



RH2 ENGINEERING, INC.  
www.rh2.com  
mailbox@rh2.com  
1.800.720.8052

WASHINGTON  
LOCATIONS

BOTHELL  
MAIN OFFICE  
22722 29th Drive SE, Suite 210  
Bothell, WA 98021

BELLINGHAM

EAST WENATCHEE

ISSAQUAH

RICHLAND

TACOMA

OREGON  
LOCATIONS

NORTHERN OREGON  
MAIN OFFICE  
6500 SW Macadam Ave. Suite 100  
Portland, OR 97239

SOUTHERN OREGON  
Central Point

COASTAL OREGON  
North Bend

March 14, 2014

Mr. Rob Jammerman  
Development and Environmental Services Engineering Manager  
City of Kirkland  
123 Fifth Avenue  
Kirkland, WA 98033

Sent via: Email and US Mail

Subject: Hydraulic Analyses for 4604 116<sup>th</sup> Avenue NE Development

Dear Rob:

This letter contains the results of the hydraulic analyses performed by RH2 Engineering, Inc., (RH2) for the proposed Bridle Trails development at 4604 116<sup>th</sup> Avenue NE. These analyses were performed using a computer model of the City of Kirkland's (City) existing water system to determine the fire flow capability throughout the property. This letter summarizes the results of the hydraulic analyses and the operational conditions used in the hydraulic model. These engineering services are being provided in accordance with your March 7, 2014, email authorization.

**BACKGROUND**

The owner of the property located at 4604 116<sup>th</sup> Avenue NE is proposing a 37-lot single-family residential subdivision. The development is located in the City's 590 Zone on the east side of 116<sup>th</sup> Avenue NE. A new 8-inch-diameter water main will be installed within the subdivision and is shown in the enclosed Preliminary Grading and Utility Plan. The proposed water main will connect to the City's existing 8-inch water main in 116<sup>th</sup> Avenue NE. The City has indicated that the fire flow requirement for the development is 1,000 (gallons per minute) gpm.

**HYDRAULIC ANALYSES RESULTS**

The computer model of the City's existing water system was modified to include the developer-proposed water main improvements shown in the attached Preliminary Grading and Utility Plan. Fire flow analyses were performed to determine the fire flow capability of the water system with the proposed water main improvements. The results of the analyses are shown in **Table 1**. The fire flow rates shown are based on a residual pressure of 20 pounds per square inch (psi) in the water main adjacent to the hydrant and water velocities in the distribution system at 8 feet per second (fps) or less. The results of the analyses indicate that proposed 8-inch water main extending through the subdivision will meet the fire flow requirement of 1,000 gpm at all locations.



**Table 1**  
**Hydraulic Analyses Results**

<b>Location</b>	<b>Available Derated Fire Flow (gpm)</b>	<b>Approximate Pressure (psi)</b>
Proposed water main connection in 116th Ave NE	1,252	101
Proposed ROW intersection at Lots 1, 25 and 26	1,252	94
Proposed hydrant at Lot 35 and 36	1,252	86
Proposed hydrant at Lot 32 and 33	1,252	60
Proposed hydrant at Lot 27 and 28	1,252	86

Pressure analyses were also performed with the hydraulic water model under peak hour demand conditions. The results of the analyses, shown in **Table 1**, indicate that the pressure within the development will vary from 60 to 101 psi, depending on the location. These pressures are within the acceptable pressure range recommended by the Washington Department of Health.

**HYDRAULIC ANALYSES CRITERIA**

A summary of the operational conditions used in in the hydraulic model to perform the analyses is shown in **Table 2**.

**Table 2**  
**Hydraulic Analyses Operational Conditions**

<b>Description</b>	<b>Fire Flow Analysis</b>	<b>Pressure Analysis</b>
Demands	2013 MDD (Projected)	2013 PHD (Projected)
Supply Station S1 Control Mode	N/A - Pressure Control	N/A - Pressure Control
Supply Station S1 head (feet)	544	544
Supply Station S2 Control Mode	N/A - Pressure Control	N/A - Pressure Control
Supply Station S2 head (feet)	531	531
Supply Station S3 Control Mode	N/A - Pressure Control	N/A - Pressure Control
Supply Station S3 head (feet)	533	545
North Reservoir HGL (feet)	423.89	429.27
South Reservoir HGL (feet)	531.89	535.24
650 Zone BPS Status	Three Large Pumps Operating	Two Small Pumps Operating
545 Zone BPS Status	Off	Off



Mr. Rob Jammerman  
March 14, 2014  
Page 3

If you have any questions regarding the analyses, please call me at (425) 951-5394. Thank you for the opportunity to assist you with this project.

Sincerely,  
**RH2 ENGINEERING, INC.**



Michele R. Campbell, P.E.  
Project Manager



Tony V. Pardi, P.E.  
President

TVP/MRC/jq/ms

Enclosure: Preliminary Grading and Utility Plan

3/14/14



12112 116th Ave. NE  
Kirkland, WA 98034-8629  
425.821.8448  
425.821.3481 fax  
800.488.0768 toll free  
www.triadassociates.net

Prepared by: [Signature]

PRELIMINARY GRADING AND UTILITY PLAN  
KLN CONSTRUCTION, INC.  
**BRIDLE TRAILS**

WASHINGTON

CITY OF KIRKLAND.

DATE: 02/20/2013 BY: [Signature]

REVISIONS

NO. [ ] DATE [ ] DESCRIPTION [ ]

ROY E. LEWIS, JR., P.E.  
PROJECT MANAGER  
MARK S. HARRISON, PLS.  
PROJECT SUPERVISOR  
HELEN C. FLYNN, P.E.  
PROJECT ENGINEER  
DENISE LITTON, PLS.  
PROJECT LANDSCAPE ARCHITECT  
FIRST SUBMITTAL DATE:  
SCALE: HORIZ. 1"=50' VERT. 1"=2'

**PRELIMINARY**

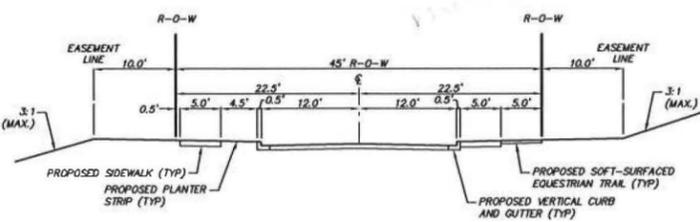
STAMP NOT VALID UNLESS SIGNED AND DATED

JOB NO. **13-097**

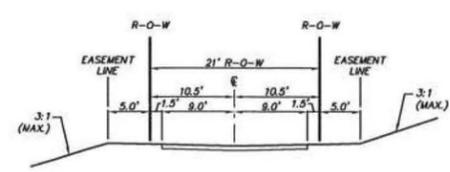
SHEET NO. **3 of 5**

APPROXIMATE EARTHWORK QUANTITIES  
CUT = 39,880 CU YDS  
FILL = 34,780 CU YDS  
VAULT EXCAVATION = 10,707 CU YDS  
NET = 15,807 CU YDS (CUT)

© 2013 TRIAD ASSOCIATES



**SECTION A-A**  
TYPICAL ONSITE ROAD



**SECTION B-B**  
ACCESS TRACT

APPROXIMATE EARTHWORK QUANTITIES  
CUT = 39,880 CU YDS  
FILL = 34,780 CU YDS  
VAULT EXCAVATION = 10,707 CU YDS  
NET = 15,807 CU YDS (CUT)