

Introduction to the Hydraulic Report



The Hydraulic Report

The hydraulic report is intended to serve as a complete documented record containing the engineering justification for all drainage modifications that occur as a result of the project. The primary use of a hydraulic report is to facilitate review of the design and to assist in the preparation of the PS&E. The writer should approach the hydraulic report from the position of its defense in a court of law. It should be clearly written and show conditions before and after construction.

Hydraulic Reports for WSDOT projects need to be:

- stamped by a professional engineer
- written by someone who has taken the 2014 HRM training since that person's HRM certificate number is required on the cover page

Hydraulic Report Resources

- Hydraulics Report Outline
- Hydraulic Report Checklist
- Region Hydraulics Office Contacts
- HQ Hydraulics Web page

<http://www.wsdot.wa.gov/Design/Hydraulics/>

- HRM Homepage

<http://www.wsdot.wa.gov/Environment/WaterQuality/Runoff/HighwayRunoffManual.htm>



- HQ Hydraulics Section – Special Designs - Fish passage culverts & large culverts, stream work, scour, riverine, floodplain, pump design, backwater analysis

WSDOT Region Contacts

- John Maas – Northwest Region
- Kyler Kokenge – Olympic Region
- Jonathan Abuyan – Southwest Region
- Luke Assink – South Central Region
- Greg Lahti / Keith Kusler - Eastern Region
- David Toften – North Central Region
- Le Nguyen – Mega Projects



Hydraulic Report Building Blocks

- Start with the Hydraulics Report Outline and Hydraulic Report Checklist
- Using the information in the scope of work, determine the HRM Minimum Requirements for the project
- Perform a Site assessment an, existing drainage features, existing utilities
- Using the existing drainage plans, contour maps to delineate the Threshold Discharge Areas (TDAs)



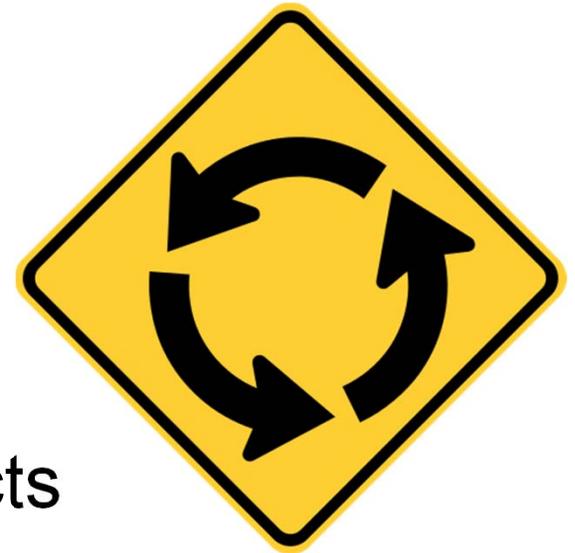
Building Blocks (cont.)

- From the approved channelization plans, determine the net new impervious surface areas, PGIS areas that need to be treated and detained.
- Determine the locations for the proposed detention and treatment BMPs. Field check.
- BMP Selection (check with Region Hydraulics Engineer)
- Size the facilities



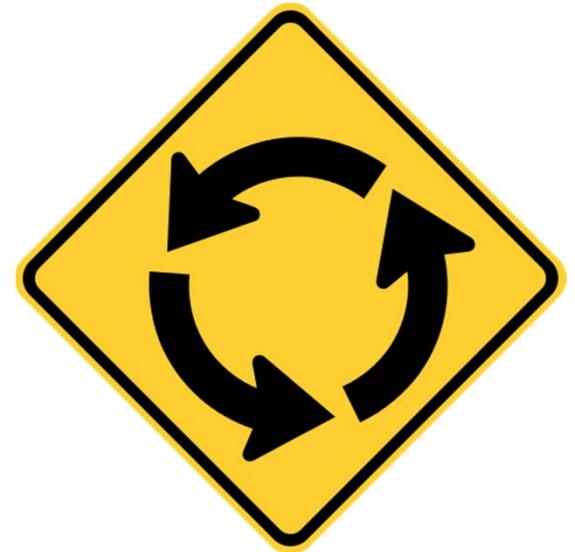
Building Blocks (cont.)

- Constructability review with construction office
- Field verify - check for utilities conflicts
- Check for sensitive areas such as wetlands, jurisdictional ditches.
- Avoid putting detention/treatment BMPs in sensitive areas. If it is unavoidable, determine the impacts and mitigate the impacts accordingly.



Building Blocks (cont.)

- Are there any special designs?
If yes, contact HQ Hydraulics for help.
- Survey the existing site, determine utilities locations, identify utilities conflicts and resolve them.
- Right-of-Way assessment: can all the detention/treatment BMPs fit within existing R/W? If not, additional R/W would be required.



Building Blocks (cont.)

- From the approved channelization plans, design collection systems (catch basins, ditches)
- Design conveyance systems (enclosed pipes, ditches)
- Start writing the report



Report Writing

- Keep it short, precise and clear. Use plain English.
- Do not copy text from the manuals and include it the report. If needed, refer to the manual sections instead.
- Hydraulic Report is a standalone document. All relevant information must be included in the report.



Types of hydraulic reports

- Type A: big and complicated projects. Typically, involve detention and treatment facilities.
- Type B: small and simple projects. Do not require detention or treatment.
- Summary: either no drainage work or very minor drainage work.
- Special designs could be included in the report/summary as an appendices



Types of hydraulic reports

- Conceptual Hydraulic Reports for Design-Build projects: 10%-30% design typically. Show the TDA delineation, BMPs (types, sizes and locations), minimum requirements determination, commitments and any other special designs.
- Typically omitted: gutter calculations, collection and conveyance design



Types of hydraulic reports

- Design-Build Projects – Final Hydraulic Reports with as-built plans to be submitted toward the end of the project when most of the drainage features have been built.
- Final check before accepting (field verify vs. contract plans)
- As-built plans must reflect the field conditions

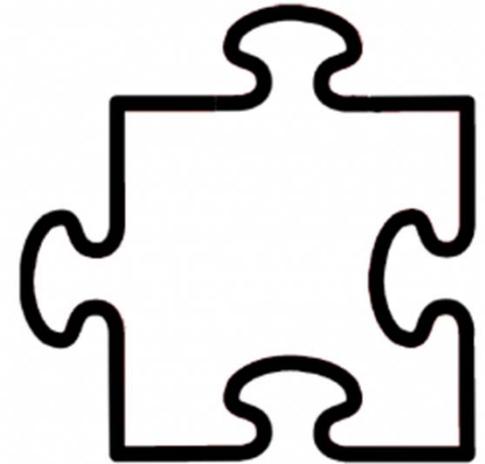


Hydraulic Report Components

Text portion: project description, location, scope of work, design criteria, minimum requirements.

Existing condition: existing drainage features (ponds, pipes, swales, ditches, etc.), wetlands, sensitive areas, utilities.

Proposed condition: collection system, conveyance system, flow control and treatment BMPs

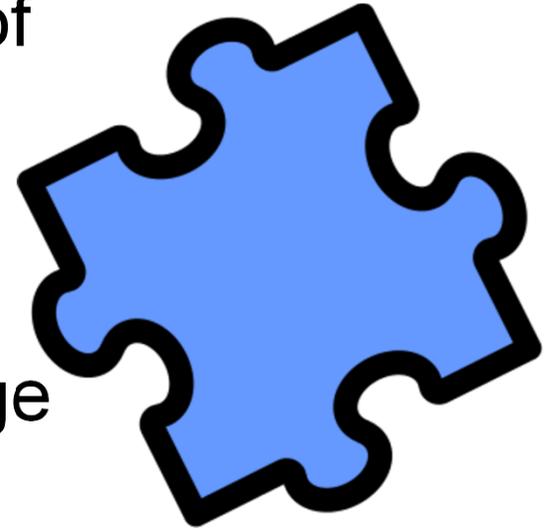


Hydraulic Report Components (cont.)

Drainage Plans: show the locations of the drainage features such as CBs, MHs, Ponds, Pipes, Detention & Treatment BMPs, special designs

Drainage Profiles: profiles of drainage pipes, ponds and other drainage features

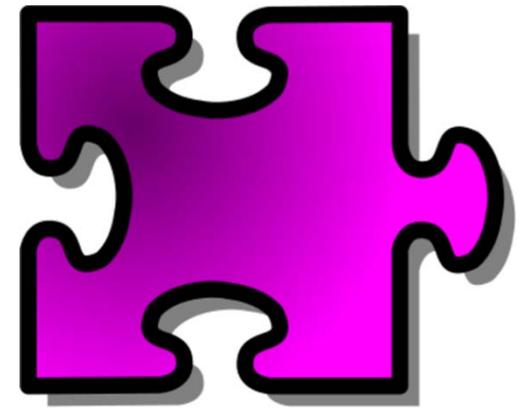
Drainage Details: control structure details, emergency overflow structure, energy dissipaters, flow spreaders, etc.



Hydraulic Report Components (cont.)

Structure Notes: drainage items and quantities, locations of the items. Note: for Design-Build projects, structure notes are not needed.

Not included in the hydraulic report but required: _Temporary Erosion and Sediment Control (TESC) report. _Maintenance Operation Procedure and Maintenance Plans



Hydraulic Report Components (cont.)

Backup Calculations: MGS Flood, MGS Flood Inputs spreadsheet, StormShed, gutter analysis, stormsewer design, HY-8, floodplain analysis, backwater analysis, biofiltration swale design, etc..

TDA Maps: showing the TDA delineation, TDA boundaries and outfall locations.

Roadway Sections: showing X-sections



Hydraulic Report Components (cont.)

Roadway Profiles: mileposts, stations, longitudinal slopes

Roadway Super-elevation Diagrams: showing the cross slopes

Soil Maps: showing existing soil types (A,B,C,D) Outwash, Forest, Pasture, Till



https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_034094.pdf

Hydraulic Report Components (cont.)

Deviations: HRM and HM deviations must be approved by the State Hydraulics Engineer and included in the hydraulic reports.

Stormwater Design Documentation Spreadsheet (SDDS): documents the drainage areas before and after development. Quantified areas to be treated and detained, retrofitted areas.

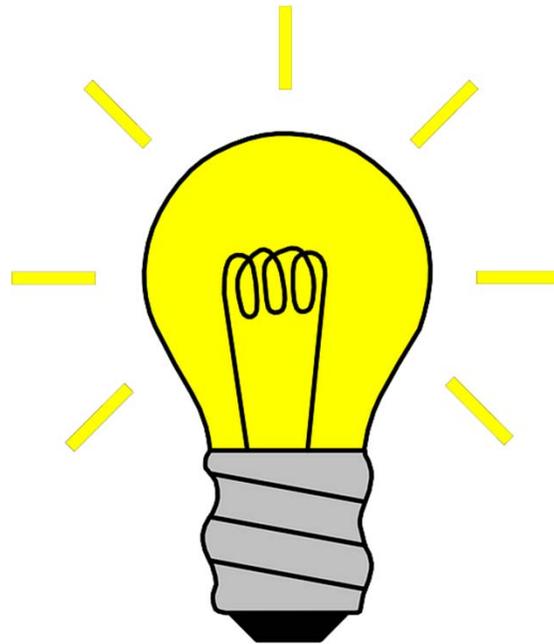


Hydraulic Report Components (cont.)

Stormwater Retrofit Requirements: It is not a one-size-fit-all policy. When in doubt, ask. Within the Puget Sound Basin, follow the requirements here

<http://www.wsdot.wa.gov/Environment/WaterQuality/Runoff/HighwayRunoffManual.htm>

Who to ask? Alex Nguyen, Le Nguyen or Jana Ratcliff



Hydraulic Report Components (cont.)

Traffic Analysis Data: the projected ADT in the future (design year, typically 30 years out)

Environmental Issues: any issues that are not already covered in the report.



Hydraulic Report Components (cont.)

TESC Preparation Guidelines: See the WSDOT TESC Manual!

Contact: Region Hydraulics Engineer or HQ Elsa Pond – PondE@wsdot.wa.gov (360) 570-6654

<http://www.wsdot.wa.gov/Environment/WaterQuality/ErosionControl.htm>

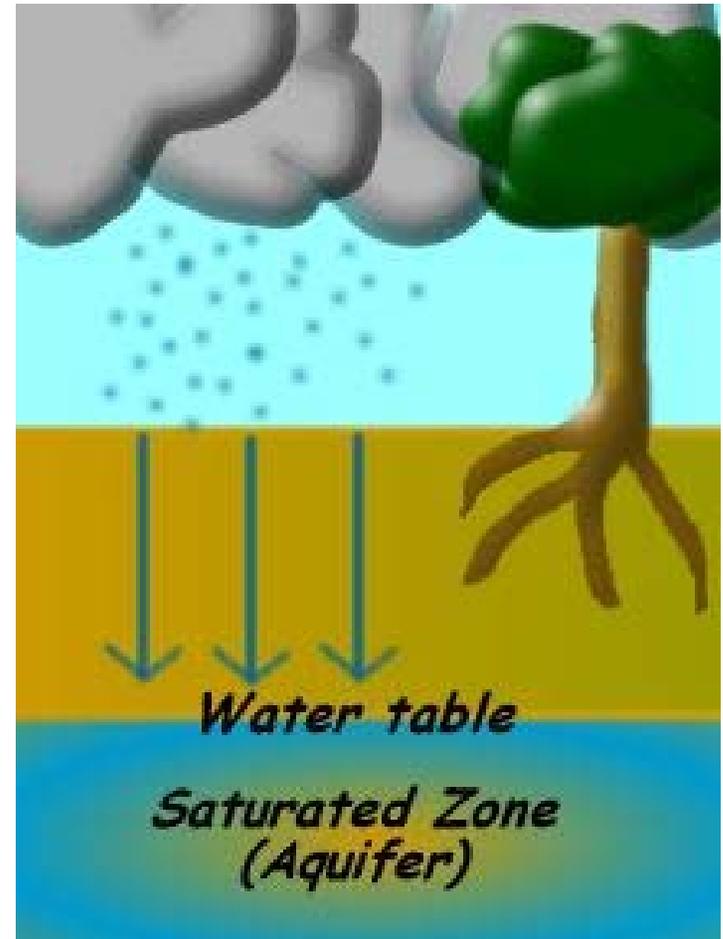
Specialty Designs: coordinate with HQ Hydraulics and include the Special Reports as appendices in the HR.



Things to be considered

Infiltration BMPs: depend on existing soil infiltration rates and seasonal groundwater surface elevations. Install piezometers and geotechnical work should be done as soon as infiltration BMPs are identified and proposed.

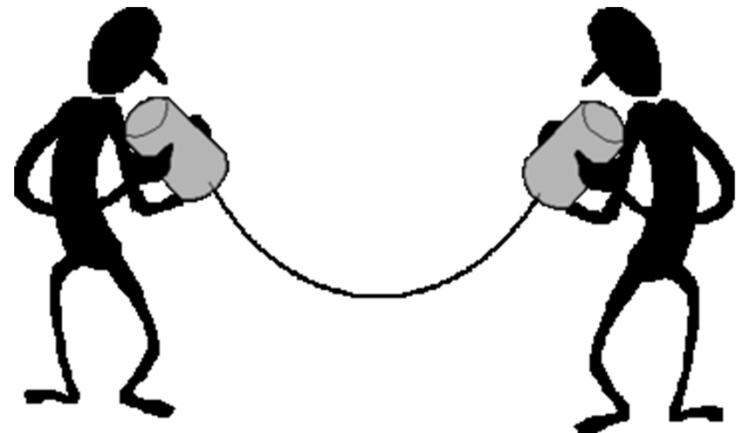
Check the HRM Section 4-5.1 for Site Suitability Criteria (SSC) – HRM



Things to be considered

Utilities Conflicts: should be identified and resolved as soon as possible.

Constructability and Maintainability: consult with Construction Office and Maintenance Office throughout the design.



Things to be considered

Design consideration

- **Costs** (initial cost, operation and maintenance cost, replacement cost).
- **Construction methods:** if you can draw a straight line on a piece of paper, it does not mean that Contractor can build it per plans, or if they can, it could be very costly.



Things to be considered

Design consideration

- **Artistic design:** ponds don't have to be square or rectangular shapes
- **Environmental Benefits:** ditches are less expensive to build and do provide some environmental benefits compared to enclosed pipe systems



Things to be considered

Thickness of typical hydraulic reports

- How thick should they be? As thick as they need to be. The reports should document the designs and all relevant information and backup calculations, but they don't need to explain how BMPs work or discuss about BMPs performance. Don't copy text from the manuals and include in the reports.



Hydraulic Report Writing



Any Questions?

How many hydraulic reports do I have to write before I can be considered as a drainage guru? 1-10? More?