



AMERICAN ASSOCIATION OF STATE HIGHWAY
AND TRANSPORTATION OFFICIALS

COMMITTEE CORRESPONDENCE

May 20, 2002

Address Reply to
Philip L. Thompson, HIBT-20
Senior Hydraulics Engineer
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400 7th Street, SW., Room 3203
Washington, D.C. 20590

TO: Members, AASHTO Task Force on Hydrology and Hydraulics
Officers, AASHTO Subcommittee on Design (Attachment A)

FROM: Secretary

SUBJECT: Minutes of the Spring Meeting, Coeur d'Alene, Id

Attached are minutes of the meeting of the Task Force on Hydrology and Hydraulics held at the Coeur d'Alene Resort Hotel in Coeur d'Alene, Idaho on May 6-10, 2002. Corrections will be accepted prior to the next meeting. At the meeting, the task force members extended their appreciation to Lotwick Reese for his handling of the outstanding meeting arrangements and for setting up the field trip.

All members should check the minutes for action items which are identified with an * on the left margin.

Sincerely,

Philip L. Thompson, P.E.

Enclosures

Chair Merrill Dougherty opened the meeting at 8 a.m. The following members were present unless noted absent or resigned. (See attachment A for addresses):

<u>TASK FORCE MEMBER</u>	<u>STATE</u>	<u>JOINED</u>	<u>REGION</u>
B. Bailey	Wyoming	1994	4
B. Booher	Arkansas	2002	2 (absent, new)
J. Boynton	Minnesota	1998	3
D. Bryson	Oregon	1994	4 (absent, resigned)
S. Choudhary	Ontario	1998	3
G. DeCou	California	1994	4 (absent)
M. Dougherty, Chair	Indiana	1994	3
M. Fazio	Utah	2001	4
P. Helms	South Carolina	2001	2 (absent)
D. Henderson	North Carolina	2000	2
D. Landry	Vermont	1997	1 (absent, resigned)
M. Miles	Alaska	2000	4
R. Mills	Virginia	1999	2 (absent)
B. Newman	Pennsylvania	1997	1
F. Nishioka	Hawaii	1991	4
T. Ngo	Oklahoma	1991	4
M. O'Connor/Bob Dawe	Illinois	2001	3
L. Reese	Idaho	1996	4
R. Renna	Florida	2001	2
J. Richardson, Vice Chair	Kansas	1996	3
D. Stolpa	Texas	2001	4
P. Thompson, Secretary	Washington, DC	1989	1
Duc minh Tran	Quebec	1999	1 (absent)
R. Veeramachaneni	Maryland	1997	1

VISITORS PRESENT (see attachment B)

1. **MEETING SUMMARY**

MEETING AGENDA (See attachment C)

PAST MEETINGS (Minutes available from Secretary)

<u>YEAR</u>	<u>MEETING</u>	<u>ZONE</u>	<u>LOCATION</u>	<u>DATE</u>
2002	63-Fall	4	OK	October
2003	64-Spring	3	IN	May
2003	65-Fall	4	WY	October
2004	66-Spring	3	IL	May
2004	67-Fall	4	TX	October

2. WELCOME AND INTRODUCTIONS

- A. Chair Merrill Dougherty welcomed the members of the task force and:
 - Thanked Lotwick for making the outstanding meeting arrangements.
 - Asked everyone to introduce themselves (see attachment B for visitors).
 - Noted that the meeting registration cost would be \$85.
- B. Lotwick welcomed the task force, made observations related to the importance of water, noted that he was “truly in love with his life’s work” and introduced Jimmy Ross.
 1. Jimmy Ross, chief engineer, Idaho Transportation Dept. provided the following observations:
 - a. His career with ITD started with graduation from ID University with BSCE. He obtained his PE in 1975. He has been a project, resident and district engineer and in 1995 became State Highway Administrator (Chief Engineer). He has 4 children and 7 grand children.
 - b. Area is known for Coeur d’Alene Lake, but Pend Oreille Lake to the north is comparable to Coeur d’Alene Lake and has a Naval submarine research facility.
 - c. Idaho is 83,557 sm and has a diverse terrain which varies from the forested area of the meeting to the high desert area in the south that receives about 13" of rain/yr. Idaho is the 39th largest state with 1.3 M people, has a population density of 15 people/sm (US average is 78). People live mainly in urban areas (57%). Boise has the most people with 200k. Idaho now has 3 MPO, but will have 6 in new census. Idaho is known as an agricultural state, but high tech is a close 2nd with firms such as HP and MICRON. Tourism is third.
 - d. Famous people from Idaho include Filo T. Farnsworth inventor of TV who was born in Rigby in 1907, Earnest Hemingway who lived & is buried in Ketchum, and Lana Turner from Wallace.
 - e. Interesting features of Idaho are: 63% of land in public ownership, largest wilderness areas in lower 48 states, Snake River is 500 miles (longest in state), and has a seaport at Lewiston.
 - f. Challenges - Since a significant mileage of roads is along rivers, endangered species and plants are frequently a factor. Explosive population growth and move to urbanized areas is putting a strain on transportation funding. Since 1978, drivers have increased by 100% while population growth was only 40%. At the same time, ITD revenue which comes from fuel tax and registrations has only increased 19%.
 - g. ITD has 5 divisions (aeronautics with 30 airports, public transportation, administration, motor vehicles and highways), 6 districts, 5000 miles of highways, and 1800 people (1400 in highways).
 - h. Idaho has only one major north-south highway, US 95. About 5 years ago, a large flood event on the Salmon River closed the road. The detour length around the closed bridge was 500 miles. Jimmy noted that ITD replaced the bridge with it’s permanent replacement in 19 days which is an amazing accomplishment.
 2. Lotwick discussed the field trip on Wednesday to visit to visit Bennet Bay Bridge and construction projects in the area. District Engineer Scott Stokes will guide the tour. He noted that the group dinner on Tuesday will be at the Cedars floating restaurant and that we will be taking a boat trip of the Coeur d’Alene Lake after the field trip.
 - * 3. Jim McDonnell, AASHTO, handed out and discussed the SCOH Reorganization Resolution and the new SCOH organization chart. He noted that chart which was adopted shows 2 new councils (project delivery and operations) which are made up of the chairs of the subcommittees. The councils are to improve coordination and do not create an additional layer. Jim cited a recent bridge rail issue which was created when the SOD adopted one value and SOB&S adopting another. Neither coordinated because each thought that it was their turf. The resolution on the 3rd page indicates that task force meetings should be combined with subcommittee meetings and that this should be the only yearly meeting. This affects SOD more than other subcommittees since most of SOD groups operate independently. SOD will be discussing this issue at their meeting in June. **He recommended contacting your SOD member so that they are aware of your position on this issue.** Another change is that SCOH now wants work plans which includes time lines for products.

3. **BUSINESS MEETING ACTIVITIES (Monday & Thursday)**

- A. Membership: The nominations of Brooks Booher of AR, Rick Renna of FL and Preston Helms of SC have all been approved by the AASHTO Region 2 Steering Committee. The chair and Jim McDonnell will request replacements for Dave Bryson of OR and Danny Landry of VT.
- B. Treasurer Report - tabled
- C. The chair or secretary discussed the following attachments:
 - A. Membership List
 - B. Visitors List
 - C. Agenda
 - D. HDG & MDM Status and assignments
 - E. Task Force Publication History
 - F. Scour Evaluations Progress Report
 - G. FHWA Technology Applications
 - H. FHWA NHI Training Activities
 - I. FHWA Publication List (not handed out)
 - J. FHWA Software List (not handed out)
- D. Handouts - The following items were provided before or at the meeting:
 - 1. Roy Jorgensen CDROM with 2003 SI MDM & HDG and all corrections for NCHRP 15-23
 - 2. Roy Jorgensen hard copy of 2003 SI MDM & HDG to chair and secretary for NCHRP 15-23
- * E. Future meeting locations were discussed and sites selected (see page 1). The Fall 2002 meeting will be held in Oklahoma City, OK on 10/7-11/2002. Te said that the hotel rate of \$85 will include breaks and breakfast if at least 17 attend. The Spring 2003 meeting will be in Indiana. The Fall 2003 meeting will be in WY at Jackson Hole or Cody. Matt O'Connor agreed to host the Spring 2004 meeting in Illinois. David Stolpa requested that the Fall 2004 meeting be held in Texas.
- F. The following agenda items are proposed for the next meeting:
 - 1. Resolution of SOD comments of rewrites for 2003 SI HDG and MDM.
 - 2. Review of SCOH ballot comments for HDG 15, Guideline for Hydraulic Design Consultants.
- G. Reviewed guideline and MDM target dates. See attachment D which contains assignments for MDM chapters and HDG volumes. Corrections were made at the meeting to assignments on attachment D. Brooks Booher will be chair for Channels chapters of MDM & HDG and Mike Fazio agreed to be the chair of Planning chapters. Matt O'Connor was added to the Culvert chapter team.
- H. The following topics were previously suggested for future work of the task force: MS4 guidelines, workflow processing guideline, marketing, ground water hydraulics, hydroplaning.
- I. Chair recommended providing a written response to the SOD chair on the reorganization recommendations of SCOH and contacting SOD members. The task force voted to recommend to SOD that 2 independent meetings/year be continued. The secretary will email letter to the task force. The following observations were made at the meeting:
 - 1. Our membership has no overlap with SOD.
 - 2. Our meetings are held off-peak to minimize cost.
 - 3. A joint meeting would require all of design leadership to be out of the office at the same time.
 - 4. Very hard to update publications in 5 year cycle with only one meeting/year.
 - 5. An electronic meeting would substantially increase the meeting time, because interaction at the meeting minimizes the time to reach consensus on wording and because it would be very hard to focus time if in the office, interruptions would be common.
- J. Raja Veeramachaneni sent out a pool funded project request for Scour in Cohesive Soils by email that the secretary forwarded. He is seeking \$5 to 10k from each participant to expand the EFA device.

4. **FHWA ACTIVITIES AND SCOUR EVALUATION PROGRESS REPORT**

- Phil Thompson briefed the task force on the status of FHWA Technology Applications projects, NHI course development and scour evaluation activities. (Some FHWA publications are available at isddc.dot.gov.)
- A. The following is a summary of items discussed from attachments G and H:

1. HEC 24, Pump Station software was received for testing on 5/2.
 2. HEC25, Tidal Hydrology and Hydraulics outline has been prepared.
 3. Most NHI courses have now been awarded under new 5 year IDIQ contract.
- B. The overview of scour evaluations progress was prepared by Jorge Pagán. A handout was provided which indicated a Summary of Scour Evaluations Nationwide (Attachment F). Phil noted the following which is summary of 4/15/02 data:
1. Only 144 of 484,286 bridges over water have not been screened. Of bridges screened, 18.4% (88,912 bridges) have unknown foundations.
 2. 93% (368,097) of 395,374 bridges needing evaluation have been evaluated for scour and 7% (27,277) still need evaluation.
 3. 7 DOTs have completed 100% and 34 DOTs have completed more that 90% of needed evaluations (10 > 90%, 7 > 95% and 17 > 98%), see attachment F (Part 2)
 4. 11 DOTs have not completed 90% of their needed evaluations (7 > 80%, 3 > 70%, & 1 > 65%).
 5. 24 DOTs have over 1000 bridges to evaluate if unknown foundations are included.
 6. When unknown foundations are included, only 18 DOTs have completed > 90%.
- C. Research Topics - not presented, see www.tfhr.gov or contact Sterling Jones, FHWA.

5. NCHRP

Timothy Hess, NCHRP Program Officer who handles hydraulics, geotechnical and roadside design, provided an overview of NCHRP projects related to hydraulics using transparencies. He provided handout of the presentation slides (some of the material below was provided at earlier meetings):

- A. Background - TRB is a unit of the National Academy of Sciences which is the operating arm for the National Academies. TRB has 5 Divisions. The two divisions of most interest to the task force are Division A Technical Activities and Division D Cooperative Research Council. NCHRP started in 1962 and the Transit CRP started in 1992. NCHRP has 13 FTE that administers 157 active panels with 1039 panel members. The CRP homepage is trb.org.
1. Financial support is from State DOTs which provide a 5.5% contribution from their State Planning and Research Federal-aid funds. The contribution is voluntary and comes through FHWA. The funding was \$3.5M in 1968, \$8.5M in 1991, \$15.3M in 1992 and \$17.7M in 1997. TEA21 increased funding to \$27M through 2003.
 2. Division B synthesis projects are provided funds by SCOR through project 20-5 which is managed by Jon Williams (JWilliams@nas.edu).
- B. Problem Statements - Ideas come from States, AASHTO and FHWA.
1. TRB committees can submit statements through AASHTO subcommittees.
 2. The review process begins on June 1 with problem statements, FHWA and NCHRP review the statements. The revised statements must be submitted to NCHRP by November 1 in order to be considered at the March SCOR meeting. Both Research Advisory Committee and SCOR rank projects and then a combined ranking is prepared.
 3. Most awards go to industry, 45%, and universities, 36%. About 90% of projects are published.
 4. The task force members should send proposed projects to: Robert J. Reilly, Secretary, Standing Committee on Research, TRB, 2101 Constitution Avenue, Washington, D.C. 20418. The letter should indicate which projects were selected from 24-8 list and should note "Projects on list were carefully considered and the following projects are the task force's highest priority."
- C. NCHRP Project Status Reports for Hydrology and Hydraulics (updated 5/7/02). Current status can be found at <http://www4.nationalacademies.org/trb/crp.nsf/NCHRP+projects>
1. 21-5(2) Unknown Foundation Instrumentation - research has stopped, final report is complete and is being considered for printing. RFP for risk based guidelines will be advertised 11/01(\$100k).
 2. 24-7(2) Countermeasures - \$450k Ayres will include partnering with states for field verification. Phase 1 report is available for loan. Phase 2 guidelines start 4/01 for 3 years to 10/2004.
 3. 24-14 Scour at Contracted Bridge Sites - \$500k Art Parola/Dave Mueller - interim report, complete June 2003. USGS is matching with \$500k.
 4. 24-15 Bridge Scour in Cohesive Materials - \$350k TX A&M, have interim report, complete

- 8/2002. The panel received \$400k for FY 2003 to study abutments.
5. 24-16 Channel Migration - \$650k Ayres, Pete Lagasse, extended to 6/2003 to include photo interpolation handbook, complete 6/2003
 6. 25-12 Wet Detention Pond Research - \$580k by David Young of WSU, final report is due.
 7. 21-07 Development of Portable Scour Monitoring Equipment - \$300k Ayres, Jim Schall, started 4/00 and will be complete 11/2002.
 8. 24-8, Scour at Bridge Foundations Research Needs - FY 98 three projects were funded from list: 24-14, 24-15 and 24-16. No projects funded in FY 99 or 2000 and 3 in FY 2001.
 9. 15-23 Technical support for MDM and HDG - \$200k (see below), \$50k added in FY 2003.
 10. 24-18 Countermeasures to Protect Bridge Abutments - #12 on 24-8, \$450k, Brian Bartoff, Mississippi State Univ. has 3 year contract which he will take with him to Michigan Tech Univ.
 11. 24-19 Environmentally Sensitive (Non-structural) Channel & Bank Protection - \$350k, John McCallum, Redding, CA (see Erosion draw and Biodraw software) awarded 6/2001, target completion 5/2004
 12. 24-20 Prediction of Scour at Bridge Abutments - \$500k, contract awarded 4/2002 to Robert Ettama, University of Iowa.
 13. 20-07(146) Development of Software Verification Protocol for Hydrologic and Hydraulic Models - \$100k, panel members are: Saeed (chair), Barry, Te, Mark, Bill and Joe Krolak. Scope has been developed and RFP will be by invitation.
 14. 15-24 Hydraulic Loss Coefficients for Culverts (FY 2003)
 15. 24-23 Riprap Design Criteria, Specifications, and Quality Control (FY 2003)
- D. NCHRP Projects for 2001 - 3 of 5 (60%) task force submitted projects approved. Overall success rate is 40% (20 of 51) for AASHTO Committees and 15% (6 of 66) for AASHTO members. Overall, 45 of 144 (35%) submitted projects were funded for \$17.2M plus 19 of 20 continuations for \$9.2M. Total funded was \$26.4M of \$58M requested. The approved hydraulics projects are:
1. 15-23 Technical support for MDM and HDG - (see below)
 2. 24-18 Countermeasures to Protect Bridge Abutments (see above)
 3. 24-19 Environmentally Sensitive (Non-structural) Channel & Bank Protection (see above)
- E. NCHRP Projects for 2002 - The task force voted on the following priority at Spring 2000 meeting and to submit the top six. The individuals listed will draft the problem statement by July 15 and submit to the chair. Number in bracket [#] is the number of votes received that this was a high priority project:
1. Effects of Debris on Pier Scour & Hydraulic Performance [14] - Phil
 2. Coordinated Update of Rainfall Maps [12] - have statement, Phil/Sterling
 3. Software Certification Protocol [9] - Saeed
 4. Riprap Specification (Design & Construction) [7] - Larry
 5. Drainage Design for Shoulderless Roadways [7] - Raja
 6. Scour in Rock at Bridges [6] - #13 on 24-8, have statement - Phil
 7. Effects of Riprap on Fish Habitat [6]
 8. Time Rate of Scour at Wide & Skewed Bridge Piers [6] - #8 on 24-8, have statement
 9. Roughness Coefficients for Culverts [6]
 10. Criteria for Selecting Hydraulic Models [4]
 11. Time of Concentration for Pavement Drainage [3]
- F. NCHRP Projects for 2002 - The chair sent the following problem statements to Tim Hess of NCHRP with a copy to Ken Kobetsky on August 18, 2000:
1. Effects of Debris on Pier Scour at Bridges - prepared by Phil Thompson and Dr. Art Parola based on #14 of 24-8
 2. Coordinated Update of Rainfall Maps in U.S. - prepared by Sterling Jones and Will Thomas
 3. Software Validation and Certification Protocol for Hydrologic and Hydraulic Models for All Aspects of Storm Drainage - prepared by Bill Hulbert and Saeed Choudhary
 4. Riprap Design Criteria, Specifications and Quality Control - prepared by Dr. Larry Arneson
 5. Effects of Fractured or Degradable Rock on Pier Scour at Bridges - prepared by Phil Thompson and Dr. Joe Haggerty based on #13 of 24-8

- G. NCHRP Projects for 2002 - None of the above submitted projects were funded.
 - 1. 24-20 Prediction of Scour at Bridge Abutments that was submitted by AZ was funded. This project which was similar to 24-8 project 5 was funded for \$500k
 - 2. SCOR funded \$14.6M (28 out of 147) new projects and \$9M, 20 project continuations, for a total of \$23.6M. The total requested was \$63.3M for 167 projects.
- H. NCHRP Projects for 2003 - The chair identified the following proposed problem statements for consideration at the next meeting and then identified the listed people as drafters. The statements should be drafted and sent to the chair by April 1st:
 - 1. Effects of Riprap on Fish Habitat - Dave Bryson
 - 2. Time Rate of Scour at Wide & Skewed Bridge Piers - #8 on 24-8, Phil Thompson/Jorge Pagán
 - 3. Roughness Coefficients for Culverts - Saeed Choudhary
 - 4. Criteria for Selecting Hydraulic Models (1D/2D) - Shawn McLemore
 - 5. Integration of Water Quality and Drainage Structure Design - Raja Veeramachaneni/Dave Henderson
 - 6. Long Term Performance of BMPs - Barry Newman/Raja Veeramachaneni
- I. NCHRP Projects 2003 - Problem statements were developed for H1-4 and provided to the task force before the 5/2001 meeting. Since H5 and H6 were not prepared they were deferred. F2 above was tabled since a nationwide study may be starting. Jim McDonald recommended F3 to SCOH and it was funded, see 20-07(146) above. The following priority order was agreed to 5/2001. Tim Hess indicated at 5/2002 meeting that the problem statements were considered at March 2002 SCOR meeting and that the top two projects were funded. This year 42 of 121(35%) funded for \$15.5 M and 17 continuations for \$9.2 M. DOTs got 16 of 72 (24%), AASHTO 23 of 41 (56%) and task force 3 of 8 (38%). The secretary forwarded Tim's email requesting nominations for 2003 project panels after the meeting to task force members.
 - 1. Riprap Design Criteria, Specifications and Quality Control - prepared by Dr. Larry Arneson who included reference to 24-18 and 24-7(2). [see 24-23]
 - 2. Develop Hydraulic Loss Coefficients for Culverts - prepared by Saeed Choudhary [see 15-24]
 - 3. Effects of Debris on Pier Scour at Bridges - prepared by Phil Thompson and Dr. Art Parola based on #14 of 24-8
 - 4. Criteria for Selecting Hydraulic Models (1D/2D) - prepared by Shawn McLemore
 - 5. Effects of Fractured or Degradable Rock on Pier Scour at Bridges - prepared by Phil Thompson and Dr. Joe Haggerty based on #13 of 24-8
 - 6. Effects of Riprap on Fish Habitat - prepared by Dave Bryson
 - 7. Time Rate of Scour at Wide & Skewed Bridge Piers - #8 on 24-8, Phil Thompson/Jorge Pagán
- * J. NCHRP Projects 2004 - The following projects were proposed at the 5/2003 meeting. Problem statements are needed for projects shown with an *. **THE AUTHOR HAS UNTIL 6/17/2002 TO EMAIL A PROBLEM STATEMENT TO THE SECRETARY** who will send out an electronic ballot to the task force [**Secretary send zip file of 1-5 & 7 to task force after the meeting**]:
 - 1. Effects of Debris on Pier Scour at Bridges - prepared by Phil Thompson and Dr. Art Parola based on #14 of 24-8
 - 2. Criteria for Selecting Hydraulic Models (1D/2D) - prepared by Shawn McLemore
 - 3. Effects of Fractured or Degradable Rock on Pier Scour at Bridges - prepared by Phil Thompson and Dr. Joe Haggerty based on #13 of 24-8
 - 4. Effects of Riprap on Fish Habitat - prepared by Dave Bryson
 - 5. Time Rate of Scour at Wide & Skewed Bridge Piers - #8 on 24-8, Phil Thompson/Jorge Pagán
 - * 6. Develop Hydraulically Efficient Bridge Rail - David Stolpa
 - * 7. Coordinated Update of Rainfall Maps in U.S. - David Stolpa will update based on TXDOT study
 - * 8. Turbidity and Wash Load Effect on Scour Depth - Rich Renna
 - * 9. Development of a Specification to Mitigate Hydroplaning Effects - Phil Thompson will consider NCHRP 1-29, superpave, and legal case studies
 - * 10. Development of Bench Test Method for Determining Manning's n for Culverts - Phil Thompson
 - * 11. Coastal and Tidal Waterway Stability and Scour - Mark Miles will use NCHRP 24-8 draft
 - * 12. Development of a Prediction Model for Ice Jam Formation - Saeed Choudhary

- * 13. Integration of Water Quality and Drainage Structure Design - Raja Veeramachaneni/Dave Henderson
 - * 14. Long Term Performance of BMPs - Barry Newman/Raja Veeramachaneni
- K. NCHRP 15-23 Technical support for MDM and HDG, \$200k (Tim Hess, project manager) - Task force panel is Merrill Dougherty (chair), Phil Thompson, Dave Bryson, Shawn McLemore, Roy Mills, and John Boynton.
1. At the 5/01 meeting, Roy Jorgensen PI, Ken Shearin, and Don Potter provided a handout and discussed their vision of the project. The following items were discussed:
 - a. P2, 1A3 - Don will do all conversions and accuracy consistent determinations.
 - b. P3 - Peter Smith will provide independent review of both HDG and MDM.
 - c. P4 - Units will generally be kept as used in manual. Ken gets "US Metric Association Newsletter" which indicates that only about 10 states are primarily SI.
 - d. P7 - Don will rerun all problems with new versions of programs. Joe Krolak agreed to provide Don with a Windows version of HYDRAIN.
 - e. P8 - Word 97 to Word 2000 conversions are better than earlier conversions.
 - f. P8, 8D3 - agreed to use one column in HDG with small figures on right of text wrapped left.
 - g. P9 - DGN micro station format graphics will be converted to EPS or DXT format so that they can be read into Word.
 - h. Agreed to use the following: 11 pt, Arial with 1.1 line spacing, block letters in equations, margins left and right will be 1", margins top and bottom will be tried at 0.75", line numbers will be used down margin for the draft, and that lines in margins will be considered to indicate where major changes have been made.
 2. At the 10/01 meeting, Roy Jorgensen PI, Ken Shearin, and Don Potter provided handouts and discussed the following items:
 - a. Ken passed around a mock up of the SI MDM to demonstrate the format used. Handed out & discussed Style and Format Guide and the Editing Recommendations. Ken Kobetsky provided guides to AASHTO staff for review. AASHTO style recommendations were adopted.
 - b. Ken passed out inventory of graphics and indicated that Phil would review and provide updates.
 - c. Don will rerun computer models, review metric numbers using Green Book as a guide.
 - d. Ken reviewed schedule: SI drafts in Jan 2002, draft approved in April, conversion strategy will need to be approved by May 2002.
 - e. Don reviewed the task 1 & 2 requirements. He noted that 300 hours of review provided 635 suggestions. He indicated that there were differences between HYDRA 6.1 and previous calculations. (NOTE: 6.2 should be obtained from Joe Krolak)
 - f. Task Force chairs reviewed and approved the majority of comments. The remainder were discussed and either adopted, rejected or modified. Ken and Don took notes and will revise the recommendations report to indicate the changes and corrections. The chairs will draft material for the Appendix C enhancements and provide to the secretary by 11/ 9/01 so that they can be reviewed by task force by 11/26/01 and provided to Ken by 12/1/01.
 - g. Ken Kobetsky recommended SOD balloting of the draft 2003 SI MDM and HDG when complete 4/2001.
 - h. Task Force agreed to request \$50k from NCHRP to enhance graphics. The chair who is also chair of the NCHRP panel will formally send the request to Tim Hess. Funding approved.
 3. At the 5/02 meeting, Roy Jorgensen PI, Ken Shearin, and Don Potter provided hard copies of the the draft 2003 SI HDG & MDM to the chair and secretary. A CDROM was provided before the meeting to all task force members which included files of the manuals and comments. The following items were discussed at the meeting:
 - a. Ken summarized the improvements made to the HDG and MDM and the issues remaining to be resolved such as format of references. He circulated copies of the 85 figures that had been updated and they looked great. Don Potter summarized items remaining to be accomplished in conversion to US units and checking of computations.

- b. Task force decided the following:
 - (1) Bullets - open bullets will be used for 2nd level bullets
 - (2) Header - use comma and space instead of “/” to separate title
 - (3) Table of Contents - add chapter #, all caps, center and bold title
 - (4) Changes - from the meeting will be shown in yellow highlight
 - (5) References - number in order used in the text, Word endnotes will be used, combination of forms will be used in the text, that acronym can be used with number, figures should contain reference, and HDG chapters may retain alphabetic order if used.

- * (6) **References should be reviewed and updates emailed to the secretary ASAP.**
- (7) Next draft will retain track changes.
- (8) Some figures which are examples do not need to be converted, e.g. Fig. 18.13.
- (9) Culvert dimensions should be soft converted. Roadway geometry should be hard converted and should conform to AASHTO green book.
- (10) Readme file - add doc file which contains notes to assist State DOTs in revising Word files. Note styles/format feature used and instructions on changing features like template, endnote, binder and numbering.

- * c. Ken requested the metric version of Chapter 18 from Billy Edge.
- d. Ken and Noreen Arvin used a computer and projector to effectively show text which needed to be discussed. Fixes were agreed to on the spot and changes incorporated in the files as highlighted text. Some corrections were identified at the meeting, but most were provided before the meeting in electronic format by chapter chairs and by FHWA reviewers. Since Noreen had fixed about half of the corrections before the meeting, a quick review of the fix was all that was needed.

6. AASHTO HIGHWAY DRAINAGE GUIDELINES

- A. See attachment D for status. [Guideline development time is at least 30 months: 6 months for a draft, 6 months for a table review, 6 months for SOD review, 6 months for SOD ballot, and 6 months for SCOH ballot.]
- B. HDG, Edition 3, Metric Conversion
 - 1. The chair previously send a letter to AASHTO and requested that HDG and MDM be provided to the States in electronic format and on CDROM. The chair will check the status of the request.
 - 2. The secretary has PDF files for all volumes except 7. As of 5/02, all volumes have now been converted to Word.
- C. HDG 2003, Edition 4, Updates and Revisions - The task force initiated this revision project in 1997 to prepare an updated version of the metric Edition 3. While all volumes will be reviewed, volumes 4-7 were given highest priority for a future table reading, because they are the oldest.
 - 1. Accomplishments to date:
 - a. Fall 1997, volume chairs identified editorial corrections and sections which should be updated.
 - b. Spring 1998, secretary handed out a consolidated list of comments. The list was updated after the meeting and emailed to the task force.
 - c. Fall 1998, revised sections were handed out at the meeting for volumes 4, 6, 7, and 9.
 - d. Fall 1999, secretary handed out a consolidated list of comments.
 - e. Spring 2000, revised sections were handed out at the meeting for volumes 1, 8 and 10.
 - f. Fall 2000, consolidated list of comments provided by email after the meeting.
 - g. Spring 2001, revised sections were handed out at the meeting for volumes 2, 9 and 13.
 - h. Secretary updated approved list of comments dated 7/20/01& provided to NCHRP 15-23 contractor.
 - i. Fall 2001, NCHRP 15-23 corrections reviewed and most adopted.
 - j. Spring 2002, draft SI edition reviewed before the meeting, email list of corrections provided to Ken Shearin before the meeting and final comments resolved at the meeting.
 - 2. The status of all volumes is listed below. Chapter chairs and FHWA reviewers, identified

substantive improvements and received approval of the task force at the meeting. All changes agreed to at the meeting are shown in the doc files as highlighted text. All corrections have been incorporated and, except as noted below or identified in the doc file as a promised revision.

Chairs and reviewers are reminded to provide the promised revisions in the next two weeks.

- I. Planning (Danny Landry thru 5/2002, Mike Fazio) - review is complete, corrections read 5/00
 - II. Hydrology (John Boynton) - review is complete, corrections read 5/01.
 - Search for "NAWDEX" and delete related text
 - III. Erosion & Sediment (Dave Henderson) - corrections complete 5/98, revisions complete 10/01 - retain section 3.5.19 straw bales
 - IV. Culverts (Phil Thompson) - corrections complete 5/98, revisions complete 10/98
 - add diagram on broken back culverts
 - V. Legal (Jim Richardson) - corrections complete 5/98, revisions complete 10/98
 - page 5-9, L7 - change 5 to 1 acre and 2 to 0.4 hectares
 - VI. Channels (Dave Bryson thru 5/2002, Brooks Booher) - corrections complete 5/98, revisions complete 10/98 - Mark Browning reviewed and provided corrections.
 - 10.3 Impermeable channel linings received a table reading 10/00
 - 9.4 Vegetative Streambank stabilization received a table reading 10/00.
 - VII. Bridges (Roy Mills) - corrections complete 5/98, revisions complete 10/98
 - Larry Arneson reviewed and provided comments at the meeting,
 - page 7-20, L16 change to recurrence intervals
 - page 7-31, retain figure 7-13
 - VIII. Restoration (John Boynton) - corrections complete 5/98, revisions read 5/00
 - IX. Storm Drains (Bill Bailey) - corrections complete 5/98, revisions read 5/01
 - Figure 9-19b is fuzzy (improve text), Bill offered to redraft figure.
 - section 9.7.4.1.2, L31 - add sentence provided by Bill
 - section 9.7.5 - add text on devices provided by Bill
 - X. Environment (Mark Miles) - corrections complete, revisions read 5/00
 - File of volume with corrections provided to NCHRP 15-23 contractor.
 - section 10.1.7, L28 - Mark will provide text, L34 fix typo in "environmental"
 - 10.4.3.5.2 delete "flow line" from the text and figure
 - XI. Coastal Zone (Raja Veeramachaneni) - Dr Billy Edge did a table reading of new volume and task force provided comments. Dr. Edge made corrections and provided file to the secretary who provided to Roy Jorgensen Associates.
 - section 11.3.1.1 should be 11.3.1
 - XII. SWM (Merril Dougherty) - no changes
 - XIII. Training (Mark Miles) - corrections complete 5/01
 - combine appendix D & E using new HDS 6, River Engineering, course as guide
 - Secretary agreed to provide HDS 6 NHI course outline to Mark.
 - XIV. Culvert Rehabilitation (Glenn DeCou)
 - corrections provided
 - use improved CALTRANS figures in doc format.
 - XV. Consultants - AASHTO SOD ballot complete, comments discussed 5/02.
 - Glos The definition of "guide" and "guideline" on page 40 of the glossary should be combined. The AASHTO supplied definition of a guideline is: "Guidelines - Provides direction, illustrates established practices and is intended to form a comprehensive reference manual for assistance in administrative, planning, "design," and educational efforts in a particular area." Note: "design" added by the task force to definition provided by AASHTO staff.
- D. HDG Volume 15, Guidelines for Selecting and Utilizing Hydraulic Engineering Consultants - The drafting team is Veeramachaneni (leader), Newman, and Richardson.
- 1. The following background information was identified:
 - a. MD and VA have detailed RFP for on call consultants.

- b. OR has a guideline for what they would like to receive from a consultant.
 - c. SC has design/build guidelines and Bill Hulbert provided a copy to Barry.
 - d. FL has prequalification procedures, but not for hydraulic consultants.
 - e. The training guideline should be referred to.
 - f. TX procedures are at: "www.dot.state.tx.us/insdot/orgchart/des/continfo/precert.htm"
 - g. The team has reviewed the guidelines produced by the Task Force on Preconstruction Management and Raja has a copy.
 - h. Bill provided SC evaluation document.
 - i. Dave provided OR guidelines for bridge reports.
 - j. Phil provided FHWA CORE competencies to Raja, Bill and Shawn after the meeting.
 2. The proposed outline of the guideline was approved at the fall 1998 meeting. At that meeting, it was decided to:
 - a. Reference the AASHTO consultant document and reduce the size of section 1.
 - b. Reference ACEC joint group 1996 document and planned update.
 - c. Gary Croskey agreed to provide score sheet for prequalifying hydraulic qualifications.
 - d. Consider including a sample list of qualifications to use for an RFP.
 3. The drafting team prepared a revised outline.
 4. A draft was read at 10/2000 meeting. The task force agreed to include checklists. The very well written draft received minor editing at the meeting. The task force adopted the draft and voted to send it to SOD for review by Jan 15, 2001. Since review draft was not completed, SOD review was deferred until summer 2001.
 5. At Fall 2001 meeting, final draft provided to AASHTO (Ken Kobetsky) for SOD ballot.
 - * 6. Spring 2002 meeting, ballot comments received provided to task force by email before the meeting. Raja Veeramachaneni discussed comments at the meeting. Raja will make the corrections, add a column to the comment matrix to discuss resolution and provide the updated files to Jim McDonnell and the secretary.
7. **MODEL DRAINAGE MANUAL (MDM)**
- A. Metric Edition 2 (1999 MDM)
 1. The text of all chapters was updated and graphics converted to TIF format by Dr. Tom Debo. The graphics were integrated into the WP 6.1 files by TTI. The task force final review was completed on April 2, 1998. On June 30, 1998, TTI sent deliverables to NCHRP who sent to AASHTO by letter dated July 8, 1998.
 2. 7E Wetlands Hydrology - The Water Budget, distributed February 2000.
 3. 15G Wetland Creation and Restoration, distributed February 2000.
 - B. Edition 3, (2003 MDM) - Accomplishments to date:
 1. Fall 1997, leaders identified editorial corrections and sections which should be updated.
 2. Spring 1998, secretary handed out a consolidated list of comments. The list was updated after the meeting and emailed to the task force.
 3. Fall 1998, revised sections have been emailed or handed out for chapters 2, 6, 8, 9, and 10.
 4. Fall 1999, secretary handed out a consolidated list of comments.
 5. Spring 2000, revised sections were handed out for chapters 6, 17, 18, 20 and 21.
 6. Fall 2000, consolidated list of comments provided by email after the meeting.
 7. Spring 2001, revised sections were handed out for chapters 13, 15-19.
 8. Secretary updated approved list of comments dated 7/31/01& provided to NCHRP 15-23 contractor.
 9. Fall 2001, NCHRP 15-23 corrections reviewed and most adopted.
 10. Spring 2002, draft SI edition CDROM reviewed before the meeting, email list of corrections provided to Ken Shearin before the meeting and final comments resolved at the meeting.
 - * C. Edition 3, (2003 MDM), Status by Chapter - Chapter chairs and FHWA reviewers, identified substantive improvements and received approval of the task force. All changes agreed to at the meeting are shown in the doc files as highlighted text. All corrections have been incorporated and, except as noted below or identified in the doc file as a promised revision. **Chairs and reviewers are**

reminded to provide the promised revisions in the next two weeks.

1. Introduction (Phil Thompson) - corrections complete 5/98, revisions complete 10/98,
2. Legal (Jim Richardson) - corrections complete 5/98, revisions complete 10/98
 - a. Use "1.00" and "304.8" for NFIP requirement
 - b. Use "one acre or more" for NPDES threshold
3. Policy (Francis Nishioka) - corrections complete 5/98
4. Documentation (Glenn DeCou) - Glenn indicated chapter is current 5/99
5. Planning (Danny Landry through 5/2002, Mike Fazio) - review and corrections complete 10/00
6. Data Collection (Lotwick Reese) - corrections complete 5/98, revisions complete 10/00
7. Hydrology (John Boynton) - revisions complete 10/00, corrections complete 10/01
 - * a. Check on NFF completion, provide reference or web site address
 - b. Joe Krolak assisted John at the 5/2002 meeting.
8. Channels (Dave Bryson thru 5/2202, Brooks Booher) - corrections complete 5/98, revisions complete 10/98
 - a. Mark Browning served as chair at 5/2002 meeting.
9. Culverts (Phil Thompson) - corrections complete 5/98, revisions complete 10/98
 - a. Corrections included in file provided on 2nd CDROM for 5/2002 meeting.
10. Bridges (Roy Mills) - corrections complete 5/98, revisions complete 10/98
 - a. Larry Arneson served as chair at 5/2002 meeting.
11. Energy (Phil Thompson) - corrections complete 5/98, revisions complete 10/00
 - a. Corrections included in file provided on 2nd CDROM for 5/2002 meeting..
12. Storage (SWM) (Merril Dougherty) - corrections complete 5/98, revisions complete 5/01
13. Storm Drains (Bill Bailey) - corrections complete 5/98, revisions read 5/01
 - a. Sterling Jones provided review comments for 5/2002 meeting.
 - * b. Page 13.19 add statement on junction loss difference with HYDRA.
14. Pump Stations (Dan Ghere) - corrections complete 5/98, revisions complete 10/00
 - * a. Fig 14-18 should be replaced with HEC 24 figure 9.1, secretary will provide file.
 - * b. Dan will provide revision for design criteria and possibly design procedure.
15. Environment (Mark Miles) - review complete 10/00, revisions read 5/01
 - * a. Mark agreed to provide a rewrite for comment A368.
 - b. Appendix 15G will be retained as is. Reference to 15G is provided in the chapter.
16. Erosion & Sediment Control (Dave Henderson) - corrections complete 5/98, revisions read 5/01
 - a. One acre threshold for NPDES needs to be made
 - b. Section 16.6.4 straw bales will be retained to be consistent with HDG and State use.
17. Bank Protection (Bill Hulbert thru 10/2001, Barry Newman) - corrections complete 5/98, revisions read 5/01. Bart Bergendahl assisted chair at 5/2002 meeting.
 - a. Figure 17-8 - add CORR factor correction to example.
 - * b. 17.7.1.24 add limitations and reference provided by Barry
 - c. Figure 17-11 - check against FHWA-HI-95-038
 - * d. 17.7.5 - Bart will provide text for partially grouted riprap
 - e. Page 17-30, L26 - fix step 10
 - f. Page 17-45, Step 8 - check applicability
 - g. Page 17-46, L27 - check 203 mm
 - * h. Page 17-47, example 2 - Bart will rework.
 - i. Page 17-52 - add qualifying note to clarify sharp bend radius
18. Coastal Zone (Raja Veeramachaneni) - corrections complete 5/98, Bill Hulbert arranged for the tidal pooled fund study to have Ayres/Dr. John Fisher and Dr. Billy Edge prepare this chapter:
 - a. A draft was discussed at 10/00 meeting. The following was decided:
 - (1) Desirable to include design procedures, illustrated with example problems.
 - (2) Agreed to reference web sites in the text.
 - (3) West coast (winter storms) and tsunamis will be discussed.
 - (4) 18.5.3 add example of Hudson equation.
 - (5) Show ACES output for worked examples and include boundary conditions with Surge.

- b. Task Force reviewed draft and provided comments to Bill Hulbert by 12/1. Consolidated list of comments were provided to Dr. Billy Edge that were dated 12/14/2000. Dr. Edge handed out copies of the comments and a new draft at the May 2001 meeting and highlighted major changes. He invited another reading of the draft so that all editorial corrections are identified. It was agreed that this version be produced in SI units to agree with NCHRP first task to make all MDM corrections in 1999 SI edition; that references should be numbered and identified in the text; an appendix needs to be added to list software availability and the following changes should be made:

- (1) p18-4, Bill Bailey needs to add definitions to glossary.
- (2) p18-9, 18.1.5 & 2 added, 18.3 reduced, but file of material was saved for HDG.
- (3) p18-16, Shore Protection Manual (SPM) is no longer available and is being replaced by new Coastal Engineering Manual (CEM). Phil agreed to see if FHWA could make old and new manuals available to DOTs. **[Note: check "Pile Buck" on web for SPM and other manuals that are available on CDROM.]**
- (4) p18-19, add USGS web site for datum conversion software and add conversion example from Ayres report.
- (5) p18-23, add example of extra-tropical storm (see Mark Miles).
- (6) p18-32, 18.4.5 - SBEACH costs about \$495 from contractor, FL has DNR software.
- (7) p18-34, add Dean and Dalrymple (1991) reference as alternate to SPM.
- (8) p18-37, add Corps EM web site.
- (9) p18-40, agreed to leave fig 18.13 in as an example & not include all 10 figures.
- (10) p18-54, move ACES discussion before where it is referenced in the text.
- (11) p18-58, 18.8.2 - reference maps from FEMA/state/others.

- c. Secretary provided updated file to NCHRP 15-23 contractor after the 5/01 meeting.

19. Construction (Te Ngo) - review complete 5/01, revisions read 5/01

- * a. Te requested comments on appendix A for his manual & for next edition.

20. Maintenance (David Stolpa) - review complete 5/00, corrections read 5/00

- a. Fig. 20-1, efficiency of sediment basins needs to be revised.
- b. 20.3.4 - delete 1st sentence, move "detention facilities" to 2nd sentence.
- c. 20.5.2 - delete sentence "A permanent ... very expensive."
- d. 20.5.3 - refer to culvert rehabilitation guidelines, HDG 14

21. Restoration (John Boynton) - review complete, chapter deleted from this edition at 5/00 meeting

- * Glossary (Bill Bailey) - review pending - Bill requested that each chair check their chapters for possible additions to the glossary.

8. **NATIONAL TRANSPORTATION PRODUCT EVALUATION PROGRAM (NTPEP)**

- A. NTPEP was discussed at the Spring 2001 meeting in Topeka, KS by David Megger, KDOT, who is member of NTPEP Oversight Committee and chair of the HDPE product evaluation committee:

1. The NTPEP pools professional and physical resources of AASHTO members. They test materials of common interest against existing standards and provide a one-stop shop report.
2. Products proposed for testing in 2001 are HDPE, rolled erosion control products, and geotextiles. Future tests could be PVC pipes and geocomposites.
3. The NTPEP process was recommended by President Tom Warne by letter after meeting with the Task Force and hearing of the need for software validation and certification.
4. The standard NTPEP has the following steps: (a) create committee to guide product testing (task force would have to provide testing protocol), (b) NTPEP staff would collect fees and administer program, (c) test products and (d) publish results.
5. For the task force proposed project of software certification, he recommended using "validation" rather than certification. He indicated that manufacturers sit on NTPEP committees. He noted that there is no funding from NTPEP. Funding will have to come from firms to be evaluated, pool funded project or from other sources. He asked the following question:
 - a. How do vendors feel about being tested?
 - b. What about effect on small 1 to 2 person firms?

- c. Since NTPEP uses established standards, what exists for software?
- d. Can task force establish minimum requirements?

B. NTPEP Performance-Based Specifications & NCHRP 20-7(163) Rolled Erosion Control Products (RECP) were discussed at the Spring 2002 meeting by Steve Loop of ITD and Dan Hunt of SI Geosolutions. They provided a handout of their Powerpoint presentation.

1. An overview on NTPEP was provided (www.NTPEP.org). AASHTO representative is Mujeeb Basha, 202-624-3695.
2. RECP is a joint effort with Erosion Control Technology Council (ECTC) (www.ectc.org). The ECTC was formed in 1992 to develop standards and testing procedures for RECP. Slope (ASTM D 6459-99) and channel (ASTM D 6460-99) testing have been conducted by members. Bench and large scale correlations are under way. ECTC has not approved bench scale testing yet.
- * 3. NCHRP 20-7(163) for RECP was approved for 2003 funding. Tim Hess is the project manager. NTPEP oversight committee requested that the task force provide members for the project panel. Those interested should contact Tim.

9. **FIELD TRIP**

On Wednesday, the task force received copies of the following papers: Earth-Changing Drama...In a Geologic Heartbeat, Pleistocene Ice Dams and Glacial Lake Missoula Floods in Northern Idaho and Adjacent Areas, and Bennett Bay Centennial Bridge. In addition, a topographic atlas of the area was provided. Mr. Scott Stokes, District 1 Engineer sstokes@itd.state.id.us, and Mr. Bill Capaul, District Geologist bcapaul@itd.state.id.us, provided an overview of the tour and discussed points of interest along the trip to Sand Point. The following sites were toured:

- A. Bennett Bay Bridge
- B. Lake Pend Oreille
- C. Rathdrum Prairie and Purcell trench
- D. Trestle Creek where the aggradation had filled most of the highway bridge opening
- E. Lightning Creek where the stream meander was threatening the bridge pier
- F. Bridge over Clark Fork River with large gravel load
- G. Closed county road bridge which will soon be replaced over the Clark Fork River

10. **TECHNOLOGY PRESENTATIONS**

- A. **Changing Paradigms in River Management** - Dr. Peter Goodwin shared a Powerpoint presentation in 3 parts: (1) Changing Perspectives, (2) Proving the benefits of mitigation, & (3) a view of the future: prioritizing mitigation actions. In Part 1, he discussed environmental restoration in the western US and provided examples of the generations that restoration has gone through. We are currently in the 3rd generation in the 1990s which includes the use of templates, refined models and designing for dynamic equilibrium; e.g. Delaware Bay and San Diego lagoon and Sonoma Baylands. He discussed good, bad and ugly river management and provided examples of each. We were introduced to new terms "TINA" (There is No Alternative) and "Ecohydraulics" (Simulation of Physical Processes in River Ecosystem Management), see <http://boise.uidaho.edu/eco/default.asp>. He demonstrated what can be done with an integrated river management system by discussing the "Living River Strategy" for Napa County, CA. In Part 2, he discussed the Red River near Elk City, ID project which is only 4 miles of 500 mile system which was studied by Steve Clayton (sclayton@uidaho.edu). He concluded that adaptive management, evolution of design criteria and performance assessment works. Information is available at <http://boise.uidaho.edu/redriver.htm> He recommended consulting the International Association of Hydraulic Research (IAHR) web site which is <http://www.iahr.org/>
- B. **River Engineering for Highway Encroachments (HDS 6)** - Dr. Peter Lagasse provided a handout and discussed HDS 6 and NHI 135010 enhancements using a Powerpoint presentation. HDS 6 is complete and is available at www.fhwa.dot.gov/bridge/hydrpub.htm. The course walk through was completed in December and the pilot was held in March in CA. NHI will soon be selecting a presentation contractor. He discussed 3 lessons from the instructors guide: 1(Introduction), 4 (River Morphology) and 12 (Sediment Transport Workshop) by quickly going through the slides to illustrate the objectives of the lessons. He noted that the HDS 6 revisions included expanded sediment

transport chapter, more channel response case studies, and better integration with HEC 18/20/23.

- C. Virtual Tour of Las Vegas Wash - Dr. Larry Arneson provided an overview of the computer images that are being used for a virtual field visit of the lesson 12 degradation problem which is the comprehensive workshop for NHI 135010. The wash has 2200 sm of runoff area. Because urbanization has increased, runoff has also increased over time. He provided background and historic perspective by showing slides of previous structures and attempted fixes. He showed highlights of the virtual tour and construction slides of the grade control structures being installed. He indicated that the estimated life of the 3 structures is 25 to 30 years and that the anticipated degradation over that time frame is 25'.
- D. Countermeasure Design for Bridge Scour and Stream Instability - Dr. Peter Lagasse provided a handout and discussed HEC 23 and the new course NHI 135048. HEC 23 is complete and is available at www.fhwa.dot.gov/bridge/hydpub.htm. Walk through of course will be conducted in June. He provided an overview of the proposed course and illustrated the 12 design guidelines that are included in HEC 23. He noted that 7 guidelines will be taught in the course. The course will include monitoring techniques from DP 97 which are included in HEC 23.
- E. Bridge Scour in Gravel-bed Streams - Dr. James Milligan discussed his observations on the effect of coarse graded sediments on scour. He noted that our primary responsibility for estimating scour is to assure public safety, health and welfare. He indicated that live bed scour depths in gravel streams are similar to those of sand bed streams. However, with coarse bed streams, there is time dependency which he illustrated with a 3D schematic. He said that coarse sizes do not form ripples, that there is a reduction of clear water peak scour from uniform to graded beds and that live bed peak is same whether graded or uniform particle size. In coarse bed streams, armor layer can develop if there is sufficient > 90% size material. The amount that is sufficient varies between 1 to 10% depending on the researcher asked. He provided a method for adjusting for armor threshold for clear water peak, but not for live bed peak which is the same. He recommended Raudkivi "Loose Boundary Hydraulics" for local scour and armoring reference which is available at <http://www.addall.com/Browse/Detail/0080340733.html> and Melville "Bridge Scour" which is available at <http://www.wrpllc.com/books/bsr.html>
- F. Hydrology - Joe Krolak discussed updates to HDS 2, Highway Hydrology, and the related course NHI 135067 using a Powerpoint presentation. His Powerpoint presentation was distributed to the task force after the meeting and should be consulted for details. He indicated that HDS 2 draft was complete in December, but is being updated to include a Special Topics chapter. The Special topics which are being included are wetlands, snow melt, arid lands and advanced applications. The new chapter will be drafted by June and the manual should be final by September.
- G. Eastern and Southern Resource Center Hydraulics Conference - Joe Krolak advertised that the conference will be held Sept 17-19 in Louisville, KY. Information can be found at www.fhwa.dot.gov/bridge/hyd2002.htm Registration can be accomplished online.
- H. SMS/WMS Updates - Dr. Larry Arneson showed the current versions of both software packages: WMS 6.1 and SMS 8.0. He discussed and showed the new online registration procedure. He cautioned that the procedure must be done from the computer where the software will be used. He indicated that the biggest problem with the process is applicants providing the wrong state. The state is important, because the user verification is done by the state coordinator. Larry said that HYDRA interface is being added to WMS and that a new feature of SMS is a steering module to assist in spinning down to boundary conditions.
- I. Innovative Approaches to Countermeasure Design - Dr. Peter Lagasse, using Powerpoint and a handout, provided the findings of the 1998 scanning review of European practice and provide an overview of NCHRP 24-07(2). One of the recommendations for the scanning review was partially grouted riprap. He showed slides of fully grouted and partially grouted riprap for comparison. In addition, he showed a grout placement sequence, equipment for grouting both above and below water. Other items discussed were heavy filters made up of two layers of non-woven geotextile with sand in between and large geo-containers which are geotextile sacks filled with sand. Pete provided an overview of the NCHRP project which is underway to study riprap, partially grouted riprap and other countermeasures in the laboratory and the field. He listed the partners that he had to date and

asked for them to reconfirm their commitment and requested additional partners. As an inducement, he showed the portable arm for scour monitoring that had been developed under another NCHRP project and indicated that it would be used to document and monitor field sites. The arm can be constructed for about \$50k and \$25k for instrumentation. They will use the equipment June 3 & 4 in Idaho to establish a baseline.

- J. Pump Station Design Software - Dan Ghere demonstrated the beta software for HEC 24. He noted that he is testing the software and that it is not ready for release. The software is being produced by Jay Vose of GEOPAK under subcontract to Peter Smith of PB. He showed that the software is user friendly and has help screens for all the data. He said that the either SI or US units can be used. He demonstrated the software using the HEC 24 US unit example. The data must be entered in order: system storage, pump specifications, piping configuration, and pump performance data. **Rick Renna of Florida requested that a tailwater hydrograph be added.**

11. CONCERNS OF THE STATES - Deferred

AASHTO TASK FORCE MEMBERS/MEMBER'S REPRESENTATIVES (May 13, 2002)

[Please Review Your Address, Make Corrections, & Initial]

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AASHTO TASK FORCE MEMBERS/MEMBER'S REPRESENTATIVES (May 13, 2002)

[Please Review Your Address, Make Corrections, & Initial]

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VISITORS
Coeur d'Alene, ID, May 6-10, 2002

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AASHTO TASK FORCE ON HYDROLOGY AND HYDRAULICS**Spring 2002 MEETING**

Coeur d'Alene, ID, May 6-10, 2002

AGENDA

Monday 5/6	<ul style="list-style-type: none"> ● Call to Order ● Status of Task Force projects ● FHWA Activities & Updates ● Scour Update ● NCHRP 15-23 Project Overview ● NCHRP 15-23 Recommended Changes ● MDM Review of 2003 SI draft 	Merrill Dougherty, Chair Phil Thompson Phil Thompson Phil Thompson Ken Shearin Don Potter Chapter 1-11 Chairs
Tuesday 5/7	<ul style="list-style-type: none"> ● MDM Review of 2003 SI draft ● HDG Review of 2003 SI draft ● NCHRP Update ● NTPEP & Rolled Erosion Control Products ● NCHRP Problem Statements 	Chapter 12-20 Chairs Chapter 1-14 Chairs Tim Hess Stephen Loop & Daniel Hunt Merrill Dougherty
Wednesday 5/8	<ul style="list-style-type: none"> ● Field trip 	All
Thursday 5/9	Technical Presentations <ul style="list-style-type: none"> ● Changing Paradigms in river Management ● River Engineering for Highway Encroachments ● Las Vegas Wash Virtual Tour ● Revisions to HEC 23 & NHI Course ● Bridge Scour in gravel-Bed Streams ● Revisions to HDS 2 and NHI Course ● Update on WMS/SMS and NHI Courses ● Pump Station Design Software ● Business Meeting 	Dr. Peter Goodwin Dr. Peter Lagasse Dr. Larry Arneson Dr. Peter Lagasse Dr. James Milligan Joe Krolak Dr. Larry Arneson Dan Ghere All

GOALS AND TARGET DATES FOR COMPLETION (May 2002)
AASHTO (202) 624-5800, www.aashto.org

AASHTO HIGHWAY DRAINAGE GUIDELINES
1999 Metric Edition 3 - Volumes 1-13 & Glossary, 740 pg, Cost \$125 (\$100 to members)
2000 Volume 14 is \$39 (\$32 to members)
4th Edition in dual units & chapters in progress for 2003

<u>Chapter</u>	<u>GUIDES</u>	<u>Chair</u>	<u>Ch</u>	<u>GUIDES</u>	<u>Chair</u>
1	Planning	[Fazio]	9	Storm Drainage	Bailey
2	Hydrology	Boynton	10	Environmental	Miles
3	Erosion Control	Henderson	11	Coastal Zone	Veeramachaneni
4	Culverts	Thompson	12	Stormwater Man.	Dougherty
5	Legal Aspects	Richardson	13	Training	Miles
6	Channels	[Booher]	14	Culvert Materials	DeCou
7	Bridges	Mills		Glossary	Bailey
8	Restoration	Boynton			

<u>Chapter</u>	<u>NEW GUIDES</u>	<u>Chair</u>	<u>STEP COMPLETE</u>	<u>ACTION NEEDED</u>
15	Consultants	Veeramachaneni	8	Final draft for SCOH ballot
	Chronicles	Ghere/Thompson	4	Review of update

STEPS FOR GUIDELINE PREPARATION

1. Author prepares draft.
2. Draft is reviewed by task force.
3. Author revises draft and defends at a task force meeting.
4. Author finalizes draft and sends copy of text and file to the secretary.
5. Secretary transmits to AASHTO for Subcommittee on Design (SOD) review.
6. Secretary transmits comments to author.
7. Author prepares final draft and sends file to the secretary who forwards to AASHTO.
8. AASHTO ballots SOD and informs secretary & task force chair of ballot results.
9. Author resolves comments and sends file to the secretary who forwards to AASHTO.
10. AASHTO ballots SCOH and informs secretary & task force chair of ballot results and whether the Board of Directors has elected to ballot.
11. AASHTO prints and distributes guide.

MODEL DRAINAGE MANUAL ASSIGNMENTS
1991 First Edition, 1368 pages, Cost \$260 (\$208 to members)
1999 Metric Edition [2nd] - WP6.1, 1248 pg, Cost \$360 (\$300 to members)
2000 Appendix 7E & 15G \$40 (\$34 to members)
3rd Edition, separate SI & English manuals in progress for 2003

<u>Chapter</u>	<u>Leader</u>	<u>Team - FHWA in italics</u>	<u>Chapter</u>	<u>Leader</u>	<u>Team - FHWA in italics</u>
1 Intro	Thompson		12 Storage (SWM)	Dougherty	Veeramachaneni
2 Legal	Richardson		13 Storm Drain	Bailey	Reese, Jones
3 Policy	Nishioka	Ngo, Richardson	14 Pump Station	Ghere	DeCou, Reese
4 Document.	DeCou	Bailey	15 Environment	Miles	Henderson, Newman
5 Planning	[Fazio]	Richardson, Tran	16 Erosion & Sed.	Henderson	Dougherty
6 Data Col.	Reese	Nishioka, Veeramachaneni	17 Bank Protection	Newman	Choudhary, Bergendahl
7 Hydrology	Boynton	Newman, Stolpa, Krolak	18 Coastal Zone	Veeramachaneni	Henderson
8 Channels	[Booher]	Choudhary, Browning	19 Construction	Ngo	Richardson
9 Culverts	Thompson	Ngo, [O'Connor]	20 Maintenance	Richardson	Henderson
10 Bridge	Mills	Nishioka, Arneson	21 Restoration	(only in 1991 & 1999 editions)	
11 Energy	Thompson	Newman, Ngo	Glossary	Bailey	Thompson

AASHTO TASK FORCE ON HYDROLOGY AND HYDRAULICS (May 2002)

www.aashto.org/aashto/home.nsf/FrontPage
for SOD use *design.transportation.org*

1. AASHTO Highway Drainage Guidelines (HDG) contain an overview, discussion and design philosophy for each of the covered topics:
 - A. HDG [Edition 1]
 - 1973, Volumes 1-3, Planning & Location, Hydrology, Erosion & Sediment Control
 - 1975, Volume 4, Hydraulic Design of Culverts
 - 1977, Volume 5, Legal Aspects of Highway Drainage
 - 1979, Volume 6, Hydraulic Analysis & Design of Open Channels
 - 1982, Volume 7, Hydraulic Analysis for the Location and Design of Bridges
 - 1987, Volumes 1-7 and 8, Hydraulic Aspects in Restoration & Upgrading of Highways
 - B. HDG [Edition 2]
 - 1992, Volumes 1-8 updated, Volume 9 (Storm Drain), Volume 10 (Environment) and Glossary
 - 1994, Volume 11, Coastal Zone
 - C. HDG, 1999 Metric Edition [3]
 - 1995, Volume 12, Stormwater Management approved, but printing was deferred.
Volume 13, Hydraulics Engineer Training and Career Development also deferred.
 - 1999, Volumes 1-13 and glossary were distributed on July 26, 1999.
 - 1999, Volume 14, Culvert Inspection, Material Selection and Rehabilitation was approved by SCOH. AASHTO distributed on 3/06/00.
 - D. HDG Edition 4 (Dual Units)
 - 1997, Review and update of volumes 1-13 was initiated.
 - 1998, Volume 15, Guideline for Hydraulic Design Consultants, *SOD ballot complete.*
 - 2001, NCHRP 15-23 www4.nationalacademies.org/trb/crp.nsf/rfps
 - 2001, Fall, review and discuss list of recommended changes prepared by Roy Jorgensen Associates.
 - 2002, *Spring, review and finalize 2003 SI draft prepared by Roy Jorgensen Associates.*

2. AASHTO Model Drainage Manual (MDM) contains recommended design policy, criteria and procedures:
 - A. 1991 - MDM Edition 1 distributed 1/92 to states, Cost \$235 and \$190 to members. The 21 chapters include design procedures, example problems, and computer solutions for most aspects of highway hydraulic design.
 - B. 1994 - All chapters have been updated and graphics have been converted to digital format in preparation for producing metric version of the manual (not distributed).
 - C. 1999 - MDM Metric Edition [2] - The NCHRP contractor was TTI and Dr. Tom Debo. Three chapters (storage, pump stations and storm drains) were substantially revised. The WP6.1 format includes graphics in electronic format. MDM distributed on April 26, 1999.
2000 - Wetlands Hydrology appendices 7E & 15G distributed by AASHTO on 3/6/00.
 - D. 1997 - MDM Edition 3 (Dual Units), Review and update of chapters 1-21 was initiated
2001, NCHRP 15-23 www4.nationalacademies.org/trb/crp.nsf/rfps
2001, Fall, review and discuss list of recommended changes prepared by Roy Jorgensen Associates.
2002, *Spring, review and finalize 2003 SI draft prepared by Roy Jorgensen Associates.*

TOTAL HIGHWAY BRIDGES AS OF 4/15/02 (5/3/02)

Attachment F

State	Bridges Over Waterways	Scour Screening										Scour Evaluations			
		Low Risk				Scour Susceptible	Unknown Foundations	Tidal	Scour Critical	Total Screened	%	Total Evaluated	Evaluation Candidates	%	
		Culverts	Screened	Assessed	Total										
AK	810	34	0	372	406	0	201	53	150	810	100	556	53	91	
AL	14108	5559	0	2222	7781	3386	2797	0	144	14108	100	7925	3386	70	
AR	11623	2304	0	3518	5822	0	5548	0	253	11623	100	6075	0	100	
AZ	5561	3482	40	956	4478	71	172	0	840	5561	100	5278	111	98	
CA	15386	2910	2507	5536	10953	412	3661	29	324	15379	100	8770	2955	75	
CO	6793	1339	0	4987	6326	12	38	0	417	6793	100	6743	12	100	
CT	2360	572	0	1245	1817	48	82	0	413	2360	100	2230	48	98	
DC	94	0	0	93	93	0	0	0	1	94	100	94	0	100	
DE	576	181	0	270	451	0	0	0	125	576	100	576	0	100	
FL	8258	1711	653	2604	4968	196	2681	149	264	8258	100	4579	998	82	
GA	12147	5332	0	732	6064	0	6007	0	76	12147	100	6140	0	100	
HI	860	130	50	566	746	24	11	2	64	847	98	760	89	90	
IA	23493	3228	642	14724	18594	87	3996	0	816	23493	100	18768	729	96	
ID	3209	1073	0	1284	2357	0	587	0	265	3209	100	2622	0	100	
IL	21641	3914	160	15633	19707	3	1272	0	614	21596	100	20161	208	99	
IN	15903	1001	0	12703	13704	56	444	0	1699	15903	100	15403	56	100	
KS	23803	6100	57	15685	21842	1432	93	0	441	23808	100	22226	1484	94	
KY	11225	2641	0	8110	10751	11	424	0	39	11225	100	10790	11	100	
LA	9891	0	0	3060	3060	810	5473	0	548	9891	100	3608	810	82	
MA	2467	281	0	679	960	232	404	1	870	2467	100	1830	233	89	
MD	3163	1017	0	992	2009	0	560	0	594	3163	100	2603	0	100	
ME	1867	272	0	1039	1311	18	191	112	235	1867	100	1546	130	92	
MI	7575	1111	0	2700	3811	2375	709	0	680	7575	100	4491	2375	65	
MN	11331	4460	31	5474	9965	377	509	0	480	11331	100	10414	408	96	
MO	20912	4026	0	16435	20461	308	18	0	101	20888	100	20562	332	98	
MS	14790	2269	0	3137	5406	14	8608	0	762	14790	100	6168	14	100	
MT	3578	154	304	1289	1747	34	1746	0	51	3578	100	1494	338	82	
NC	14135	4485	49	3227	7761	14	6195	81	88	14139	100	7800	140	98	
ND	4132	771	113	1023	1907	20	2132	0	73	4132	100	1867	133	93	
NE	14830	2780	13	2616	5409	1237	7762	0	395	14803	100	5791	1277	82	
NH	1755	163	80	1388	1631	30	50	0	44	1755	100	1595	110	94	
NJ	3551	316	0	2428	2744	49	344	40	367	3544	100	3111	96	97	
NM	3001	1563	172	671	2406	73	498	0	24	3001	100	2258	245	90	
NV	889	555	31	114	700	33	53	0	102	888	100	771	65	92	
NY	12096	1619	0	9474	11093	129	62	133	679	12096	100	11772	262	98	
OH	23326	1338	0	16283	17621	5273	241	0	191	23326	100	17812	5273	77	
OK	20835	5981	8	14345	20334	0	0	0	501	20835	100	20827	8	100	
OR	5480	252	0	1782	2034	17	1890	68	1471	5480	100	3505	85	98	
PA	17328	1680	886	7315	9881	1442	461	0	5544	17328	100	14539	2328	86	
PR	1605	244	63	758	1065	26	372	33	109	1605	100	1111	122	90	
RI	337	30	0	176	206	0	0	0	131	337	100	337	0	100	
SC	7784	1054	0	1170	2224	0	3704	155	1701	7784	100	3925	155	96	
SD	5373	1000	0	1653	2653	136	2584	0	0	5373	100	2653	136	95	
TN	16520	7816	0	6022	13838	391	1236	0	1055	16520	100	14893	391	97	
TX	40562	16647	0	12442	29089	757	9923	49	673	40491	100	29762	877	97	
UT	1682	435	0	527	962	101	447	0	172	1682	100	1134	101	92	
VA	9818	2747	0	7014	9761	2	0	0	55	9818	100	9816	2	100	
VT	2304	68	0	1348	1416	373	246	0	298	2333	101	1714	344	83	
WA	5157	145	0	3729	3874	72	305	0	906	5157	100	4780	72	99	
WI	10689	1682	0	6722	8404	215	2002	0	68	10689	100	8472	215	98	
WV	5742	350	4	3404	3758	25	1735	0	225	5743	100	3979	28	99	
WY	1931	396	12	1063	1471	32	438	0	2	1943	101	1461	32	98	
Nationwide	484286	109218	5875	232739	347832	20353	88912	905	26140	484142		368097	27277		
Percent		22.6%	1.2%	48.1%	71.8%	4.2%	18.4%	0.2%	5.4%	100.0%		93.1%	6.9%		

BRIDGE SCOUR EVALUATION SUMMARY as of 4/15/02 (5/13/02)
(SORTED BY "EVALUATIONS > 90%" AND "EVALUATIONS NEEDED," Bold if >1000)

State	Scour Evaluation Progress				Substantial Progress		Action Plan		Unknown Foundations		
	Needed	Completed	Total	Percent	Evaluations Complete	Evaluations >90%	Revised Plan	Target Date	Unknown Needed	Total Needed	Percent
OH	5273	17812	23085	77%			No		241	5514	76%
AL	3386	7925	11311	70%				1/2003	2797	6183	56%
PA	2328	14539	16867	86%			No		461	2789	84%
CA	2955	8770	11725	75%				12/2002	3661	6616	57%
MI	2375	4491	6866	65%			No		709	3084	59%
NE	1277	5791	7068	82%			No		7762	9039	39%
FL	998	4579	5577	82%			No		2681	3679	55%
LA	810	3608	4418	82%			No		5473	6283	36%
MT	338	1494	1832	82%			No		1746	2084	42%
VT	344	1714	2058	83%			No		246	590	74%
MA	233	1830	2063	89%				12/2002	404	637	74%
KS	1484	22226	23710	94%		Yes			93	1577	93%
TX	877	29762	30639	97%		Yes			9923	10800	73%
IA	729	18768	19497	96%		Yes			3996	4725	80%
MN	408	10414	10822	96%		Yes			509	917	92%
TN	391	14893	15284	97%		Yes			1236	1627	90%
MO	332	20562	20894	98%		Yes			18	350	98%
NY	262	11772	12034	98%		Yes			62	324	97%
NM	245	2258	2503	90%		Yes			498	743	75%
WI	215	8472	8687	98%		Yes			2002	2217	79%
IL	208	20161	20369	99%		Yes			1272	1480	93%
SC	155	3925	4080	96%		Yes			3704	3859	50%
NC	140	7800	7940	98%		Yes			6195	6335	55%
SD	136	2653	2789	95%		Yes			2584	2720	49%
ND	133	1867	2000	93%		Yes			2132	2265	45%
AZ	111	5278	5389	98%		Yes			172	283	95%
NH	110	1595	1705	94%		Yes			50	160	91%
UT	101	1134	1235	92%		Yes			447	548	67%
ME	130	1546	1676	92%		Yes			191	321	83%
PR	122	1111	1233	90%		Yes			372	494	69%
NJ	96	3111	3207	97%		Yes			344	440	88%
HI	89	760	849	90%		Yes			11	100	88%
OR	85	3505	3590	98%		Yes			1890	1975	64%
WA	72	4780	4852	99%		Yes			305	377	93%
NV	65	771	836	92%		Yes			53	118	87%
IN	56	15403	15459	100%		Yes			444	500	97%
AK	53	556	609	91%		Yes			201	254	69%
CT	48	2230	2278	98%		Yes			82	130	94%
WY	32	1461	1493	98%		Yes			438	470	76%
WV	28	3979	4007	99%		Yes			1735	1763	69%
MS	14	6168	6182	100%		Yes			8608	8622	42%
CO	12	6743	6755	100%		Yes			38	50	99%
KY	11	10790	10801	100%		Yes			424	435	96%
OK	8	20827	20835	100%		Yes			0	8	100%
VA	2	9816	9818	100%		Yes			0	2	100%
GA	0	6140	6140	100%	Yes				6007	6007	51%
AR	0	6075	6075	100%	Yes				5548	5548	52%
ID	0	2622	2622	100%	Yes				587	587	82%
MD	0	2603	2603	100%	Yes				560	560	82%
DE	0	576	576	100%	Yes				0	0	100%
RI	0	337	337	100%	Yes				0	0	100%
DC	0	94	94	100%	Yes				0	0	100%
Nationwide	27277	368097	395374	93%	7	34	8	3	88912	116189	76%

TECHNOLOGY APPLICATIONS (May 2002)

www.fhwa.dot.gov/bridge/hyd.htm

Chien-Tan Chang, HIBT, (202) 366-6749 is the COTR (Contract Office Technical Representative) for all projects. The COTR and the hydraulic engineers shown in parentheses provide technical oversight. The lead hydraulic engineer for each project is shown in **BOLD**.

1. DP 98, Underwater Inspection (**Thompson**, Pagán) *Contract has been closed out.*
2. DOT Information Service Digital Document Center (isddc.dot.gov) (**Thompson**)
DOT publications can be obtained over the web or through the mail (one free copy).
 - 32 publications on CD in HTML are available in PDF format at www.fhwa.dot.gov/bridge/hydpub.htm
 - *New reports are being provided in PDF format and historic reports are being scanned.*
 - *HDS 5, FHWA-NHI-01-020 is now available.*
 - *HDS 6, FHWA-NHI-01-004 is now available.*
 - *HEC 14 has been converted to section 508 compatible HTML, but is not yet posted.*
3. FHWA Hydraulics Library (CD ROM) (**Thompson**) - Dr. Bill Grenney & Pallas Inc.
 - The CD with HDS 5, video, and MDM Chapter 9 was distributed in February 1997.
 - Library includes 32 publications (7 HDS, 19 HEC, HIRE, & 5 TS/IP), 3 videos. CDs distributed on 6/8/00. Windows HY8Energy & HY8InpGen available at bridge web site.
 - *Dr. Grenney has completed task to enhance HY8InpGen to cover all shapes (beta received).*
4. SMS & WMS (**Arneson**) - Version 6.1 of WMS and Version 8 of SMS are available at "www.ems-i.com". FHWA purchased new 3 year unlimited licenses for State DOTs on 10/1/99.
 - SMS contains FESWMS (FLO2DH), RMA2, and WSPRO interfaces.
 - WMS contains HEC1, TR20, NFF and rational interfaces.
 - Contract was awarded to add SMS interface for BRI-STARs.
 - *WMS interface for HYDRA awarded summer 2001. FLO1D interface is proposed.*
5. HEC 24, Design of Highway Pump Stations (**Ghere**, Thompson) - FY97, Contract to develop a manual, software and 1-day module for NHI 13027 was awarded to PB (Peter Smith).
 - On 7/99 final \$100k obligated to contract and completion date extended to 1/21/2000.
 - HEC 24 available on web site. Training materials & HEC 24 printed.
 - *Beta software has been tested and final test version received 5/3/02*
6. HEC Conversion to Dual Units (**Pagán**, Jones, Arneson, Krolak)
 - Funds provided for NHI task order for finalizing HEC 18 (4th Ed.), HEC 20 (3rd Ed.) and HEC 23 (2nd Ed.).
 - HEC 18, HEC 20 and 23 printed in early May 2001 and have being converted to Word format.
7. HEC 9, Design of Debris Control Structures (**Beucler**, Pagan, Krolak) - *West Consultants, PI Dennis Richards.*
 - Kick off meeting has been held 4/01.
 - *Outline has been finalized.*
8. HEC 25, Tidal Hydrology and Hydraulics (**Arneson**, Pagán, Krolak) - Ayres (Dr. Lyle Zevenbergen) tidal pool funded project contractor awarded task to convert project material to HEC format.
 - *Outline has been reviewed.*
9. CAESAR Manual (**Pagán**, Arneson) - *Dr. Richard Palmer, University of Washington awarded contract 9/01 to develop manual and customize CAESAR for use by State DOTs.*
 - *Enhancements are underway.*
10. Convert HEC 18, 20, and 23 to Spanish (**Pagán**) - *pool funded project with NHI, International & HIBT*
 - *HEC 18 draft is being reviewed.*

NATIONAL HIGHWAY INSTITUTE (May 2002)

www.nhi.fhwa.dot.gov

Larry Jones, (703) 235-0523, is the NHI Course Coordinator. Technical oversight of each course is provided by Larry Jones and the hydraulic engineers shown in parentheses. The lead FHWA and contractor hydraulic engineer for each course is shown in **BOLD**. Course descriptions can be found at www.nhi.fhwa.dot.gov/coursecff.htm and www.fhwa.dot.gov/bridge/hydtrain.htm

1. NHI 135010, Highways in the River Environment, 5 days (**Phil Thompson**) FHWA instructor Dr. Larry Arneson
 - Ayres instructors are **Dr. P. Lagasse**, Dr. E.V. Richardson, Dr. Lyle Zevenbergen and Dr. Jim Schall.
 - Ayres completed study of alternatives for providing dual units (available at www.fhwa.dot.gov/bridge).
 - *HDS 6 manual is available on web site.*
 - *NHI has advertised task for presenting courses.*
2. NHI 135027, Urban Drainage Design, 3 days (**Dan Ghere**, Cynthia Nurmi, Bart Bergendahl and Brian Beucler FHWA instructors). Ayres instructors are **Dr. Jim Schall**, Johnny Morris, Arlo Waddoups & Chris Carlson.
 - Course is available in either SI or English units. *HEC 22 dual units is available at isddc.dot.gov.*
 - *NHI 135028, Pump Station Design, is available. HEC 24 is available at www.fhwa.dot.gov/bridge/hydpub.htm*
3. NHI 135035, Bridge Backwater Program, (WSPRO), 4 days (**Dr. Larry Arneson**, Krolak FHWA instructors)
 - WSPRO and PDF User's Manual are available at www.fhwa.dot.gov/bridge/hydsoft.htm.
4. NHI 135041, HEC-RAS, 4.5 days (**Arneson**) Ayres instructors are **Mr. John H. Hunt**, Dr. Lyle W. Zevenbergen, Mr. Anthony L. Firenzi, Mr. William M. deRosset and Mr. Brian K. Varrella.
5. NHI 135046, Stream Stability and Scour at Highway Bridges, 3 days (**Jorge Pagán**, Arneson, Sterling Jones, Joe Krolak, Nurmi, Ghere FHWA instructors); Ayres Associates (thru 5/31/2002) instructors are **Lagasse**, Richardson, Johnny Morris, Arlo Waddoups and Zevenbergen.
 - NHI 13047, 1-day for bridge inspectors, is taught by Ayres.
 - HEC 18 (4th Ed), HEC 20 (3rd Ed) and HEC 23 (2nd Ed) are printed and have been converted to Word..
 - *Lesson plans developed for 3 day courses: 135046 (HEC 18 & 20) & 135048 Countermeasures (HEC 23 and DP 97).*
 - *NHI will advertise task for course presentation after the walk through.*
6. NHI 135056, Culvert Design, 3 days (**Thompson**, Toillion, Joe Krolak FHWA instructors)

Ayres Associates instructors are **Schall**, Morris, Waddoups, John Hunt, Dave Frick and Scott Hogan.

 - HDS 5 is reference manual. The "Reprint 1998" edition is available at isddc.dot.gov.
 - Metric HEC 14 in PDF format available at www.fhwa.dot.gov/bridge/hydpub.htm
 - *Dual unit HDS 5 has been completed. Course is being converted to dual units.*
7. NHI 135057, HYDRAIN, Integrated Drainage Design Software, 3 days, (**Krolak** FHWA instructor)

GKY and Associates instructors are **Stu Stein**, Bret Martin, Dr. Ken Young, Dave Pearson, Christine Estes

Course manuals have been updated to Version 6.1 Contract was extended to 5/2002.

 - *Error correction task is complete, version 6.2 will be posted soon.*
8. NHI 135065, Introduction to Highway Hydraulics, 3.5 days, (**Pagán**, Toillion, Brian Beucler FHWA instructors)

Ayres Associates instructors are **Schall**, Morris, Waddoups, Dave Frick, and Doug Leiho.

 - *HDS 4 has been converted to dual units.*
 - *Future task to produce 1-day overview course with flume for construction & maintenance personnel.*
9. NHI 135067, Practical Highway Hydrology, 3 days, (**Krolak** FHWA instructor) **Roger Kilgore**, Dr. Gary Lewis, Mr. Jerry Normann, and Mr. Tamim Atayee are Kilgore Consulting and Management instructors.
 - *HDS 2, Highway Hydrology - Draft dual units edition is being completed.*
 - *Course update is being completed.*
10. NHI 135071, FESWMS/SMS, 4.5 days, (**Arneson** FHWA instructor) *EMS-I* Instructors are **Dr. Alan Zundel**, Darren Gonzales, Rusty Jones, Tom Moreland, and Jeff Davis.
 - *User's manual is being worked on by Dr. Dave Froehlich.*
 - *New 1-D course proposed for FY 2002 in partnership with tidal scour pool funded project.*
11. NHI 135080, Hydrologic Modeling with the Watershed Modeling System (WMS), 3 days (**Arneson** FHWA instructor)

EMS-I instructors are **Dr. Jim Nelson**, Colby Manwaring, Chris Smemoe, Doug Gallup, and Jeff Davis.

FHWA Hydraulic Engineering Publications
www.fhwa.dot.gov/bridge/hydpub.htm
May 2002

Publications are available from NTIS, National Technical Information Service, 5285 Port Royal Rd, Springfield, VA 22161, (703) 605-6000 (www.fedworld.gov/ntis). Electronic versions for some publications are available at DOT digital document center: isddc.dot.gov.

HYDRAULIC DESIGN SERIES (HDS)		YEAR	FHWA-#	NTIS-#
HDS-1	Hydraulics of Bridge Waterways	1978	EPD-86-101	PB86-181708
HDS-2	Highway Hydrology (SI)	1996	SA-96-067	PB97-134290
HDS-3	Design Charts for Open-Channel Flow	1961	EPD-86-102	PB86-179249
HDS-4	Introduction to Highway Hydraulics (Dual Units)	2001	NHI-01-010	
HDS-5	Hydraulic Design of Highway Culverts *	1985	IP-85-15	PB86-196961
HDS-5	Hydraulic Design of Highway Culverts	2002	NHI-01-020	
HDS-6	River Engineering for Highway Encroachments	2002	NHI-01-004	
HYDRAULIC ENGINEERING CIRCULARS (HEC)		YEAR	FHWA-#	NTIS-#
HEC-9	Debris-Control Structures	1971	EPD-86-106	PB86-179801
HEC-11	Design of Riprap Revetment	1989	IP-89-016	PB89-218424
HEC-14	Hyd. Design of Energy Dissipators for Culverts & Channels *	1983	EPD-86-110	PB86-180205
HEC-15	Design of Roadside Channels with Flexible Linings *	1988	IP-87-7	PB89-122584
HEC-17	Design of Encroachments on Flood Plains using Risk Analysis	1981	EPD-86-112	PB86-182110
HEC-18	Evaluating Scour at Bridges, Edition 3 (Dual units)	2001	NHI-01-001	
HEC-20	Stream Stability at Highway Structures, Edition 2 (Dual units)	2001	NHI-01-002	
HEC-21	Bridge Deck Drainage Systems	1993	SA-92-010	PB94-109584
HEC-22	Urban Drainage Design Manual (Dual Units)	2001	NHI-01-021	
HEC-23	Bridge Scour & Stream Instability Countermeasures (Dual Units)	2001	NHI-01-003	
HEC-24	Highway Stormwater Pump Station Design	2001	NHI-01-007	
IMPLEMENTATION REPORTS (IMP)		YEAR	FHWA-#	NTIS-#
IMP	Underground Disposal of Storm Water Runoff, Design Guidelines	1980	TS-80-218	PB83-180257
IMP	Guide for Selecting Manning's Roughness Coef. for Natural Channels and Flood Plains	1984	TS-84-204	PB84-242585
IMP	Culvert Inspection Manual	1986	IP-86-2	PB87-151809
IMP	Structural Design Manual *	1983	IP-83-6	PB84-153485
PUBLICATIONS ON CD-ROM		YEAR	FHWA-#	NTIS-#
HDS-5	Hydraulic Design of Highway Culverts (CDROM), v1.00	1996	SA-96-080	N/A
	Installation and User's Guide (SI computation aids)	1996	SA-96-081	N/A
	FHWA Hydraulics Library	2000	IF-00-022	

* Also available from McTRANS - 512 Weil Hall, Univ. of Florida, Gainesville, FL 32611-6585
352- 392-0378, FAX 352- 392-3224, Messages 1-800-226-1013

FHWA Hydraulics Software List
www.fhwa.dot.gov/bridge/hydsoft.htm
October 2001

The software and related publications listed below are available at www.fhwa.dot.gov/bridge/hydsoft.htm or:

McTRANS - 512 Weil Hall, Univ. of Florida, Gainesville, FL 32611-6585, (352) 392-0378, FAX (352) 392-3224, Messages 1-800-226-1013 (www-mctrans.ce.ufl.edu)

PC-TRANS - 2011 Learned Hall, Lawrence, KS 66045, (913) 864-5655, FAX (913) 864-3199 (kuhub.cc.ukans.edu/~pctrans/index.html)

	TITLE	YEAR	MCTRANS	FHWA-#	NTIS-#
HY-7	Bridge Waterways Analysis Model	1999	WSPRO		
	WSPRO Research Report	1986	WSPRO.D	RD-86-108	PB87-216107
	WSPRO User's Manual (Version P60188)	1999	WSPRO.D	SA-98-080	
HY-8	FHWA Culvert Analysis (Version 6.1)	1999	HY8		
	Hydraulic Design of Highway Culverts	1985	HY8.D	IP-85-15	PB86-196961
	Research Report (Version 1.0)	1987	HY8.D		
	HY 8 Applications Guide	1987	HY8.D	ED-87-101	NA
HY8InpGen	HY 8 Input Generator (95/98/NT)	2000			
HY8Energy	HY 8 Energy (95/98/NT)	2000			
HY-9	Scour at Bridges (Version 5.0) - Now in WSPRO	1994			
HY-10	BOXCAR (Version 1.0) [Version 2 ACPA]	1989	BOXCAR		
	BOXCAR Users Manual	1989	BOXCAR.D	IP-89-018	PB90-115486
	Structural Design Manual	1983	BOXCAR.DS	IP-83-6	PB84-153485
	PIPECAR (Version 2.1)	1993	PIPECAR		
	PIPECAR Users Manual (Version 1.0)	1989	PIPECAR.D	IP-89-019	PB90-115478
	Structural Design Manual	1983	PIPECAR.DS	IP-83-6	PB84-153485
	CMPCHECK (Version 1.0)	1989	CMPCHECK		
HY-11	Preliminary Analysis System for WSP	1989	PAS		
	PAS USERS MANUAL	1989	PAS.D	IP-89-013	PB90-112723
HY-12	Flo2DH (Version 3)	2001			
	<i>Flo2DH, Users Manual</i>	2001?		RD-01-??	NA
	FESWMS-2DH, Research Report	1989	FESWMS.DS	RD-88-146	PB91-106492
HY-22	Urban Drainage Design (see HEC-22)	1999			
	VisualUrban (95/98/NT)	2001			
CANDE	CANDE-89 (Version 1.0)	1989	CANDE		
	CANDE, Users Manual	1989	CANDE.D	RD-89-169	NA
HYDRAIN	Drainage Design System (Version 6.1)	1999	HYD6		
	HYDRAIN Users Manual (PDF)	1999	NA	IF-99-008	NA
BRI-STARS	Bridge Stream Tube for Alluvial River Sim.	2000			
	BRI-STARS Users Manual (Version 5.03)	2000		RD99-190&1	