

Memo

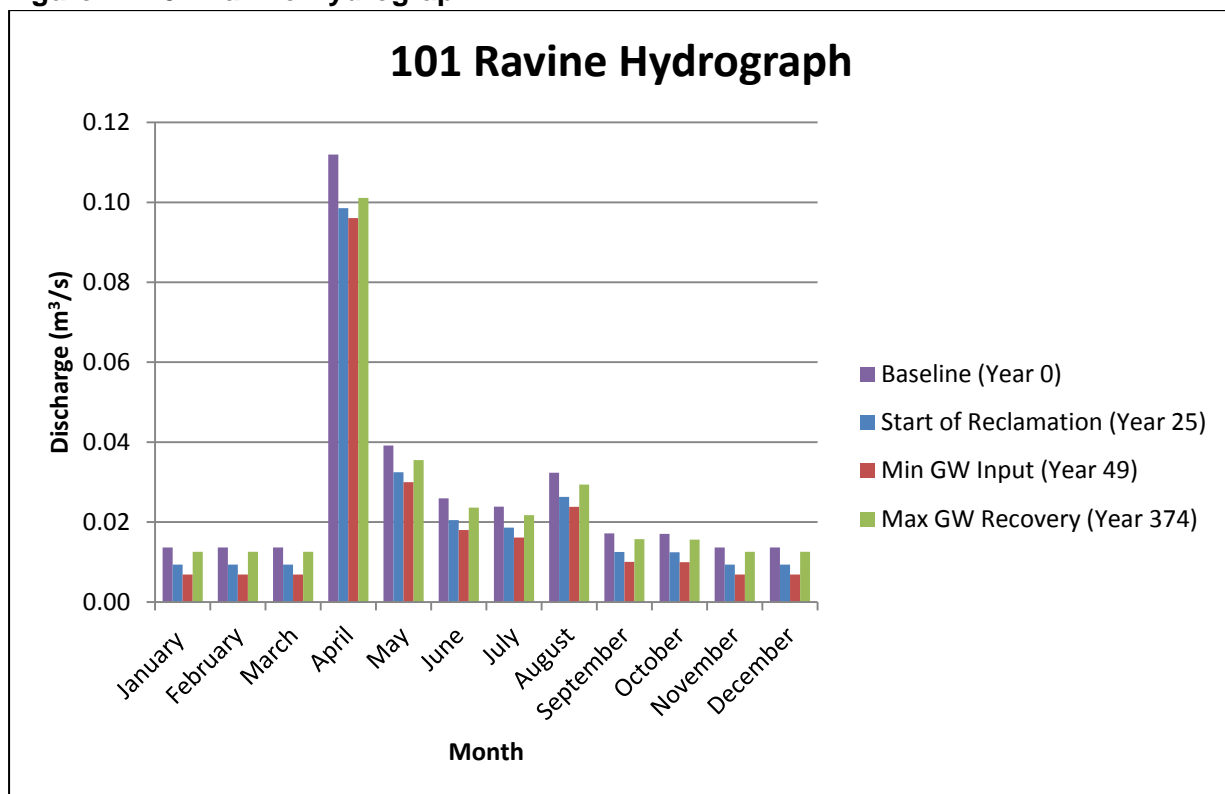
To: Ethan Richardson
Company: Shore Gold
From: Gary Beckstead
 Josh Strukoff
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Email: gary.beckstead@amec.com
Subject: Fish and Fish Habitat Assessment Clarification Questions

File No: SX0373313
Date: 22 November 2013
cc:

The following summary is in response to an email sent by Ethan Richardson (ER) of Shore Gold to AMEC on 14 November 2013 regarding fish habitat assessment.

Provided on **Figure 1** is the hydrograph for 101 Ravine as requested by ER.

Figure 1: 101 Ravine Hydrograph



At any point, the hydrograph is made up of surface (overland) runoff, and baseflow. The surface runoff is affected by drainage area and other catchment characteristics. The change in drainage areas in the watersheds looked at is summarized in **Table 1**.

Table 1
Baseline and Closure Drainage Area Summary

Stream	Drainage Area		
	Baseline Year 0 (km ²)	Closure Year 25+ (km ²)	% of Baseline
Duke	11.69	14.6	125%
Wapiti	3.75	1.76	47%
English	81.24	80.3	99%
101	24.3	21.1	87%

The baseflow is affected by groundwater levels and gradients within each catchment as well as lingering effects of mine operations as groundwater levels recover. From the information SRK provided us, groundwater flows return to 68% to 97% of baseline values across the various drainage basins.

The water balance combines monthly average baseflow and surface runoff to produce total flow. Based on the four catchments considered, the ranges of change from baseline for winter (when flow is totally dependent on groundwater baseflow – because there is no surface runoff) and freshet (annual monthly maximum generally occurs in April) are:

- Duke Ravine: between -32% from baseline in the winter and 11% during freshet;
- Wapiti Ravine: between -32% from baseline during winter and -43% during freshet,;
- English: between -12% from baseline during winter and -6% during freshet; and
- 101 Ravine: between -10% from baseline during winter and -8% during freshet.

The annual flows (surface runoff and baseflow) in the four streams considered are computed to reach between 65% and 92% of baseline values. **Table 2** summarizes the annual changes in flows from baseline.



Table 2
Change in Flow Summary from Baseline

Year 350 (after mining)	Duke Ravine	Wapiti Ravine	English Creek	101 Ravine
% Change in Baseflow from Baseline	-32%	-32%	-12%	-8%
% Change in Surface Runoff from Baseline	24%	-53%	-2%	-10%
% Change in Total Annual Flow from Baseline	-14%	-35%	-8%	-9%

Yours truly,

AMEC Environment & Infrastructure

Reviewed by:

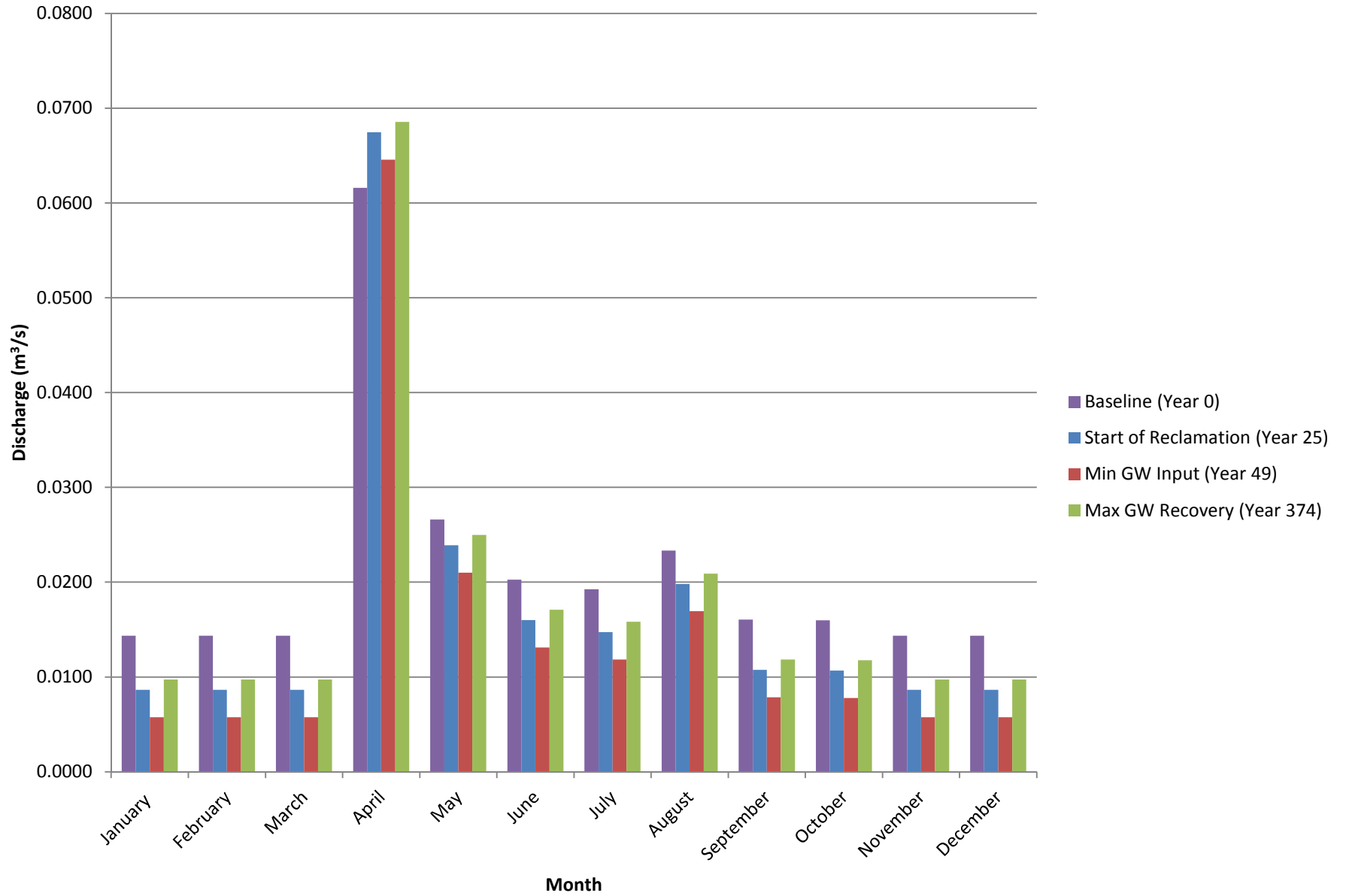
Gary Beckstead
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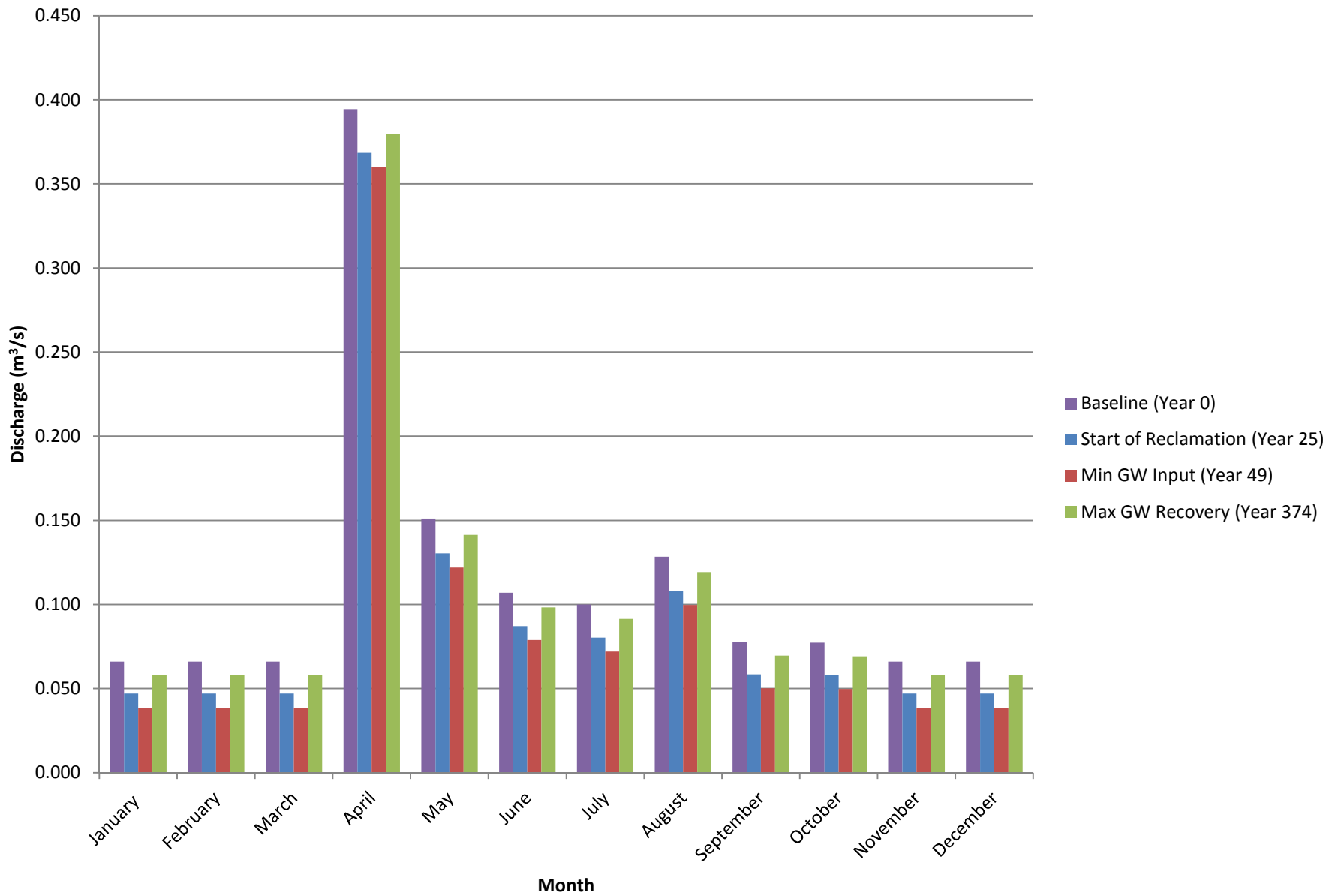
Josh Strukoff
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JS/elf

Duke Ravine Hydrograph



English Creek Hydrograph



Wapiti Ravine Hydrograph

