Richard Martin Groundwater LLC

TECHNICAL MEMORANDUM

Date: December 3, 2025
To: Ryan Larsen - LandPro Group, Inc.
From: Richard Martin, LHG

RE: Approach to Modeling Groundwater Flow for the Arlington 360 Project, Arlington, Washington

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This technical memorandum presents our approach for simulating groundwater flow for the Arlington 360 Project in Arlington, Washington. The proposed residential development has steep slopes along the northern edge of the uplands, and partially on the east and west sides as well. Groundwater emanates along the slopes as seeps, which in turn supports the hydrology of wetlands and streams near the base of the slopes. To maintain the hydrology to the extent feasible, an evaluation of the impact of the development on groundwater flow below the site and to the slopes may be needed to assess the potential impacts to the wetlands and streams.

Groundwater elevation data and stream flow data are currently being collected to support an evaluation. It is anticipated that sufficient data to characterize both dry season and wet season hydrology will be available by early spring. A decision will be made at that time to determine the specific approach to evaluating the development's impact on groundwater and the downstream hydrology.

The groundwater evaluation will be performed using MODFLOW as part of the Groundwater Vistas Version 6 (Environmental Simulations, 2011) groundwater modeling program. MODFLOW was developed by the United States Geological Survey (McDonald and Harbaugh, 1998), and is the most widely used groundwater modeling program in the industry.

The following sections describe the general approach to developing the model.

The results of the groundwater model will be used to support the hydraulic evaluation for the wetlands and streams near the base of the steep slopes.

Model Grid

A 10,000-foot by 10,000-foot grid centered on the project is currently planned for the model. Grid spacing is anticipated to be 5 feet in the area of the seeps along the slopes to approximately 150 feet at the edges of the grid (the actual grid spacing at the edges will be determined once the grid is constructed). The number of rows and columns will be determined by the grid generator based on a 5-foot spacing near the seeps.

Boundary Conditions

Model boundary conditions are used to simulate how groundwater moves in and out of the active model area. For the upgradient boundary conditions we anticipate using a general head boundary, which will be used to simulate the regional groundwater flowing into the model area. The downgradient boundary will include drain boundaries to simulate the groundwater seeps. Simulating the groundwater seeps will be a challenge given the generally diffuse nature of the seepage. Stream flow data currently being collected at the site will be reviewed to evaluate the need and parameters of the upgradient seeps.

Hydraulic Parameters

The two primary groundwater parameters for simulating groundwater flow include hydraulic conductivity and the storage coefficient. The hydraulic conductivity will be estimated based on soil grain size distribution from laboratory testing of selected soil samples collected during drilling. Additionally, slug testing may be performed on select monitoring wells to correlate the results of the grain size analyses, to refine the hydraulic conductivity values, and to provide a basis to understanding the variability in hydraulic conductivity at the site.

The storage coefficient is difficult to estimate in the absence of a pumping test, which is currently not scoped for the project. Instead the storage coefficient will be estimated based on our experience with similar subsurface conditions and refined during modeling.

Aquifer Recharge

Aquifer recharge will be applied to the groundwater flow model based on average daily precipitation provided by the team, our understanding of natural infiltration from the geotechnical explorations, groundwater elevation data collected during the wet season, and experience working with similar soil and groundwater conditions.

Parametric Analysis

Because of the limited amount of subsurface data and soil variability in the project area, a parametric analysis will be performed. The parametric analysis is performed by varying model input parameters, including boundary conditions and hydraulic parameters, and observing the changes in model output.

Additionally, as a result of the variability in rainfall on a year-by-year basis, multiple model scenarios will be simulated to evaluate changes in groundwater flow conditions during low, average, and high rainfall years.

Reporting

Once the modeling is complete, a brief technical memorandum will be prepared describing the construction of the model, model inputs, and model results.