

**Syllabus July 2008**

The course has two types of modules. Core modules are given in all sessions noted as C1, C2, C3, etc. Treatment modules noted as T9, T10, etc, focus on specific pollutants: TPH, metals, phosphorus, nitrogen, bacteria, temperature, and gross solids (litter). There is insufficient time in the two days to present all seven modules. We focus on the pollutants attendees identify as their priorities for their community and region.

**DAY 1**

	<b>TOPIC</b>	<b>CONTENT</b>
C1	Management approach	<i>Stormwater, why the concern:</i> Impact on the hydrologic cycle and in turn streams, lakes, wetlands, and estuaries; pollutants of concern and why. <i>Control strategy:</i> integrated control of runoff rate and volume, and pollutant reduction. <i>Performance goals:</i> new developments, industrial and construction permits; current and likely.
C2	Stormwater quality	<i>What in stormwater matters to treatment and performance:</i> sources of pollutants, types of pollutants, and typical concentrations.
C3	Source control	<i>Importance of source control</i> to the ability of treatment systems to meet numeric limits, and to reduce cost of maintenance. Source control BMPs of particular benefit.
C4	UOPs	<i>Unit processes and operations:</i> a better way to understand treatment and structure treatment systems.
C5	Treatment systems	<i>Overview of what we have:</i> basins, swales, filters, infiltrators, gross solids removers, active treatment. Manufactured vaults and filters.
C6	Some engineering basics	<i>Hydraulic loading rate:</i> what it is and significance to design. <i>Stokes Law:</i> uses and limitations. <i>Vegetated/soil systems:</i> Unit processes of relative roles of chemical versus biological processes. <i>Filter media:</i> capacity vs performance; how to determine capacity. <i>System sizing:</i> commonality of sizing volume-based systems.
C7	TSS/SSC	<i>TSS/SSC:</i> What is it, common concentrations, and particle size distributions; current performance goals and benchmarks. <i>Basins:</i> wet ponds and wetlands, a more cost-effective design procedure making them much smaller than currently; extended detention, how to make it as effective as wet basins. <i>Swales and strips:</i> Origin of residence time and Manning’s criteria, design changes to improve performance. <i>Filters:</i> filter media, performance and sizing; manufactured filters.

## DAY 2

The morning of Day 2 we focus on specific pollutants. Which sessions are presented depends upon the priorities established by the attendees through the completion of the Questionnaire that comes with the Registration Form (Page 2). Final core sessions occur in the afternoon.

	TOPIC	CONTENT
T8	TSS Enhanced Removal	<i>Laminar settlers:</i> Use in small vaults <i>Active treatment:</i> Liquid and solid coagulants at construction sites.
T9	TPH	<i>Oil/water separators:</i> current performance goals and benchmarks; sizing a true separator, API and CPI; distinction from oil/grit separators; limited use is recommended; data on how well other treatment systems such as ponds and swales remove TPH.
T10	Metals	<i>Which metals are important:</i> which tend to be dissolved, what was removed with the TSS, focus on dissolved; current performance goals and benchmarks. <i>Wet ponds, and wetlands:</i> how metals are removed; role of plants versus soils; data on the relationship of basin size and performance; cost-effective sizing; inherent limits of biological systems; performance over the long-term, and relevance of vegetation harvesting. <i>Filters:</i> media types, capacity vs performance; amended sand filters, bioretention cells and swales (dry swales); performance of manufactured filters. <i>Infiltration:</i> performance as determined by what is found in groundwater beneath infiltration and porous pavement systems.
T11	Phosphorus	<i>Importance of dissolved phosphorus:</i> What was removed with the TSS; focus on dissolved; what is BAP; current performance goals and benchmarks. <i>Wet ponds, and wetlands:</i> how phosphorus is removed; role of plants versus soils; data on the relationship of basin size and performance; cost-effective sizing; inherent limits of biological systems; performance over the long-term, and relevance of vegetation harvesting. Active treatment with chemicals <i>Filters:</i> media types, capacity vs performance; amended sand filters, bioretention cells and swales (dry swales), infiltration; performance of manufactured filters. <i>Infiltration:</i> performance as determined by what is found in groundwater beneath infiltration and porous pavement systems.
T12	Nitrogen	<i>Forms of nitrogen:</i> organic, ammonia, nitrate. What was removed with the TSS; focus on dissolved; current performance goals and benchmarks. <i>Wet ponds, and wetlands:</i> how nitrogen is removed; role of plants versus soils; data on the relationship of basin size and performance; cost-effective sizing; inherent limits of biological systems; performance over the long-term, and relevance of vegetation harvesting. <i>Filters:</i> media types, capacity vs performance; amended sand filters, bioretention cells and swales (dry swales), infiltration; performance of manufactured filters. <i>Infiltration:</i> performance as determined by what is found in groundwater beneath infiltration and porous pavement systems.

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	TOPIC	CONTENT
T13	Bacteria	<i>Disease organisms in stormwater:</i> sources; health risks; current performance goals and benchmarks. <i>Treatment:</i> removal mechanisms, which systems are ineffective; which are most effective. <i>Manufactured systems:</i> new developments on positive kill systems; active disinfection.
T14	Temperature	<i>Thermal effects:</i> of pavement and treatment systems, minimizing thermal effects of ponds and wetlands; effectiveness of bioretention; use of rock galleries and piping.
T15	Gross solids (Litter)	<i>Composition:</i> what are gross solids, why control is important; current performance goals and benchmarks; current performance goals and benchmarks. <i>Control:</i> in common treatment systems; with screens and sweeping.

**CORE SESSIONS COVERED IN THE AFTERNOON**

C16	Pretreatment	<i>Why pretreatment:</i> reasonable performance target. <i>Unit operations for pretreatment, sizing:</i> strips, forebays in ponds and sand filters. <i>Manufactured vaults for pretreatment:</i> swirl concentrators (aka vortex), standard configured vaults; performance data; use of HLR for model selection.
C17	Treatment Trains	<i>Being effective and cost-effective:</i> objectives; inconsistent application of the terminology; example systems; pitfalls; performance data; rules on sticking “boxes” in series; is a second or third “box” worth it?
C18	Maintenance	<i>Effect on performance:</i> data on the effect of maintenance on performance. <i>Facility inspection program:</i> its elements and costs; cost experience.
C19	Certification of systems	<i>Certification programs:</i> requirements and status of approved manufactured systems; lab versus field testing. Manufactured systems not currently certified that will likely meet performance goals. <i>International BMP Data Base.</i> How to use it; questions to ask; its benefits and limitations; cautions in its use.
C20	Wrap up	<i>Summation:</i> summary tables of overall comparative performance of treatment systems. <i>Final questions</i>