# HYDROLINK

**A Hydrology and Hydraulics Newsletter**

**December 2010 Issue: 5**


Technical Committee on Hydrology and Hydraulics

## Message from the Technical Committee on Hydrology & Hydraulics Chair

*Rick Renna, Florida DOT*

Greetings from the Technical Committee on Hydrology and Hydraulics (TCHH), It was great to see many of you at the recent FHWA conference in Utah. The conference was well attended, had excellent information on breaking topics in hydraulics, and ran smoothly thanks to the hard work of UDOT, FHWA, and TCHH staff. Special thanks go to Mike Fazio, UDOT host for the conference. Presentations from the conference are available online (see page 11 for links).

One crucial topic at the conference was the aggressive increase in environmental storm water regulation being pursued by the USEPA. Many in the hydraulics community are deeply involved in their states' NPDES program and are working with the AASHTO Subcommittee on the Environment to provide feedback to EPA on their proposed regulations. Comments from transportation engineers and state DOTs are vital toward educating EPA on the differences between traditional point sources and state transportation agencies. I encourage you to follow EPA's regulation development process and render appropriate professional comments, balancing proper environmental stewardship with essential scientific integrity and fiscal prudence.

**In This Issue:**



Thank you for your commitment to the excellence in hydraulics engineering for transportation infrastructure.

Rick Renna
Chairman, Technical Committee on Hydrology and Hydraulics


**Technical Committee on Hydrology and Hydraulics at the 2010 Fall Meeting Park City, UT**

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## Regional Climate Change – Useful Information for DOTs

*Robert Kafalenos, FHWA*

The Regional Climate Change report summarizes the current state of available climate projections as of spring 2010. At the regional level, it provides projections of annual and seasonal temperature change and seasonal precipitation change over the 21st century. It also includes information on global sea level rise and the current research on climate change's potential influence on tropical storms/hurricanes. While the focus of the information is at the regional level, the study also includes a "typology" that cites information from multiple climate changes studies conducted at the regional/state and local level for the reader's reference. FHWA received a lot of assistance on this report from USGS, NOAA, DOE and others.
http://www.fhwa.dot.gov/hep/climate/climate_effects/

### Gulf Coast Study, Phase 2

The Gulf Coast Study Phase 2 will build on the information developed in Phase 1 to develop more definitive information about impacts at the local level. Mobile, AL has been selected as the focus area for this study. The analysis will concentrate on the key transportation links, for day to day systems operations (passenger and freight) and emergency management (evacuations-before, cleanup-after). The study will develop more precise tools and guides for State DOT and MPO planners to use in deciding how to adapt to potential climate impacts and determine vulnerability for key links for each mode. Phase 2 will also develop a risk assessment tool to allow decision makers to understand vulnerability to climate change and develop a process to implement transportation facility improvements in a systematic manner. Estimated completion date is 2013.

### Vulnerability/Risk Assessment Conceptual Model

A conceptual model has been developed that can be used by State DOTs to conduct vulnerability assessments of their transportation systems and infrastructure. The model outlines a process for developing an inventory of transportation infrastructure, developing climate change projections, assessing vulnerability and risk of assets to potential climate change, and analyzing/developing adaptation options. FHWA is funding pilots of the conceptual model in five locations: Washington State DOT, MTC (San Francisco), Oahu

MPO, New Jersey DOT, and Virginia DOT. Once the pilots are completed, FHWA plans to use the information to improve and then finalize the model.

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## HY-12 Storm Drain Analysis Program Pooled Fund Project

*Andrea Hendrickson, MN State Hydraulics Engineer*

A new posting recently went out in the Transportation Pooled Fund Program for a project titled "HY-12 Storm Drain Hydraulic Analysis Program – Phase Two of Development Efforts". The solicitation number is 1277. http://www.pooledfund.org/projectdetails.asp?id=1277&status=1

HY-12 is a FHWA developed storm drain application that uses the pavement drainage and storm drain hydraulic design approaches and methodologies recommended by FHWA. HY-12 can be used to design storm drain systems or to check the results from commercial software products.

The objective of this research effort is to develop a graphical user interface, GUI, for the HY-12 storm drain software. A stand-alone BETA version of HY-12 has been completed and successfully tested using the required input format of a text document using Notepad. The myriad of situational applications and user controlled options available through HY-12 provides a difficult and lengthy learning curve for efficient implementation with the current text document input format. Numerous State DOT Hydraulic Engineers have voiced their needs for a stand-alone HY-12 product with a graphical user interface to ensure an effective and efficient implementation.

Please consider contacting your DOT research program staff if you are interested in having your state participate in the project. The suggested contribution is $10,000 for the 12 month project.

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## HY-8 Modeling Tip: Analyzing Embedded Culverts

*Eric Brown, FHWA*

The popular and widely used Federal Highway Administration (FHWA) HY-8 Culvert Hydraulic Analysis Program has undergone significant upgrades during the last several years. With the release of the current version of the software, Version 7.2, in August of 2009, the user now has the ability to analyze embedded culverts (also known as buried culverts), such as the one depicted in Figure 1 and as defined in Figure 2. The practice of embedding circular, pipe arch and box culverts is widely used throughout the United States to improve aquatic organism passage (AOP) through waterway crossings. Embedment criteria vary by state agency and range from several inches to a couple of feet or a percentage of the rise (i.e., height) of the culvert barrel.

To perform the analysis of a buried culvert, the embedment depth is entered within the "Culvert Data" field of the HY-8 "Crossing Data" input screen, as shown in Figure 3. The depth of embedment is always a positive number (or zero to indicate no barrel embedment) with a unit designation of inches. For example, burying a 5-foot diameter pipe culvert 1 foot would require placing a "12.0" in the "Embedment Depth" field. This also means that of the 5 feet of culvert rise, only 4.0 feet is "available" for conveyance of the design flows. The remaining 1 foot is buried below the channel invert and "backfilled" with material that may or may not have the same gradation as that of the natural channel, depending upon the governing design requirements.

Two distinct Manning's n values are required for the analysis of an embedded culvert:

- one value is needed for the culvert barrel and is entered in the "Manning's n (Top/Sides)" data field
- a second value is required for the bed material and is entered in the "Manning's n (Bottom)" data field

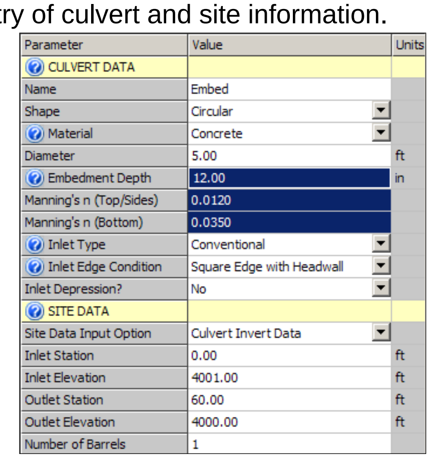
Default Manning's n values for both the culvert material and bed material are provided in HY-8, and these values can be changed by the user. The current version of HY-8 will calculate a composite roughness value by weighting the two Manning's n values with the wetted perimeter of the design discharge as described in Appendix B of Hydraulic Design Series Number 5 (HDS-5): Hydraulic Design of Highway Culverts. Manning's n values for culvert materials and stream channels/bed material are found in HDS-5 Appendix B and Appendix D, respectively. HDS-5 may be downloaded as an electronic file from the FHWA Hydraulic Engineering website: http://www.fhwa.dot.gov/engineering/hydraulics/library_listing.cfm.

Upon inputting the embedment depth and Manning's n values for the culvert analysis, it is important to correctly specify the channel invert elevation at the outlet, as illustrated in Figure 2. The channel invert elevation is entered under the "Tailwater Data" field and is typically located at the same elevation as the top of the embedment, though the channel invert elevation could be located above or below this elevation if desired. In other words, referring again to Figure 2, the channel invert at the culvert outlet would be set at an elevation corresponding to "12E + Embed". The culvert invert elevations should reflect the buried depth. In the case of a culvert embedded 1 foot, the culvert outlet elevation typically would be 1 foot less than the tailwater channel invert elevation.

HY-8 users are encouraged to review and step through the embedded culvert example included with the HY-8, Version 7.2 free software download available from the FHWA Hydraulic Engineering website: http://www.fhwa.dot.gov/engineering/hydraulics/software/hy8/. And while FHWA does not offer user support for HY-8, comments may be submitted to: CommentsOnHY8@dot.gov.

Figure 1. A partially embedded culvert to facilitate AOP.

Figure 3. A portion of the HY-8 data input window for entry of culvert and site information.



| Parameter | Value | Units |
|---|---|---|
| CULVERT DATA | | |
| Name | Embed | |
| Shape | Circular | |
| Material | Concrete | |
| Diameter | 5.00 | ft |
| Embedment Depth | 12.00 | in |
| Manning's n (Top/Sides) | 0.0120 | |
| Manning's n (Bottom) | 0.0350 | |
| Inlet Type | Conventional | |
| Inlet Edge Condition | Square Edge with Headwall | |
| Inlet Depression? | No | |
| SITE DATA | | |
| Site Data Input Option | Culvert Invert Data | |
| Inlet Station | 0.00 | ft |
| Inlet Elevation | 4001.00 | ft |
| Outlet Station | 60.00 | ft |
| Outlet Elevation | 4000.00 | ft |
| Number of Barrels | 1 | |

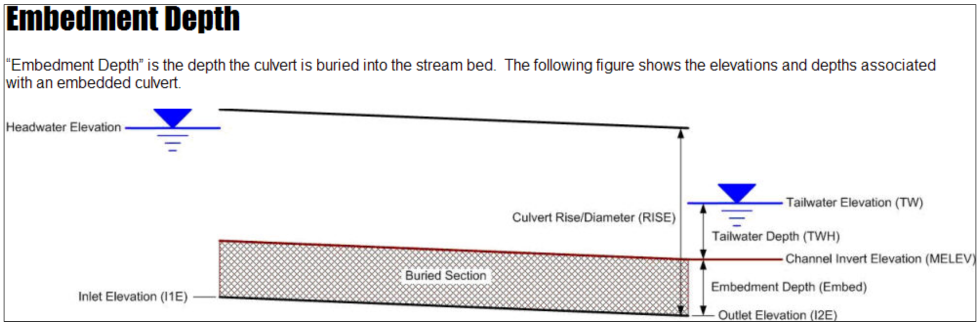



Figure 2. A definition sketch of embedment depth and elevations pertinent to HY-8 computations.

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## Vertical Deflection Measurement Trials: Hand Measurements Compared to Laser Profiling in Kentucky

*Kean H. Ashurst, Kentucky Transportation Center*

Like other states, Kentucky requires post construction inspection of storm sewer and culvert pipes. Kentucky's revised pipe inspection policy, which was implemented in 2008, requires that a portion of all newly constructed storm sewer and culvert pipes be video inspected for flaws and defects and checked for excessive deflection. The video inspection is conducted on all pipes regardless of material type. Only flexible pipes need to be checked for deflection. Pay deductions for overly deflected pipe are assessed on the following intervals: 5.0%-7.5% and 7.5%-10%. Removal and replacement of the pipe is warranted when the deflection exceeds 10%.

The approved methods for determining the magnitude of pipe deflection are by mandrel, direct hand measurement, or laser profiling. Recently, laser profiling is becoming more widely used as a means to measure deflection in storm sewer and culvert pipes. Since deflection measurements are often used as the basis for payment deductions, there is a need to compare laser profiling results to direct hand measurements. It should be noted that the laser profiling equipment used in this experiment is not a "time of flight" laser system. The laser, in this instance, is only projecting a line on the circumference of the inner wall of the pipe while a camera records the line as it travels through the pipe. Specialized software is then used to analyze the video and measure the diameter and calculate deflection.

The experiment was designed to be simple and straight forward. The experiment used a stick of 24-inch High Density Polyethylene (HDPE) pipe. A location was chosen along the pipe to measure the internal vertical diameter. The pipe was placed into a load frame and a plumb bob was used to ensure the two opposing interior points were vertical. Next, the diameter was measured the by hand to the nearest 1/16 of an inch with a carpenters rule and extension. The laser profiling equipment was then run through the uncompressed pipe three times. The pipe was then compressed vertically approximately 5.2% percent using the load frame. A hand measurement was taken and the pipe was laser profiled three more times. This process of compressing, hand measuring, and profiling was repeated two more times at increasing deflection levels of 8.0% and 10.4% (as measured by hand). Once the desired deflection was reached the load was locked in place to prevent any vertical displacement during the inspection. The laser profiling setup and process were conducted as per the manufacturer's written documentation.
The results of the experiment are summarized in Tables 1 and 2 below. The vertical diameters are reported in Table 1 and the deflections are reported in Table 2. Comparing

the laser calculated diameters to the hand measured diameters indicates that the laser results were within 0.1 to 0.2 of an inch of the hand measurements.

**Table 1 - Y Diameters**

| Trial | Hand | Laser 1 | Laser 2 | Laser 3 |
|---|---|---|---|---|
| | | (inches) | | |
| **1** | 24.125 | 24.2 | 24.2 | 24.2 |
| **2** | 22.875 | 23.0 | 23.1 | 23.0 |
| **3** | 22.188 | 22.5 | 22.4 | 22.4 |
| **4** | 21.625 | 21.8 | 21.9 | 21.9 |

The laser analysis on the uncompressed pipe reported that the pipe was deflected vertically anywhere from a 0.1% to 0.5%. When the pipe was compressed to 5.2%, as measured by hand, the laser analysis reported a deflection approximately 0.5% less than the hand calculated deflection. As the compression of the pipe continued, the difference increased to around 1.0% when compared to the hand calculated deflection.

**Table 2 – Deflection Comparison**

| Trial | Hand | Laser 1 | Laser 2 | Laser 3 |
|---|---|---|---|---|
| | | (%) | | |
| **1** | 0.0 | 0.5 | 0.1 | 0.3 |
| **2** | 5.2 | 4.7 | 4.6 | 4.6 |
| **3** | 8.0 | 7.2 | 7.2 | 7.0 |
| **4** | 10.4 | 9.6 | 9.5 | 9.5 |

Hand measured deflection was calculated by the following equation where Y1 is the uncompressed vertical diameter and Y2 is the compressed vertical diameter.

$$deflection\,\% = \frac{Y1 - Y2}{Y1} * 100$$

The results from the laser inspection shown in both tables above are as reported by the manufacturer's software analysis. The data has not been adjusted in any way. To be fair, the laser profiling software does not use the above Y1 variable to calculate deflection. However, the vertical diameters needed to calculate the true vertical deflection from the laser inspection are represented in Table 1. The results of using the vertical diameter from the software are shown in Table 3 below. The minimum difference between the hand measured deflection and the laser calculated deflection is 0.2% when the pipe was deflected 5.2% and the maximum difference was 1.0% when the pipe was deflected 8.0%.

**Table 3 – Y Deflection Comparison**

| Trial | Hand | Laser 1 | Laser 2 | Laser 3 |
|---|---|---|---|---|
| | | (%) | | |
| **1** | 0.0 | 0.0 | 0.0 | 0.0 |
| **2** | 5.2 | 5.0 | 4.5 | 5.0 |
| **3** | 8.0 | 7.0 | 7.4 | 7.4 |
| **4** | 10.4 | 9.9 | 9.5 | 9.5 |

Overall, given only three laser runs per trial, we found the laser results to be fairly repeatable with some minor variation from run to run. However, with laser deflections varying by as much as 1.0% from the hand measured deflections it is important to pay close attention to the results because pay deductions are often affected by this deflection measurement. We might recommend verifying the laser results with a field measurement when feasible.

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**The New York Canal Wave Oscillation Problem and Solution**
*Lotwick Reese, Idaho State Hydraulics Engineer*

In the spring of 2009, crews first noticed a problem in the New York Canal near ITD's Interstate 84/Orchard Road project in Boise, Idaho. As the water in the canal rushed past the bridge piers, it created an alternating vortex behind the piers. The frequency of the alternating thrusts of the water, combined with the natural frequency of the channel, created an “alternating wave oscillation harmonics” in the channel that began to erode the banks south of the canal. If left unchecked, the erosion could have compromised the integrity of the bridge.

“The water could have broken through or overtopped the banks in just a few weeks,” said District 3 EIT Marc Danley. ”The water would more than likely have pooled up in the depression areas of the roadway,” causing a whole host of safety problems.

In July 2009, riprap (large rocks) was placed along the banks to prevent further erosion. Later that summer, the water began eroding the soil under the Wright Street Bridge abutments, a frontage road bridge just downstream from the I-84 bridge. Last winter, a change order allowed flowable fill (commonly a blend of cement, fly ash, sand and water, often used for bridge reclamation) to be backfilled behind the abutments to prevent further eroding.

To research the cause of the problem, ITD and its consultants contacted the Utah State University (USU) Water Research Laboratory located in Logan UT.

USU Water Research Laboratory is well known for its expertise in water-flow modeling. Their work has included all types of hydraulics modeling , from a large dam/spillway in California, to testing city water meters, flow measuring devices, and channel revetments.

In October 2009, the university sent Civil Engineering department head, Dr. William Rahmeyer, and Steve Barfuss, a research professor and head of its laboratory, to Boise for an on-site visit with ITD’s State Hydraulics Engineer and project engineers from Horrrocks Engineers.

Over the next few months, USU graduate students built a 100-foot-long 1:9 scale model of the N.Y. Canal structure that replicated water velocities, the spacing and height of the piers… even the size of gravel in the channel (see attached video links below).

After a number of trial runs with the model, the team found that by placing an angle iron – like a nose cone – to the front of selected piers, the alternating vortices were stabilized, so that they remain fixed in position, and the wave oscillations in the channel stopped.

The team will look at two or three other devices to attach to the piers for further testing to determine which will be the most cost effective. The final solution likely will be a type of a precast-concrete device attached to some selected pier columns. If approved, ITD may be the only agency in the country to introduce such preventive measure.

In 1997, another state had a similar problem, and its solution was to build a solid concrete wall between the piers, at a cost of nearly $600,000. The solution for the New York Canal problem, adjusting for inflation, is expected to be a fraction of that cost

There are several videos that have been recorded during these trial runs, showing how the wave oscillation has been re-created in the model.

To view these videos, please enter the following links :

SW Corner of prototype
http://www.youtube.com/watch?v=CS_j18iP1Dg

NE Corner of prototype
http://www.youtube.com/watch?v=JWQptf0VrdA

USU Wave Oscillation Model Study, New York Canal, Boise Idaho
http://www.youtube.com/watch?v=IAuYJAOyaLE

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## AASHTO Update – Reauthorization Update
*Kelley Rehm P.E.*

Everyone is interested in levels of funding these days. In 2010, twenty-one States experienced transportation spending cuts and the Highway Trust Fund is also seeing a gap. In 2010, the total receipts into the Trust Fund equaled $37.1 Billion, while the total outlay equaled $46 Billion. This gap is only projected to get worse. The National Surface Transportation Policy and Revenue Study Commission found that our nation needs to spend $225 to $340 billion per year on average through 2055 to keep up with the needs of an aging transportation system. Currently we are spending less than $90 billion a year. With the current gap in the trust fund and the growing needs to maintain the system, a new plan is needed. AASHTO has drafted a plan to help prepare our transportation systems for the future. AASHTO is making the following Legislative recommendations:

- **Between 2010 and 2015, in order to invest in a robust surface transportation program to meet significant national needs, Congress should fund a $565 billion multimodal program comprised of:**
    - **Highway program funded at $375 billion**
    - **Transit program funded at $100 billion**
    - **Freight program funded at $40 billion**
    - **Intercity passenger rail program funded at $50 billion**

- Federal government must continue to play a **strong role** in investing and maintaining an integrated and multimodal national surface transportation system
- States and local governments should be provided with **maximum flexibility** to use federal revenues from existing core sources to meet systemic transportation needs

- Strong **accountability measures** must accompany substantially increased funding to ensure resources are spent as efficiently and effectively as possible
- We need to **restore purchasing power** by making sure the impact of inflation on commodities and construction costs must be addressed in setting investment levels
- Adopt a long-range approach to funding the surface transportation system that gradually moves away from dependence on the current motor fuels tax to a **distance-based direct user fee** such as a fee on vehicle miles traveled
- Assure that any **climate change** legislation that creates a new revenue source, either through a carbon tax or cap-and-trade, provides substantial funding for transportation
- **Eliminate or drastically limit earmarking** in federal transportation programs
- Incorporate as part of program reform all eligible activities and transferability provisions that exist under:
  - Interstate Maintenance (IM)
  - National Highway System (NHS)
  - Bridge Program
- Permit expanded transferability of federal funds when tied to performance management and measures that demonstrate where the greatest needs are
- Provide additional flexibility in the Highway Bridge Program and remove unnecessary environmental restrictions in bridge maintenance and replacement activities
- Continue “off-system bridge” 15% set aside
- Expand eligibility of preventive maintenance

**Proposed Program Funding Levels to Restore Purchasing Power**

| Potential Program Name | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | TOTAL |
|---|---|---|---|---|---|---|---|
| Preservation and Renewal | $28.00 | $30.80 | $33.60 | $36.40 | $39.20 | $42.00 | $210.00 |
| Highway Freight (Based on Existing Revenues) | $2.40 | $2.64 | $2.88 | $3.12 | $3.36 | $3.60 | $18.00 |
| Highway Safety Improvement Program | $2.60 | $2.86 | $3.12 | $3.38 | $3.64 | $3.90 | $19.50 |
| Operations | $2.40 | $2.64 | $2.88 | $3.12 | $3.36 | $3.60 | $18.00 |
| Transportation System Improvement/Congestion Reduction | $11.10 | $12.21 | $13.32 | $14.43 | $15.54 | $16.65 | $83.25 |
| Environment Program | $3.50 | $3.85 | $4.20 | $4.55 | $4.90 | $5.25 | $26.25 |
| TOTAL - Highways | $50.00 | $55.00 | $60.00 | $65.00 | $70.00 | $75.00 | $375.00 |
| TOTAL - Transit | $12.5 | $14.2 | $15.8 | $17.5 | $19.2 | $20.8 | $100.00 |
| TOTAL - Freight (Based on New Revenues Outside of Highway Trust Fund) | $4.2 | $5.2 | $6.2 | $7.2 | $8.2 | $9.2 | $40.00 |
| TOTAL - Intercity Passenger Rail | $5.0 | $6.3 | $7.7 | $9.0 | $10.3 | $11.7 | $50.00 |
| GRAND TOTAL | $71.67 | $80.67 | $89.67 | $98.67 | $107.67 | $116.67 | $565.00 |

Currently, the details on the Obama administration’s transportation funding plan are not available. However, the following shows the timeline of the current reauthorization efforts.

- 15 September 2008: $8.017 billion General Fund transfer to the Highway Trust Fund
- 7 August 2009: $7 billion General Fund transfer to the Highway Trust Fund
- 30 September 2009: SAFETEA-LU expired
- 1 March 2010: Highway Trust Fund shutdown for two days
- 18 March 2010: $19.5 billion General Fund transfer to the Highway Trust Fund
- 31 December 2010: Current SAFETEA-LU extension expires
- Fiscal Year 2012: Highway Trust Fund projected to become insolvent

It is AASHTO's hope that a six-year bill will be passed soon, in order to help DOTs plan for the long term.

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## Announcements

### 2010 National Hydraulic Engineering Conference Highlights

The 2010 National Hydraulic Engineering Conference was held high in the Wasatch Mountains in beautiful Park City Utah, yet still only 45 minutes from the Salt Lake City International Airport located adjacent to America's famous inland sea the Great Salt Lake, from August 31- September 3, 2010. The theme of the conference, "Highway Hydrology and Hydraulics: Where Water Meets the Road" was reflected in the range of represented agencies and disciplines, as well as the diversity of topic sessions and presentations. Attendees participated in two parallel Tracks A&B featuring 16 technical presentations and a field trip to the Provo River Restoration Project (PRRP); over 8 miles long the PRRP is the single largest stream restoration project in the country encompassing essentially the entire reach and historic flood plain of the Provo River as it flows from the Jordanelle dam into Deer Creek Reservoir.

The conference commenced with introductory remarks by Utah Department of Transportation (UDOT) Director John Njord and Federal Highway Administration (FHWA) Utah Division Administrator James Christian, followed by keynote speaker and 2010 President of the American Society of Civil Engineers Blaine Leonard. All three speakers recognized the critical transportation infrastructure needs facing the nation and the vital role that the Hydraulic Engineering discipline plays in the planning, design, and preservation of the Nation's surface transportation infrastructure in the face of increasing demands, diminishing capital resources, and simultaneous need to preserve the natural environment. These themes were interwoven throughout the twin tracks of the conference sessions. There was a concerted effort made to capture presentations and make them available to those who could not attend the conference; links to the various conference tracks are tabulated below.

The highlight of the 2010 NHEC was the awarding of the first "Mark Miles Distinguished Hydraulic Engineer Award" by the NHEC Committee to North Carolina DOT State Hydraulics Engineer Mr. David Henderson. This biennial Award was named in honor of Mr. Mark Miles, a long serving member of the AASHTO Task Force on Hydrology & Hydraulics who passed away at the 2004 NHEC. This Award is meant to formally recognize those individuals who, like its namesake Mark Miles, have made outstanding contributions while serving at or for State Departments of Transportation, Universities, Federal Agencies, or private Consulting

firms. The unanimous selection of David Henderson by the NHEC Committee recognized his career as one marked by constant service to the motoring public, his colleagues and the advancement of the transportation hydraulic engineering profession in general.
In addition to the technical sessions and PRRP field trip, the 2010 NHEC afforded numerous networking opportunities with many of the best minds in the fields of surface transportation hydrology and hydraulics. The conference hotel also served as a venue for the American Association of State Highway and Transportation Officials (AASHTO) Technical Committee on Hydrology and Hydraulics Committee meeting.

The 2010 NHEC Steering Committee, a collaborative group composed of key partners in the FHWA, supported by the AASHTO Technical Committee on Hydrology and Hydraulics representatives and as the host State Utah DOT personnel, wishes to thank all of the Conference participants, presenters, moderators, technicians, tour guides, van drivers and exhibitors for their generous contributions of time and talents to the great success of this event. The Members of the Conference steering committee especially want to thank Darcy Brantly and Amanda Holm of the Utah DOT for their conference planning expertise and their many behind the scene efforts to ensure the success of the 2010 Conference.
The next biennial conference will be held in 2012. A state DOT host and agency partners are actively being sought. Please consider attending the next conference and even making a presentation.

For questions concerning the upcoming 2012 Conference or the recently held 2010 Conference, including requests for conference presentations, please contact Cynthia Nurmi at the FHWA resource Center, 404-562-3908 (email: cynthia.nurmi@fhwa.dot.gov).

| | | |
|---|---|---|
| **1A** | Plans of Action: Preparation, Implementation, and Management | http://connect.udot.utah.gov/p61857468/ |
| **1B** | Water Quality | http://connect.udot.utah.gov/p99132196/ |
| **2A** | Improving Highway Stream Crossing with Stream Restoration Principles | http://connect.udot.utah.gov/p48886171/ |
| **2B** | Water Quality | http://connect.udot.utah.gov/p67528035/ |
| **3A** | Bridge and Culvert Hydraulic Design | http://connect.udot.utah.gov/p53826665/ |
| **3B** | Climate Change: Trends, Analyses, and Adaptation Strategies | http://connect.udot.utah.gov/p24403723/ |
| **4A** | Coastal Design | http://connect.udot.utah.gov/p95311814/ |
| **4B** | Hydrology: From Rainfall to Runoff | http://connect.udot.utah.gov/p38665149/ |
| **5A** | Hydraulic Software | http://connect.udot.utah.gov/p45065789/ |
| **5B** | Fish Passage | http://connect.udot.utah.gov/p73758658/ |
| **6A** | Hydraulic Software | http://connect.udot.utah.gov/p90931376/ |
| **6B** | Fish Passage | http://connect.udot.utah.gov/p19573240/ |
| **7A** | Bridge Scour | http://connect.udot.utah.gov/p46075890/ |

## FHWA Engineering Handbooks

Did you know you can obtain several FHWA Engineering handbooks (size 8.5” x 5.5”) for free ?

To obtain your copies contact:

**A. For the Watershed Modeling System (WMS), Surface-Water Modeling system (SMS), Finite Element Surface-Water Model System ( FESWMS & FST2DH).**

Ms. Veronica Ghelardi
FHWA Resource Center
12300 West Dakota Ave, Suite 340
Lakewood, CO 80228
720-963-3240
Email : Veronica.ghelardi@dot.gov

**B. For the “What you need to Know: Hydraulic Engineering”**

Mr. Eric Brown
FHWA Resource Center
10 South Howard St., Suite 4000
Baltimore, MD 21201
410-962-3743
Email :Eric.brown2@dot.gov

**C. For other handbooks such as : Stream Instability, Bridge Scour, and Countermeasures: A Field Guide for Bridge Inspectors, 2009.**

Ms. Veronica Ghelardi (see full information above) or
Dr. Larry Arneson
FHWA Resource Center
12300 West Dakota Ave, Suite 340
Lakewood, CO 80228
720-963-3200
Email : Larry.arneson@dot.gov

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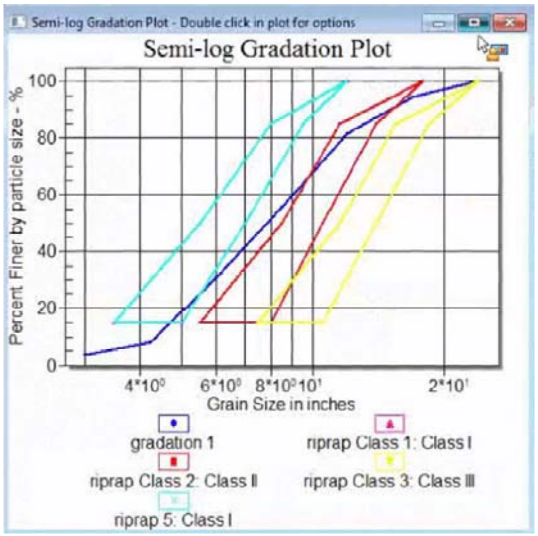
## FHWA Hydraulic Engineering Toolbox (New Version 2.0 available)

Many readers may already be aware of the older 1.0 version of the FHWA “Hydraulic Toolbox” software. Thanks in large part to the initiative and guidance of Mr. Bart Bergendahl, Senior Hydraulic Engineer with the Federal Lands Division of Federal Highways and the programming expertise of Aquaveo there now exists version 2.0, an enhanced “Hydraulic Toolbox” program. This handy windows based program not only allows a designer to perform common hydraulic computations such as channel analyses; including a HEC-15 based tractive shear computation, weir analyses, curb and gutter analyses per HEC-22, Rational Method calculation tools also include a handy IDF curve generation routine, detention basin analyses, and various report capabilities. A useful set of tools for

anyone working in the Hydraulics discipline; but the above features are not what this article will focus on. What the reader may not know is that the newest version of the program contains a really nice set of enhanced tools for evaluation and sizing of riprap for a wide variety of common place applications.
The following sampling of enhanced riprap design aid applications tells the story:

-Riprap Analysis - Revetment
-Riprap Analysis - Pier
-Riprap Analysis - Abutment
-Riprap Analysis - Spur
-Riprap Analysis - Culvert Outlet
-Riprap Analysis – Open Bottom Culvert
-Riprap Analysis – Wave Attack

One especially nice new feature is the graphical presentation of sampled riprap gradations versus standard gradations for riprap classes. There is even a tool to allow one to utilize the Wolman pebble count method to develop a sample gradation of the riprap or channel armor in the field or at a pit site and then compare it with the standard gradations as seen below:




So checkout this latest version of the Hydraulic Toolbox program; while it will not replace other programs in a typical State DOT or Consultants office it will ably serve for those times where you want quick hydraulic analyses. I am sure you will find it a useful addition in your own tool box.  Version 1.0 can be downloaded at
http://www.fhwa.dot.gov/engineering/hydraulics/software/toolbox.cfm

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## Membership News

### New FHWA Representative

**Brian L. Beucler, P.E.**
**Senior Hydraulics Engineer**
**Federal Highway Administration**
**brian.beucler@dot.gov**

**Office of Bridge Technology**
**HIBT-20, Room E75-119**
**1200 New Jersey Avenue, SE**
**Washington, DC 20590**

Brian works in the Office of Infrastructure, Office of Bridge Technology in FHWA's headquarters office in Washington, DC. He serves as the Senior Hydraulics Engineer within the Hydraulic and Geotechnical Programs Team. He provides expertise in the areas of hydrology, hydraulics, floodplains, coastal issues, scour, bridge navigational clearance, and climate change adaptation and related regulations, policies, technologies, research and deployment.

He is a friend of TRB Committee A2A03 for Hydraulics and Hydrology, and has served on NHI course development panels for "Design and Implementation of Erosion and Sediment Control" and "Water Quality Management of Highway Runoff" and has co-instructed the NHI Urban Drainage Design course. Brian was project manager for the FHWA publication, Hydraulics Engineering Circular 9, Debris Control Structures.

Prior to working in FHWA headquarters, Brian was the team leader for the Hydraulics section in the Technical Services Branch of the Eastern Federal Lands Highway Division (EFLHD) since 1994. Daily work as Hydraulics Engineer for EFLHD included working with bridge and roadway designers, environmental specialists, project managers, bridge inspectors, hydraulic and geotechnical engineers on bridge and culvert rehab/replacements, stream stability projects, erosion and sediment control reviews, and providing storm water management designs where required. Project locations included National Parks/Refuges/Forests and Indian reservations and military installations.

Brian joined EFLHD in 1982 as a roadway designer, served on the in-house training program with assignments in Construction, Bridge Inspection, Hydraulics and Roadway Design. He served as roadway design squad leader in 1987-1988 and as a hydraulics engineer since 1990.

When not working, Brian and his wife Janet answer to their teenage daughter Anna, shuttling her back and forth from soccer practice and orthodontist appointments.

B.S. Civil Engineering -University of Virginia, 1982
M.S. Civil and Environmental Engineering – George Washington University, 1996
Professional Engineer in the State of Virginia, 1989

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## Calendar of Events

**Transportation Research Board (TRB)**
January 23-27, 2011
Washington, DC
http://www.trb.org/AnnualMeeting2011/Public/AnnualMeeting2011.aspx

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**Water Resources Management**
May 23-25, 2011
Riverside, CA
http://www.wessex.ac.uk/11-conferences/waterresourcesmanagement-2011.html

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**AASHTO Subcommittee on Bridges and Structures**
May 15-19, 2011
Norfolk, VA
http://bridges.transportation.org

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**AASHTO Subcommittee on Design**
July 2011
St. Louis, Missouri
Meeting in conjunction with the Subcommittee on Right of Way and Utilities
http://design.transportation.org

***This newsletter is published biannually by the AASHTO Technical Committee on Hydrology and Hydraulics. Please send suggestions for articles and comments to:*** *Andrea.Hendrickson@dot.state.mn.us****, or call*** **651-366-4466.**

***To be added to the mailing list please send your email to Kelley Rehm at:*** ***krehm@aashto.org***

***For more information on the Technical Committee on Hydrology and Hydraulics see:*** **http://design.transportation.org**

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