Hydraulics & Hydrology Training
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Introduction

• HQ Hydraulics Staff
• Region Hydraulics Staff
• Who are you by show of hands - WSDOT Designers? Consultants? Local Agencies? Permitting Staff? Maintenance?
• Class objectives – Why are you here? What do you want to learn about? Name Tag?
• Workbooks
• Informal training format – ask lots of questions but we may defer some for off-line discussions
• Logistics – bathrooms, emergencies, exits, lunch, 2-day training

The Beginning
Course Schedule – Day 1

8:00 – 8:45  Introduction to the Hydraulics Manual and HQ Hydraulics Section
8:45 – 9:30  Lesson 1: Hydraulics Manual Policies (HM Chapter 1)
9:30 – 9:45  Break
9:45 – 11:30 Lesson 2: Hydraulics and Hydrology Methods (HM Chapter 2)
11:30 – 12:30 Lunch
12:30 – 2:30 Lesson 3: Pavement Drainage Design, and Pipe Sizing (HM Chapters 5 and 6) and Group Exercises 1 - 3
2:30 – 2:45  Break
2:45 – 3:30  Continue Lesson 3 and Group Exercises 1 - 3
3:30 – 4:30  Lesson 4: Hydrologic Processes and Large Woody Material
Course Schedule – Day 2

8:00 – 9:00 Lesson 5: Fish Passage, Stream Design, Bridge Scour
9:00 – 9:30 Lesson 6: How to use the HM and HRM
9:30 – 9:45 Break
9:45 – 11:30 Lesson 7: Introduction to the Hydraulic Report
11:30 – 12:30 Lunch
12:30 – 1:30 Lesson 8: Hydraulic Issues for Design-Build vs Design-Bid-Build Projects
1:30 – 2:00 Lesson 9: Pipe Materials
2:00 – 2:15 Break
2:15 – 4:20 Lesson 10: Culvert and Ditch Design (HM Chapter 3 and 4) and Group Exercise 4
4:20 – 4:30 Wrap up
2-day Training at a Glance

• Hydraulic Design policy and Some Hydraulic Manual Chapters
• Hydraulic Design Group Exercises
• Links between Highway Runoff Manual (HRM) and HM and how they fit together
• Tips and Tools to write a hydraulic report
• Design-Build vs Design-Bid-Build – drainage perspective
What is the WSDOT Hydraulics Manual?

- Hydraulic Design policy
  - Responsibilities between different offices within WSDOT
  - Writing Hydraulic Reports
- Selecting the appropriate Hydrology Method - rainfall to runoff
- Selecting the appropriate Hydraulics Methods – taking the flow rate and designing things like pipes, culverts, ditches, channels
What is the WSDOT Hydraulics Manual?

- Design guidelines for:
  - Culverts and Open Channels
  - Inlet Spacing – getting water off the roadway
  - Storm Sewer (pipe network) design guidelines
  - Fish Passage
  - Pipe Materials
  - Large Woody Material, Stream Design, Scour
Hydraulics Manual Organization

• Chapter 1
  – Design Policy

• Chapter 2
  – Hydrology

• Chapter 3
  – Culvert Design

• Chapter 4
  – Open Channel Flow

• Chapter 5
  – Drainage of Highway Pavements

• Chapter 6
  – Storm Drains

• Chapter 7
  – Fish Passage

• Chapter 8
  – Pipe Classifications and Materials

• Chapter 9
  – Highway Rest Areas

• Chapter 10
  – Large Woody Material

Latest electronic copy can be found at:

http://www.wsdot.wa.gov/Publications/Manuals/M23-03.htm
HQ Hydraulics
Program Support

Julie Heilman, State Hydraulic Engineer

Roger Millar, Secretary of Transportation

Keith Metcalf, Acting Deputy Secretary of Transportation
Program Support

- Stormwater Retrofit
- Fish Barrier Removal
- Major Drainage
- Chronic Environmental Deficiencies (CED)
- Bridge Scour
- Bridge Replacement
- Emergencies/Emergent needs
- Design Build technical support of RFP template development for fish passage design and hydraulics design
Stormwater Retrofit

Many existing highways either do not have any stormwater flow control or treatment facilities, or do not have enough to manage the runoff from all impervious surfaces. WSDOT identifies, prioritizes, and implements retrofit solutions to manage stormwater runoff from these highways.

HQ Hydraulics is working with HQ Environmental Services Office (ESO), HQ CPDM, and Region Program Management to developed a streamlined process for developing basis of design and PS&E support for successful and efficient project delivery of stormwater retrofit projects.
Fish Barrier Removal

State highways cross streams and rivers in thousands of places in Washington State, which can impede fish migration. WSDOT has worked for more than two decades to improve fish passage and reconnect streams to help keep our waterways healthy. WSDOT Fish Barrier Correction is a priority.

HQ Hydraulics has developed a streamlined process for developing basis of design and PS&E support for successful and efficient project delivery of fish passage projects.
Fish Barrier Removal/Wildlife Passage
Major Drainage

As an example of stewardship on Major Drainage Systems, WSDOT inventories and inspects thousands of culverts to identify those that need to be fixed. A drainage control system is a complex system which may include:

- Culverts or other drainage structures
- Connectivity of streams in the watershed
- Wetlands
- Ditches
- Manmade detention or retention basins

HQ Hydraulics is developing a streamlined process for developing basis of design and PS&E support for successful and efficient project delivery of Major Drainage Projects.
Chronic Environmental Deficiencies (CED)

CEDs are locations along state highways where maintenance and/or repairs are:

- causing impact to fish and fish habitat
- recent (last 10 years)
- frequent (three or more incidents)

HQ Hydraulics has developed a streamlined process for developing basis of design and PS&E support for successful and efficient project delivery of CED projects.
Chronic Environmental Deficiencies (CED)
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Bridge Scour

Scour is the leading cause of bridge failures in Washington State and nationwide. Of the 70 documented bridge failures in Washington State history, 43 were due to scour. WSDOT has approximately 1,583 vehicular bridges and culverts over 20-feet in length that span over water. 262 of these bridges are considered scour critical.

HQ Hydraulics has developed a streamlined process for developing basis of design and PS&E support for successful and efficient project delivery of bridge scour projects.
Bridge Scour
HQ Hydraulics supports the Bridge and Structures Office for providing safe, economical and reliable structures for Washington's transportation system, which includes nearly 3,100 existing vehicular bridges and typically 18 new bridges per year. Support includes river and coastal analyses for water crossing structures, in addition to bridge deck drainage for all structures.

HQ Hydraulics has developed a streamlined process for developing basis of design and PS&E support for successful and efficient project delivery of bridge replacement projects.
HQ Hydraulics section supports regions statewide with onsite assistance on recommendations for temporary and permanent repairs and/or replacements.