CITY OF PORTLAND
ENVIRONMENTAL SERVICES

1120 SW Fifth Ave, Suite 613, Portland, Oregon 97204 ▪ Mingus Mapps, Commissioner ▪ Dawn Uchiyama, Director

M E M O R A N D U M

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TO: **Jeff Caudill, Environmental Planner, Bureau of Planning and Sustainability;**
Patricia Diefenderfer, Chief Planner, Bureau of Planning and Sustainability

CC: **Kaitlin Lovell, Manager II, Bureau of Environmental Services,**
Kristen Acock, Manager III, Bureau of Environmental Services,
Strategy & Integrated Planning

FROM: **Gregory Savage, PE; Engineer II, Bureau of Environmental Services,**
Risk Assessment Division, System Analysis and Modeling Support Section

RE: **Summary of the Methodology Used to Create the Modeled Willamette River 1996 Flood Extent**

In 2020, the Risk Assessment Division (RAD) of the Bureau of Environmental Service (BES) began collaborating with the US Army Corps of Engineers' Portland District Office (Corps) in the development of hydraulic models of the lower Willamette River using the Corps' HEC-RAS computer application. This work was initiated because of the manifold need for updated modeling to support of current planning and design work, and to put into motion the development of an updated FEMA Flood Insurance Study (FIS). While the FIS modeling work is still in progress and contingent upon other Corps work that is still in progress, deliverable goods have been produced with the first being an unsteady-state, 1D model of the lower Willamette provided in March of 2022.

The 1D unsteady model includes all of the lower Willamette from its confluence with the Columbia up to Willamette Falls along with portions of the Columbia extending from the Portland Airport down to the city of St Helens. The domain was established by the need to tie into stream gages that are used to establish model boundary conditions, and to dynamically model the flow splits and reversals around Sauvie Island. The model includes several runs used for calibration, including the February 1996 flood event.

The 1D unsteady model was developed using the Corps' HEC-RAS computer modeling application with the Corps' Water Management System (CWMS) digital terrain model (DTM) that was derived from multiple sets of lidar and bathymetric data. This DTM represents the most extensive and contiguous surface however the lidar data from which it is derived appears to pre-date the most recent Metro regional consortium flight of 2019. The DTM is used in pre-processing the river's cross-sectional data as well as post-processing the results. Most of the pre- and post-processing tasks were handled using the RAS-Mapper utility in HEC-RAS but much of the work involved the use of GIS. Model development is documented in the Corps' May 2022 "Lower Willamette River Unsteady HEC-RAS Model" report.

The data from the 1996 model run that were exported out of RAS-Mapper include a raster GIS layer of the resultant water surface elevation (WSE), inundation extents polygons, and polylines providing a topographic contour representation of the WSEs. The output for the WSE contours was specified at 0.1-foot intervals. A point layer marking off the river miles (RM) in 1/10th mile increments is also included in this modeling output package.

It should be noted that the RM stationing used in the model differs from those published in the current FEMA FIS and found in the City's GIS. Since none of these various coverages match exactly, the decision was made to use the Corps' determination of river stationing since the model is entirely based on the Corps' long-standing modeling framework. The RM point layer includes not only RM designations but also contains WSEs extracted from the WSE raster layer at each station point. In conformity with FEMA standards and Corps practices, all elevations are reference to the North American Vertical Datum of 1988 (NAVD 88)

The output of this model, referred to as the Modeled Willamette River 1996 Flood Extent in the zoning code (Title 33), refines the flood hazard area currently depicted in Metro's Title 3 Map (known as the 1996 Flood Inundation Area) and will be a part of the City's "combined flood hazard area," as defined in Chapter 33.910 of the zoning code.