater @ DuPont/Invista. Mike Liberati (for Mike Sherrier)

- From results of phase I study, found Hg leaving in some of the 11 permitted outfalls
- Phase II will move upstream in the stormwater and outfall systems, and attempt to quantify incremental sources of Hg to the discharges under base and stormflow conditions
- Will use compositing, flow-proportioned samples for analysis
- Work to this point has consisted of obtaining sample equipment, weir modifications, equipment deployment
- Will also test to find out extent of bioavailability of Hg leaving plant
- Will try to target normal storms for “Storm event conditions” (not Isabel type storms)
- Rob Mason was curious as to how samples would be filtered to 0.45µm w/out the filters becoming clogged) Pre-filters?
- Outfalls that don’t receive stormwater will only be sampled at baseflow conditions (any chance there could be indirect stormflow contributions via infiltration/inflow into those outfalls during heavy rain events?)
- During probing of old storm sewer lines at DuPont/Invista, found and removed ¼ cup of Hg in an abandoned line; however, line was still attached to extant system
- There are still more branches to be examined for Hg, should all be inspected w/in the next few months

- Had to reconstruct flume for 008 (caused parking lot flooding in original configuration)
- 1st round of baseflow sampling to occur w/in the week.
- Plan on pulling manhole covers for visual/sniffing probing of Hg next week
- J. Schmerfeld – “will also do Hg on TSS?” Mike L- “yes”
- Refer to Presentations folder for Powerpoint presentation

Atmospheric Deposition. Dean Cocking

- Performed survey at “landscape level” county sized survey
- Amir looked at deposition around mines, smelters, etc.
- Cheap tanglefoot traps provide lots of samples at many sites
- Problem w/samplers is that it under estimates wet deposition (overflows during storms)
- Use CVAA Perkins-Ehmer Flow Induction Mercury Syst. (FIMS)
- Some puzzling high results west of Waynesboro along 250, some high spots east of Basic City; also some high spots in Harrisonburg- nowhere near DuPont, however in 2004 Harrisonburg sites were low
- Fungicides from orchards might be responsible for Hg hits; currently checking around orchards
- Jim Pizzuto- “what sources of Hg for non-South River hotspots?” Dean- “contaminated river bottom soils might be harvested/transported for landscaping”
- Ralph Turner- suggested particle load basis standardization would make data more useful (get ng Hg/g of dust) or aluminum, since it comprises highest % of dust particle. Also have lots of insects, tough to filter out; maybe use duplicate plates to measure dust
- Hot spots may just represent dustier/buggier sites (bugs have Hg also)
- Consensus that need to quantify bug and dust content to make data more useful
- Mike Neuman- “can you exclude bugs?” Dean- “maybe” using cheesecloth, or something similar? Problem is that Dean doesn’t have \$\$ to implement suggestions
- Refer to Presentations folder for Dean’s Powerpoint presentation

Water Column Hg. Ralph Turner, Dick Jensen

- Sampled South and South Fork Shen Rs under moderate and flood conditions
- no difference in Hg in initial (pre-breach) up and down from McGaheysville dam
- Most MeHg is dissolved
- @ moderate flow, most TSS might not be sediment but might be dead algae. However, DEQ TOC data are usually non-detect (<2 mg/L)
- Calculated Hg_{TSS} for this study phase
- Crimora Hg_{TSS} results probably too low; some error
- Don Kain- “are these results consistent w/ point source problems?” Ralph T. thinks all “sources” are downstream; doesn’t think Invista outfall 001 Hg contribution could account for all problems in the river; pointed out that dissolved Hg from a source drops “like a rock” not like the dissolved results we’ve been seeing
- For heterogeneous samples w/ very high TSS, errors of calculated Hg_{TSS} are relatively high

- “Dissolved Hg” might be colloidal, don’t really know. Might try ultrafiltration later to see (~0.2 μm pore size)
- On down-side of storm hydrograph, Rockfish Run had ~7ng/L diss. Hg
- Did a test to det. if we’re getting diss. Hg released from soils and sed.; worst case scenario. From 4-96, no difference in suspension times. Higher TSS yield higher releases of diss. Hg
- River bed sediment didn’t release as much Hg as soil; ox-bow sediment may not be a sig. source of diss. Hg during flooding
- Haven’t yet addressed role of TOC (low under normal flow, but unknown at flood conditions)
- Is the released Hg bioavailable? Colloidal?
- Nancy Grosso- if used Hg contaminated river water for suspension experiment, would expect same results? Ralph T.- yes.
- Refer to Presentations folder

Floodplain Survey. Annette Guiseppe-Elie

- Will use all data in Conceptual Model
- see average soil Hg of about 10 ppm, but up to 330 ppm in deep cores
- Ralph and Dick got samples from eroded banks at Hopeman that had been overgrown during first attempt at collection for that site (poison ivy), no results from those samples yet
- Still need to sample a few more sites
- once all data into database, will begin running statistical analyses
- Results mostly confirm past study results
- Jim Pizzuto- have granularity data for samples? No, but will get that data in the future
- Rob Mason- are these the same soils? Annette- Seems to be about the same
- Original estimate of Hg on floodplains about 98,000 lbs, but haven’t used new data to address total mass in floodplain
- See Presentations folder

Shake and Bake Results. Rob Mason

- Used contaminated sediment, suspended and measured TSS, MeHg
- Hg on TSS after 96 hrs. settling, higher than Hg in bulk sediment, but expected. Probably due to clays
- Stirring duration had little effect on MeHg production
- Most MeHg is dissolved (similar results to Ralph and Dick’s data)
- DOC addition did seem to boost methylation
- Concluded that do get Hg into column w/ suspension, but didn’t increase methylation, nor did DOC addition significantly increase it
- Dick Jensen- must be some methylation going on, since there’s some MeHg in sediment @ beginning of experiment. Andrew Heyes- leafy sediments probably hotspots of methylation activity, but most sediment isn’t
- Mike Neuman- periphyton have oxic and anoxic zones like a trickle filter; could be a lot of methylation going on there; lots of contact w/ ecosystem as well- microflora as well as algae. Methylation could also be taking place on other biologically active surfaces

- Dick Jensen- Rob's sediment #s are less than 1%, but in the river #s are closer to 2%
- Mike Neuman- there are other routes of getting Hg into food (maybe from periphyton)
- Oxbow doesn't provide enough to explain fish Hg#s.
- See Presentations folder

Fish Feeding. Steve Reeser for Greg Murphy

- Differences detected between rivers, sexes and seasons. These are expected to drive some of the upcoming planned sampling and analytical events
- Terrestrial insects may provide transport of Hg from soil back to fish (June beetles in Basic park ~10 ppm Hg)
- Hg in gastropoda ~ 40% (similar to results in shucked *Corbicula*)
- BASS (Bioaccumulation and Aquatic System Simulation) model might be useful as a river management tool (used in this study). In this study, food and gill uptake were included in model.
- Of necessity, many assumptions were made to flesh out model
- In smallmouth, differences between sexes and seasons apparent. Difference due to sex greater than due to season; 10-20% higher in females, 14-21% higher in spring than in fall w/in sexes
- One caveat mentioned; study essentially performed during period of extreme drought
- Model suggests required sediment Hg reduction of 75% may lower Hg in small fish to below 1ppm (but not the 0.5 ppm level which triggers consumption advisory limiting consumption).
- Ralph Turner obs'd.; difficult to make predictions based on sediment concentrations on the basis of sediment heterogeneity and difficulty in standardizing sediment samples (don't usually get a good correlation between MeHg in sediment and MeHg in invertebrates).

Clam Studies. Doug Graber-Neufeld and Tom Benzing

- By using clams, can control exposure, place wherever we want to study them
- During invasion of *Corbicula* into the States, really changed the ecology
- *Corbicula* can filter bacteria
- Sometimes get mass die-offs, if conditions are deleterious
- for each transplant, took 3 samples through time.
- Found that clams accumulated Hg very quickly
- Spike late in April may reflect reproductive cycles
- MeHg changed from ~28% before, to 55% at the end; if clams are getting rid of inorg. Hg, then that would increase relative percent of MeHg in tissue. Do they shed inorg. Hg during reproduction?
- Future studies may want to do long term monthly sampling
- Look at MeHg changes; what might causes be?
- Takes clams transplanted from contaminated sites about 3-4 weeks to loose Hg (clams from Forestry Center placed in clean water in lab)
- Caged clams probably only need about 2 months exposure (to equilibrate w/ local clam Hg concentrations?)
- Mike Neuman likes the clams due to the statistical power of the approach

- Ralph Turner- if there are differences due to reproduction, might not be as useful, but if can assume all those effects even out, then they should be pretty useful
- Control clams run about 0.05 ppm Hg
- Refer to Presentations folder

Lunch-Group Photo



Outreach. Mike Liberati

- Discussed newsletter information
- “Should I Eat Fish” Brochure

Publications. Ralph Stahl

- Document the origin of the South River Science Team/Hg problem; currently under way
- SETAC- will have several presentations; Ralph Turner may also present some information

Crop Studies. Bill Berti

- Objective of study was to determine if Hg was significantly taken up into crop plants sufficiently to pose a human health risk
- Flooding caused problems in Sept. '03 and '04
- MDL 3 ppb; 10 vegetables in '03 and '04 were below MDL
- Practical Quantitation Limits (PQLs); values below this limit are only estimates
- Results in all years below PQLs, but many above MDL, but lettuce and spinach got close to PQL; carrots exceeded it when unpeeled in 2003, but below in '04
- Rob Mason- if the Hg we're seeing is inorg, then it's much less of a health risk issue
- MeHg in plants is usually about 10% of total
- In general, Hg advisory levels for people subsistence fishing are 0.2-0.3 ppm
- Still some crops in the field at this time

- May want to lower the PQL, if SRST thinks it's necessary
- Refer to Presentations folder

Water, Sediment, Soils, etc. Dick Jensen and Ralph Turner

- Need to try to describe mechanism of Hg movement/transformation w/in and through the system
- Performed an Hg balance in vicinity of the Invista (DuPont) plant
- Eroding banks may be very important sources of Hg- plan to look at sediment directly under the crumbling banks
- Jim Pizzuto- groundwater and river may be the same water
- Hg in the soil/sediment beneath the plant?
- John Schmerfeld- alluvial water may be very important; flow through karst, fractures, water balance on the river may yield clues on alluvial significance
- Joel Hennessy- Genicom karst info may help out; Mike Sherrier has info on this data
- Groundwater/surface water interface may be methylating; high nutrients, low DO at the interface.
- Refer to Presentations folder

Flux Chamber. Rick Landis

- Takes 2-3 weeks, just in cleaning/preparing to deploy
- Can double chamber units to provide some replication
- Beveled edges for driving into sediment (probably wouldn't be able to drive it into South River bed sediments; too rocky, wouldn't seal well)
- ~12 Liter capacity
- Capability of coupling w/ underwater camera for \$600
- Can probably work around cobbles problems, figure out a way to seal around bottom of chamber (would be very tough to do)
- Mike Neuman wanted to know if you could exclude algae from the chamber
- Might work well in ox-bow, low energy regions (mud deposits from initial Mud-Mapping expedition?)
- Refer to Presentations folder

TMDL. Jutta Schneider

- Want to avoid duplicating effort w/ SRST
- During developmental process, may determine TMDL need not be developed/implemented
- Will assess atmospheric contributions
- Also assess MeHg , flux, production, cycling etc.
- Analyses performed through USGS Hg Lab
- May need to address advisory limit/trigger
- Get feedback from SRST, make sure TMDL folk are aware of all historic data
- Should the TMDL group be incorporated into SRST, or have a subcommittee report to the SRST?
- Process should be complete by 2008

- Ralph Turner- what happens when you lower Hg in water but fish tissue concentrations don't decrease? Might do a lot of work that doesn't fix the advisory problem
- For success, fish tissue concentrations need to come down by about 4x
- Mike Liberati- likes the idea of a liaison between SRST and TMDL folk
- Jack Eggleston has a copy of the TMDL proposal
- Refer to Presentations folder

Sediment Hg Bioavailability. Rob Mason

- Measure MeHg, total Hg, diss. Hg, see if we can force methylation in various sediment fractions
- Diss. Hg gives best correlation to fish tissue Hg concentrations.
- Gary Biggam- also should try to get *demethylation* in a separate experiment
- Best to filter samples in field, if possible
- Might be able to make a mesocosm to test algal methylation
- Dick Jensen suggested that a flume could be used to test cobble and algal methylation

Sediment Transport/Geomorphology. Jim Pizzuto

- Important to develop silt/clay budget
- Want to describe for segment from Waynesboro to Port Republic
- River bed and bank storage and exchange isn't well understood
- Suspect that floodplain storage/exchange isn't significant
- USGS will be monitoring turbidity (realtime?); input and output will be focus of Phase II
- Sediment transport scientists don't know what happens to a particle once it erodes from a bank and becomes entrained
- Hg may be the best transport tracer
- Refer to Presentations folder

Conceptual Model. Nancy Grosso

- "CSM" Conceptual System Model- primarily a risk assessment tool
- CSM ties data together and identifies data gaps
- Used to evaluate Hg fate, transport, bioaccumulation
- Ralph Stahl- suggests make sure we compile all data as we collect it
- Gary Biggam- models generally only good to an order of magnitude; when we need to figure 30% reduction in fish tissue
- Refer to Presentations folder

Future Studies. Marcella Kelly

- Mentioned other modeling approaches- Hg bioaccumulation dynamics (Orth, Vance; using Bass Model stuff)
- Bioaccumulation in amphibians (Hopkins, Kelly), noted maternal transfer affects reproductive success

- Frog larvae mostly herbivores; salamander larvae mostly carnivorous, represent various trophic levels
- Would want to link Hg to population effects
- Bioaccumulation in mammals- otters, muskrats, raccoons; really tough to assess reproductive success (use radio telemetry, very field intensive)
- Would moles in floodplains be of interest? Eating beetle grubs (June beetles high in Hg)

Caged Clam Study. Tom Benzing

- 19 of 20 cages survived; 80.1% clam survival
- All results in wet weight
- In Jones Hollow MeHg was approx. 60%, and higher than South River from outfall 001 down to Jones Hollow
- Rob Mason- says maybe only inorganic Hg in 001, so clams only accumulating inorg. Hg; might be sequestering Hg into granules?
- Might it be possible to identify hot spots, and ongoing sources by looking for areas where the ration of inorg. to MeHg are highest?
- If this is the case, then Jones Hollow probably isn't a site of new Hg coming into the system, or the slow flow in Rockfish Run might result in more complete methylation as it runs it's course
- Mike Neuman- we've ID'd 001 as a source, so we should plug it to find out what effect it has on the river. It may not be the only source, but it's certainly one of them
- Hurricane Jeanne resulted in about a 5 year flood; topped 12K CFS
- Wild clams in '02 were about 38% MeHg
- Refer to Presentations folder

DAY TWO- November 10, 2004

2005 DEQ Fish Tissue Survey. Bill Van Wart

- Plan on doing clams along w/ regular 5 year fish 2005
- Will do catfish in '05, seasonal SMB (in South River if populations are sufficient)
- 10 SMB, spring and fall to assess variation through season and between sexes
- If not enough fish in South River, we'll use the South Fork Shenandoah
- Plan to look at holdover trout in South River; Waynesboro (adipose fins were clipped to ID stocking from fall.
- Central Office Fish Tissue program will be leap-frogging over our 5 yr. program in the South Fork Shenandoah
- Most states require 2 consecutive samplings below advisory levels to remove a stream from an advisory
- Corbicula data may be problematic, if inorg. and MeHg levels are variable- if have to do MeHg for all samples, clams no longer cheaper than fish, since MeHg is expensive
- Still need to sample MeHg in water; Ralph T. and Dick J. plan to sample MeHg from Constitution Park to Dooms sometime in January
- Back to clams- would have to set up at DEQ for depuration; need to purchase equipment
- White suckers in Bridgewater- Steve Reeser thinks these would be the most likely human health risk (fairly heavily fished in Bridgewater by Menonite community)

- May or may not be able to do fish biomass estimate- will be up to DGIF
- Refer to Presentations folder

Bird Fitness vs. Hg. Dan Cristol

- Plans to look at individuals of a species- evaluate fitness
- See Dave Evers article in Ecotoxicology
- Wood duck might be ok, but don't accumulate contaminants well
- wants to look at ~20 nesting pairs/yr.
- Paul Bugas- would you want hunted/eaten species, to address human health risks (mallards?)?
- Kingfishers - <10 nests/yr/site
- Loons feathers have about ½ the Hg as the liver (but very consistent correlation)
- Loons, kingfishers, tree swallows, all are about 90-99% MeHg in tissue
- 1st egg in a clutch has most Hg
- Ralph Turner- SAIC/DOE in Oakridge may have some tree swallow Hg data from similarly contaminated area
- Gary Biggam- Can you rule out effects from other compounds (pesticides, etc.)?
- John Schmerfeld- Do a few full spectrum samples
- Mike Neuman- suggests using a Development Stability Index (i.e., begging behavior modification, etc.)
- Refer to Presentations folder

Creel and Angler Survey. Steve Reeser

- Have data from a '97 survey of area; asked how much fish eaten, how aware of advisory details, etc.
- Roving survey; performed from canoe, you meet lots of different anglers
- 46% knew about advisory, but only 24% knew details
- Most fishermen not eating fish from South And S.F. Shen.
- If we do a new survey, the survey would have to be crafted not to bias responses
- Ralph Turner- maybe use mail in surveys
- Tom Benzing- fact that catfish consumption (info from survey) is relatively high in the system demonstrates that not all the population is aware of the advisory
- Develop means of getting data on fishers from fishing license application? Target surveys?

What do We Know/What do We Think We Know? Ralph Stahl

- Outreach intermission: Cacapon Meeting Billy plans to do either a poster or presentation.
- We've been doing presentations at schools, kids take information home to parents
- Further outreach suggestions contact Don Kain, Paul Bugas, Mike Liberati w/ ideas
- Genicom- TCE and chromium problems; have a map of contaminant plume
- no groundwater testing at DuPont at ultra trace levels; don't know about any testing at that resolution for off-site wells.

- Is the recent data collected (Ralph and Dick; Jeanne flood, etc.) consistent w/ one or more of the suggested models of Hg release (“Hot Spot”, “Slow Drip”, etc.)? Ralph T- we’re not seeing step functions that you’d expect to see if you had hot spots
- Andrew Heyes- thinks it’s possible that DuPont 001 could provide enough Hg to account for MeHg in stream, but not Total Hg (but is it enough to account for all the fish tissue Hg along the affected reach to Front Royal?)
- Can’t completely discard the “Old Globule” hypothesis/model, but seems to be less likely in light of newer results (not finding any suggestions of it near plant)
- Joel Hennessy- has detailed aerial photos from ’37 on; might yield some information on Hg distribution in system
- “Combo Hypothesis” may be best model for fish tissue problems

Filling Data Gaps. All

- Need to coordinate next bimonthly clean Hg runs w/ Ralph and Dick, if possible
- Ralph Turner suggests we delineate stream segments by disjunctions in stream morphology
- Could also use stream gradient changes to delineate segments
- Ralph Turner- Low gradient areas would be expected to have more Hg storage, plus slower flow, more time for methylation to occur
- Mike Neuman- might want to define reaches on a management basis- create delineations at point in the stream where type of management would change
- Need to do sampling upstream and downstream from mill races during storm events. Could be important source of dissolved Hg, as indicated by Ralph and Dick’s sediment/soil flux experiment
- Ralph and Dick will plan to do some ultrafiltration (0.2 μm) to see if Hg is associated w/ colloidal components, and speciation in that fragment
- Look at speciation in 001 outfall
- Might be able to use native clams if the inorganic component does appear to indicate Hg source. If areas under question don’t have clams, can always transport them
- Will look at clipped trout in April ’05, then if enough individuals, look again in fall to see if survivors accumulate
- May want to examine methylation upstream and downstream of heavily overgrown/algified areas
- Need to check to see if Greg Murphy tested snails (*Goniobasis?*); may have also tested algae in S.F., since it was a primary diet component for catfish
- Group plans to consolidate data to make a “master-data-base” of every piece of information all groups have on the South and South Fork Shenandoah Rivers.
- Would probably be beneficial to contact someone to see what’s been done on the N.F. Holston; Ralph T.- will get us paper by George Southworth, et al., 2004.
- Refer to Ralph’s handout in Attachment 2, page 13

Next Meeting: Feb. 8, 2005 (changed from original date of Jan 18, 2005)

Attachment 1. List of Attendees

SOUTH RIVER SCIENCE TEAM MEETING – November 9, 2004

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Attachment 2. Filling in the Data Gaps (updated 9/16/2004)

Studies Ongoing or Completed

- ❖ Sources of Hg to the system
 - Plant site stormwater investigation. Phase 1 completed.
 - Atmospheric – Dean Cocking, JMU, ongoing. Preliminary results obtained in summer 2004.
 - Floodplain Soils – Rob Mason, shake & bake, 90% completed as of 8/10/2004.
- ❖ Media investigations
 - Sediments. Initial coring and dating studies completed. Pilot test of “guzzler” completed.
 - Floodplain soils. Phase 1 completed.
 - Water column. Intensive water sampling (Lumex and otherwise) for Hg (total and dissolved) completed. Ion investigation completed. DEQ efforts continue.
- ❖ Biological investigations
 - Corbicula – EMU, JMU – Doug & Tom. Phase 1 (& intensive around plant site) – finished. Transplant studies ongoing.
 - Fish Diet Studies - Virginia Tech – Greg Murphy, Don Orth, Tammy Newcomb – completed.
- ❖ Hydro geological investigations
 - River / land use survey – completed
 - Mud mapping – completed.
 - Water flows / water balance – initial study completed.
- ❖ Exposure, risk, outreach
 - Food crop study – Bill & Dean – Phase 1 completed. Phase 2 underway.
 - Piscivorous birds – initial exposure estimates completed.
 - Minority community – radio spots completed. Bi-lingual consumption advisory signs under development.
 - Publications – 5 abstracts accepted for SETAC World. Congress, Nov. 2004. 1 journal manuscript completed, 3 in preparation.

Studies Planned, Proposed or Under Development

- ❖ Sources of Hg to the system
 - Plant site stormwater investigation – Phase 2 planned, possible in fall 2004.
 - Bridges & tribs – planned pending results of shake & bake experiments.
 - Floodplain soils – check ponds as methylation “hot spots”.
 - Second street landfill – pending agreement with City of Waynesboro.
 - Atmospheric – USGS in 2005 – 06
 - Speciation of Hg – preliminary discussions on need / specifics
- ❖ Media investigations
 - Water column – total and dissolved Hg (and MeHg) at plant site and downstream – Ralph Turner, October 2004
 - Sediments – DEQ planning

- Dam removal sampling – water and sediment
- Flux chambers
- ❖ Biological investigations
 - Corbicula – EMU, JMU – more transplant studies considered.
 - Fish 1 – Trust fund monitoring, DEQ refining plans for 2005, may include small forage fish [trout study – hold overs from spring stocking]
 - Fish 2 – Request additional ideas from Virginia Tech
 - Corral studies ?
 - Earthworms – Dean Cocking w/students
 - Periphyton, Attached Vegetation – under discussion [site for methylation ? can we get this another way ?]
- ❖ Hydro geological investigations
 - Geomorphology – Jim Pizzuto, Univ of Delaware proposal made.
 - Modeling – Hydroqual proposal being refined.
- ❖ Exposure, risk, outreach
 - Piscivorous and other birds – John S. developing names, concepts.
 - Creel, angler survey – DGIF to conduct in 2005 for SFSR.
 - Minority community, anglers – Bi-lingual advisory brochure under consideration

Data Management

- Database development – searchable, planned to begin in 4Q2004 [includes documents, data, reports, aerial photos, Science Team meeting minutes]

Suggestions from 2003 Expert Panel meeting – testing hypotheses

1. Are floodplain soils a source of bioavailable mercury
Shake and bake study using soils, river water and measuring MeHg production over time
2. Are river bed sediments a source of bioavailable mercury
Shake and bake study using sediments, river water and measuring MeHg production over time (could combine with clam uptake studies)
3. In 1 and 2, add organic matter to provide food source for bacteria (to stimulate microbial activity) – stack the deck. Maybe have a streamside flow through system – soils / sediments, river water, and clams (and enhancements to microbes) to see if bioavailable mercury is released.
4. For slow drip hypothesis, or new source hypothesis: need intensive water column study with total and dissolved Hg along with low detection limit. Sample at low flow period if possible. Include tributaries and other potential inputs other than the point at which the transect is specified. Need to check the ratio of total to methyl along with the change in this ratio downstream. Separate inorganic data from methyl data. The

change in these will be reflective of new inputs to system – may need a statistical power test to help identify how many samples are needed to determine whether we'll be able to detect a difference.

5. For slow drip, hot spots of methylation: need intensive water column study and target areas in river conducive to methylation for MeHg analysis. Need to include flow measurements with this effort, particularly when going to areas where methylation might occur. Have to combine upstream, in the zone, and downstream of these areas.
6. For hypothesis # 3, for this to work, there would have to be an erosional process in the sediments and soils that would provide the continued input of inorganic Hg to the system. In the absence of the erosional process, it is likely that the levels in fish would have gone down.
7. For the globules hypothesis – difficult to distinguish from other hypothesis. Headspace analysis in water, sediment or soil samples (using inert gas like Argon) and measure elemental mercury content. Might be able to use PIMS or similar type of sampler. Difficult to distinguish among various forms particularly when adding air or other medium drives changes in speciation. Soil / vapor analysis might be useful for soils but it is unlikely that elemental mercury will be present. Might be helpful for studies on the plant site, particularly along river bank that are wetted during rain events (but need 10-20 ppm in soils to be able to measure any elemental mercury; need to have about 100 ppm before able to measure anything in vapor).
8. Mass balance estimate: how much biomass is produced each year and knowing the MeHg, how much mercury would be required to maintain this level.