Appendix 5.1.1.1A
2013 Hydrometeorology Report

NEW GOLD INC.
BLACKWATER GOLD PROJECT

2013 HYDROMETEOROLOGY REPORT

PREPARED FOR:

New Gold Inc
Suite 1800, Two Bentall Centre
555 Burrard Street
Vancouver, BC V7X 1M9

PREPARED BY:

Knight Piésold Ltd.
Suite 1400 – 750 West Pender Street
Vancouver, BC V6C 2T8 Canada
p. +1.604.685.0543 • f. +1.604.685.0147

Knight Piésold
CONSULTING
www.knightpiesold.com

VA101-457/6-12
Rev 0
November 4, 2013

ISO 9001 - FS 64925
ISO 14001 - EMS 550121
OHSAS 18001 - OHS 550122

NEW GOLD INC.
BLACKWATER GOLD PROJECT

2013 HYDROMETEOROLOGY REPORT
VA101-457/6-12

Rev	Description	Date	Approved
0	Issued in Final	November 4, 2013	

Knight Piésold Ltd.
Suite 1400
750 West Pender Street
Vancouver, British Columbia Canada V6C 2T8
Telephone: (604) 685-0543
Facsimile: (604) 685-0147
www.knightpiesold.com

Knight Piésold
CONSULTING

EXECUTIVE SUMMARY

The Blackwater Gold Project is located on the Nechako Plateau, approximately 110 km south-west of Vanderhoof, in central British Columbia. Knight Piésold Limited (KP) was requested to complete an engineering hydrometeorology report for the project, with long-term values of meteorological and hydrological parameters estimated on the basis of available site and regional data. Hydrological and meteorological data have been collected at the project site since early 2011.

Meteorological data are currently being collected at two stations in the immediate project area, which are identified as Blackwater High and Blackwater Low. The meteorological parameters presented herein are for the Blackwater High station, at elevation of 1,470 masl, unless stated otherwise.

- Mean monthly temperature values were estimated based on a long-term synthetic monthly temperature series developed for the project site. This series has a mean annual temperature of 2.0°C, with minimum and maximum mean monthly temperatures of -7.7°C and 12.5°C occurring in January and July, respectively.
- Regional wind speed data are not available for any locations near the project area, so mean monthly values were derived from the limited measured Project site record. The mean annual wind speed on site in 2012 was 2.4 m/s, with the wind occurring predominantly from the southwest.
- No evaporation data are available for any locations near the Project area, and therefore lake evaporation for the site was estimated according to the Thornthwaite equation. The long-term site lake evaporation is estimated to be 445 mm.
- The mean annual precipitation at the site is estimated to be 636 mm. Precipitation is fairly evenly distributed throughout the year, with mean monthly values ranging from a low of 20 mm in April to a high of 74 mm in November. This estimate takes into consideration potential rainfall undercatch at the regional and Project climate stations.

Hydrometric data are currently being collected at 7 stations in the immediate project area. The data were reviewed by Knight Piésold and streamflow records were developed. Of these records, three were used in the development of long-term synthetic flow series for the project area. The flow series were developed by correlating the measured streamflow records with the concurrent record collected by the Water Survey of Canada (WSC) at their Dean River below Tanswanket Creek (08FC003) station.

- The long-term mean annual unit runoff considered to be generally representative of the project area is 6.1 l/s/km^2, which equates to a watershed averaged runoff depth of 198 mm.
- The effective annual runoff coefficient for natural drainage areas in the project area is estimated to be approximately 0.31 based on the ratio of mean annual runoff to mean annual precipitation
- Return period peak flow and 7-day low flow values were developed for the project area using a combination of project and regional information. Example values for hydrometric monitoring station H2, which has a watershed area of 47.2 km^2, are an instantaneous 200-year peak flow of 11.5 m^3/s and a 10-year 7-day summer low flow of 0.08 m^3/s.

Climate change has not been considered explicitly in the hydrometeorological estimates, and appropriate allowances should be made where necessary. A discussion has been included on long-term climate trends in the region.

In order to refine the flow estimates and gain a better understanding of the hydrologic variability amongst the project drainages, it is recommended that data collection be continued at all stations and that these estimates be refined as the Project continues to develop.

TABLE OF CONTENTS

PAGE

TABLES

FIGURES

PHOTOS

APPENDICES

1 – INTRODUCTION

1.1 PROJECT DESCRIPTION

New Gold Inc. (New Gold) is in the early stages of developing the Blackwater Gold Project (Blackwater Project), a large low grade gold deposit located approximately 110 km south-west of Vanderhoof, in central British Columbia. The project location is shown on Figure 1.1.

The Blackwater project site is located on the Nechako Plateau, which is an area of gently undulating highlands dissected by glacial and nival melt water channels. The elevation of the study area ranges from approximately 1,000 masl in the valleys to 1,700 masl on Mount Davidson. The deposit is located on the north slope of Mount Davidson, in the Davidson Creek watershed, and drains north-east to Tatelkuz Lake. Tatelkuz Lake drains to the Nechako River, a tributary of the Fraser River. The Nechako River was diverted during construction of the Kenney Dam in 1952, and runoff now drains into the Nechako Reservoir. Forest cover is predominantly sub-boreal spruce, with deciduous shrubs and trees prevalent in lowland areas.

1.2 PREVIOUS STUDIES

Knight Piésold Ltd (KP) has been assisting New Gold with the Blackwater Project, in a variety of roles. Technical support for the hydrometric and climate network commenced in early 2011, with Richfield Ventures (property owner at the time) utilizing Avison Management Services (Avison) to perform all on-ground field visits related to these programs, under the supervision and guidance of KP. Following seven months of data collection, KP completed a **Preliminary Assessment of Blackwater Gold Project Hydrometric Monitoring Program**, and issued a summary letter on December 23 2011 (VA11-01959). A few months later, KP completed a **Hydrometeorology Report**, which provided initial design parameters to support the Preliminary Economic Assessment (PEA) of the project. This report was issued on February 17, 2012, and utilized long-term regional data from Government Agency climate and hydrometric monitoring stations to derive preliminary Hydrometeorological parameters for the project (VA101-457/4-1, Rev 0). A letter was issued on December 20, 2012, which provided a summary of **Winter Low Flow Measurements** completed at various locations within the project area during the winters of both 2010-2011 and 2011-2012 (VA12-01922). Finally, the Rev 1 Hydrometeorology Report was issued on February 22, 2013 (VA101-457-1 Rev 1). The current study is a revision to the Rev 1 Hydrometeorology Report.

1.3 SCOPE OF REPORT

KP has been retained by New Gold to assist with Hydrometeorological studies to support an Environmental Impact Assessment and a Feasibility Study for the Blackwater Project. The scope of this report is to provide Hydrometeorological characterization for the project, in terms of expected long-term climatic and hydrologic conditions at the site. The report summarizes, integrates, and analyses data collected at the project site as well as regional data from Environment Canada and the BC Forest Service Wildfire Management Branch. The results of this report supersede those in the 2013 Rev 1 Hydrometeorology Report.

2 – CLIMATE DATA

2.1 PROJECT SITE STATIONS

Two climate stations are installed at the Blackwater Project site. These stations were installed by KP engineers and scientists with the support of Avison Field Technicians. The first station was installed in July, 2011 at an elevation of 1,050 masl (Blackwater Low), and the second station was installed in July, 2012 at an elevation of 1,470 masl (Blackwater High). Blackwater High and Blackwater Low are shown on Photos 1 and 2, respectively. Differences between the data from these installations provide useful information relating to lapse rates and orographic effects resulting from changing elevations within the project area. Blackwater High is installed at a similar elevation to the main project facilities, and consequently this report assumes that **1,470 masl** is the **design project elevation**. Each of the project climate stations monitors the following parameters:

- Air Temperature (°C)
- Relative Humidity (%)
- Atmospheric pressure (KPa)
- Precipitation (Pluvio – mm)
- Snow depth – m
- Solar radiation (W/m^2)
- Wind speed (m/s), and
- Wind direction (Degrees from True North, and Standard Deviation Wind Direction).

A CR1000 datalogger is installed at both stations and data are collected at hourly increments. Loggers are set to Pacific Standard Time (PST) to avoid data gaps and overlaps and to be consistent with standard monitoring practices. The stations are visited approximately bi-monthly, and standard quality control procedures are followed to ensure that collected data are reliable. Details of the project stations are given in Table 2.1 and the locations are shown on Figure 2.1.

In addition to these continuously monitoring stations, three snow course survey stations were commissioned in February 2012 and were visited three times during that same winter. Snow course survey data were used to estimate snow accumulation, density and melt patterns at the project site. The locations of snow course survey stations are given on Figure 2.1.

2.2 REGIONAL STATIONS

Several regional climate stations that are/were operated by Environment Canada are/were located in the general project region. The names, locations, and periods of record of these stations are summarized in Table 2.1, and station locations are shown on Figure 2.2. The majority of the regional stations have now been deactivated with the only active Environment Canada stations being Vanderhoof (1098D90), located approximately 112 km north of the project site, and Ootsa (1085836) located approximately 100 km northwest of the project site. In addition, the Kluskus Climate Station (Kluskus), which is operated and maintained by the BC Forest Service Wildfire Management Branch, and also listed in Table 2.1, was incorporated into these analyses. Kluskus is located approximately 35 km from the project site, but only provides climate data for spring, summer and fall months.

The following sections summarize key climate parameters that were derived for the project site using both site and regional data.

2.3 TEMPERATURE

Temperature data are recorded at both Blackwater climate stations using a Vaisala HMP155 integrated temperature/relative humidity sensor. Hourly average, maximum and minimum temperature data are recorded at both stations, and the corresponding monthly average temperatures are summarized in Table 2.2. The summary indicates that the Blackwater High station is colder than the Blackwater Low station; however, temperature inversions have been recorded and validated by field observations. While temperature inversions have been noted to occur, properly quantifying the inversions has not yet been completed due to insufficient data.

Site data are currently of insufficient length to provide estimates of temperature Normals for the project area. Accordingly, site data from the Blackwater High climate station were correlated with concurrent regional data from the Vanderhoof station, which is located approximately 112 km away and 832 m lower. Linear regression was used to determine two correlation relationships; one for the winter months, and one for the spring, summer and fall months, as shown on Figure 2.3. Strong correlations (R^2 = 0.98) between temperatures at the two sites are evident in both periods. The winter regression equation shows that below an approximate temperature of -5.7°C in Vanderhoof, temperatures in Vanderhoof are colder than those at the Blackwater High station, indicating the presence of a temperature inversion. Further investigation into the frequency and timing of temperature inversions on site was not completed because of the limited extent of the site data. The regression equations from Figure 2.3 were applied to the Vanderhoof long-term temperature record to generate long-term temperature estimates for the Blackwater High station.

The mean monthly temperature estimates for the project site are provided in Table 2.2. The mean annual temperature is estimated to be approximately 2.0°C, with minimum and maximum mean monthly temperatures of -7.7°C and 12.5°C, occurring in January and July, respectively. Field investigations in April 2013 revealed a programing error in the temperature sensor at the Blackwater High climate station. This programing error caused temperature readings to be higher than they should have been. A new programming algorithm was subsequently written by Campbell Scientific and implemented to correct the error.

2.4 WIND SPEED AND DIRECTION

Wind Speed and Direction are important parameters in structural design. Wind speed affects evaporation and dust transportation capacity, both of which will be an important consideration during design and permitting. Wind speed and direction data are collected at each of the Blackwater project climate stations using an RM Young 05103AP-10 Wind Monitor, mounted on a 10 meter tower and oriented to true north. Hourly wind direction, standard deviation wind direction and wind speed are recorded at both stations. These data are the only wind data available for the project site. Recorded wind speed and wind direction values are summarized in Table 2.3, and monthly Wind Roses, utilizing standard deviation of wind direction data, for both the Blackwater Low and Blackwater High stations, are provided on Figures 2.4 and 2.5, respectively. The predominant wind direction at the Blackwater Low station is from the southwest and the mean annual speed is 2.4 m/s. Preliminary data for the Blackwater High station suggests that the predominant wind direction is from the west, as shown on Figure 2.5.

2.5 RELATIVE HUMIDITY

Humidity can be expressed and measured in several ways, but relative humidity is the most common. Relative humidity is presented as a percentage and is the ratio of the partial pressure of water vapor in a packet of air to the saturated vapor pressure of water in the same packet of air. Relative humidity is defined by the equation:

$$\boldsymbol{RH = \frac{e}{e_s} \times 100}$$

Where $\boldsymbol{RH}$ is relative humidity, $\boldsymbol{e}$ is vapor pressure, in kPa, and $\boldsymbol{e_s}$ is saturation vapor pressure, also in kPa. $\boldsymbol{e}$ is an absolute measure of the amount of water vapor in a packet of air, and is related to dew point temperature (the temperature to which a packet of air would be required to be cooled to, in order to render the air saturated), while $\boldsymbol{e_s}$ is the maximum amount of water vapor that same packet of air can hold at a given air temperature. Hence, the relative humidity of air depends not only on temperature but also on the pressure of the system of interest.

Relative Humidity is recorded at both Blackwater climate stations using a Vaisala HMP155 integrated temperature/relative humidity sensor. Hourly average, maximum and minimum relative humidity data are recorded at both stations. Monthly summaries of relative humidity are provided in Table 2.4. As with wind speed and direction, no relative humidity data were available at the regional stations and the only data applicable to the site location was collected at the low and high elevation climate stations. The mean relative humidity at the low elevation station in 2012 was 61%, with a maximum relative humidity of 74% occurring in November and December, and a minimum relative humidity of 49% occurring in May. Site data suggest that Blackwater High is experiencing higher relative humidity than Blackwater Low, which is the expected pattern as Blackwater High has lower temperatures. It was previously reported that an investigation into the functionality of the relative humidity sensor at Blackwater High be undertaken. The previous report (VA101-457/4-1 Rev 1) noted that Blackwater High was reporting higher relative humidity values than Blackwater Low, despite also recording higher temperatures. Such an investigation is now unnecessary given the new temperature programing algorithm implemented at Blackwater High, as mentioned in Section 2.3.

2.6 SOLAR RADIATION

Solar Radiation data are collected at each of the Blackwater Project climate stations using SPLITE^2 and NRLITE instruments. The SPLITE^2 measures incoming solar radiation, and the NRLITE measures outgoing (reflected) solar radiation (the difference being the radiation absorbed by the ground surface and the atmosphere immediately above the ground surface). Data collected at the Blackwater climate stations are the only solar radiation data available for project site, as no regional data relating to solar radiation are available.

Incoming solar radiation data are affected by the solar angle, atmospheric dust, smoke from forest fires, cloud cover and, in winter, accumulation of snow on the SPLITE^2 instrument. Net radiation data are affected by vegetation cover and snow accumulation on the ground surface (snow generally having a higher albedo than normal ground surfaces). Maximum and mean monthly incoming solar radiation data are shown in Table 2.5. The mean values do not incorporate readings of zero. Site data indicates that solar radiation tends to be zero following sunset and prior to sunrise, and at a maximum during the middle of the day when the sun is at its zenith. Annually, solar radiation tends to be greatest in the spring and summer months, when the incident solar angle is at its highest. The maximum solar radiation to occur at the low and high elevation climate stations have values of 1033 W/m^2 and 997 W/m^2, respectively, and both occur in July. It should be noted that the high elevation station does not yet have a full year of data. The large difference in maximum values during November and December, 2012 are likely due to snow accumulation, localized weather and shade. As clouds move through the region and impede solar radiation, it is possible for this movement to affect the recorded maximum values since these maximums are calculated on an hourly basis. The small differences in the average values can also be attributed to the same effect.

2.7 ATMOSPHERIC PRESSURE

Atmosphere pressure is the pressure exerted by the weight of the earth's atmosphere. Average Atmospheric Pressure data are collected on hourly increments at each of the Blackwater Project climate stations using an RM Young BPA2547 Barometric Pressure sensor. These data are summarized as monthly averages in Table 2.6. Atmospheric pressure tends to be highest in September, with 103 KPa and 102 KPa recorded in 2012 at the low and high elevation climate stations, respectively, and lowest during January, with approximately 101 KPa recorded at the low elevation station. No January data have been collected for the high elevation station at this time. Atmospheric pressure is approximately 101 KPa at sea level. Typically as elevation increases, atmospheric pressure decreases; however, atmospheric pressure is also affected by weather systems. Site data indicate consistently higher pressures at the lower station, and both climate stations show that the mean monthly atmospheric pressure is greatest in the summer months and lowest during the winter months. This can be attributed to the predominance of large high pressure systems during the summer, and the predominance of low pressure systems during the winter.

2.8 EVAPOTRANSPIRATION

Evaporation is a crucial design parameter, especially important for water balance studies. There are no pan evaporation data available for the project area and no evaporation estimates given for regional climate stations, which is not unusual given the difficulty inherent in reliably collecting these data. Monthly Potential Evapotranspiration (PET) data were estimated using the Thornthwaite equation (Thornthwaite 1955). The benefit of the Thornthwaite equation over other methods is that the equation only requires inputs of temperature values, which are usually available for a given project area. A limiting factor of the Thornthwaite equation is that 12 months of data in a year are always required; otherwise the respective year must be ignored. However, as the long-term temperature estimates for the project area contain 32 complete years of values, the Thornthwaite equation was determined to be appropriate for calculating PET. The Thornthwaite PET is defined as the amount of evapotranspiration that would occur given an infinite supply of water from a crop surface, and these values are believed to be reasonably representative of lake evaporation conditions (Ponce, 1989 and Maidment, 1993). The long-term temperature values presented in Section 2.3 were used as inputs to the Thornthwaite equation. Resultant monthly and annual estimates of PET are summarized in Table 2.7. The estimated long-term annual potential evapotranspiration value for the project is **445 mm**, with little to no evapotranspiration occurring during winter months. Actual evapotranspiration (AET) is typically in the order of 60% to 80% of PET for the coniferous vegetation native to the project area, and therefore likely in the order of 267 mm to 356 mm (Penman 1950).

2.9 SUBLIMATION

Sublimation is the process by which moisture is returned to the atmosphere directly from snow and ice without passing through the liquid phase (Liston and Sturm, 2004). Sublimation can play a significant role in the annual hydrologic water balance in areas where winter precipitation comprises a large proportion of annual precipitation. The processes causing and influencing sublimation are not well understood, and many estimates and methods of estimation found in the literature are site-specific, subject to significant uncertainty, and not easily extrapolated.

It is known that sublimation values can vary substantially according to a number of factors, most notably terrain characteristics, vegetation cover, wind speed and humidity. Sublimation at the project location was estimated to be 100 mm for the winter season. Sublimation was assumed to be distributed fairly evenly over the period of November through March, when precipitation predominantly occurs as snow. The estimate of 100 mm is roughly based on a general sublimation rate of approximately 30% of the average winter snowfall of 302 mm (Section 2.10.2.1). This rate and the estimated sublimation total are generally consistent with values reported in the literature (Montesi *et al*., 2004; Strasser *et al*., 2008; Winkler and Moore, 2010).

2.10 PRECIPITATION

2.10.1 Regional and Project Data

Mean monthly precipitation distributions for the most relevant and active regional climate stations are presented in Table 2.8. These data suggest that precipitation in the region is fairly evenly distributed throughout the year, though highest in mid-summer and early-winter, and lowest during late winter and early spring.

Project precipitation data are collected using OTT Pluvio2 total precipitation gauges, which use a weighing mechanism to record total precipitation at hourly increments. A wind screen has been installed on both stations in order to mitigate the effects of wind. There are approximately 18 months of data available from the Blackwater Low station and 6 months of data available from the Blackwater High station. A summary of average monthly precipitation recorded at these stations is given in Table 2.8. Project precipitation data are generally considered to be good quality, although there is concern about the validity of the winter data, since snowfall is typically very difficult to accurately collect with automated systems. Accordingly, additional project data from three snow course survey stations (SS1, SS2 and SS3) were incorporated into the analysis of precipitation.

2.10.2 Data Analysis

Orographic effects, which are the result of wind forcing air masses up the sides of elevated land formations, are typically characterized by increases in precipitation with increases in elevation. No strong orographic patterns are evident in either the site or regional data, and in fact the higher elevation climate stations in the region typically receive less precipitation than the lower elevation stations. This was not unexpected for the spring, summer and fall months, when weather patterns in the region are dominated by convective storm systems that are generally independent of elevation.

However, such a trend is unexpected in the winter months, where frontal systems typically predominate and frequently result in pronounced orographic effects. Estimation of the monthly precipitation distributions were therefore undertaken as two separate analyses: 1) winter and 2) spring, summer and fall. These are discussed in the following two sections.

2.10.2.1 Determination of Winter Precipitation

It is expected that wind effects at both regional and project precipitation gauges may be resulting in the under-recording of precipitation (also called under-catch), despite the use of wind screens. To resolve this issue, regional and project-specific snow course survey data were integrated and analyzed to estimate the relative distribution of snowfall around the project area during the winter months.

The two closest regional snow course survey stations are 1A23 and 1B06, as shown on Figure 2.2. 1A23 and 1B06 are located approximately 65 km and 35 km from the project site, at elevations of 1,196 masl and 1,596 masl, and have 23 and 24 years of record, respectively. Project snow survey data are also available from three stations within the project area. These stations were established at various elevations, and their locations are shown on Figure 2.1. A summary of the regional and site snow course data, in terms of snow water equivalent (SWE), is provided in Table 2.9. The 2012 and long-term values for the regional stations indicate that conditions in 2012 were reasonably representative of long-term average conditions.

These data show that the cumulative snow pack depth increases as the elevation increases, which is the expected relationship. However, this may be due more to temperature differences than orographic effects, as the period of snow accumulation may be longer at higher elevations. To isolate just the orographic effects, month to month changes in SWE values were examined for the two regional stations, for periods of January to February and February to March, when temperatures are consistently below freezing. Analysis of these values, as shown in Table 2.10, indicates little to no effect in January to February, but an approximate 8% increase in precipitation per 100 m increase in elevation in February to March. This rate is generally consistent with expected patterns, based on unpublished studies by KP on orographic precipitation patterns throughout BC, and indicates the presence of regional orographic patterns within the project area during winter months, which are not evident in the available precipitation data.

In recognition of an expected orographic effect in the site winter precipitation, long-term winter precipitation data from Vanderhoof, Fraser Lake and Ootsa were adjusted by the orographic factor to generate long-term winter estimates for the project site at an elevation of 1,470 masl. The results were applied to the entire winter period as frontal weather systems were assumed to be dominant during that period. Though all the regional data are not concurrent, the length of each data set was assumed to be sufficient to provide an accurate representation of the precipitation patterns in the respective areas. The adjusted mean monthly precipitation values for each station were averaged, and the results were used as the mean monthly precipitation for the project location. This resulted in a mean November to March precipitation of 302 mm, which is approximately 115 mm more than recorded at the regional stations, but is generally consistent with regional snowpack values when sublimation is considered.

Shoulder season months (October and April) will likely experience a mix of convective and frontal storms; however, they were not considered under a separate analysis. Both were considered as part of the spring, summer and fall analysis, as per the seasonal breaks determined in Section 3. These assumptions, along with the entire winter precipitation analysis, should be revisited once more site specific data have been collected.

2.10.2.2 Determination of Spring, Summer, and Fall Precipitation

Long-term precipitation data for spring, summer and fall months are available from the Kluskus climate station, which operates at a lower elevation than the project site. Precipitation values from this station were correlated with concurrent values from the Blackwater Low station using a double mass curve (DMC) analysis, as shown on Figure 2.6, and the resulting equation was applied to the long-term precipitation record for Kluskus to generate a long-term spring, summer and fall precipitation series for Blackwater Low. A similar DMC analysis was used to correlate the very short term concurrent Blackwater Low and Blackwater High precipitation records, as shown on Figure 2.7, and the resulting equation was applied to the long-term Blackwater Low precipitation series to generate corresponding spring, summer and fall precipitation values for Blackwater High.

2.10.3 Mean Annual Precipitation

Combining the winter and summer precipitation estimates presented above yielded a long-term synthetic precipitation record from 1990 to 2012, and a corresponding mean annual precipitation (MAP) estimate of **636 mm**.

2.10.4 Monthly Precipitation Distribution

The estimated mean monthly distribution of precipitation at the Blackwater Project is presented in Table 2.11, and was derived from the long-term synthetic precipitation record described above. This distribution is generally consistent with the regional distribution patterns shown in Table 2.8. Precipitation occurs reasonably consistently throughout the year, although conditions are notably driest in April, which has an average precipitation of 20 mm, and wettest in November, December and January, which have average precipitation totals of approximately 73 mm.

Estimates of the how much precipitation falls as rain or snow were developed on the basis of regional patterns, with consideration of project specific temperatures. It is estimated that on average approximately 49% of the annual precipitation falls as rain and the remaining 51% falls as snow.

As a means of checking the reasonableness of the site precipitation estimates, values were generated using the well-known PRISM (Parameter-elevation Regressions on Independent Slops Model) model, which uses point measurements of regional precipitation and temperature to produce monthly and yearly precipitation estimates for any location in BC (http://www.prism.oregonstate.edu/). The PRISM model indicates a MAP of 605 mm for the period from 1981 to 2009, and mean monthly values ranging from a low of 24 mm in April to a high of 91 mm in June. These values are generally consistent with the estimated project values.

2.10.5 Snowmelt

The timing of spring snowmelt (freshet) has a significant impact on the magnitude and timing of spring runoff. Snowmelt rates are impacted by numerous factors, such as temperature, slope, aspect, solar radiation, wind speed, and elevation. Three snow surveys have been completed at the three local snow survey sites (SS1, SS2 and SS3). However, as site visits were not performed every month and only one year of data are currently available, these data cannot be used to provide estimates of snowmelt rates and/or the annual reduction in snowpack, on a monthly basis, at this time. An analysis was subsequently performed using regional snow survey stations, as summarized in Table 2.12. The closest station to the project is Mount Swannel (1B06), which is located 30 km northwest of the Blackwater site at an elevation of 1,596 masl. Archived SWE data at Mount Swannel indicate an average snowmelt pattern of 62% in May and 38% in June. The Bird Creek station (1A23), which is located 60 km from site at an elevation of 1,196 masl, produced a similar but earlier pattern of 66% in April and 34% in May. From these data, average snowmelt rates at the project site (1,470 masl) were estimated on the basis of proximity and elevation. The snowmelt pattern at the project site is estimated to be 21% in April, 53% in May and 26% in June.

2.10.6 Extreme Precipitation

Estimates of extreme precipitation are required for many aspects of design, and are subsequently presented in a variety of forms. The most common and useful form is the 24 hour extreme precipitation, given for different return periods and for the probable maximum precipitation (PMP).

Extreme 24 hour precipitation values were estimated for the project site using a frequency factor approach, as presented in the Rainfall Frequency Atlas for Canada (Hogg, 1985). This approach involves using estimates of the mean and standard deviation of the annual 24 hour extreme precipitation, and utilizes frequency factors based on the Extreme Value Type I (Gumbel) distribution. Estimates of the mean and standard deviation were derived directly from the Atlas, as well as from the synthetic precipitation record presented in section 2.10.3. For the Atlas values a factor of 1.5 was applied, as recommended in the Atlas, in recognition of potential orographic effects and the fact that the Atlas values are largely based on data from valley stations. For the synthetic precipitation values, a factor of 1.13 was applied to account for potential differences between daily and 24 hour precipitation (Hershfield, 1961). The resulting mean and standard deviation values are 38 mm and 9 mm for the Atlas and 26 mm and 6 mm for the synthetic record.

Given the uncertainty inherent in the two sets of estimates, it was considered prudent and appropriate to adopt the larger values as the design values. Accordingly, the Atlas values were used with the frequency factors to generate the design storm values, as summarized in Table 2.13. The 100 year, 200 year and PMP 24 hour values for the site are estimated to be 66 mm, 71 mm, and 195 mm, respectively.

2.10.7 Wet and Dry Year Precipitation

Estimates of wet and dry year annual precipitation are required to assess the range of probable moisture conditions at the site. Wet and dry year annual precipitation totals were calculated based on a normally distributed probability of occurrence. The calculations require mean and standard deviation values for annual precipitation, which were determined from the long-term synthesized climate series for the site (Section 2.10.3) to be 636 mm and 62 mm, respectively. The wet and dry annual precipitation values for various return periods are presented in Table 2.14, which indicates a 1 in 200 year wet MAP of 794 mm and a 1 in 200 year dry MAP of 478 mm.

3 – HYDROLOGY DATA

3.1 PROJECT STATIONS

Hydrometric data have been collected at seven stations in and around the Blackwater Project area since March, 2011. Station locations are presented on Figure 2.1. Four of the seven stations (H1, H2, H3, H5) were installed in the spring of 2011, while the remaining three (H4B, H6 and H7) were installed in the spring of 2012.

In 2011, all stations were removed for the winter months in order to avoid damage by ice. Discharge measurements were continued through the winter, when possible. A summary of the 2011/2012 winter program along with plans for the 2012/2013 program were specified in a Winter Low Flow Summary letter issued December 20, 2012 (VA12-01922).

Continuous water level (stage) data were collected up to the end of October 2012, when stations H1 and H2 were removed for the winter to avoid ice damage. Station H3 was destroyed by a large wind storm in October 2012, and this station has since been discontinued because of persistent technical issues associated with hydraulic control shifts and site access. Station H5 remains installed during the winter as this location has been observed to have open water throughout the winter months. Stations H4B, H6 and H7 were also left in for the winter months as these sites use Ultrasonic look down sensors that are less susceptible to ice damage than standard pressure transducers. Station H4B is a relocation of H4, which was active in 2011 but returned poor data quality and was therefore discontinued. Station details are provided in Table 3.1 and station photos are shown on Photos 3 to 16.

3.2 REGIONAL STATIONS

The locations of regional Water Survey of Canada (WSC) hydrometric stations in the proximity of the project are shown on Figure 2.2. Station details and summary information are provided in Table 3.2, and monthly discharge and unit runoff summaries are given in Table 3.3. Of the five sites listed, only four are active. Of these four sites, only the Dean River (08FC003) is still active. While analysis with Dean River data is not ideal for assessing hydrologic conditions in the project area, due to the Dean River's significantly larger catchment area and prolonged freshet runoff period, it is the only viable regional station for this purpose because it is the only one with concurrent data that is located within a reasonable distance from the project area.

The average daily discharge hydrograph for the Dean River is presented on Figure 3.1. Regional runoff patterns are characterized by low flows during winter months when precipitation falls almost exclusively as snow, high flows during the spring and early summer months that are driven predominantly by snowmelt, low flows during dry late summer months, and sustained flows in response to storm systems during fall months.

3.3 STREAMFLOW ESTIMATES

3.3.1 Measured Streamflow Records

Preliminary rating curves and streamflow records were developed for the seven hydrometric monitoring stations in the project area. These rating curves are provided in Appendix A, and are represented by an equation, or series of equations, of the form:

$$\boldsymbol{Q} = \boldsymbol{C} \times (\boldsymbol{Stage} - \boldsymbol{A})^{\boldsymbol{n}}$$

Where Q is discharge in cubic meters per second (m^3/s), C is a curve coefficient, $Stage$ is the height of the water surface above an arbitrary site datum, A is an offset (frequently given as the stage of zero flow), and n is a curve exponent. Measured discharges used in the development of these rating curves are also provided in Appendix A. Time series data from stream dataloggers were corrected to surveyed water levels obtained during routine site visits. These corrected stage records were then integrated with the site rating curves resulting in the calculation of an instantaneous discharge record. Daily average unit runoff records for all project stations are shown on Figure 3.2a, and average unit runoff records for Van Tine Creek, Laventie Creek and the Dean River are shown on Figure 3.2b. No average records are shown for Whitesail Middle Creek or North Beach Creek because these stations do not have any complete years of data. The Dean River and Van Tine Creek demonstrate similar unit runoff, but runoff in Laventie Creek is an order of magnitude higher, which reflects glaciers, and a much wetter climate due to its proximity to the coast.

3.3.2 Frequency Paired Regression Analysis

Long-term project specific runoff values are required to accurately define the hydrologic characteristics of a project site. Unfortunately, short-term project streamflow data are often insufficient on their own to define these characteristics. Frequency paired regression analysis is a technique used to synthesize long-term runoff using a derived relationship between long-term regional streamflow data and short-term project streamflow data. In contrast to ordinary linear regression (also known as chronological pairing in the context of hydrologic analyses), wherein discharges are regressed based on their time of occurrence, frequency paired regressions are based on the frequency of occurrence of discharges. When comparing concurrent sets of ranked daily flows for two or more streamflow records, each flow value of equal rank has an equal probability of exceedence within the data set (since the data sets are of equal length). Therefore, a comparison of ranked daily flows amounts to a comparison of flow frequency distributions. Furthermore, data are usually segmented into distinct seasons, thereby accounting for differences in drainage area and other characteristics that affect the timing and magnitude of runoff. This seasonal segmentation is typically undertaken through hydrograph analysis and it is assumed that parameters driving runoff are generally constant within any one season. For example, the timing of peak runoff occurring as a result of snowmelt may be highly variable between two stations (up to several weeks in some cases), as a result of differences in drainage area and elevation, but will typically occur within the same season. Similarly, the runoff response to storm events may be offset by hours or days, but will typically occur within the same larger period such as a week or month. The comparison of flow frequency distributions by season overcomes differences in the timing of rainstorm or snowmelt events between watersheds, and ultimately provides a better model for synthetically generating a likely scenario of future flow patterns.

The ultimate objective of utilizing frequency pairing is not to reproduce the exact historical flow patterns of the project area streams, so that one can predict what the flows were on any particular day, but rather to generate datasets that provide an accurate representation of the expected long-term discharge characteristics in each creek and the associated year-to-year, month-to-month and day-to-day variability and frequency of flows. Frequency paired regression has been shown to significantly improve the accuracy and precision of long-term estimates of runoff when compared with chronological pairing (Butt, 2013).

Analysis of the instantaneous discharge hydrographs determined that stations H1, H2 and H5 contained data of sufficient quality and quantity for inclusion in a regression analysis. Stations H4B, H6 and H7 did not have data of sufficient length to perform a regression analysis, and station H3 does not have reliable data and was therefore not considered suitable for a regression analysis. A frequency paired regression analysis was performed for stations H1, H2 and H5, with data from these stations correlated with concurrent runoff data from the Dean River. The 2011-2012 winter streamflow data for the Dean River was marked as “provisional” by WSC, and it is believed that these data were affected by ice formation, so they were removed from the dataset, as indicated on Figure 3.3. Accordingly, frequency pairing could not be completed for the winter period, and a separate analysis was performed.

3.3.2.1 Spring Freshet and Summer/Fall Runoff

Frequency pairing analysis was done for two seasons: Spring Freshet, which had a period from April to July, inclusive, and Summer/Fall, which had a period from August to October, inclusive. Seasonal breaks were determined from the daily average Dean River hydrograph, shown on Figure 3.1. Within each season, streamflow data were ranked from highest to lowest unit runoff, with the resultant frequency paired regressions being presented on Figures 3.4 to 3.12. Flows are presented in terms of unit runoff, which is discharge normalized to catchment area, with units of $L/s/km^2$.

For the Summer/Fall season, the H1/Dean River regressions indicated that the Dean River has slightly higher unit runoff than H1. In contrast, the H1/Dean River regressions during the spring freshet indicate that H1 has generally higher unit runoff than Dean River. This is consistent with field observations of relatively low summer flows and high freshet flows at H1. The extremely low flows at H1 during the summer months are likely the result of water going to ground and flows not being significantly replenished by a headwater source. This assumption is supported by field observations. By contrast, regression modelling with the H2 data indicates that the H2 basin has consistently higher unit runoff than the Dean River, especially during high flow periods. This is not unexpected since smaller catchment areas in a region typically exhibit higher unit runoff than comparable large catchments because of higher average elevations and correspondingly higher precipitation. Regression modelling with H5 data shows that the Dean River generally has higher unit runoff, although there is some variability, with the most notable departure during low flows, when unit runoff is consistently higher at H5. This pattern is very likely due to the attenuating effect that Tatelkuz Lake has on H5 flows, with lake water feeding the creek during low rainfall and snowmelt periods. The regression results are considered preliminary because they are based on limited data, and they should be re-evaluated once another year of data has been collected at the project stations.

Concurrent synthetic and measured instantaneous daily discharge hydrographs were compared, as shown on Figures 3.13 to 3.15, along with their associated Flow Duration Curves (FDC), which are shown on Figures 3.16 to 3.18. All discharge hydrograph comparisons indicate reasonable matches between the flow series, although the freshet peak flows for the synthetic flow series are delayed, relative to the measured flow series. This result is attributed to modelling the flows with data from the Dean River, which has a much larger catchment with a greater range of elevation than the

H1, H2 and H5 basins, and accordingly snowmelt occurs over a longer period and runoff takes longer to reach the basin outlet for the Dean River.

3.3.2.2 Winter Runoff

Very little continuous winter data exists for stations H1, H2 and H5, and no winter data exists for the Dean River for the concurrent year, as it was determined to be ice affected. As such, there are limitations in the extent to which winter analyses can be performed at this time. However, as both summer and winter low flows are primarily driven by groundwater discharge, it is reasonable to assume that summer and winter low flow patterns are similar, and therefore that summer low flow relations can be used to estimate winter low flows. This idea is supported by the plots on Figure 3.19, which indicate that correlations between low flows at two regional sites are very similar in summer and winter. Accordingly, summer low flow frequency pairing relations were developed for stations H1, H2 and H5, as shown on Figures 3.6, 3.9 and 3.12, and then were applied to Dean River winter data to generate corresponding winter flow values for the three site stations.

Winter 2011 and 2012 data were not available for the Dean River, and as such a separate analysis was undertaken to estimate winter flows for those years. Winter flow data from the Dean River were analyzed and were shown to be very consistent overall, as indicated on Figure 3.20. This finding is in accordance with the understanding that runoff in this region of British Columbia tends to be quite predictable during the winter with a gently receding pattern. This is due to the condition that the majority of winter precipitation falls as snow and consolidates as a snowpack, until it melts with the onset of warm spring temperatures. Accordingly, it was concluded that reasonable preliminary estimates of 2011 and 2012 daily winter flow values for the site stations could be determined by assuming direct linear connections between successive intermittent 2011-2012 site winter flow data.

The analysis was completed on the basis of the H5 winter flow dataset, since this is the most complete and reliable dataset available. Winter measurements at H5 suggest a very smooth winter recession curve, with flows gradually reducing over the winter period. A simple linear interpolation was performed between these periodic measurements to determine estimates of daily winter runoff.

Winter flows at H2 were determined by pro-rating streamflow estimates at H5 by the ratio of catchment areas. This method was determined to be appropriate as H2 has been documented to have flow present throughout the winter.

At H1 it was noted on February 1, 2012 that the creek was frozen to the bed and no flow was present. As such, it was assumed that this creek freezes on January 1 and does not thaw until March 1. These assumptions were based on the relatively low flows in the creek during the late fall and the sub-zero winter temperatures characteristic of the project area.

The current site hydrologic data collection program includes the measurement of winter low flows, and these data should be reviewed and incorporated into any future low flow analyses.

3.3.3 Long-term Synthetic Discharge and Unit Runoff

The frequency paired regression analyses and winter discharge analyses resulted in 40 year synthetic daily flow series for H1, H2 and H5. These series are summarized as monthly discharge statistics in Table 3.4, and corresponding annual hydrograph plots in terms of runoff and % of annual runoff are given on Figures 3.21 and 3.22, respectively. All three stations exhibit similar general hydrograph shapes, with the lowest flows in the winter months and the highest flows during the spring freshet period. There are notable differences, however, with H2 exhibiting substantially higher runoff year around, and H1 having markedly lower low flows. These differences can largely be explained by differences in basin elevation and associated orographic precipitation, and by differences in groundwater flow conditions.

H1 and H2 have very similar basin elevation and aspect, and accordingly likely experience similar precipitation conditions, but H1 appears to have much greater groundwater recharge and flow, and therefore has substantially lower surface runoff. H5 has a substantially lower basin elevation (~300 m) than both H1 and H2, and correspondingly receives less precipitation, but it has much less groundwater recharge than H1 and similar recharge conditions to H2, and as a result, has similar annual runoff to H1, but lower annual runoff than H2. The shape of the H5 hydrograph is also influenced by the presence of Tatelkuz Lake, which stores freshet runoff and slowly releases it throughout the year.

Of the three stations, the unit runoff and the hydrograph shape at H2 are expected to most appropriately represent streamflow patterns in the project area. This is due to its close proximity to the project site, the moderate size of its catchment (47.2 km^2), as well as similarities to the project area in terms of vegetative cover, slope, aspect, and basin elevation. Furthermore, the H2 basin does not contain any large lakes (H5) and does not appear to have unusually high groundwater recharge (H1).

The mean annual unit runoff for the project site is therefore estimated to be **6.1 l/s/km^2**, as shown in Table 3.4. The highest monthly runoff tends to occur in May, with 18.5 L/s/km^2, and the lowest occurs in February, with 2.7 L/s/km^2. The annual unit runoff equates to an annual runoff depth of **198 mm**, which is generally consistent with the estimates of precipitation (636 mm), AET (267 mm to 356 mm), and sublimation (100 mm) that are discussed in Section 2 of this report.

3.3.4 Runoff Coefficient

The runoff coefficient is a dimensionless number that defines the annual ratio of runoff to precipitation. The results of this analysis suggest an annual runoff coefficient of **0.31 (31%)**, which is consistent with regional coefficients. This estimate should be refined seasonally following additional data collection and analysis.

3.4 WET AND DRY RETURN PERIOD FLOWS

Wet and dry monthly flow values were estimated for the project area for recurrence intervals of 5, 10, 20 and 50 years, as presented for Stations H1, H2 and H5 in Tables 3.5a to 3.5c, respectively. These values were estimated by fitting statistical distributions to the monthly flows values. For most of the monthly datasets, a lognormal distribution was selected, but in some instances a better data fit was obtained with an alternate distribution, such as the inverse Gaussian distribution. Generally, the greatest variability of flows occurs during the freshet period, and the lowest variability occurs during the summer months.

3.5 7-DAY LOW FLOWS

There are two periods, annually, that result in minimum 7-Day low flow conditions within the Project region. These periods are summer, in response to depleted groundwater flows and low precipitation, and winter, in response to depleted groundwater flows and surface water being contained as ice and snow. These distinct low flow periods are evident in both the Project and regional datasets.

3.5.1 Summer 7-Day Low Flows

Recurrence interval 7-day summer low flows were generated using Environment Canada's LFA statistical low flow software, with annual low flow values derived from the lowest continuous 7-day runoff period within the long-term synthetic flow series generated for stations H1, H2, and H5. LFA uses a Gumbel distribution to model return period low flows from these inputs, and the resultant return period values are presented in Table 3.6. There is variability between project sites, which is not unexpected given the wide range of runoff conditions discussed in Section 3.3.3.

The low flows do not appear to vary substantially with return period amongst the higher return periods, which suggests that flows stabilize at some minimum level. However, this is likely an artefact of the distribution assumptions inherent in frequency analysis and the use of flows from the much larger Dean River for generating the synthetic flow series. H1, at the very least, is likely to go to a zero flow condition for the longer return period events. For comparison purposes, a low flow analysis was performed on late summer 7-day low flows for two nearby regional stations (Van Tine Creek and Dean River), and the results are also presented in Table 3.6. The Dean River 100 year values tend to be approximately 20% lower than the 10 year values, while in contrast, the comparable Van Tine Creek values differ by approximately 60%. Van Tine has a catchment area more comparable to those within the project area (than Dean River), and accordingly, this variability is likely more representative of project area conditions. Measured summer 7-day low flows from the 2011 and 2012 monitoring are also summarized in Table 3.6. These measured values generally agree with the estimated 2 to 5 year values presented in the same Table, and therefore provide support to the short return period results of the LFA. It is therefore concluded that only the 2, 5 and 10 year values can be considered to be representative of actual conditions.

Obedkoff (1999) provides a regional methodology for estimating 10 Year 7-day low flows. This method is shown diagrammatically on Figure 3.23. The project sites, as well as both the Dean River and Van Tine Creek, are located in the Obedkoff hydrologic sub-zone "e". The regional values, which are indicated by triangles, demonstrate great variability, as do the project site values. H1, H2 and H5 low flows lie above the subzone curve but within the range of measured values for the southern interior region. Flows at H2 are expected to be the most generally representative of conditions in the project area, but KP recommends that summer 7-day low flows be assessed on a case-by-case basis, and that Figure 3.23 should be used to select a design flow with an appropriate degree of conservatism. Appropriate caution should be used when interpreting the results of both the LFA and Obedkoff analyses given the observed regional variability and inherent uncertainty in these values.

3.5.2 Winter 7 Day Low Flows

Recurrence interval 7-day winter low flows were generated using Environment Canada's LFA statistical low flow software, with annual low flow values derived from the lowest continuous 7-day runoff period within the long-term synthetic flow series generated for stations H1, H2, and H5. The resultant return period values are presented in Table 3.7.

As with the summer low flows, the winter low flows do not appear to vary substantially with return period amongst the higher return periods, the flows at H1 likely to go to a zero for the longer return periods, and the variability of the Van Tine Creek values is likely reasonably representative of project area conditions. Unfortunately no measured winter data is available to compare with the calculated return period events. As such, the 7 day return period low flows cannot be supported with measured data at this time.

Obedkoff (1999) provides a regional methodology for estimating annual 10 Year 7-day low flows that is shown diagrammatically on Figure 3.24. This methodology does not specifically pertain to the winter period, but it is known that the lowest annual flows occur during late winter and accordingly the results can be considered to represent winter flows.

As stated previously, the project sites, as well as both the Dean River and Van Tine Creek, are located in the Obedkoff hydrologic sub-zone “e”. The lower bound curve on Figure 3.24 is generally representative of this subzone. H1, H2 and H5 low flows lie above the subzone curve but within the range of measured values for the southern interior region. It should be noted that low flows at H5 will be influenced by the upstream presence of Tatelkuz Lake, which would serve to increase low flows, and therefore the estimates are likely conservatively low.

Flows at H2 are expected to be the most generally representative of conditions in the project area, but KP recommends that winter 7-day low flows be assessed on a case-by-case basis, and that Figure 3.24 should be used to select a design flow with an appropriate degree of conservatism. Appropriate caution should be used when interpreting the results of both the LFA and Obedkoff analyses given the observed regional variability and inherent uncertainty in these values.

3.6 PEAK FLOWS

Peak flows for the project area occur almost exclusively during the spring and early summer snowmelt freshet period, and may result from either snowmelt or from rainfall events combined with snowmelt. Peak flow analyses contain numerous opportunities for uncertainty and it is necessary to explain this uncertainty in the context of these estimates. Peak flows are frequently calculated using the maximum peak flow event within each complete year of available data. This peak flow event often occurs well above the maximum measured discharge of the site rating curve, and hydraulic conditions governing the relationship between stage and discharge can, and frequently do, change with increasing discharge, further complicating rating curve extrapolation. Peak flow events can also result in changes to channel geometry. Consequently, the accuracy of the annual peak flow is heavily influenced by the accuracy of the site rating curve, as well as the quality and completeness of the site record. Frequency and chronological pairing techniques, used to generate long term synthetic records (the former used in generation of long-term record used in this Report), are subject to uncertainty associated with extrapolation beyond the maximum discharge within the concurrent record. Finally, peak flow analysis, although standard practice, requires the application of statistical techniques that project flow magnitudes well beyond the measured and synthetic period of record, and hence, return period peak flows such as the 100 year flood are a function of distribution fitting. The cumulative effect of these uncertainties needs to be understood when interpreting results of peak flow analyses, and appropriate caution should be taken when using peak flow statistics for design. Catchment variability within the Project site, identified and discussed in previous sections, lends further support to the determination of peak flows on a case-by-case basis.

A flood frequency analysis was conducted using daily average discharge from the long-term synthetic streamflow series developed for H1, H2 and H5. As peak daily values are invariably smaller than peak instantaneous values, daily average discharge values were converted to equivalent instantaneous values by the application of a conversion factor. To determine an appropriate conversion factor, peak daily and instantaneous discharge data were obtained from WSC for both Van Tine Creek and the Dean River, and the respective peak daily to instantaneous flow ratios were determined to be 1.17 and 1.02. Analysis of measured site data revealed that the ratios of peak instantaneous to daily discharge for the H1, H2, and H5 records were 1.08, 1.10, and 1.02, respectively, as shown in Table 3.8. These latter results, though based on very short-term periods of record, are consistent with the regional estimates. The relatively low values of the all the ratios reflects the major role that snowmelt plays in the peak flow generation. The highest ratio, which is 1.17 for Van Tine Creek, was selected for this analysis because it provides reasonable yet prudently conservative estimates. This ratio was applied to the peak annual daily flow series for each site resulting in corresponding sets of instantaneous peak flow values.

A flood frequency analyses was completed for each set of values using Environment Canada's CFA software package, and the results based on a Generalized Extreme Value were selected. This distribution is commonly applied to peak flows and has been shown to consistently provide a reasonable fit to measured data (Cathcart, 2001). Similar analyses were also conducted for the historical peak flow records for the Dean River and Van Tine Creek, and all the results are presented in terms of unit runoff in Table 3.9.

As a means of assessing the validity of the peak flow estimates, the 2011 values in Table 3.8 were compared with the return period values in Table 3.9, and it was found that the 2011 values for the project stations fall in between the estimated 20 and 50 year return period flows. For comparison, the Dean River 2011 flow value has an estimated return period of between 50 and 100 years. This result suggests that the project station values are likely in the correct order, and possibly slightly high. However, there is considerable uncertainty associated with the estimates, and given the need to be appropriately conservative in the determination of design flood values, another approach was adopted based on the regional flood model developed by Obedkoff (1999).

Obedkoff provides an index flood methodology for estimating flood flows using the 10 year peak instantaneous flow. A regional scaling plot of 10 year flood flows including the values from Table 3.9 is provided on Figure 3.25. The derived values all fall well below the relevant regional curve, which is for subzone "e." Accordingly, a new bounding curve was drawn passing through the Van Tine Creek value and parallel to the regional curves, and it is recommended that this curve be used to develop design flood estimates. It is recognized that the curve is positioned well above the derived site values, and accordingly may considerably overestimate the flood potential of the project area, but a very conservative approach should be adopted until more definitive site information is available. Ratios of return period peak flows to the 10 year flow corresponding to the values in Table 3.9 are summarized in Table 3.10, and the patterns for the two regional stations are very similar, as are the ones for the three project sites that were generated on the basis of the synthetic daily flow series. It's not clear which set of ratios is most applicable to the project site area, and accordingly, it is recommended that the average of all these values, as provided at the bottom of the table, be adopted as the design values. Using these ratios and the 10 year peak flow curve on Figure 3.25, example return period flow values were computed for stations H1, H2 and H5, as provided in Table

3.11. This approach is the recommended approach for computing peak design flow values for the Project.

It should be noted that it is common practice to apply a climate change adjustment factor to peak flow estimates to account for the uncertainty of future events given that the flood estimates are based on historical events. According to APEGBC Guidelines (APEGBC, 2012), the factor should be +20% or estimated according to historical trendlines. However, as the peak flow trendlines presented in Section 5 are inconclusive or decreasing, and given that an upper envelope approach was used in determining design peak flows, which resulted in flood estimates that are substantially greater than flood values based on the site specific annual peak flow series (Figure 3.25), and therefore prudently conservative, the adoption of an additional climate change factor was not considered necessary.

4 – WATER BALANCE MODELING INPUTS

4.1 GENERAL

This section defines additional hydrometeorological parameters required for engineering design and water balance modelling. These parameters help to quantify the climatic and hydrologic variability in the project area. For water balance modelling, natural watersheds will be simulated using the monthly runoff estimates proved in Section 3.0; while the runoff generated from the mine site facilities (i.e. TSF, ore stockpiles and waste rock storage areas) will be simulated using monthly precipitation inputs multiplied by typical runoff coefficients for 'disturbed' areas. To maintain consistency, the monthly precipitation values applied to disturbed areas will be back-calculated from the simulated runoff in natural areas using a runoff coefficient of 0.31, and it will be assumed that all precipitation occurring between November and March, inclusive, accumulates as snow and melts according to the snowmelt pattern in Table 2.12.

The year-to-year variability of monthly runoff in the project area is quantified with coefficient of variation (Cv) values that were derived from the long-term flow series developed for H2, and are presented in Table 4.1. Cv values are also provided for Van Tine Creek and the Dean River, as a basis for comparison. The site values are generally consistent with the regional values during the non-winter period, but are consistently lower during the winter period. This lowness is attributed to the narrower elevation range and the higher overall average elevation of the H2 basin, which equates to a longer and more consistent freezing period, such that there is a much lower chance of occurrence of winter rain and melt events that can cause large variations in winter flows.

5 – CLIMATE CHANGE

5.1 CLIMATE CHANGE ANALYSIS OVERVIEW

There is a general consensus in the scientific community that the global atmosphere is warming and that worldwide climate patterns are changing as a result. According to the Pacific Climate Impacts Consortium (PCIC), mean temperatures in British Columbia are expected to increase by approximately 1.8 °C by the 2050s. Winter precipitation is predicted to increase by 8% with summer precipitation expected to decrease by 1%, and winter snowfall predicted to decrease by 58% (PCIC 2012). The estimated values represent the projected change from the 1961-1990 baseline and are shown in Table 5.1. These changes could in turn affect streamflow patterns as warmer winters would raise freezing levels and decrease the amount of precipitation stored as snow during the winter months, which would also result in lower freshet flows due to the decreased snowpack.

Given these predicted changes in climate, there is some concern about whether or not historical flow and climate records reasonably represent conditions that might be expected over the next 30 years through project operations, or even longer time scales through project closure. In an effort to address this concern, historic trends of annual temperature, precipitation and unit runoff were examined.

5.2 CLIMATE TRENDS

The Ootsa climate station operated by Environment Canada has the longest climate record available in the region (46 years of complete data). This dataset was used to analyze long-term regional climate trends applicable to the project area. Three temperature data sets were assessed and are shown on Figure 5.1. While there are very slight trends showing an overall increase in temperature, none were significant at the 10% level. This significance level means that one cannot be confident that the trends are not due to random chance. Trend plots of annual precipitation are presented on Figure 5.2, and indicate slight increases in annual precipitation and annual rainfall, and a slight decrease in annual snowfall, but again, no trends were significant at the 10% level. These findings lead to the conclusion that there is no notable evidence in the regional data of climate change effects on temperature and precipitation patterns.

Insights into the possible long-term climate effects on streamflow in the project area are provided by examining flow records for the Dean River and Van Tine Creek. Figure 5.3 shows the annual mean unit runoff for the entire period of complete record. A slight decreasing trend is visible; however, when the high outlier flow from 1976 is removed from the dataset, the trend disappears. A similar pattern is also evident in the trend plots of annual mean unit runoff for Van Tine Creek, as shown on Figure 5.4. Similarly, when the annual hydrograph for the first half of the Dean River record (1973-1992) is compared to the hydrograph for the second half (1993-2010), as shown on Figure 5.5, there appears to be reduction in the freshet volume, and it has a corresponding lower mean annual discharge of 15.7 m^3/s, compared to 17.1 m^3/s. However, when the anomalously high flow year of 1976 is removed from the earlier dataset, the two hydrographs match very closely, as shown on Figure 5.6, and the MAD for the earlier period drops to 15.6 m^3/s, making it almost identical to that of the later period. As with the climate trend analyses, these results lead to the conclusion that there is no notable evidence in the regional data of climate change effects on annual streamflow patterns.

Figures 5.7 and 5.8, present the respective trendlines for the annual peak flows in Van Tine Creek and the Dean River. Both trendlines have a negative slope suggesting that peak flows have decreased over time; however, while the Van Tine Peak flow trendline is statistically significant; the Dean River trendline is not. It had been previously reported (VA101-457-1 Rev 1) that both peak flow data sets demonstrated statistically significant trends of decreasing flood severity; however, peak flow data for Dean River were only presented up to 2006. The addition of four peak flow values from 2007 to 2010 has altered the trendline so that it is no longer statistically significant. As both data sets do not result in statistically significant trends, no conclusions can be drawn on whether or not peak flows are decreasing with time within the Project Area.

5.3 SUMMARY

A review of long-term climate and streamflow records indicates no notable climate change effects on climatic or hydrologic conditions near the project, with the exception of possibly decreasing peak annual peak flows. This result, combined with the inherent variability of climatic and hydrologic patterns, and our inability to accurately predict and model future climate patterns, leads to the reasonable conclusion that current climatic and hydrologic records provide an appropriate basis for assessing hydrometeorologic conditions in the project area.

6 – REFERENCES

APEGBC, 2012*. Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate in BC.* The Association of Professional Engineers and Geoscientists of British Columbia.

Butt, C., 2013. *Evaluation of The Performance Of Frequency And Chronological Pairing Techniques In Synthesising Long-Term Streamflow*. Masters Thesis. University of British Columbia. Vancouver BC. Canada

Cathcart, J., 2001. *The Effects of Scale and Storm Severity on the Linearity of Watershed Response Revealed Through the Regional L-Moment Analysis of Annual Peak Flows*. Ph.D. Thesis, Department of Forest Resources Management, University of British Columbia, Vancouver, BC, Canada.

Doorenbos, J. and W.O. Pruitt, 1992. *Crop Water Requirements*. Food and Agriculture Organization of the United Nations. Rome, Italy

Hershfield, D.M., 1961. *Rainfall Frequency Atlas of the United States*, Department of Commerce, Washington D.C, USA

Hogg, W.D. and D.A. Carr, 1985. *Rainfall Frequency Atlas for Canada*. Canadian Climate Program, Canada.

Liston, G.E. and M. Sturm, 2004. *The role of winter sublimation in the Arctic moisture budget*, Department of Atmospheric Science. Colorado, USA.

Maidment, D.R. 1993. *Handbook of Hydrology*. McGraw-Hill Inc., Washington, DC, USA

Montesi, J., K. Elder, R.A. Schmidt, and R.E. Davis, *Sublimation of Intercepted Snow within a Subalpine Forest Canopy at Two Elevations*, Journal of Hydrometeorology – Special Section, American Meteorological Society, 2004.

Obedkoff, W., 1999. *Streamflow in the Cariboo Region*. Water Inventory Section Resources Inventory Branch, Ministry of Environment, Lands, and Parks.

Oregon State University. 2012. Prism Climate Group. Available at: http://www.prism.oregonstate.edu/ Accessed January 23, 2013.

Pacific Climate Impacts Consortium (PCIC). 2012. University of Victoria. 2012. Available at: http://www.pacificclimate.org/tools-and-data/plan2adapt

Ponce, M. P., 1989. *Engineering Hydrology – Principles and Practices.* Prentice-Hall Inc., New Jersey, USA.

Penman, H., 1950. *Evaporation over the British Isles*. Quart Jl. Roy. Met. Soc., vol. 76, no 330, pp. 372-383.

Strasser, U., M. Bernhardt, M. Weber, G.E. Liston, and W. Mauser, 2008. *Is snow sublimation important in the alpine water balance?* The Cryosphere, 2, pp. 53-66.

Thornthwaite, C.A. and J.R. Mather, 1955. *The Water Balance.* Climatology 8(1), Lab of Climatology, New Jersey, USA.

Winkler, R. D. and D. Moore, 2010. *Compendium of forest hydrology and geomorphology in British Columbia – Chapter 6*. FORREX Forum for Research and Extension in Natural Resources., BC, Canada.

7 – CERTIFICATION

This report was prepared, reviewed and approved by the undersigned.

Prepared:

Brendan Worrall, EIT
Staff Engineer

Reviewed:

for Cameron Butt, P.Geo., PMP
Senior Scientist

PROFESSIONAL PROVINCE J. G. CATHCART BRITISH COLUMBIA ENGINEER

Nov 5, 2013

Reviewed:

Jaime Cathcart, PhD, P.Eng.
Specialist Hydrotechnical Engineer

Approved:

for Ken Brouwer, P.Eng.
President

Knight Piésold CONSULTING

TABLE 2.1

NEW GOLD INC.
BLACKWATER GOLD PROJECT

SUMMARY OF REGIONAL AND PROJECT CLIMATE STATIONS

Print 11/01/13 10:48

Station Name	Station ID.	Agency/Owner	Latitude	Longitude	Elevation (m)	Distance from Project Location (km)	Years of Record	No. of Years Complete Record	Active or Inactive	Start Year	End Year
Blackwater Low Climate Station[2]	-	New Gold Inc.	53.30	-124.80	1050	15	1.5	1	Active	2011	2012
Blackwater High Climate Station[2]	-	New Gold Inc.	53.18	-124.85	1470	2	0.5	-	Active	2012	2012
Fraser Lake North Shore	109C0LF	Environment Canada	54.08	-124.85	674	100	39	37	Inactive	1969	2007
Vanderhoof	1098D90	Environment Canada	54.03	-124.02	638	112	28	25	Active	1980	2012
Tatelkuz Lake	1088007	Environment Canada	53.3	-124.73	914	17	8	4	Inactive	1970	1977
Endako Mine	1092676	Environment Canada	54.03	-125.1	984	97	10	8	Inactive	1973	1982
Fort Fraser 13S	1092905	Environment Canada	53.88	-124.58	701	106	24	23	Inactive	1970	1993
Ootsa[4]	1085836	Environment Canada	53.77	-126	861	100	57	44	Active	1956	2012
Kluskus[3]	-	BC Forestry	53.38	-124.51	1137	34	22	-	Active	1991	2012

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Meteorology\[Station Summary Table.xlsx]Table 2.1

NOTES:

1. THE ABOVE METEOROLOGICAL WAS DATA OBTAINED FROM ENVIRONMENT CANADA.
2. THE PROJECT CLIMATE STATION IS NOT PART OF THE ENVIRONMENT CANADA DATABASE.
3. THE KLUSKUS STATION HAS NO COMPLETE YEARS AS NO VALID WINTER DATA WAS COLLECTED. THE STATION IS MONITORED BY BC FORESTRY.
4. THE OOTSA STATION HAS MONTHLY DATA UP TO 2007 THEN DAILY DATA UNTIL 2012.

0	31OCT'13	ISSUED WITH REPORT VA101-457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE 2.2

NEW GOLD INC.
BLACKWATER GOLD PROJECT

ESTIMATED LONG-TERM TEMPERATURE AT BLACKWATER PROJECT SITE (°C)

Print Nov/01/13 10:53:01

Station Name	Elevation (m)	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Blackwater Low Station	1050	2011								12.7	10.5	3.4	-3.2	-0.2	-
		2012	-0.8	-4.0	-1.9	2.8	6.5	10.3	15.2	14.3	11.8	0.8	-4.0	-5.0	3.8
Blackwater High Station	1470	2012							13.8	12.2	10.5	-0.3	-4.1	-8.3	-
Vanderhoof	638	2012	-7.1	-3.5	0.3	5.2	9.7	14.1	18.4	16.6	13.0	2.8	-3.2	-5.9	5.0
		1980-2012	-8.8	-5.6	-0.3	5.4	10.6	14.4	16.5	15.8	11.1	5.0	-2.4	-8.4	4.4
Blackwater Project Site[1]	**1470**	**Long-Term**	**-7.7**	**-5.6**	**-2.1**	**1.6**	**6.7**	**10.4**	**12.5**	**11.8**	**7.2**	**1.3**	**-3.5**	**-7.4**	**2.0**

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Meteorology\[Regression Comparison_Long Term Temp - cmb with adjustments.xlsx]Temperature Table - ADJUSTED

NOTES:

1. THE BLACKWATER PROJECT SITE LONG TERM ESTIMATES ARE CALCULATED BY APPLYING THE DERIVED REGRESSION EQUATIONS BETWEEN VANDERHOOF AND THE BLACKWATER HIGH STATION

0	31OCT'13	ISSUED WITH REPORT VA101-457/6-12	CMB	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE 2.3

NEW GOLD INC.
BLACKWATER GOLD PROJECT

MEAN WIND SPEED AND DIRECTION AT BLACKWATER CLIMATE STATIONS

Print Oct/08/13 14:12:20

Station	Year	Avg Wind Speed (m/s)												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Blackwater Low	2011								2.4	2.7	2.5	3.2	2.5	-
	2012	2.8	2.1	3.0	2.2	2.7	2.5	2.2	2.3	2.4	2.1	2.1	2.1	2.4
Blackwater High	2012							2.0	2.3	2.8	2.5	3.4	4.2	-

Station	Year	Avg Wind Direction (^{o} from True North)												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Blackwater Low	2011								240	209	207	204	189	-
	2012	189	205	203	200	227	227	224	217	226	207	208	204	211
Blackwater High	2012							219	231	237	191	202	236	-

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Meteorology\KPL Stations\[Blackwater Data.xlsx]Wind Speed Table

0	31OCT'13	ISSUED WITH REPORT VA101-457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold
CONSULTING

TABLE 2.4

NEW GOLD INC.
BLACKWATER GOLD PROJECT

MEAN RELATIVE HUMIDITY AT BLACKWATER CLIMATE STATIONS (%)

08/10/2013 14:12

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Blackwater Low	2011								54	57	60	65	64	-
	2012	69	70	56	57	49	58	55	55	51	65	74	74	61
Blackwater High	2012							61	63	56	78	80	82	-

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Meteorology\KPL Stations\[Blackwater Data.xlsx]RH Table

0	31OCT'13	ISSUED WITH REPORT VA101-457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE 2.5

NEW GOLD INC.
BLACKWATER GOLD PROJECT

MAXIMUM AND AVERAGE INCOMING SOLAR RADIATION AT BLACKWATER CLIMATE STATIONS

Print Oct/08/13 14:12:20

Station	Year	Maximum Solar Radiation (W/m^2)												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Blackwater Low	2011								883	857	565	350	267	-
	2012	304	514	734	871	996	967	1033	889	742	592	387	293	1033
Blackwater High	2012							997	938	791	603	609	383	-

Station	Year	Average Solar Radiation (W/m^2)												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Blackwater Low	2011								301	247	161	97	68	-
	2012	79	137	224	262	305	266	323	308	270	152	80	64	323
Blackwater High	2012							299	297	298	139	91	82	-

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Meteorology\KPL Stations\[Blackwater Data.xlsx]Solar Radiation Table

NOTES:

1. SOLAR RADIATION TENDS TO BE ZERO DURING THE NIGHT
2. MAXIMUM VALUES ARE BASED ON A 1 HOUR RECORDING INTERVAL
3. AVERAGE VALUES DO NOT USE "ZERO" READINGS IN THE CALCULATION

0	31OCT'13	ISSUED WITH REPORT VA101-457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE 2.6

NEW GOLD INC.
BLACKWATER GOLD PROJECT

ATMOSPHERIC PRESSURE AT BLACKWATER CLIMATE STATIONS (KPa)

Print Oct/08/13 14:12:20

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Blackwater Low	2011								102.4	102.3	102.1	101.4	103.1	-
	2012	100.9	102.1	101.1	101.9	102.3	102.0	102.5	102.5	102.7	102.2	101.8	101.3	102.0
Blackwater High	2012							101.8	101.8	102.0	101.3	100.7	100.2	-

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Meteorology\KPL Stations\[Blackwater Data.xlsx]Atmospheric Pressure Table

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	31OCT'13	ISSUED WITH REPORT VA101-457/6-12	BW	CMB	JGC

Knight Piésold
CONSULTING

TABLE 2.7

NEW GOLD INC.
BLACKWATER GOLD PROJECT

ESTIMATED LONG-TERM SITE POTENTIAL EVAPOTRANSPIRATION (mm)

01/11/2013 10:55

Location	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Blackwater	mm	0	0	0	20	66	93	104	91	54	13	0	0	**445**
	% Annual	0%	0%	0%	4%	15%	21%	23%	20%	12%	3%	0%	0%	100%

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Meteorology\[PET_calculator_BW Edit.xlsx]Table 2.7

NOTES:

1. THE LONG-TERM PET ESTIMATES ARE BASED ON SYNTHETIC LONG-TERM MEAN MONTHLY TEMPERATURE RECORDS AND USING THE THORNTHWAITE EQUATION.
2. THE THORNTHWAITE EQUATION ASSUMES THAT WHEN MEAN MONTHLY TEMPERATURE IS ZERO OR BELOW, PET IS ZERO.
3. THE ANNUAL AVERAGE PET DOES NOT EQUAL THE SUM OF THE MEAN MONTHLY PET AS 1998, 1999, 2000, 2006 AND 2007 HAVE MISSING MONTHS.

0	31OCT'13	ISS2UED WITH REPORT VA101-457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

![Knight Piésold Consulting]

TABLE 2.8

NEW GOLD INC.
BLACKWATER GOLD PROJECT

SUMMARY OF REGIONAL AND PROJECT SITE PRECIPITATION DISTRIBUTIONS

Print 11/1/13 10:57

Station Name	Period of Record	Elevation (m)	Distance from Site (km)	Mean Total Precipitation													
				Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Blackwater High Climate Station	2012	1470	2	mm	-	-	-	-	-	-	60.9	44.1	14.7	55.3	19.8	8.5	-
				% annual	-	-	-	-	-	-	-	-	-	-	-	-	-
Blackwater Low Climate Station[1,2]	2011	1051	15	mm	-	-	-	-	-	-	-	15.4	42.2	6.2	19.9	36.5	-
				% annual	-	-	-	-	-	-	-	-	-	-	-	-	-
	2012			mm	-	19.0	21.6	51.1	32.2	66.1	50.1	66.9	7.2	60.9	22.5	8.2	
				% annual	-	-	-	-	-	-	-	-	-	-	-	-	-
Klusksus[3]	1991-2012	1137	34	mm	-	-	-	19.3	40.9	65.4	53.1	47.0	49.6	41.1	-	-	-
				% annual	-	-	-	-	-	-	-	-	-	-	-	-	-
				%Rain	-	-	-	100%	100%	100%	100%	100%	100%	100%	-	-	-
				% Snow	-	-	-	0%	0%	0%	0%	0%	0%	0%	-	-	-
Fraser Lake	1969-2007	674	100	mm	49.6	30.1	27.7	20.3	37.9	54.1	55.9	45.2	48.1	49.3	48.8	50.2	**517**
				% annual	10%	6%	5%	4%	7%	10%	11%	9%	9%	10%	9%	10%	100%
				%Rain	8%	13%	21%	70%	97%	100%	100%	100%	100%	85%	36%	8%	64%
				% Snow	92%	87%	79%	30%	3%	0%	0%	0%	0%	15%	64%	92%	36%
Ootsa	1956-2012	861	100	mm	42.6	25.0	22.4	18.3	27.5	44.5	44.2	39.9	36.1	41.4	42.8	46.3	**431**
				% annual	10%	6%	5%	4%	6%	10%	10%	9%	8%	10%	10%	11%	100%
				%Rain	13%	13%	19%	64%	95%	100%	100%	100%	99%	81%	31%	17%	63%
				% Snow	87%	87%	81%	36%	5%	0%	0%	0%	1%	19%	69%	83%	37%
Vanderhoof	1970 - 2012	674	112	mm	43.7	28.1	22.7	25.2	35.4	55.1	51.4	46.7	42.6	50.9	45.5	41.1	**488**
				% annual	9%	6%	5%	5%	7%	11%	11%	10%	9%	10%	9%	8%	100%
				%Rain	15%	19%	28%	78%	99%	100%	100%	100%	100%	86%	36%	13%	68%
				% Snow	85%	81%	72%	22%	1%	0%	0%	0%	0%	14%	64%	87%	32%
Tatelkuz	1970 - 1977	914	17	mm	51	25	25	17	20	70	64	42	37	38	40	55	**483**
				% annual	10%	5%	5%	3%	4%	15%	13%	9%	8%	8%	8%	11%	100%
				%Rain	7%	4%	14%	27%	96%	100%	100%	100%	95%	80%	21%	21%	61%
				%Snow	93%	96%	86%	73%	4%	0%	0%	0%	5%	20%	79%	79%	39%

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Meteorology\[Regression Comparison_Long Term Precip.xlsx]Precip Summary Table

NOTES:

1. THE PLUVIO CABLE WAS DESTROYED ON JANUARY 2011 AT THE BLACKWATER LOW STATION.
2. DECEMBER AT BLACKWATER LOW AND HIGH HAS INCOMPLETE DATA FOR 2012.
3. THE KLUSKUS STATION DOES NOT HAVE VIABLE DATA FOR THE WINTER AND ALL PRECIP CAPTURED IS ASSUMED TO BE RAIN.

0	31OCT'13	ISSUED WITH REPORT VA101-457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE 2.9

NEW GOLD INC.
BLACKWATER GOLD PROJECT

REGIONAL AND SITE SNOW COURSE DATA (mm)

31/10/2013 14:00

Station Name	Elevation (m)	Year	January	February	March
1B06	1596	Mean Annual	211	254	290
		2012	199	254	273
1A23	1196	Mean Annual	108	133	143
		2012	104	156	132
SS1	1412	2012	70	93	-
SS2	1168	2012	28	57	-
SS3	1051	2012	15	42	-

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Meteorology\[Manual Regional Snow Data_Rev B.xlsx]Tabl 2.9

NOTES:

1. THE DATA ARE PRESENTED AS SWE (SNOW WATER EQUIVALENT).

0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE 2.10

NEW GOLD INC.
BLACKWATER GOLD PROJECT

OROGRAPHIC EFFECT ANALYSIS

31/10/2013 14:02

Change in Snowpack			
Station Name	Unit	Jan-Feb	Feb-Mar
1B06	mm	19.4	31.5
1A23	mm	20.9	23.7

Percentage Difference Between Months			
Station Name	Unit	Jan-Feb	Feb-Mar
1B06 vs. 1A26	%	-7.0%	33.1%
1B06 vs. 1A26	% per m elevation	-0.02%	**0.08%**

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Meteorology\[Manual Regional Snow Data_Rev B.xlsx]Table 2.10

NOTES:

1. THE DIFFERENCE IN ELEVATION IS 400m.
2. THE VALUE OF 0.08% IS USED AS THE WINTER ORAGRAPHIC FACTOR.
3. THE ABOVE ANALYSIS WAS PERFORMED WITH CONCURRENT DATA

0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE 2.11

NEW GOLD INC.
BLACKWATER GOLD PROJECT

AVERAGE MONTHLY PRECIPITATION

Print Jan/07/10 16:25:23

Station	Elevation	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Blackwater	**1470**	Total Precip (mm)	**73**	**45**	**39**	**20**	**50**	**66**	**52**	**51**	**47**	**47**	**74**	**72**	**636**
		%/month	12%	7%	6%	3%	8%	10%	8%	8%	7%	7%	12%	11%	100%
		Rain (mm)	0	0	0	13	50	66	52	51	47	31	0	0	310
		% Precip as Rain/month	0%	0%	0%	65%	100%	100%	100%	100%	100%	65%	0%	0%	49%
		Snow-SWE (mm)	73	45	39	7	0	0	0	0	0	16	74	72	326
		% Precip as SWE/month	100%	100%	100%	35%	0%	0%	0%	0%	0%	35%	100%	100%	51%
Rev 0 Hydromet Blackwater	1350	mm	60	34	31	23	37	63	64	53	49	47	54	65	**580**
		%/yr	10%	6%	5%	4%	6%	11%	11%	9%	8%	8%	9%	11%	100%
PRISM	1470	mm	60	31	29	24	33	91	81	56	43	46	56	55	**605**
		%/yr	10%	5%	5%	4%	5%	15%	13%	9%	7%	8%	9%	9%	100%

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Meteorology\[Regression Comparison_Long Term Precip.xlsx]MAP Table

NOTES:

1. RAIN AND SNOW PERCENTAGES ARE SHOWN AS % OF THE TOTAL PER MONTH. TOTAL MONTHLY PRECIPITATION IS SHOWN AS THE % OF THE ANNUAL TOTAL.

0	31OCT'13	ISSUED WITH REPORT VA101-457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE 2.12

NEW GOLD INC.
BLACKWATER GOLD PROJECT

REGIONAL AND ESTIMATED LONG-TERM SNOWMELT DATA

05/11/2013 14:57

Regional Snow Survey Summary									
Station Name	Station Number	Elevation (m)	Years of Record	% Reduction in Snowpack					
				January	February	March	April	May	June
Bird Creek	1A23	1196	24	0%	0%	0%	66%	34%	0%
Mount Swanell	1B06	1596	23	0%	0%	0%	0%	62%	38%

Estimated Long-Term Blackwater Site Snow Melt Distribution							
Station Name	Elevation (m)	% Reduction in Snowpack					
		January	February	March	April	May	June
Blackwater Project Site	1470	0%	0%	0%	21%	53%	26%

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Meteorology\[Manual Regional Snow Data_Rev B.xlsx]Snowpack Table

NOTES:

1. HISTORICAL SNOW COURSE RECORDS ARE PROVIDED BY ENVIRONMENT CANADA.
2. LONG-TERM ESTIMATE IS BASED ON INTERPOLATING BY ELEVATION BETWEEN MOUNT SWANNEL AND BIRD CREEK VALUES

0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold
CONSULTING

TABLE 2.13

NEW GOLD INC.
BLACKWATER GOLD PROJECT

ESTIMATED PROJECT SITE 24 HOUR EXTREME PRECIPITATION RETURN PERIOD VALUES

Mean Extreme Daily (mm) = **38**
Standard Deviation (mm) = **9**

Print: 11/04/13 10:19

Return Period (years)	Frequency Factor	24 hr Extreme Event (mm)
2	-0.164	37
5	0.719	44
10	1.305	50
15	1.635	53
20	1.866	55
25	2.044	56
50	2.592	61
100	3.137	66
200	3.679	71
500	4.395	78
1000	4.936	82
PMP	**17.462**	**195**

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Meteorology\[Extreme Precip.xlsx]Summary 24hr rain Table

NOTES:

1. RETURN PERIOD RAINFALL AMOUNTS COMPUTED ASSUMING A GUMBEL TYPE DISTRIBUTION.
2. FREQUENCY FACTORS FOR PMP ARE ESTIMATED USING THE HERSHFIELD EQUATION.

0	31OCT'13	ISSUED WITH REPORT VA101-457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold
CONSULTING

TABLE 2.14

NEW GOLD INC.
BLACKWATER GOLD PROJECT

WET AND DRY YEAR PRECIPITATION

Print Oct/08/13 14:56:30

Return Period	Precipitation (mm)
1:200 year **wet** (mean + 2.575 s.d.)	794
1:100 year **wet** (mean + 2.326 s.d.)	779
1:50 year **wet** (mean + 2.054 s.d.)	762
1:20 year **wet** (mean + 1.645 s.d.)	737
1:10 year **wet** (mean + 1.282 s.d.)	715
Mean Annual Precipitation	**636**
1:10 year **dry** (mean - 1.282 s.d.)	557
1:20 year **dry** (mean - 1.645 s.d.)	535
1:50 year **dry** (mean - 2.054 s.d.)	510
1:100 year **dry** (mean - 2.326 s.d.)	493
1:200 year **dry** (mean - 2.575 s.d.)	478

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Meteorology\[WetDry Precip and IDF-BW Update.xls]Table 2.14 (wet & dry yrs)

NOTES:
1. STANDARD DEVIATION IS DETERMINED FROM THE ESTIMATED MEAN MONTHLY PRECIPITATION VALUES.
2. ESTIMATED VALUES ASSUME A NORMAL DISTRIBUTION OF ANNUAL PRECIPITATION.
3. THE CALCULATION OF SD DOES NOT INCLUDE YEARS WITH LESS THAN 12 MONTHS OF DATA

0	31OCT13	ISSUED WITH REPORT VA101-457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE 3.1

NEW GOLD INC.
BLACKWATER GOLD PROJECT

SUMMARY OF PROJECT HYDROMETRIC MONITORING STATIONS

01/11/2013 11:02

Station Name	Location	Latitude	Longitude	Elevation	DA (km^2)	Location	Start Year
H1	Creek 661	53.21	-124.78	1190	8.9	Creek 661	Mar-11
H2	Tributary of Davidson Creek	53.22	-124.83	1216	47.2	Tributary of Davidson Creek	Mar-11
H3	Creek 700	53.26	-124.89	1165	9	Creek 700	Mar-11
H4B	Davidson Creek	53.27	-124.77	1053	61	Davidson Creek	Nov-12
H5	Chedakuz Creek	53.32	-124.74	934	593	Chedakuz Creek	Mar-11
H6	Turtle Creek	53.29	-124.82	1029	55	Turtle Creek	Mar-12
H7	Creek 705	53.17	-125.06	1128	41	Creek 705	Apr-12

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Hydrology\[Summary Tables.xlsm]Table 3.1

NOTES:

1. H3 WAS DESTROYED BY A WIND STORM IN 2012, AND THE STATION HAS SINCE BEEN DEACTIVATED.

0	31OCT'13	ISSUED WITH REPORT VA101-457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

TABLE 3.2

NEW GOLD INC.
BLACKWATER GOLD PROJECT

SUMMARY OF REGIONAL STREAMFLOW STATIONS

Print Oct/16/13 9:42:39

Station Name	Station ID	DA (km^2)	Years of Record	No. of Years of Complete Record	Start Year	End Year	Latitude	Longitude	Distance from Project Site (km^2)	Average Annual Unit Runoff ($l/s/km^2$)	Median Basin Elevation (m)
Van Tine Creek Near the Mouth	08JA014	150	33	31	1974	2006	53^o 15' 48"	125^o 24' 30"	37	6.0	1250
Dean River Below Tanswanket Creek	08FC003	3720	51	40	1959	2012	52° 53' 23"	125° 46' 17"	67	4.6	1200
Laventie Creek Near the Mouth	08JA015	87	35	34	1976	2010	53° 39' 09"	127° 32' 13"	181	60.9	1385
Whitesail Middle Creek Near Tahtsa Reach	08JA029	7.7	14	0	1997	2010	53° 39' 48"	126° 59' 23"	148	-	1315
North Beach Creek Above Allin Creek	08JB013	9.1	13	0	1998	2010	53° 07' 36"	125° 55' 38"	182	-	1010

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Hydrology\[Summary Tables.xlsm]Table 3.2

NOTES:

1. THE DATA WERE OBTAINED FROM THE WATER SURVEY OF CANADA (WSC) BRANCH OF ENVIRONMENT CANADA (EC).
2. DATA COLLECTED AT WHITESAIL MIDDLE CREEK AND NORTH BEACH CREEK WERE ONLY RECORDED SEASONALLY DURING THE MONTHS OF APRIL THROUGH OCTOBER.

0	31OCT13	ISSUED WITH REPORT VA101-457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold
CONSULTING

TABLE 3.3

NEW GOLD INC.
BLACKWATER GOLD PROJECT

REGIONAL MONTHLY DISCHARGE AND UNIT RUNOFF SUMMARY

Print Nov/01/13 11:02:22

Station Name	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Van Tine Creek Near the Mouth (08JA014)	Unit Runoff (l/s/km^2)	1.1	0.9	1.0	8.5	23.0	15.1	8.2	2.9	3.2	3.3	3.1	1.5	6.0
	Discharge (m^3/s)	0.2	0.1	0.2	1.3	3.4	2.3	1.2	0.4	0.5	0.5	0.5	0.2	0.9
	% of Total Discharge	2%	1%	1%	12%	32%	21%	11%	4%	4%	5%	4%	2%	100%
Dean River Below Tanswanket Creek (08FC003)	Unit Runoff (l/s/km^2)	1.3	1.2	1.5	5.5	15.4	14.9	6.6	2.5	2.0	2.3	2.1	1.5	4.7
	Discharge (m^3/s)	4.7	4.3	5.6	20.3	57.3	55.5	24.5	9.3	7.4	8.5	7.9	5.7	17.6
	% of Total Discharge	2%	2%	3%	10%	27%	26%	12%	4%	4%	4%	4%	3%	100%
Laventie Creek Near the Mouth (08JA015)	Unit Runoff (l/s/km^2)	8.4	6.7	6.6	15.5	98.5	192.9	145.5	84.8	64.7	63.2	34.1	12.7	60.9
	Discharge (m^3/s)	0.7	0.6	0.6	1.3	8.5	16.7	12.6	7.3	5.6	5.5	2.9	1.1	5.3
	% of Total Discharge	1%	1%	1%	2%	13%	26%	20%	12%	9%	9%	5%	2%	100%
Whitesail Middle Creek Near Tahtsa Reach (08JA029)	Unit Runoff (l/s/km^2)	-	-	-	7.3	38.0	56.8	22.2	8.9	9.4	14.7	-	-	-
	Discharge (m^3/s)	-	-	-	0.1	0.3	0.4	0.2	0.1	0.1	0.1	-	-	-
	% of Total Discharge	-	-	-	-	-	-	-	-	-	-	-	-	-
North Beach Creek Above Allin Creek (08JB013)	Unit Runoff (l/s/km^2)	-	-	-	10.1	32.6	8.7	3.2	2.0	2.0	4.2	-	-	-
	Discharge (m^3/s)	-	-	-	0.1	0.3	0.1	0.0	0.0	0.0	0.0	-	-	-
	% of Total Discharge	-	-	-	-	-	-	-	-	-	-	-	-	-

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Hydrology\[Summary Tables.xlsm]Table 3.3

NOTES:

1. DATA WERE OBTAINED FROM THE WATER SURVEY OF CANADA (WSC) BRANCH OF ENVIRONMENT CANADA (EC) HYDROMETRIC DATA.
2. WHITESAIL AND NORTH BEACH DO NOT HAVE VALUES FOR THE % OF TOTAL DISCHARGE AS THEY DO NOT HAVE DATA WINTER DATA.

0	31OCT'13	ISSUED WITH REPORT VA101-457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE 3.4

NEW GOLD INC.
BLACKWATER GOLD PROJECT

PROJECT SITE LONG TERM UNIT RUNOFF

Print Nov/01/13 8:28:05

Station Name	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
H1	Unit Runoff (l/s/km^2)	0.7	0.7	1.2	3.6	14.5	13.6	4.0	1.9	1.5	1.6	2.1	1.0	3.8
	Discharge (L/s)	7	6	11	32	129	121	35	17	13	15	19	9	33
	Runoff (mm)	1.992	2	3	9	39	35	11	5	4	4	6	3	119
	% of Total Runoff	2%	1%	3%	8%	31%	29%	9%	4%	3%	4%	5%	2%	100%
H2[1,2]	Unit Runoff (l/s/km^2)	2.8	2.7	3.3	6.0	18.5	17.4	6.3	4.0	3.4	3.7	4.1	3.1	6.1
	Discharge (L/s)	130	127	155	281	873	820	297	188	160	173	195	148	288
	Runoff (mm)	7	7	9	15	50	45	17	11	9	10	11	8	198
	% of Total Runoff	4%	4%	4%	8%	25%	23%	8%	5%	4%	5%	6%	4%	100%
H5	Unit Runoff (l/s/km^2)	2.4	2.4	2.7	4.5	10.8	9.6	4.6	2.9	2.4	2.5	3.1	2.6	4.2
	Discharge (L/s)	1450	1437	1610	2693	6388	5683	2726	1692	1447	1490	1840	1558	2501
	Runoff (mm)	7	6	7	12	29	25	12	8	6	7	8	7	133
	% of Total Runoff	5%	5%	5%	9%	21%	19%	9%	6%	5%	5%	6%	5%	100%

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Hydrology\[Summary Tables.xlsm]Table 3.4

NOTES:

1. STATION H2 IS REPRESENTATIVE OF THE PROJECT AREA DUE TO IT'S ELEVATION AND DRAINAGE AREA BEING SIMILAR TO THAT OF THE PROJECT AREA FACILITIES.
2. THE CALCULATION OF RUNOFF IN mm ASSUMES 28 DAYS IN FEBRUARY.

0	31OCT'13	ISSUED WITH REPORT VA101-457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE 3.5a

NEW GOLD INC.
BLACKWATER GOLD PROJECT

H1 WET AND DRY RETURN PERIOD STREAMFLOW

Month	H1 Return Period of Mean Monthly Discharge (L/s)								
	Dry				Mean	Wet			
	50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	1	2	2	3	**7**	8	10	12	16
February	1	1	2	2	**6**	6	7	9	11
March	1	1	1	2	**11**	5	6	7	9
April	1	1	1	1	**32**	19	44	88	179
May	38	47	56	70	**129**	162	202	242	296
June	31	39	49	64	**121**	175	228	283	361
July	14	17	20	24	**35**	51	62	72	87
August	6	8	9	11	**17**	22	26	31	36
September	3	4	5	6	**13**	15	18	22	28
October	2	3	3	5	**15**	16	22	28	39
November	1	2	3	4	**19**	15	22	29	41
December	1	2	2	3	**9**	11	15	19	26

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Hydrology\[@ Risk.xlsm]Table 3.5a

0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold
CONSULTING

TABLE 3.5b

NEW GOLD INC.
BLACKWATER GOLD PROJECT

H2 WET AND DRY RETURN PERIOD STREAMFLOW

Month	H2 Return Period of Mean Monthly Discharge (L/s)								
	Dry				Mean	Wet			
	50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	58	90	98	108	**130**	156	172	186	203
February	53	84	91	100	**127**	145	159	172	189
March	50	57	84	93	**155**	136	150	162	178
April	34	46	60	83	**281**	280	385	502	675
May	374	432	491	573	**873**	1036	1210	1375	1588
June	308	369	434	529	**820**	1116	1358	1596	1915
July	184	204	224	250	**297**	382	427	468	519
August	136	145	153	165	**188**	215	231	245	262
September	107	116	124	136	**160**	190	207	222	262
October	88	99	110	125	**173**	203	231	256	288
November	57	91	102	117	**195**	198	227	254	288
December	57	65	99	111	**148**	169	189	207	230

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Hydrology\[@ Risk.xlsm]Table 3.5b

0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE 3.5c

NEW GOLD INC.
BLACKWATER GOLD PROJECT

H5 WET AND DRY RETURN PERIOD STREAMFLOW

Month	H5 Return Period of Mean Monthly Discharge								
	Dry				Mean	Wet			
	50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	908	991	1070	1175	**1450**	1678	1843	1991	2171
February	941	1018	1090	1186	**1437**	1634	1778	1905	2059
March	1059	1147	1230	1341	**1610**	1858	2025	2173	2352
April	824	1029	1255	1596	**2693**	3988	5074	6184	7729
May	1441	1864	2341	3090	**6388**	8878	11719	14721	19033
June	1462	1860	2304	2990	**5683**	8047	10442	12933	16458
July	990	1184	1387	1683	**2726**	3509	4257	4989	5966
August	669	784	903	1072	**1692**	2057	2443	2813	3297
September	501	618	745	934	**1447**	2213	2776	3344	4125
October	637	757	881	1062	**1490**	2153	2594	3022	3590
November	946	1086	1228	1426	**1840**	2516	2921	3302	3791
December	898	1001	1102	1240	**1558**	1936	2177	2398	2673

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Hydrology\[@ Risk.xlsm]Table 3.5c

0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE 3.6

NEW GOLD INC.
BLACKWATER GOLD PROJECT

SUMMER 7-DAY LOW FLOW

Print Nov/01/13 9:24:46

Station	Drainage Area (km^2)	Return Period 7-Day Unit Runoff ($L/s/km^2$)						Measured 7 Day Low Unit Runoff ($L/s/km^2$)	
		2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	2011	2012
H1	8.9	0.3	0.1	0.1	0.1	0.1	0.1	0.3	0.5
H2	47.2	2.3	1.8	1.7	1.6	1.5	1.5	2.2	2.6
H5	593	1.8	1.5	1.4	1.4	1.4	1.4	1.7	2.1
Van Tine Creek (LFA)	150	0.6	0.3	0.2	0.1	0.1	0.1	NA	NA
Van Tine Creek (Obedkoff)				0.2					
Dean River (LFA)	3720	0.9	0.7	0.6	0.5	0.5	0.5	1.4	1.1
Dean River (Obedkoff)				0.7					

Station	Drainage Area (km^2)	Return Period 7-Day Discharge (L/s)						Measured 7 Day Low Discharge (L/s)	
		2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	2011	2012
H1	8.9	3.0	1.2	0.9	0.7	0.7	0.7	2.9	4.4
H2	47.2	109.6	87.2	79.5	75.0	71.7	70.3	105	125
H5	593	1040	897	855	833	819	813	1020	1228
Van Tine Creek (LFA)	150	93.6	41.5	28.4	22.3	18.9	17.7	NA	NA
Van Tine Creek (Obedkoff)				37.0					
Dean River (LFA)	3720	3427	2513	2193	2005	1862	1801	5200	4090
Dean River (Obedkoff)				2450					

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Hydrology\[Peak and Low Flow Tables-cmb_20131011.xlsm]Table 3.6 - SUMMER 7-DLF

NOTES:

1. FLOWS AT H5 ARE ATTENUATED BY TATELKUZ LAKE.
2. ONLY THE 2, 5, AND 10 YEAR VALUES ARE CONSIDERED VALID FOR H1, H2 AND H5. THE INVALID VALUES ARE HIGHLIGHTED IN GREY.

0	31OCT'3	ISSUED WITH REPORT VA101-457/6-12	BW	JGC	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE 3.7

NEW GOLD INC.
BLACKWATER GOLD PROJECT

WINTER 7-DAY LOW FLOW

Print Nov/01/13 11:18:05

Station	Drainage Area (km^2)	Return Period 7-Day Unit Runoff ($L/s/km^2$)					
		2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
H1	8.9	0.4	0.2	0.2	0.1	0.04	0.01
H2	47.2	2.0	1.5	1.3	1.1	1.0	0.9
H5	593	2.2	1.9	1.8	1.7	1.6	1.5
Van Tine Creek (LFA)	150	0.5	0.2	0.1	0.1	0.05	0.04
Van Tine Creek (Obedkoff)				0.1			
Dean Creek (LFA)	3720	0.8	0.6	0.5	0.5	0.4	0.4
Dean Creek (Obedkoff)				0.5			

Station	Drainage Area (km^2)	Return Period 7-Day Unit Runoff (L/s)					
		2 yr	5 yr	10 yr	20 yr	50 yr	100 yr
H1	8.9	3.8	2.2	1.4	0.9	0.4	0.1
H2	47.2	96.2	71.5	60.5	52.8	45.8	41.7
H5	593	1279.0	1130.0	1057.0	1002.0	946.1	913.9
Van Tine Creek (LFA)	150	67.9	29.4	17.7	11.6	7.4	5.9
Van Tine Creek (Obedkoff)				14.0			
Dean Creek (LFA)	3720	2955.0	2196.0	1926.0	1765.0	1641.0	1587.0
Dean Creek (Obedkoff)				1940.0			

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Hydrology\[Peak and Low Flow Tables-cmb_20131011.xlsm]Table 3.7 -WINTER 7-DLF

NOTES:

1. FLOWS AT H5 ARE ATTENUATED BY TATELKUZ LAKE

0	31OCT'13	ISSUED WITH REPORT VA101-457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE 3.8

NEW GOLD INC.
BLACKWATER GOLD PROJECT

MEASURED PEAK FLOWS

Print Oct/31/13 15:24:11

Station	Drainage Area (km^2)	Peak Flow Conversion Ratio	Peak Instantaneous Unit Runoff (L/s/km^2)	
			2011	2012
H1	8.9	1.08	130.0	56.3
H2	47.2	1.10	147.7	44.5
H5	593.0	1.02	71.4	17.1
Dean	3720.0	1.02	64.9	30.1
Van Tine	150.0	1.17	NA	NA

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Hydrology\[Peak and Low Flow Tables-cmb_20131011.xlsm]Table 3.8 - MEAS PEAK FLOWS

NOTES:

1. THE PEAK FLOW RATIO IS USED TO CONVERT DAILY PEAKS INTO INSTANTANEOUS PEAKS.

0	31OCT'13	ISSUED WITH REPORT VA101-457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold
CONSULTING

TABLE 3.9

NEW GOLD INC.
BLACKWATER GOLD PROJECT

PEAK FLOW UNIT RUNOFF ESTIMATES

Print Nov/01/13 15:56:10

Station	Method	Drainage Area (km^2)	Instantaneous Peak Unit Runoff ($L/s/km^2$)						
			2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr
H1	CFA	8.9	38.3	68.6	92.3	118.7	157.0	189.9	225.6
H2	CFA	47.2	42.1	72.9	97.4	124.4	165.6	201.5	242.7
H5	CFA	593.0	20.3	34.9	48.5	65.5	95.3	125.1	163.6
Dean River	CFA	3720.0	24.4	34.5	42.2	50.1	61.4	70.7	80.8
Dean River	Obedkoff (1999)				40.0				
Van Tine	CFA	150.0	73.3	113.3	146.7	173.3	206.7	233.3	260.0
Van Tine	Obedkoff (1999)				155.0				

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Hydrology\[Peak and Low Flow Tables-cmb_20131011.xlsm]TABLE 3.9 - RET PER Peak Flow

NOTES:

1. THE VALUES INPUT INTO CFA STATISTICAL ANALYSIS PROGRAM WERE DAILY PEAK FLOWS. THE OUTPUTS WERE THEN ADJUSTED BY A SCALING FACTOR TO PRODUCE THE INSTANTANEOUS FLOWS. THE SCALING FACTOR IS CALCULATED AS (PEAK 15MIN OR 60MIN FLOW / AVERAGE DAILY FLOW).

2. CFA = ENVIRONMENT CANADA'S CONSOLIDATED FREQUENCY ANALYSIS SOFTWARE.

3. OBEDKOFF (1999) = STREAMFLOW IN THE CARIBOO REGION.

0	31OCT'13	ISSUED WITH REPORT VA101-457/6-12	CMB	JGC	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE 3.10

NEW GOLD INC.
BLACKWATER GOLD PROJECT

INDEX FLOOD FREQUENCY FACTORS

Print Oct/31/13 15:27:26

Station	Index Flood Frequency Factors						
	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr
H1	0.41	0.74	1.00	1.29	1.70	2.06	2.44
H2	0.43	0.75	1.00	1.28	1.70	2.07	2.49
H5	0.42	0.72	1.00	1.35	1.96	2.58	3.37
Dean River	0.58	0.82	1.00	1.19	1.45	1.68	1.92
Van Tine	0.50	0.77	1.00	1.18	1.41	1.59	1.77
Design Values	0.47	0.76	1.00	1.26	1.65	1.99	2.40

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Hydrology\[Peak and Low Flow Tables-cmb_20131011.xlsm]TABLE 3.10 - ratios

NOTES:

1. THE RECOMMENDED DESIGN VALUES ARE COMPUTED AS THE MEANS OF THE FIVE STATION VALUES.
2. FREQUENCY FACTORS ARE CALCULATED AS THE RETURN PERIOD PEAK EVENT OVER THE RETURN PERIOD 10 YEAR PEAK EVENT.

0	31JOCT3	ISSUED WITH REPORT VA101-457/6-12	CMB	JGC	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

TABLE 3.11

NEW GOLD INC.
BLACKWATER GOLD PROJECT

DESIGN PEAK FLOWS

Print Nov/01/13 16:01:23

	Catchment Area (km^2)	2 yr	5 yr	10 yr	20 yr	50 yr	100 Yr	200 yr
Index Flood Frequency Factor	n/a	0.47	0.76	1.00	1.26	1.65	1.99	2.40
10 Yr Peak Unit Runoff - H1(L/s/km^2)	8.9			278				
10 Yr Peak Unit Runoff - H2 (L/s/km^2)	47.2			193				
10 Yr Peak Unit Runoff - H5 (L/s/km^2)	593.0			111				
Station H1 (m^3/s)	8.9	1.2	1.9	2.5	3.1	4.1	4.9	5.9
Station H2 (m^3s)	47.2	4	7	9	11	15	18	22
Station H5 (m^3/s)	593.0	31	50	66	83	108	131	158

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Hydrology\[Peak and Low Flow Tables-cmb_20131011.xlsm]TABLE 3.11 - Design Peak Flow

NOTES:

1. THE INDEX FLOOD FREQUENCY FACTORS ARE FROM TABLE 3.10
2. 10 YEAR UNIT RUNOFF DETERMINED FROM THE RECOMMENDED PEAK FLOW BOUNDING CURVE ON FIGURE 3.25.

0	31OCT'13	ISSUED WITH REPORT VA101-457/6-12	CMB	JGC	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE 4.1

NEW GOLD INC.
BLACKWATER GOLD PROJECT

COEFFICIENT OF VARIATION VALUES FOR WATER BALANCE MODELLING

Print 01/11/2013 11:07

Location	Parameter	Coefficient of Variation											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Van Tine Creek	Runoff	0.88	0.90	0.88	0.87	0.54	0.64	0.80	1.04	1.06	0.88	1.05	0.74
Dean River	Runoff	0.45	0.41	0.48	0.64	0.45	0.49	0.61	0.81	0.74	0.61	0.64	0.49
Project Site	Runoff	0.36	0.32	0.37	0.62	0.78	0.83	0.82	0.74	0.66	0.41	0.55	0.40

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Hydrology\[Coefficient of Variation Calc and Table.xls]Table_CV

NOTES:

1. COFFICIENT OF VARIATION = STANDARD DEVIATION/ MEAN.
2. THE RUNOFF COFFICIENT OF VARIATION VALUES WERE BASED THE 40 YEAR SYNTHETIC DATA STRING DEVELOPED FOR H2.
3. DEAN RIVER AND VAN TINE COV ARE PRESENTED AS A COMPARISON TO THE H2 DATA SET.
4. 1974 AND 2006 WERE INCOMPLETE YEARS FOR VAN TINE CREEK.
5. 2011 AND 2012 WERE INCOMPLETE YEARS FOR DEAN RIVER.

0	31OCT'13	ISSUED WITH REPORT VA101-457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold
CONSULTING

TABLE 5.1

NEW GOLD INC.
BLACKWATER GOLD PROJECT

SUMMARY OF CLIMATE CHANGE FOR BC IN THE 2050s

01/11/2013 11:52

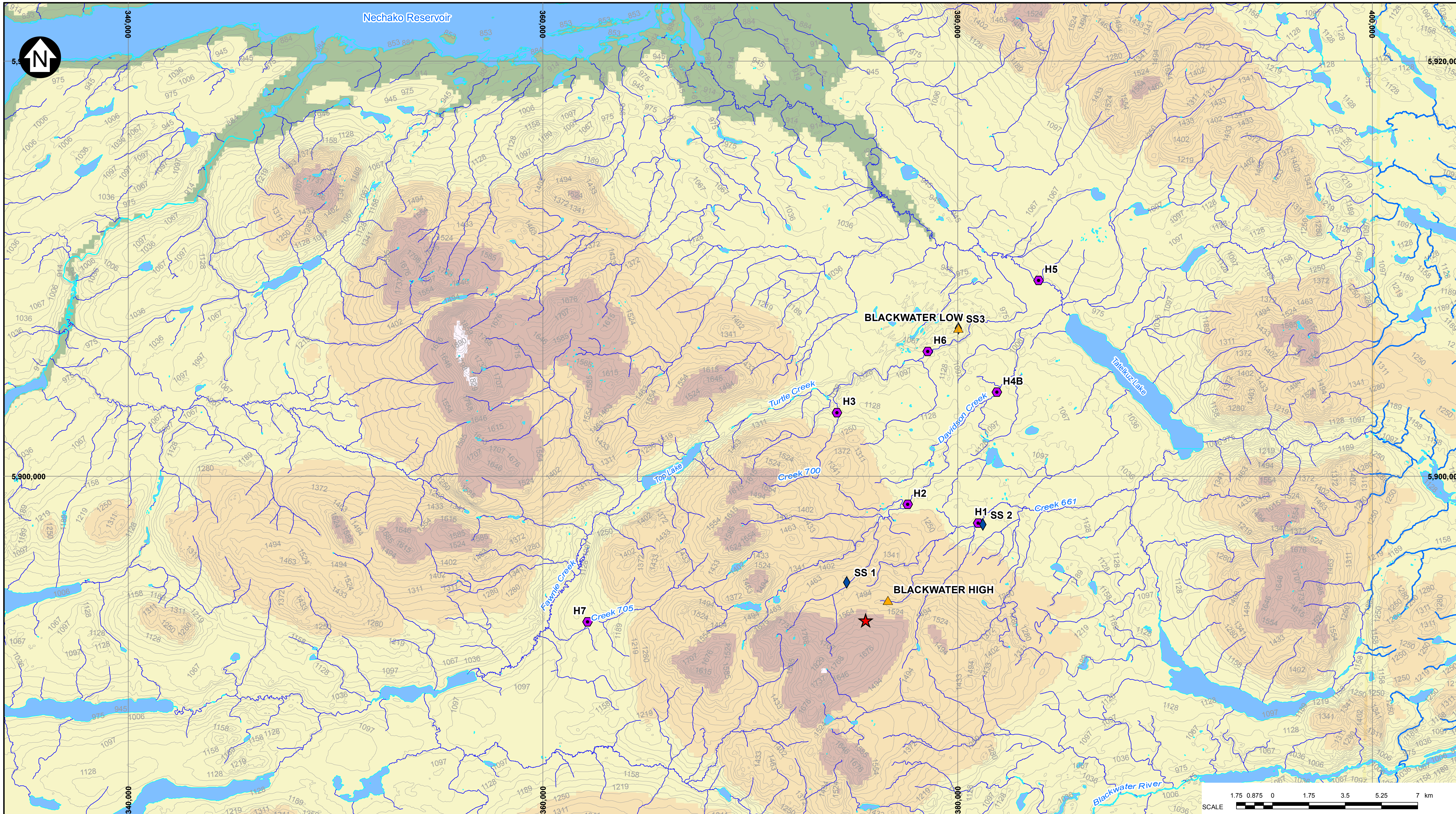
Climate Variable	Season	Projected Change in the 2050s		
		Ensemble Median	10th Percentile	90th Percentile
Mean Temperature (°C)	Annual	1.8	1.3	2.7
Precipitation %)	Annual	6%	2%	13%
	Summer	-1%	-8%	7%
	Winter	8%	-2%	15%
Snowfall (%)	Winter	-10%	-17%	2%
	Spring	-58%	-71%	-11%

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Meteorology\[Climate Change.xlsm]Table 5.1

NOTES:

1. THE ABOVE VARIABLES ARE THE PROJECTED CHANGE FROM THE 1961-1990 BASELINE.
2. DATA SOURCE: PACIFIC CLIMATE IMPACTS CONSORTIUM, 2012.

0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



LEGEND:

- PROJECT LOCATION
- PROJECT CLIMATOLOGY STATION
- PROJECT HYDROLOGY MONITORING STATION
- SNOW SURVEY STATION
- CONTOUR
- RIVER
- LAKE

ELEVATION BANDS (m)

- < 915
- 915-1220
- 1220-1525
- 1525-1830
- > 1830

NOTES:

1. BASE MAP: CANADA DEM GEOBASE.
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:175,394 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	04NOV'13	ISSUED WITH REPORT	DMW	KK	RCS	KJB

NEW GOLD INC.

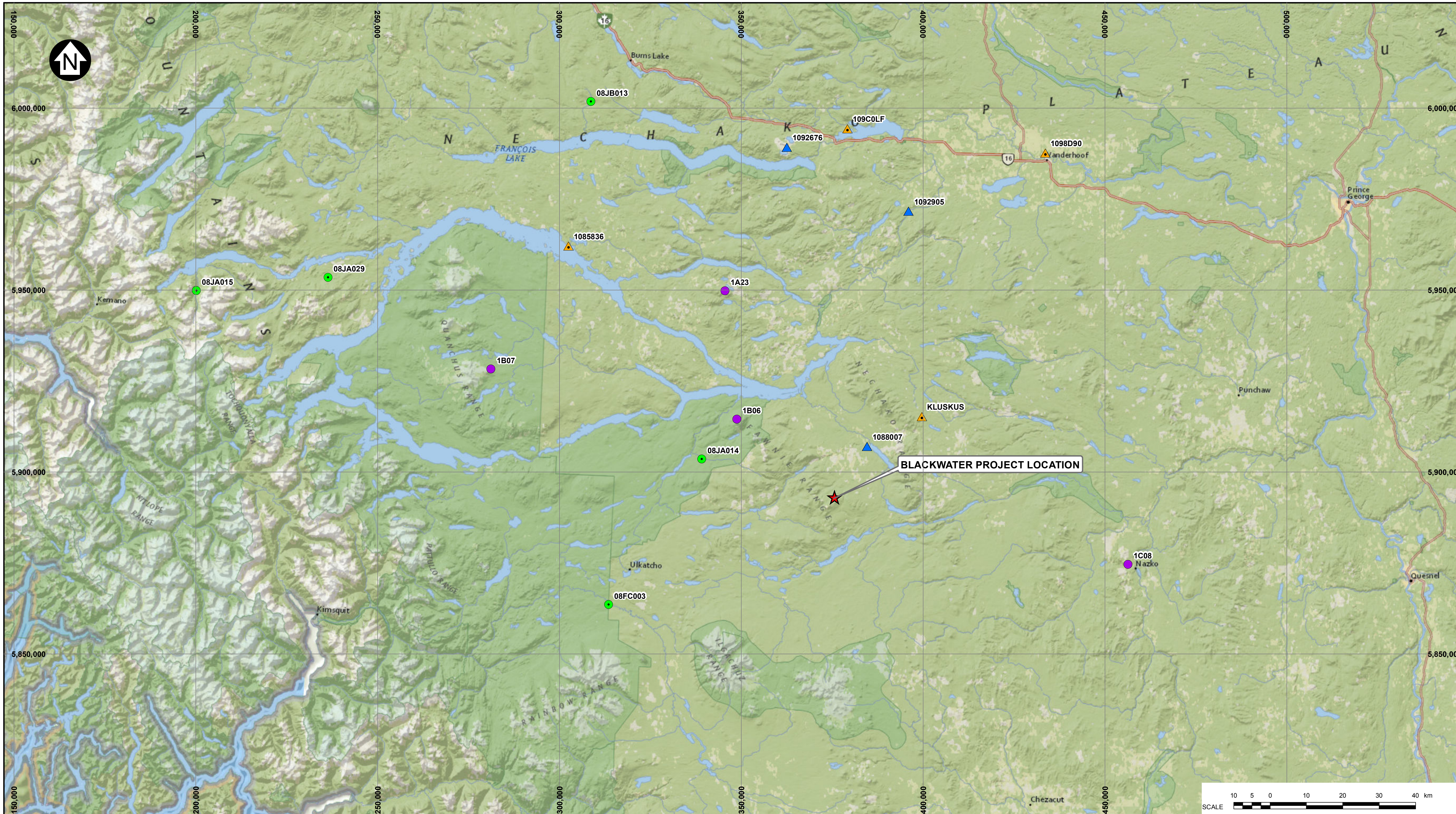
BLACKWATER GOLD PROJECT

PROJECT MONITORING STATIONS

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-457/6	12

FIGURE 2.1 REV 0



LEGEND:

- PROJECT LOCATION
- ACTIVE CLIMATE STATION
- INACTIVE CLIMATE STATION
- ACTIVE STREAMFLOW STATION
- SNOW COURSE STATION

NOTES:

1. BASE MAP: ESRI ARCGIS ONLINE MAP.
2. COORDINATE GRID IS IN METRES/DEGREES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:1,000,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	04NOV'13	ISSUED WITH REPORT	BW	KK	CMB	JGC

NEW GOLD INC.

BLACKWATER GOLD PROJECT

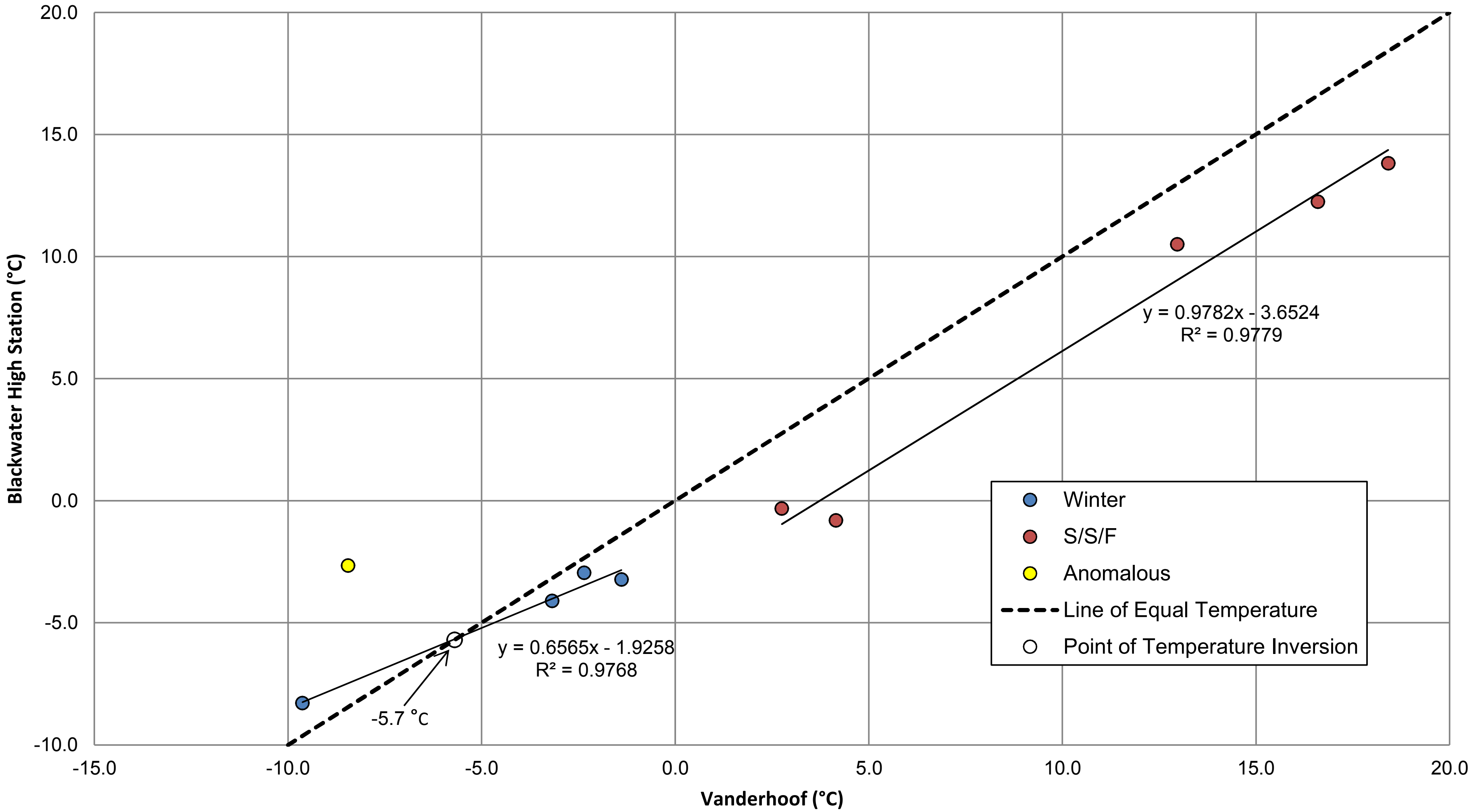
REGIONAL STREAMFLOW AND CLIMATE STATIONS

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-457/6	12

FIGURE 2.2 REV 0

SAVED: M:\1\01\00457\06\A\GIS\Figs\Report 12 - Hydromet\Figure 2.2_ RegionalStations.mxd; Nov 04, 2013 3:45 PM; kkrauszova



NOTES:
1. DURING VERY COLD CONDITIONS, TEMPERATURES ARE LIKELY LOWER AT VANDERHOOF THAN AT THE BLACKWATER HIGH STATION.

0	31OCT'13	ISSUED WITH REPORT VA13-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

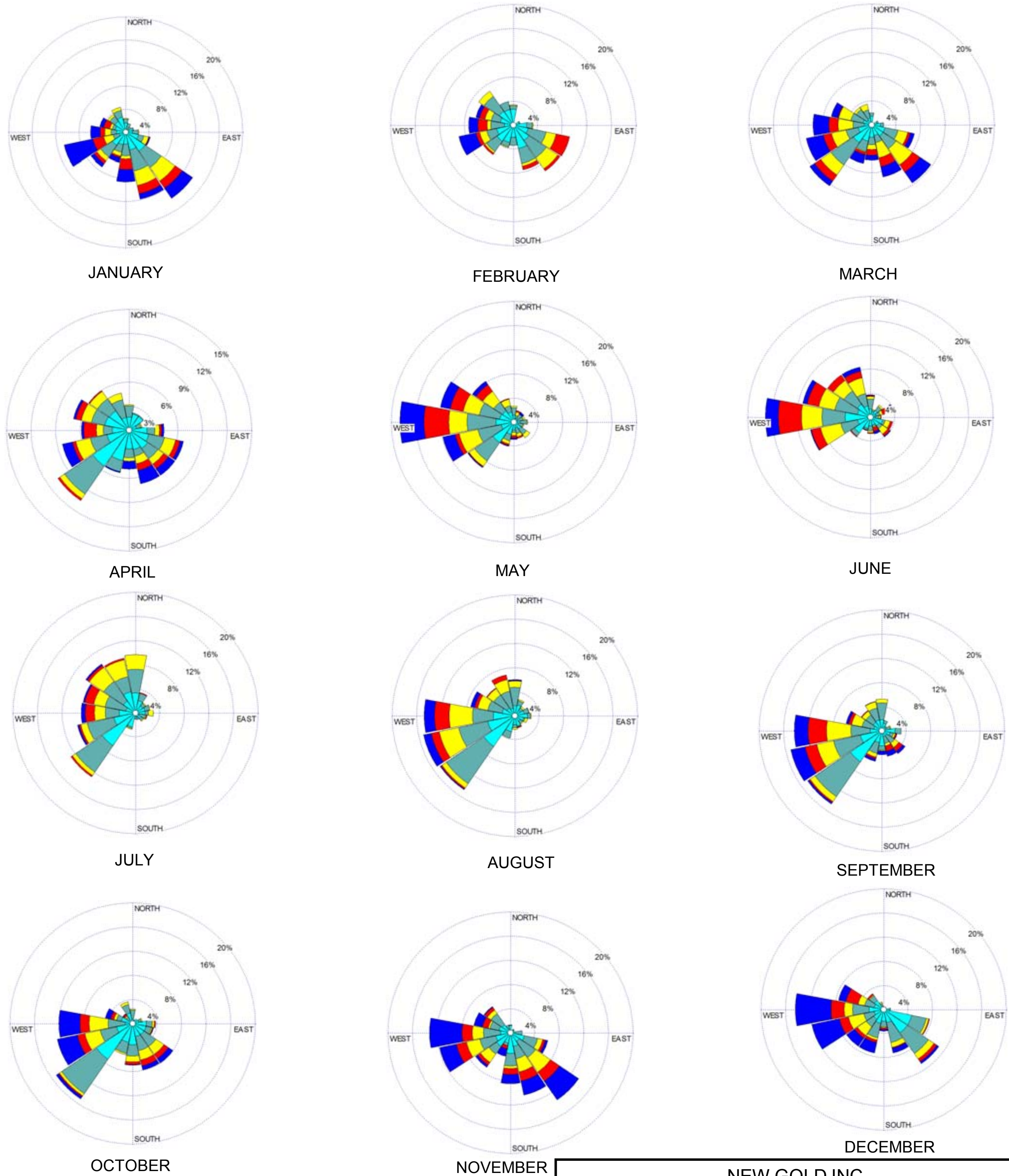
BLACKWATER GOLD PROJECT

TEMPERATURE REGRESSIONS

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-457/6	12

FIGURE 2.3 REV 0



NEW GOLD INC.

BLACKWATER GOLD PROJECT

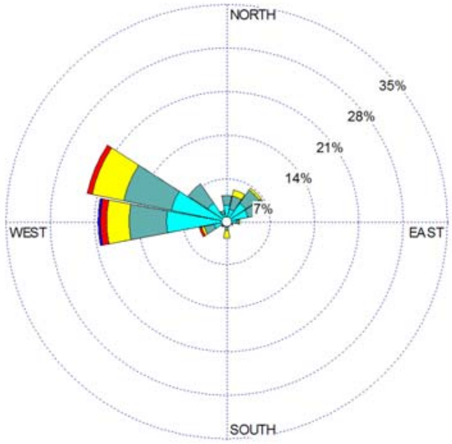
BLACKWATER LOW MONTHLY WIND ROSES

Knight Piésold CONSULTING

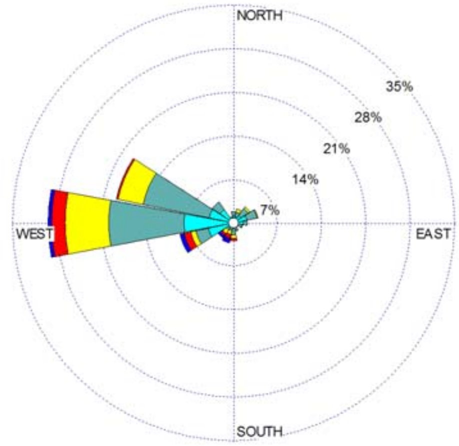
P/A NO.	REF. NO.
VA101-00457/6	12

FIGURE 2.4 REV 0

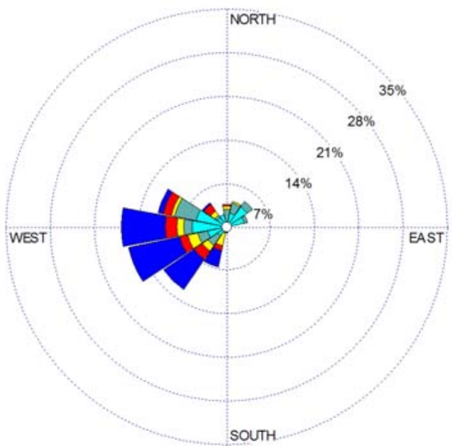
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	TO	CMB	JGC



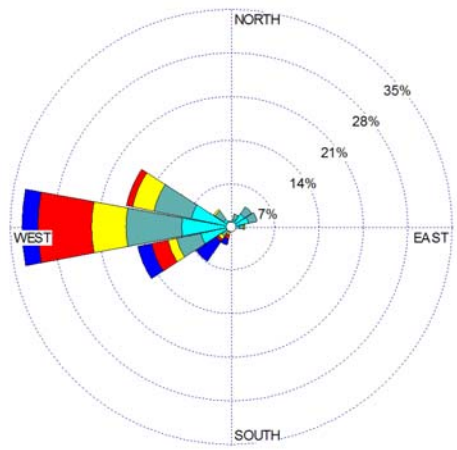
JULY



AUGUST



SEPTEMBER



OCTOBER

NEW GOLD INC.

BLACKWATER GOLD PROJECT

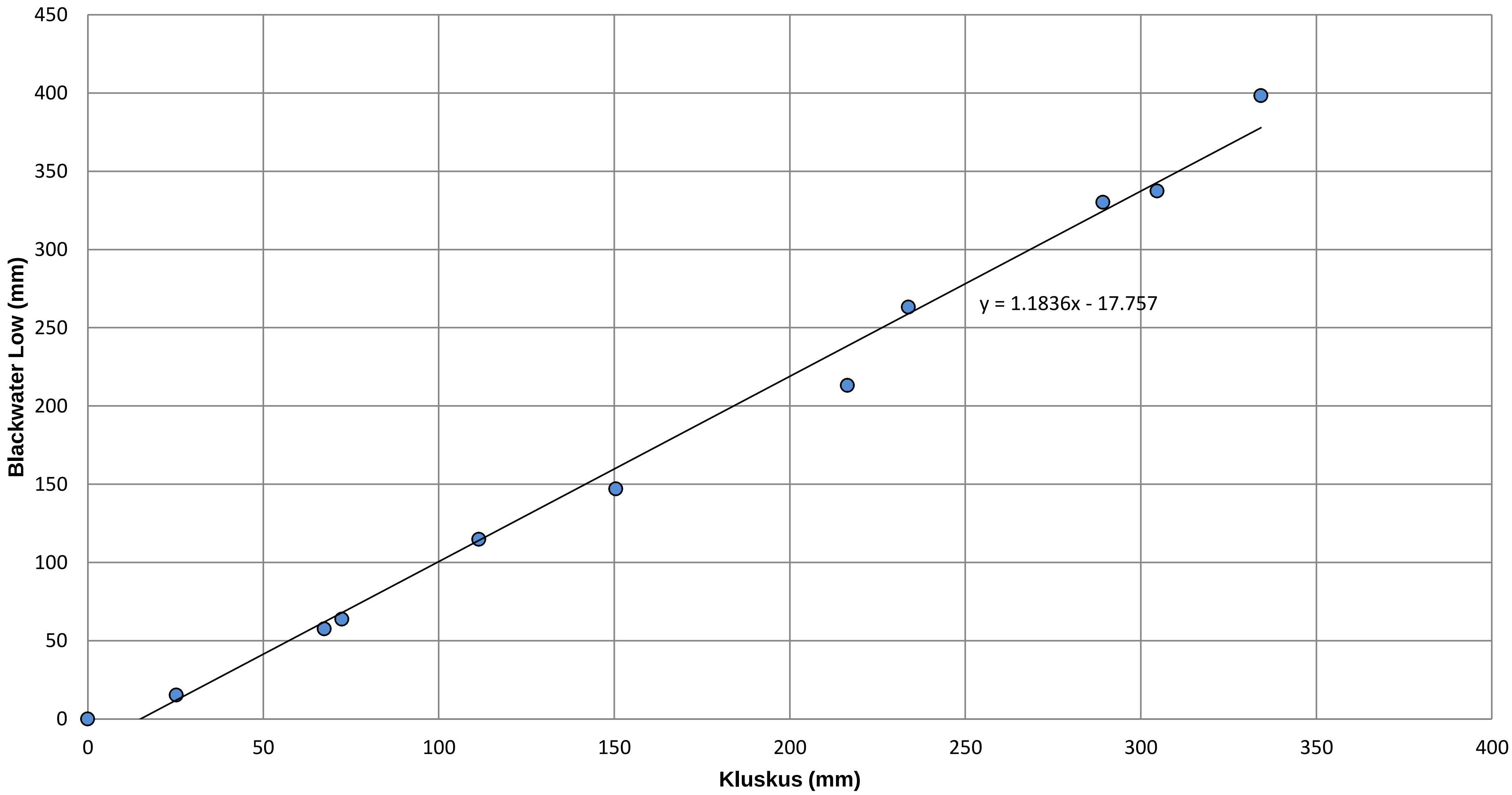
BLACKWATER HIGH MONTHLY WIND ROSES

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-0457/6	12

FIGURE 2.5 REV 0

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	TO	CMB	JGC



NOTES:
1. NO WINTER MONTHS ARE INCLUDED IN THE ANALYSIS.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC

NEW GOLD INC.

BLACKWATER GOLD PROJECT

KLUSKUS VS. BLACKWATER LOW DOUBLE MASS CURVE

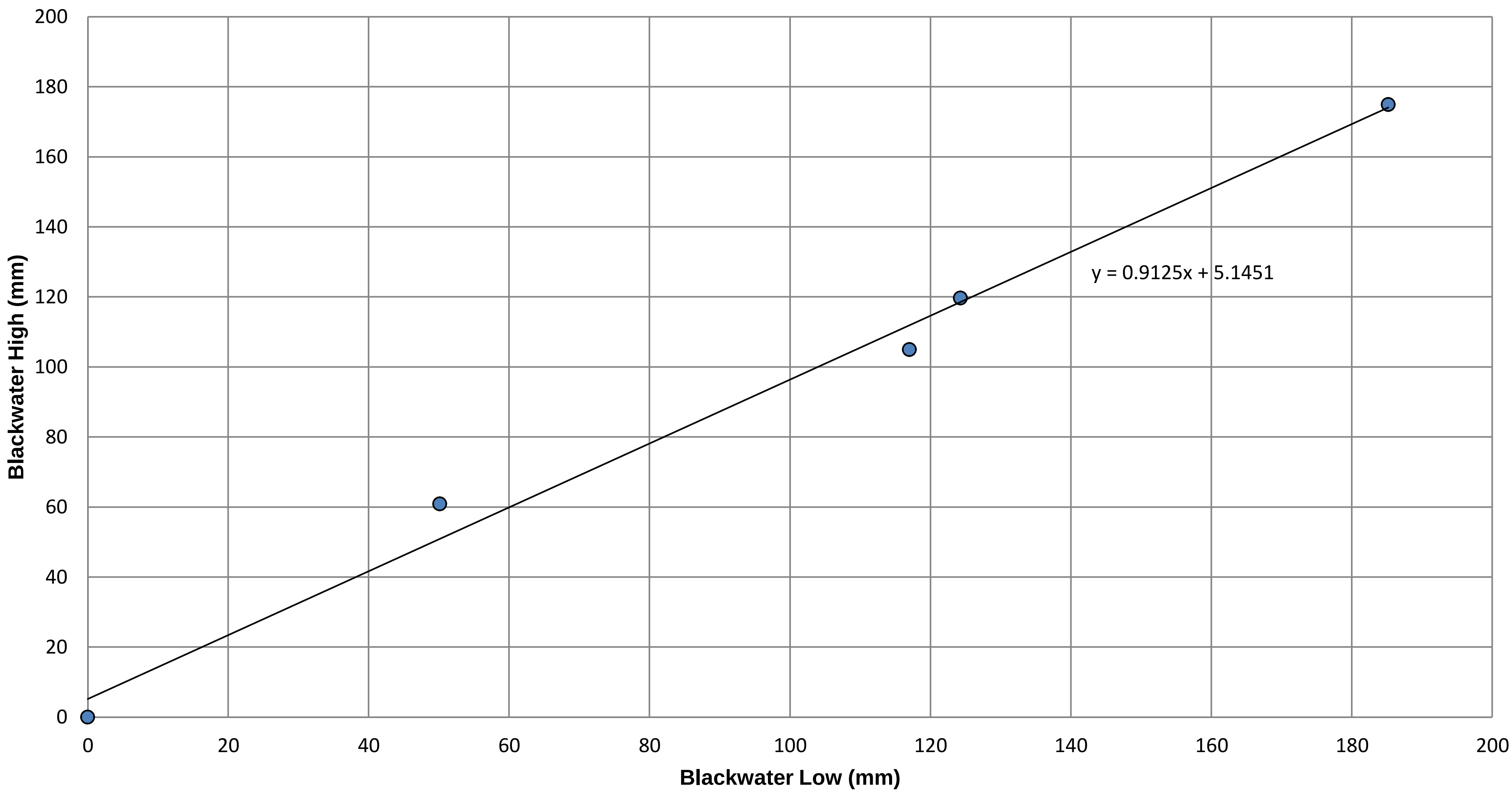
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 2.6

REV 0



NOTES:
1. NO WINTER MONTHS ARE NCLUDED IN THE ANALYSIS.

0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

BLACKWATER LOW VS. BLACKWATER HIGH DOUBLE MASS CURVE

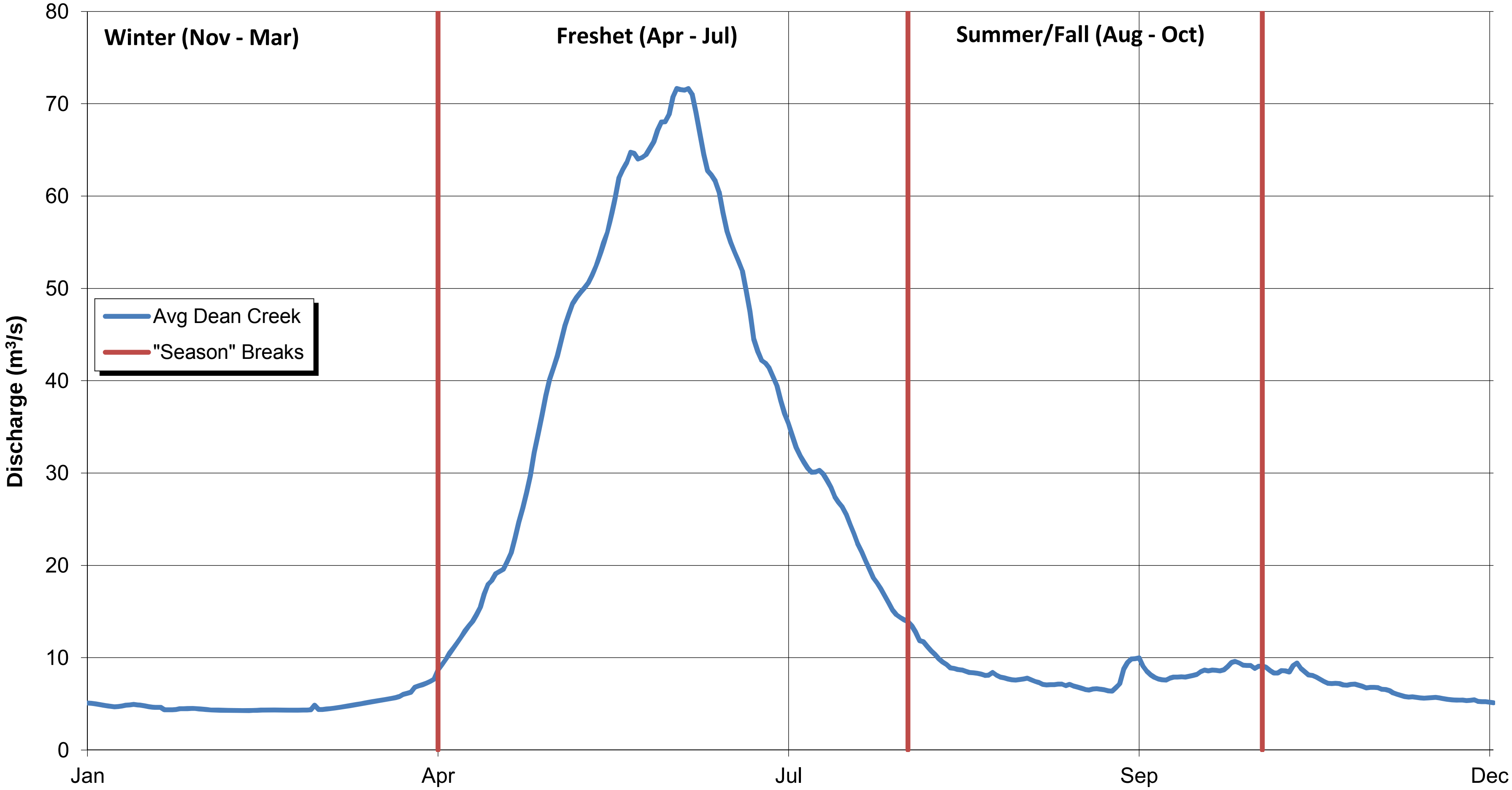
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 2.7

REV 0



0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

AVERAGE DEAN RIVER FLOW

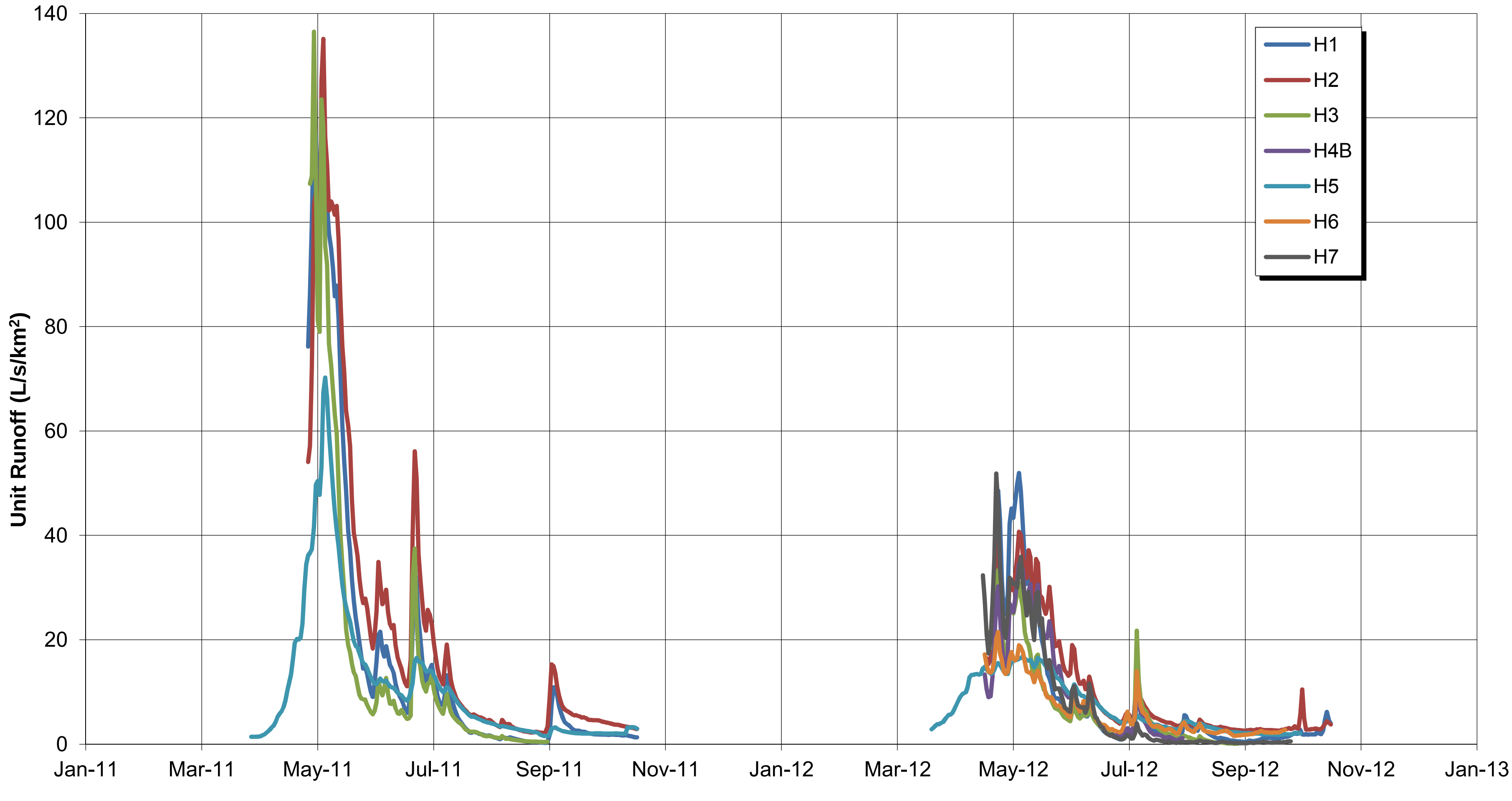
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 3.1

REV 0



0	31OCT'12	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

COMPARISON OF PROJECT STATION AVERAGE UNIT DISCHARGE HYDROGRAPHS

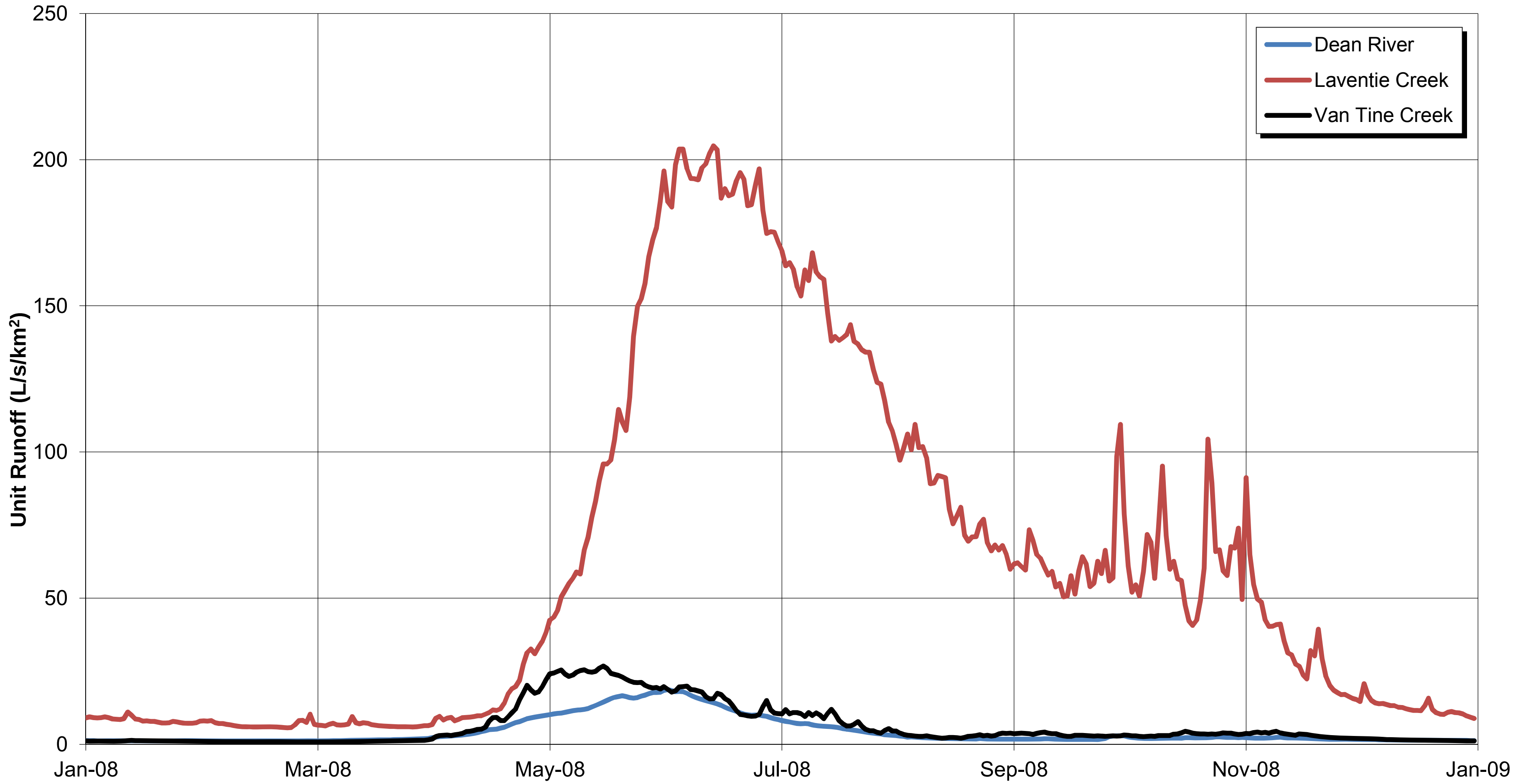
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 3.2a

REV 0



NOTES:
1. DEAN RIVER WAS CHOSEN AS THE LONG TERM REGIONAL SITE.
2. VAN TINE CREEK DOES NOT HAVE CONCURRENT DATA.
3. LEVENTIE CREEK HAS A UNIT RUNOFF THAT IS FAR TOO HIGH FOR THE PROJECT AREA.

0	31OCT'12	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

COMPARISON OF REGIONAL AVERAGE UNIT DISCHARGE HYDROGRAPHS

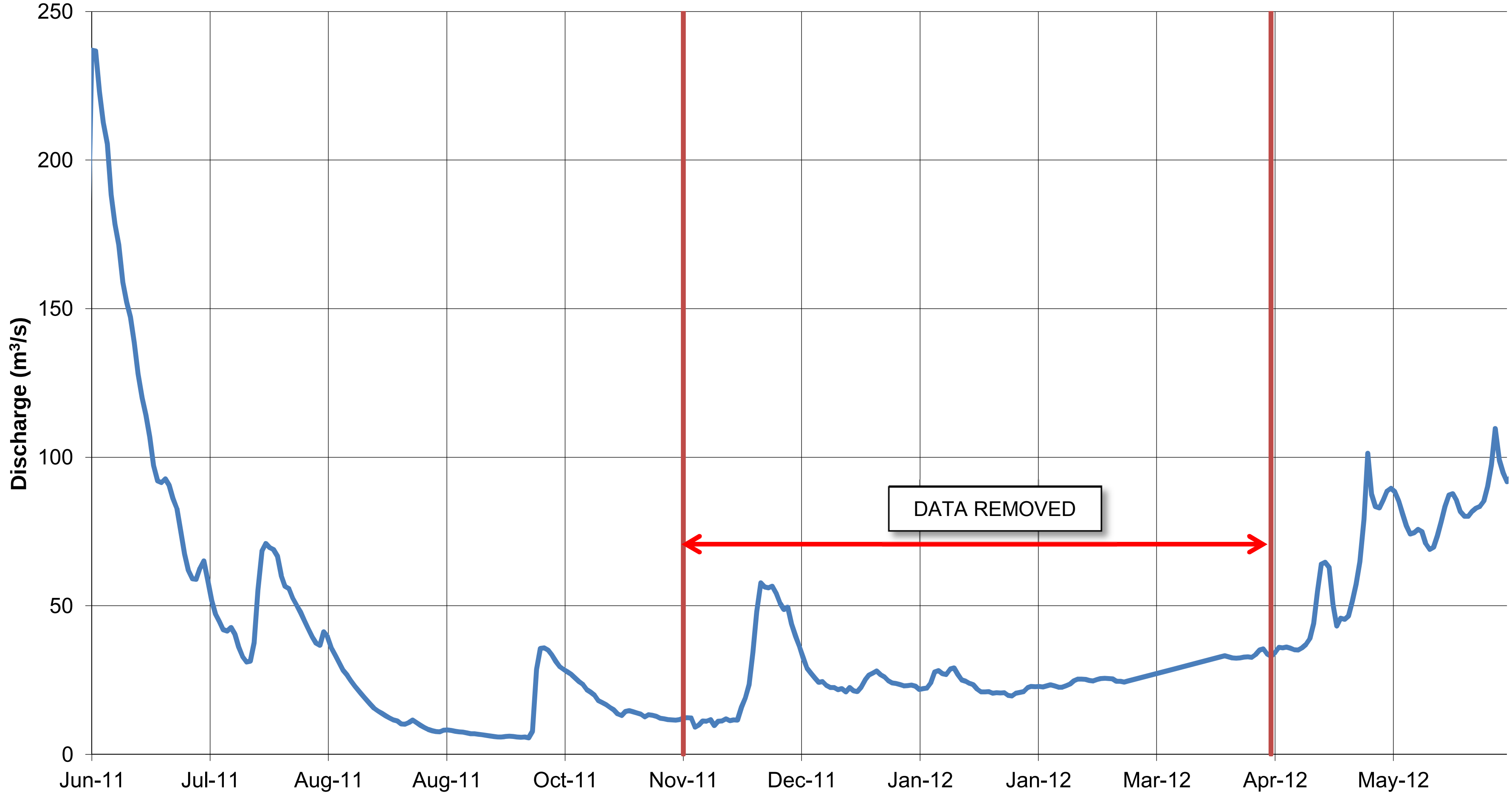
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 3.2b

REV 0



NOTES:
1. DATA WAS REMOVED FROM NOVEMBER 1, 2011 TO APRIL 1, 2012 DUE TO ICE EFFECTS.
2. DATA WAS MARKED AS PROVISIONAL BY WSC.

NEW GOLD INC.

BLACKWATER GOLD PROJECT

DEAN RIVER RAW DAILY DATA 2011/2012

Knight Piésold CONSULTING

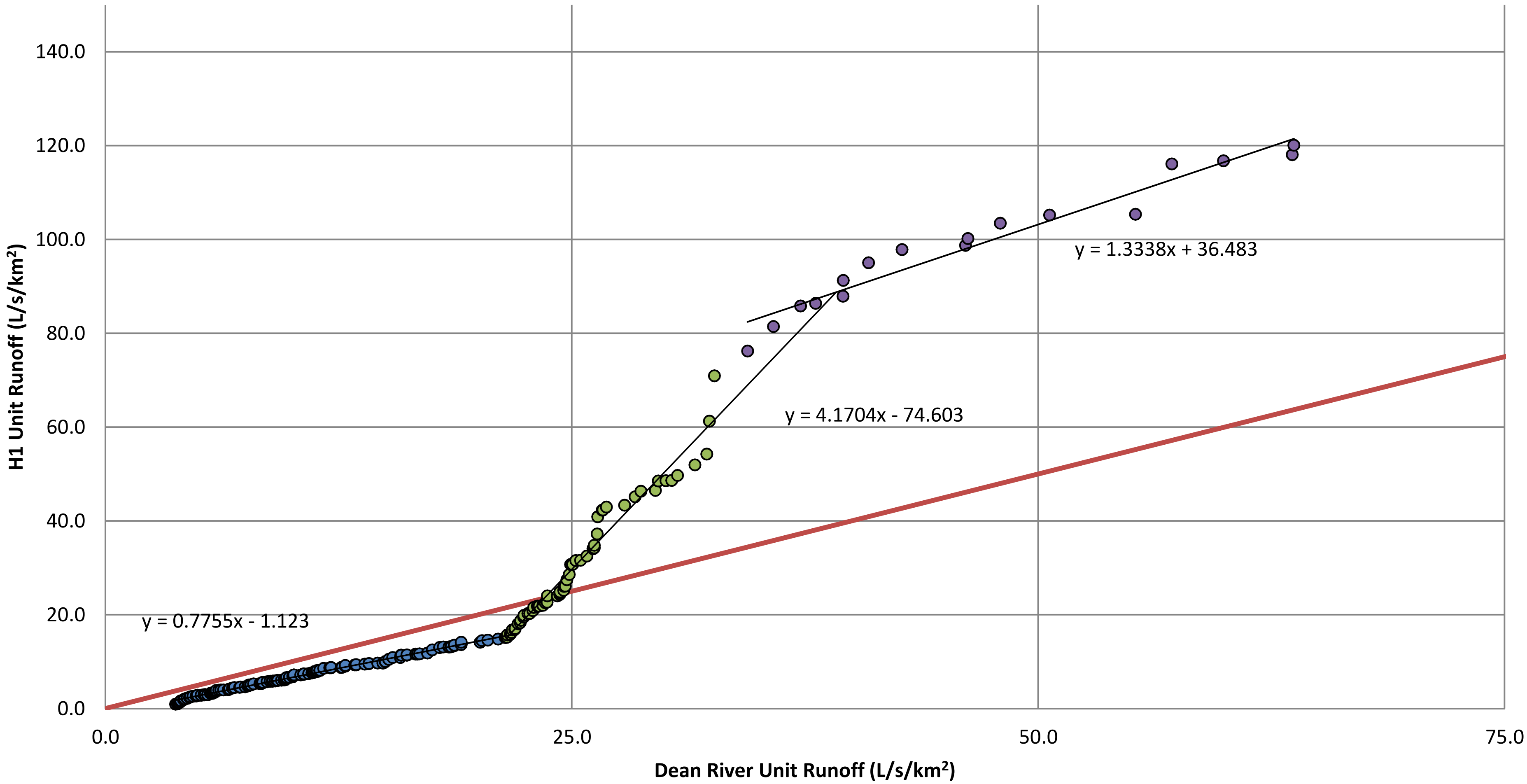
P/A NO. VA101-457/6

REF. NO. 12

FIGURE 3.3

REV 0

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC



NEW GOLD INC.

BLACKWATER GOLD PROJECT

H1
FRESHET FREQUENCY PAIRING

Knight Piésold CONSULTING

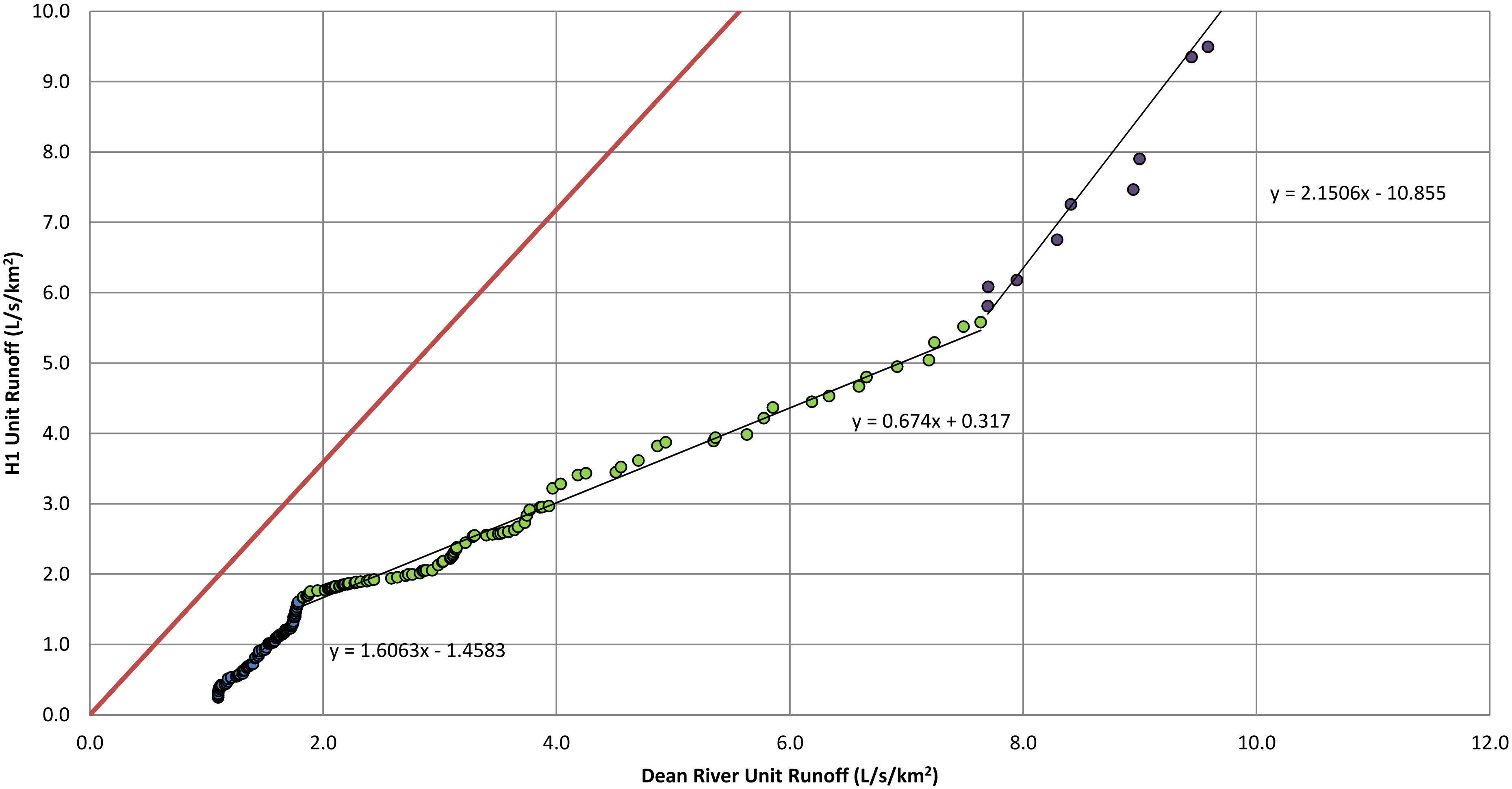
0	31OCT'31	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 3.4

REV 0



0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

H1
SUMMER/FALL FREQUENCY PAIRING

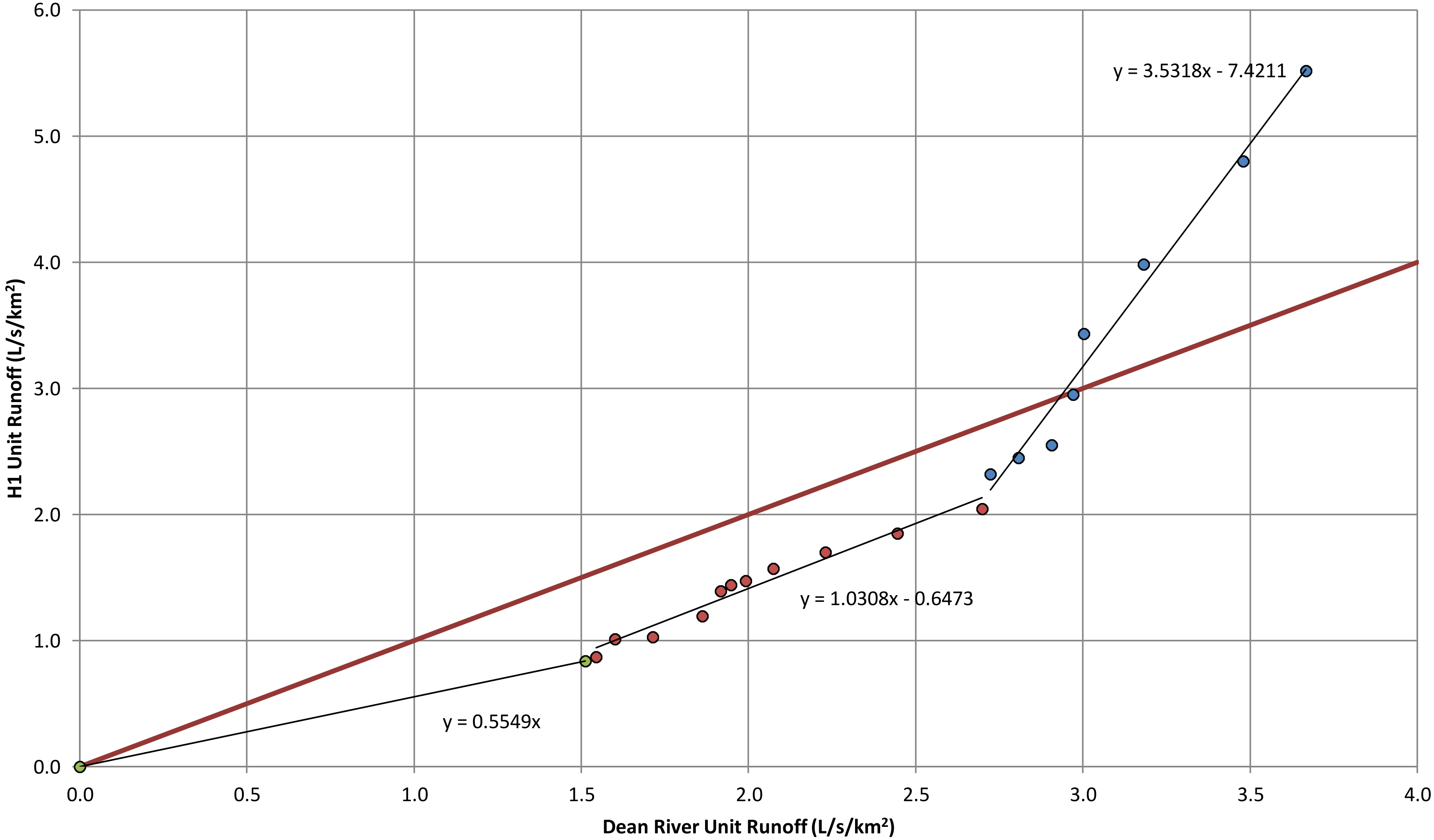
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 3.5

REV 0



NOTES:

1. THESE RELATIONS WERE DEVELOPED THROUGH FREQUENCY PAIRING OF SUMMER LOW FLOW DATA, BUT ARE ALSO CONSIDERED APPLICABLE FOR WINTER LOW FLOW CONDITIONS.

NEW GOLD INC.

BLACKWATER GOLD PROJECT

H1
SUMMER LOW FLOW FREQUENCY PAIRING

Knight Piésold CONSULTING

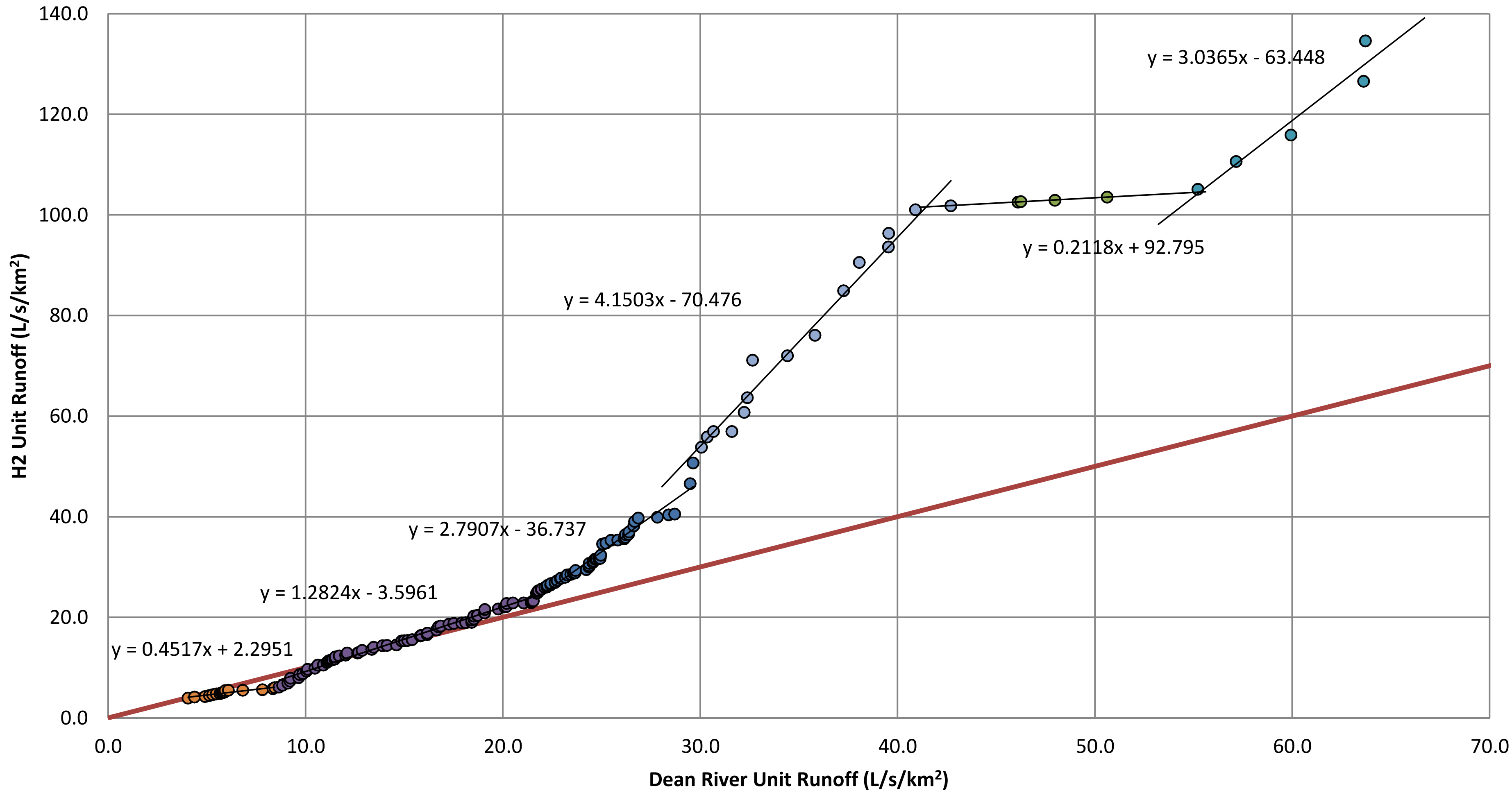
P/A NO. VA101-457/6

REF. NO. 12

FIGURE 3.6

REV 0

0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

H2
FRESHET FREQUENCY PAIRING

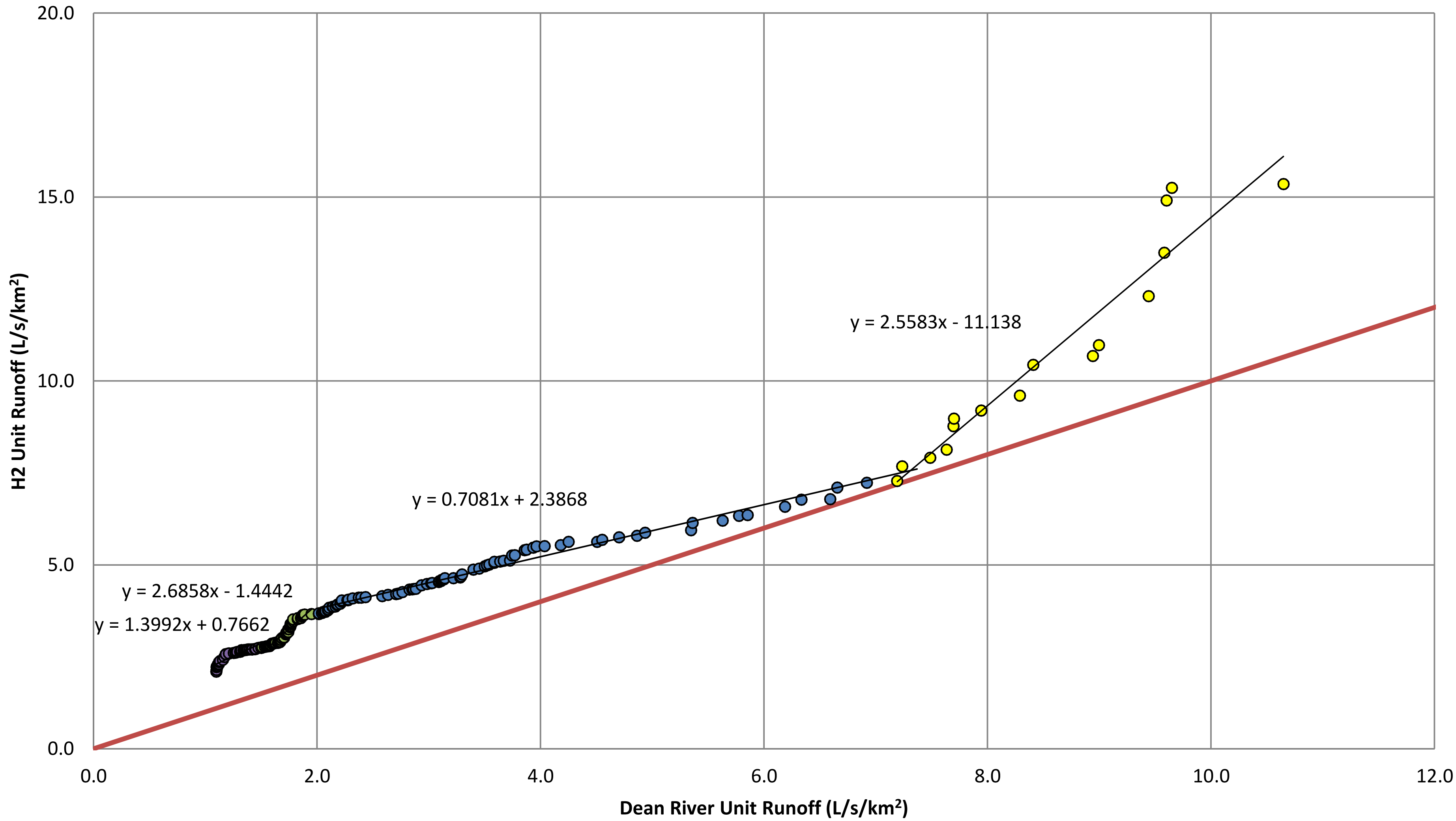
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

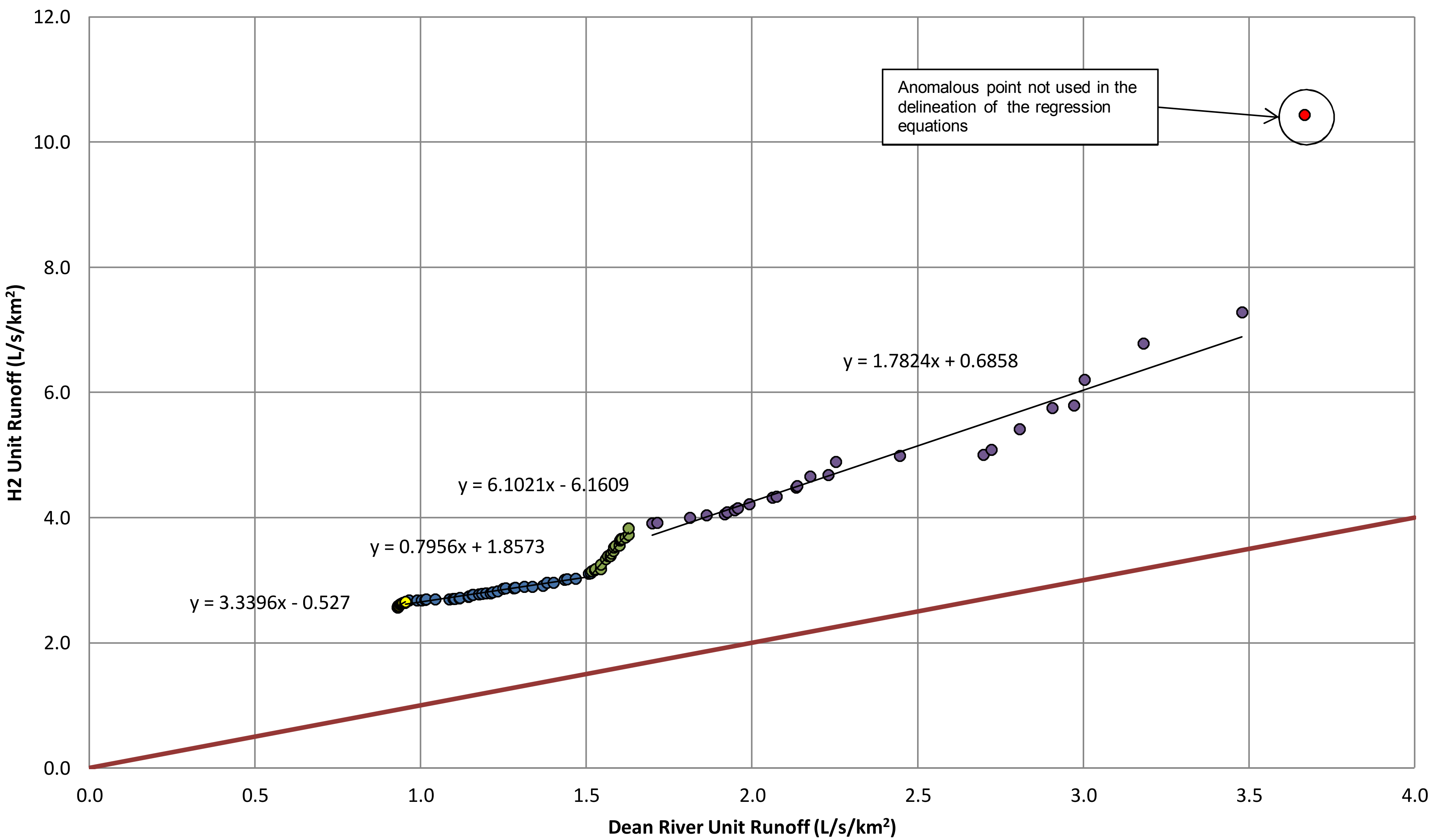
FIGURE 3.7

REV 0



NEW GOLD INC.		
BLACKWATER GOLD PROJECT		
H2 **SUMMER/FALL FREQUENCY PAIRING**		
Knight Piésold CONSULTING	P/A NO. VA101-457/6	REF. NO. 12
	FIGURE 3.8	REV 0

0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



NOTES:

1. THESE RELATIONS WERE DEVELOPED THROUGH FREQUENCY PAIRING OF SUMMER LOW FLOW DATA, BUT ARE ALSO CONSIDERED APPLICABLE FOR WINTER LOW FLOW CONDITIONS.

NEW GOLD INC.

BLACKWATER GOLD PROJECT

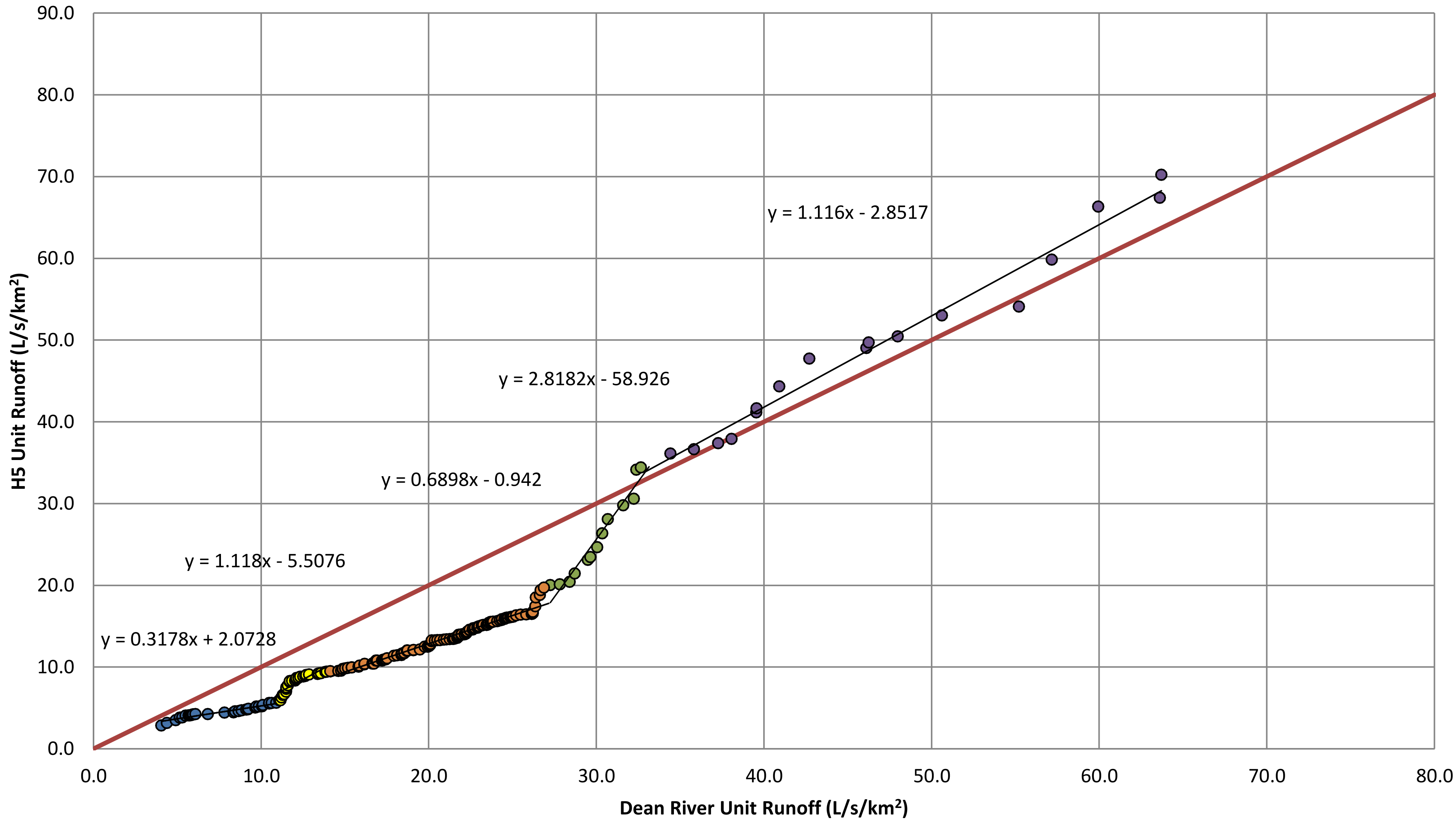
H2
SUMMER LOW FLOW FREQUENCY PAIRING

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-457/6	12

FIGURE 3.9 REV 0

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC



0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

H5
FRESHET FREQUENCY PAIRING

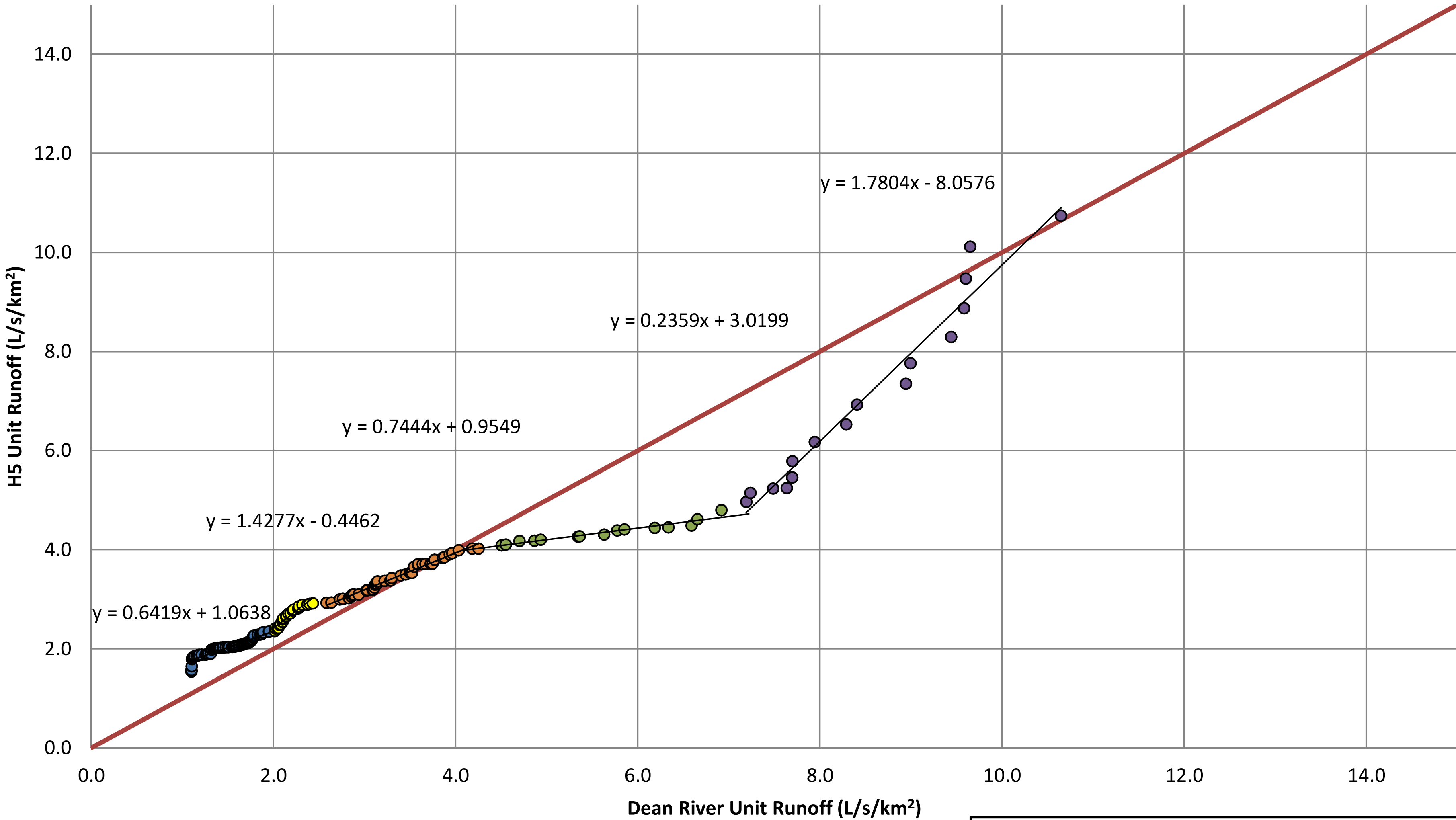
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 3.10

REV 0



NEW GOLD INC.

BLACKWATER GOLD PROJECT

H5
SUMMER/FALL FREQUENCY PAIRING

Knight Piésold CONSULTING

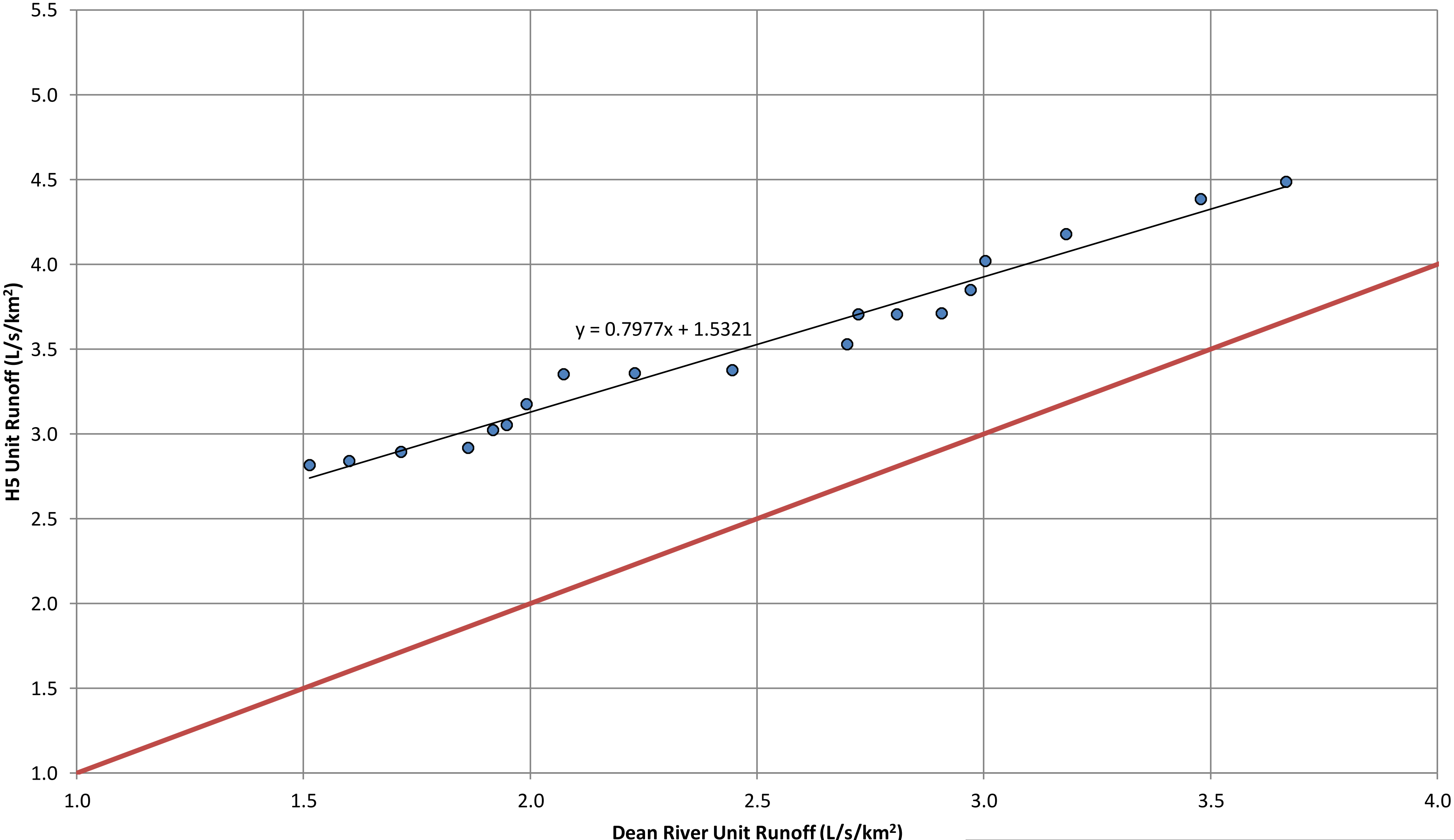
P/A NO. VA101-457/6

REF. NO. 12

FIGURE 3.11

REV 0

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC



NOTES:

1. THESE RELATIONS WERE DEVELOPED THROUGH FREQUENCY PAIRING OF SUMMER LOW FLOW DATA, BUT ARE ALSO CONSIDERED APPLICABLE FOR WINTER LOW FLOW CONDITIONS.

NEW GOLD INC.

BLACKWATER GOLD PROJECT

H5
SUMMER LOW FLOW FREQUENCY PAIRING

Knight Piésold CONSULTING

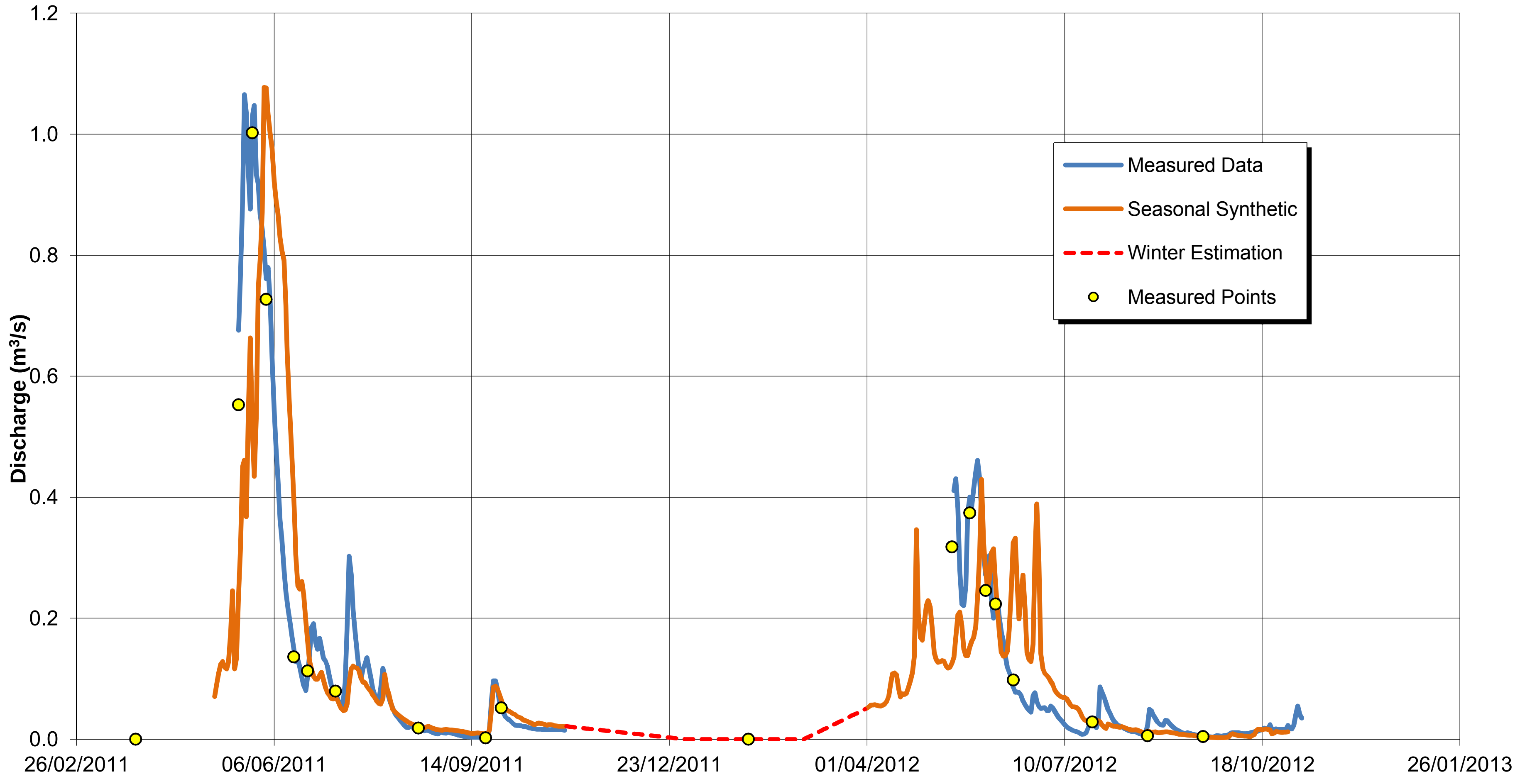
P/A NO. VA101-457/6

REF. NO. 12

FIGURE 3.12

REV 0

0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



NOTES:
1. WINTER FLOWS ESTIMATED BASED ON OBSERVED ZERO FLOW IN FEBRUARY AND LINEAR INTERPOLATION
2. THE LAG IN THE MODELLED FRESHET PEAK FLOWS IS DUE TO THE DIFFERENCE IN THE RUNOFF TIMING BETWEEN THE SITE STREAM AND THE MUCH LARDER REGIONAL MODEL STREAM.

0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

H1
SYNTHETIC VS. MEASURED DISCHARGE

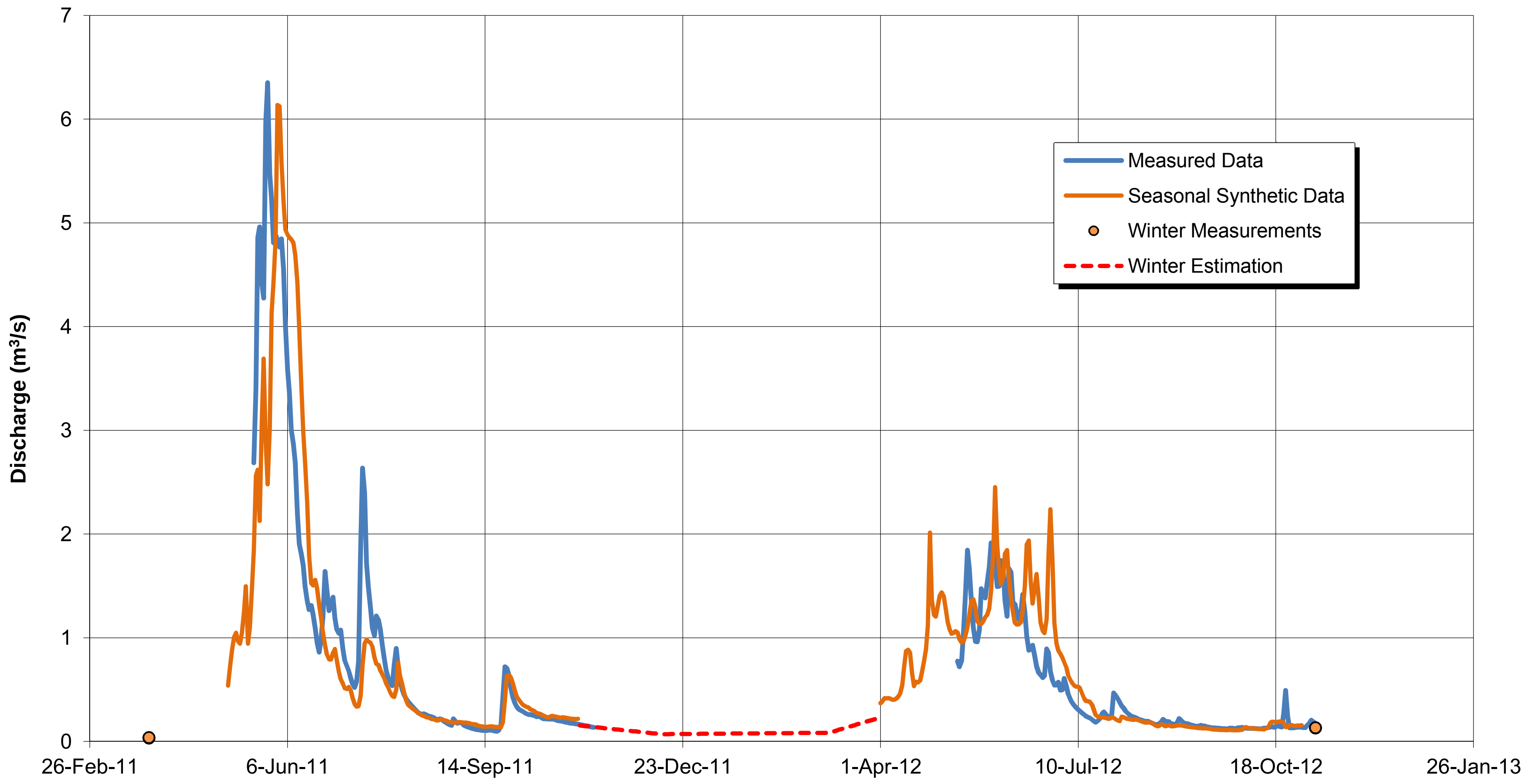
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 3.13

REV 0



NOTES:
1. WINTER ESTIMATION IS CALCULATED BY PRO-RATING H5 ESTIMATION
2. BASED ON PHOTOS IN NOV AND DEC, 2011 IT IS ASSUMED THAT FLOW IS PRESENT THROUGH THE WINTER
3. THE LAG IN THE MODELLED FRESHET PEAK FLOWS IS DUE TO THE DIFFERENCE IN THE RUNOFF TIMING BETWEEN THE SITE STREAM AND THE MUCH LARDER REGIONAL MODEL STREAM.

0	31DEC'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

H2
SYNTHETIC VS. MEASURED DISCHARGE

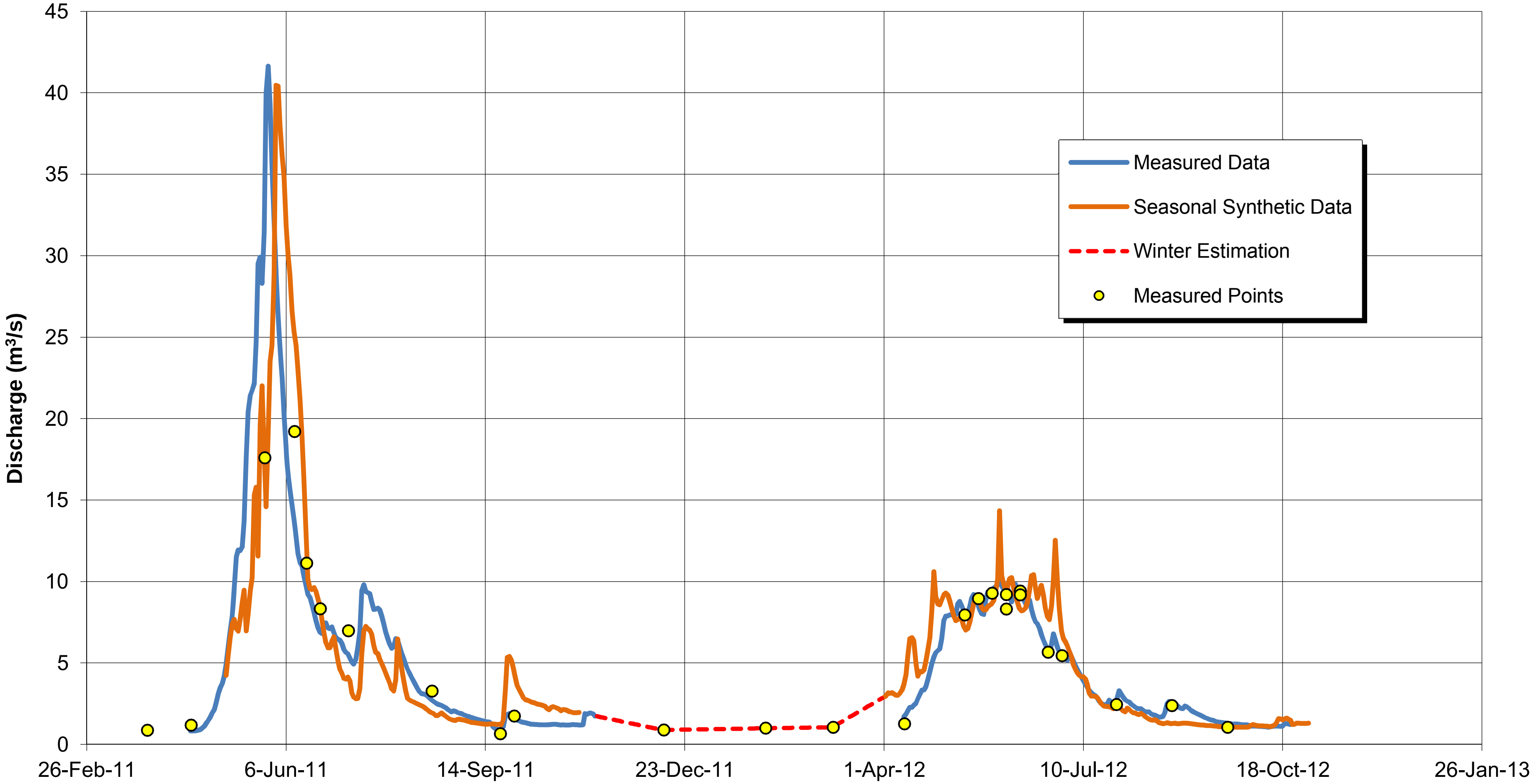
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 3.14

REV 0



NOTES:
1. WINTER FLOWS ESTIMATED BY LINEARLY INTERPOLATING BETWEEN MEASURED VALUES
2. THE LAG IN THE MODELLED FRESHET PEAK FLOWS IS DUE TO THE DIFFERENCE IN THE RUNOFF TIMING BETWEEN THE SITE STREAM AND THE MUCH LARDER REGIONAL MODEL STREAM.

NEW GOLD INC.

BLACKWATER GOLD PROJECT

H5
SYNTHETIC VS. MEASURED DISCHARGE

Knight Piésold CONSULTING

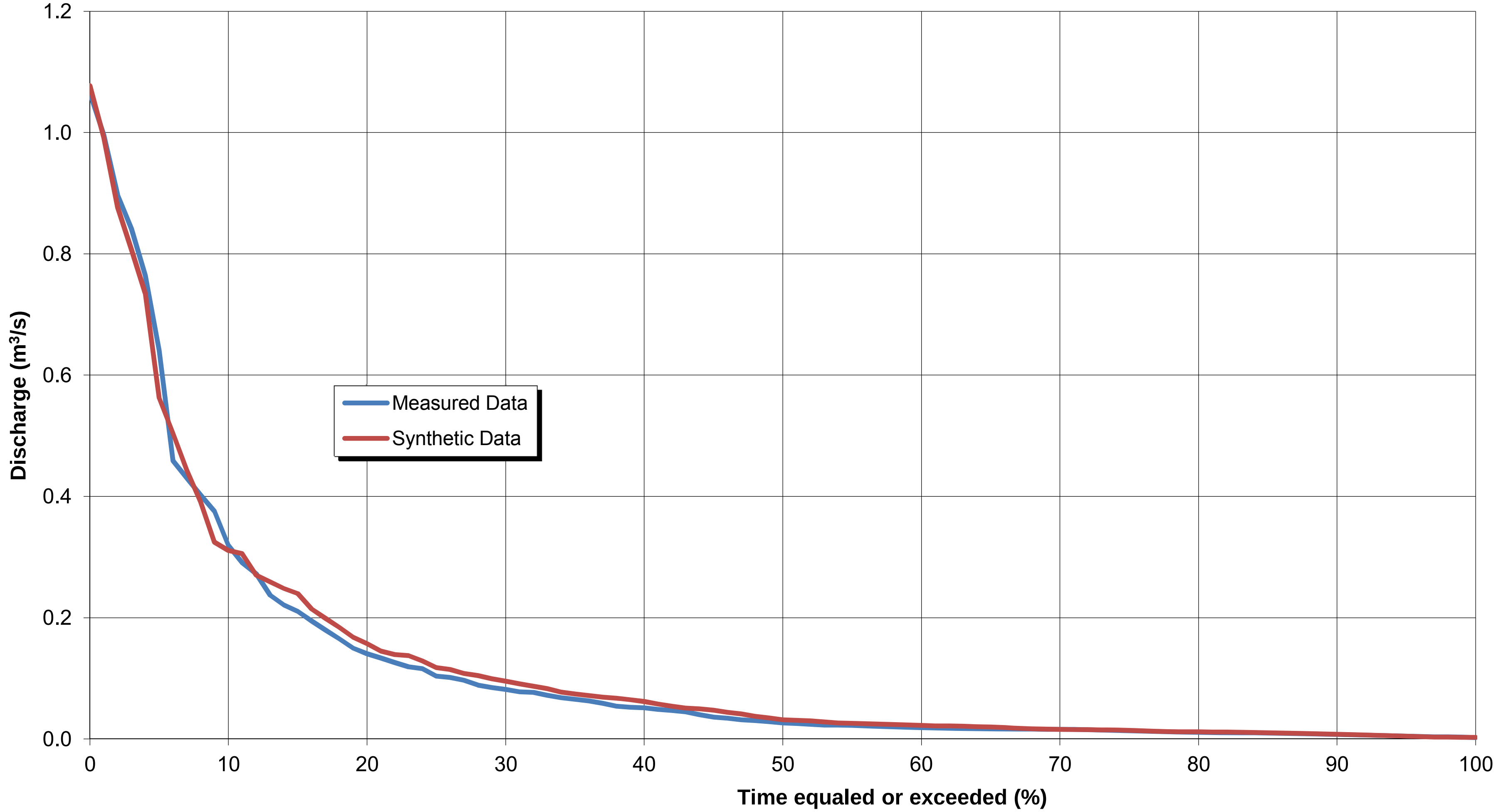
P/A NO. VA101-457/6

REF. NO. 12

FIGURE 3.15

REV 0

0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



NEW GOLD INC.

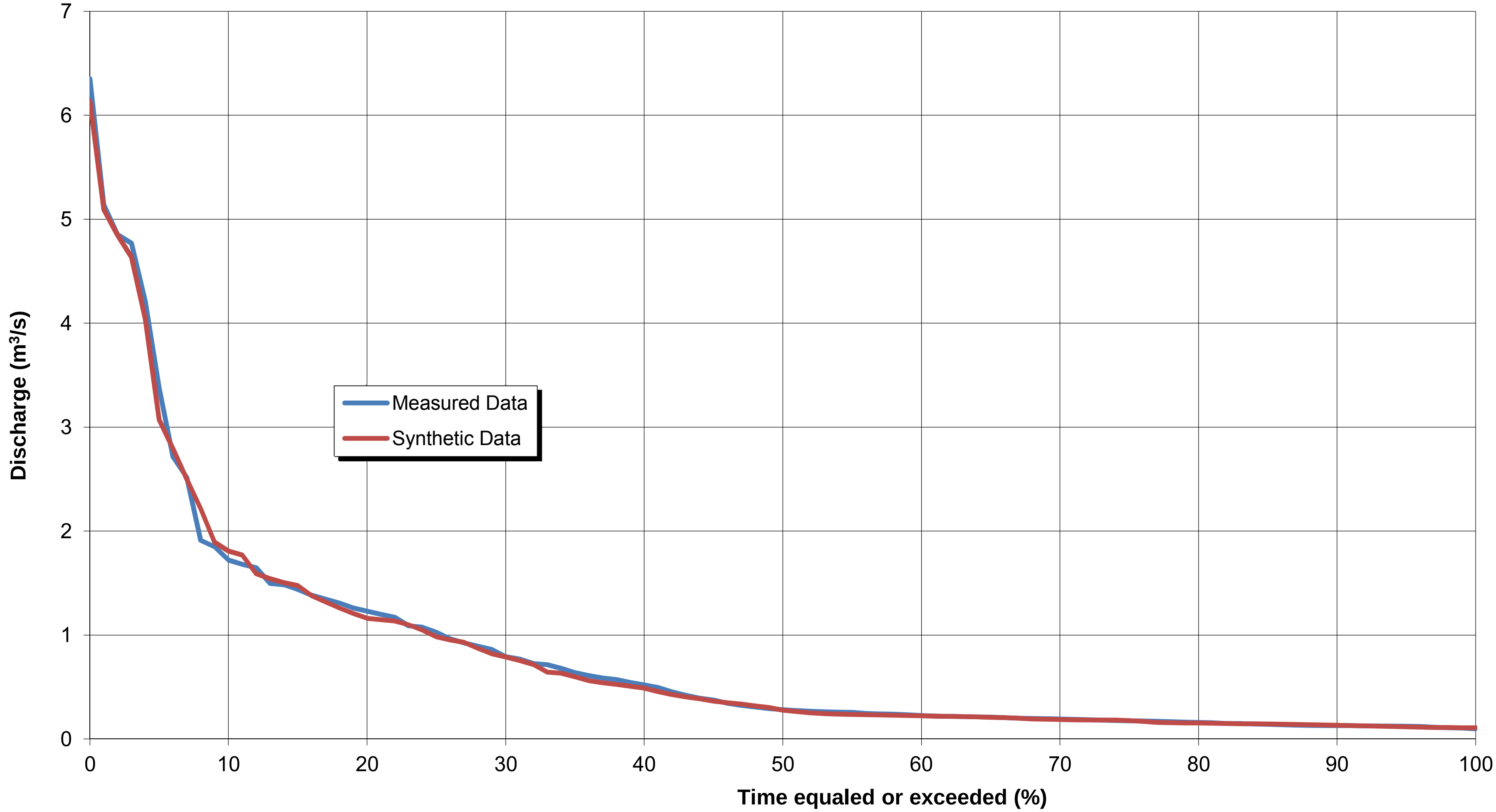
BLACKWATER GOLD PROJECT

H1
SYNTHETIC VS. MEASURED FLOW DURATION CURVES

Knight Piésold CONSULTING

P/A NO.	REF. NO.	
VA101-457/6	12	
FIGURE 3.16		REV 0

0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



NEW GOLD INC.

BLACKWATER GOLD PROJECT

H2

SYNTHETIC VS. MEASURED FLOW DURATION CURVES

Knight Piésold CONSULTING

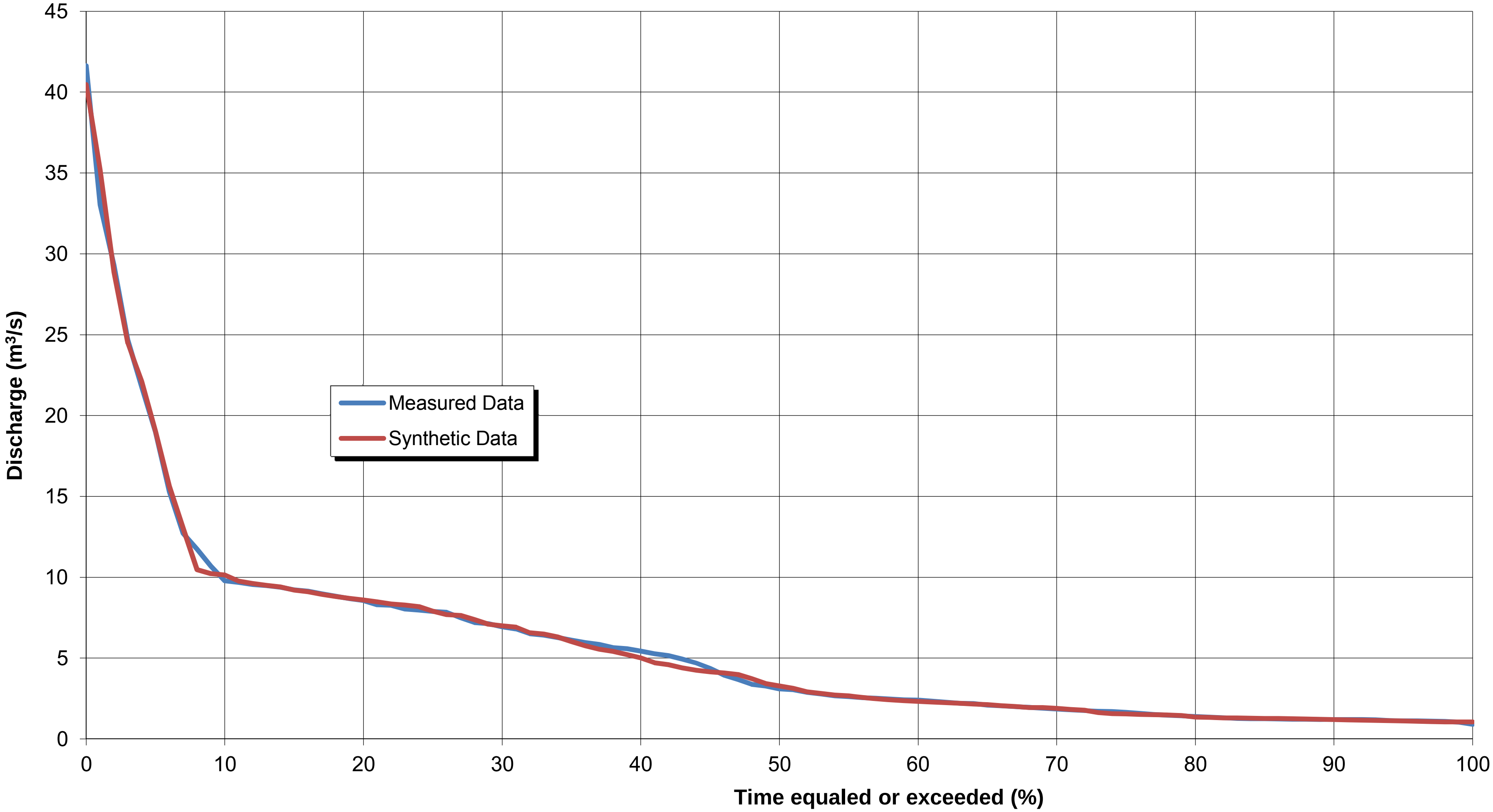
P/A NO. VA101-457/6

REF. NO. 12

FIGURE 3.17

REV 0

0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

H5
SYNTHETIC VS. MEASURED FLOW DURATION CURVES

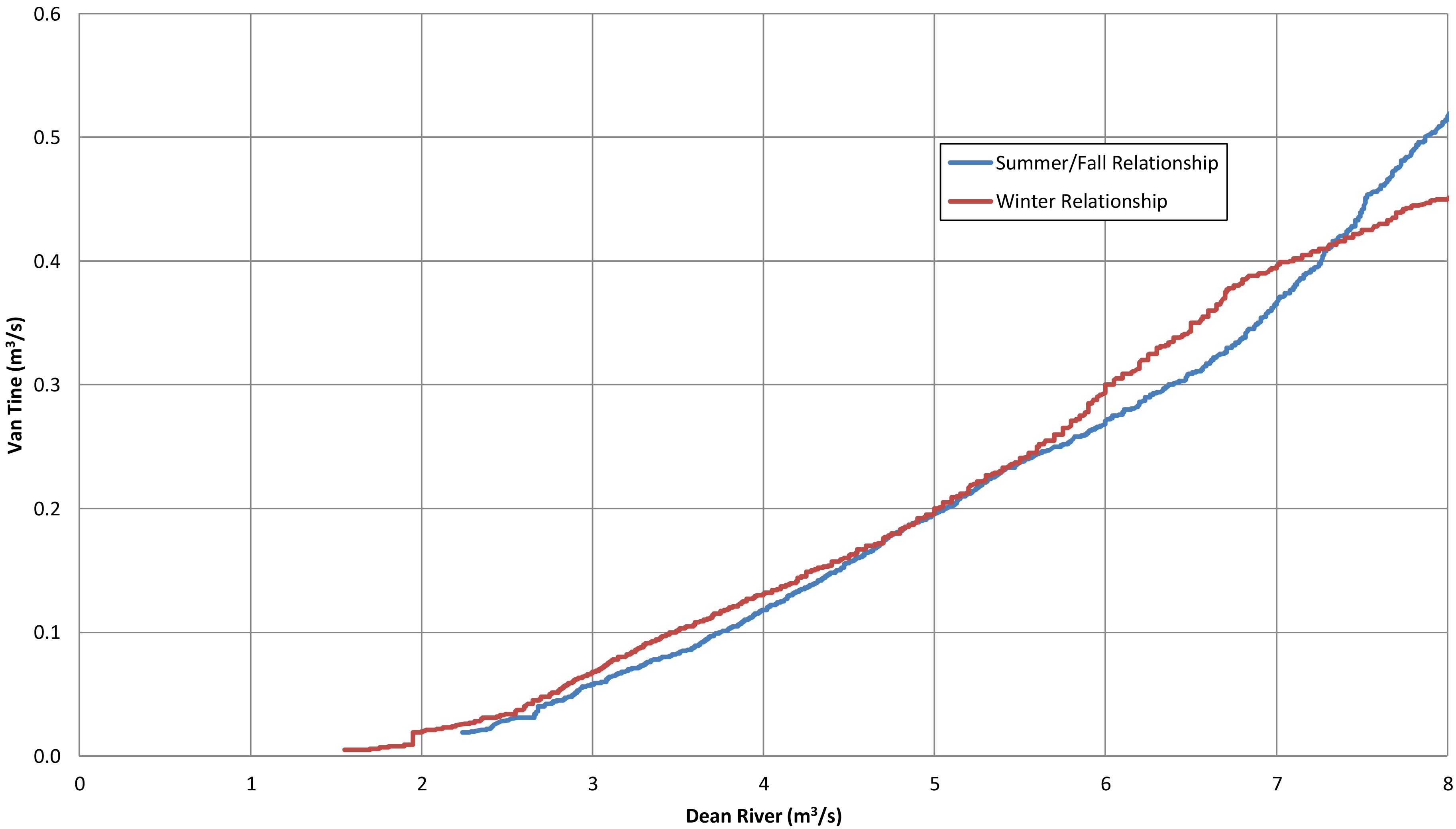
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 3.18

REV 0



NOTES:

1. THIS ANALYSIS SUGGESTS THAT, AT LOW FLOWS, THE RELATIONSHIP BETWEEN VAN TINE AND DEAN CREEK IN THE SUMMER IS SIMILAR TO THE RELATIONSHIP IN THE WINTER.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC

NEW GOLD INC.

BLACKWATER GOLD PROJECT

VAN TINE CREEK AND DEAN RIVER WINTER AND SUMMER/FALL FLOW RELATIONS

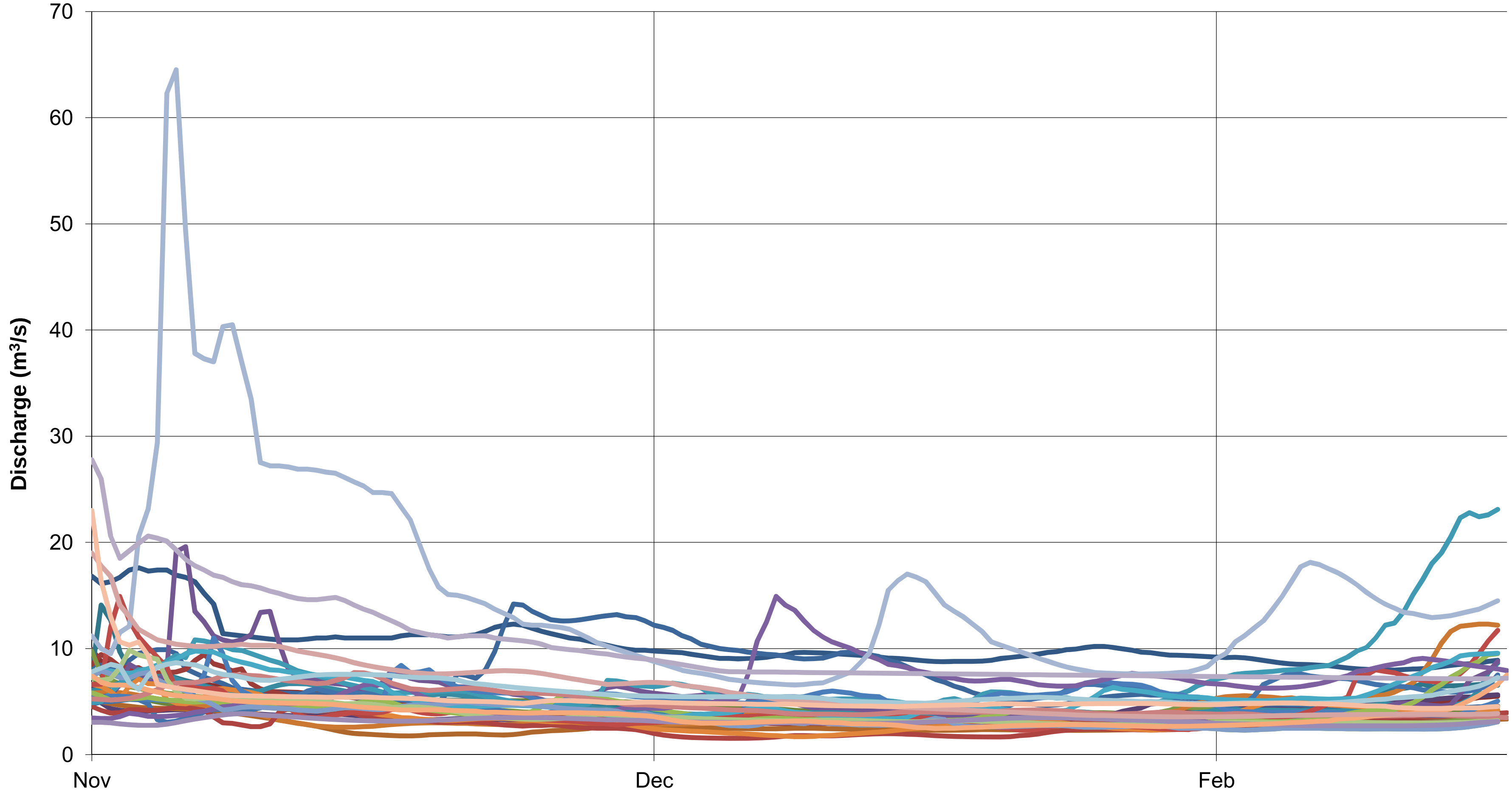
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 3.19

REV 0



NOTES:
1. VERY HIGH WINTER FLOW OCCURS IN 2004/2005

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC

NEW GOLD INC.

BLACKWATER GOLD PROJECT

COMPARISON OF DEAN RIVER YEARLY WINTER FLOWS (1973-2010)

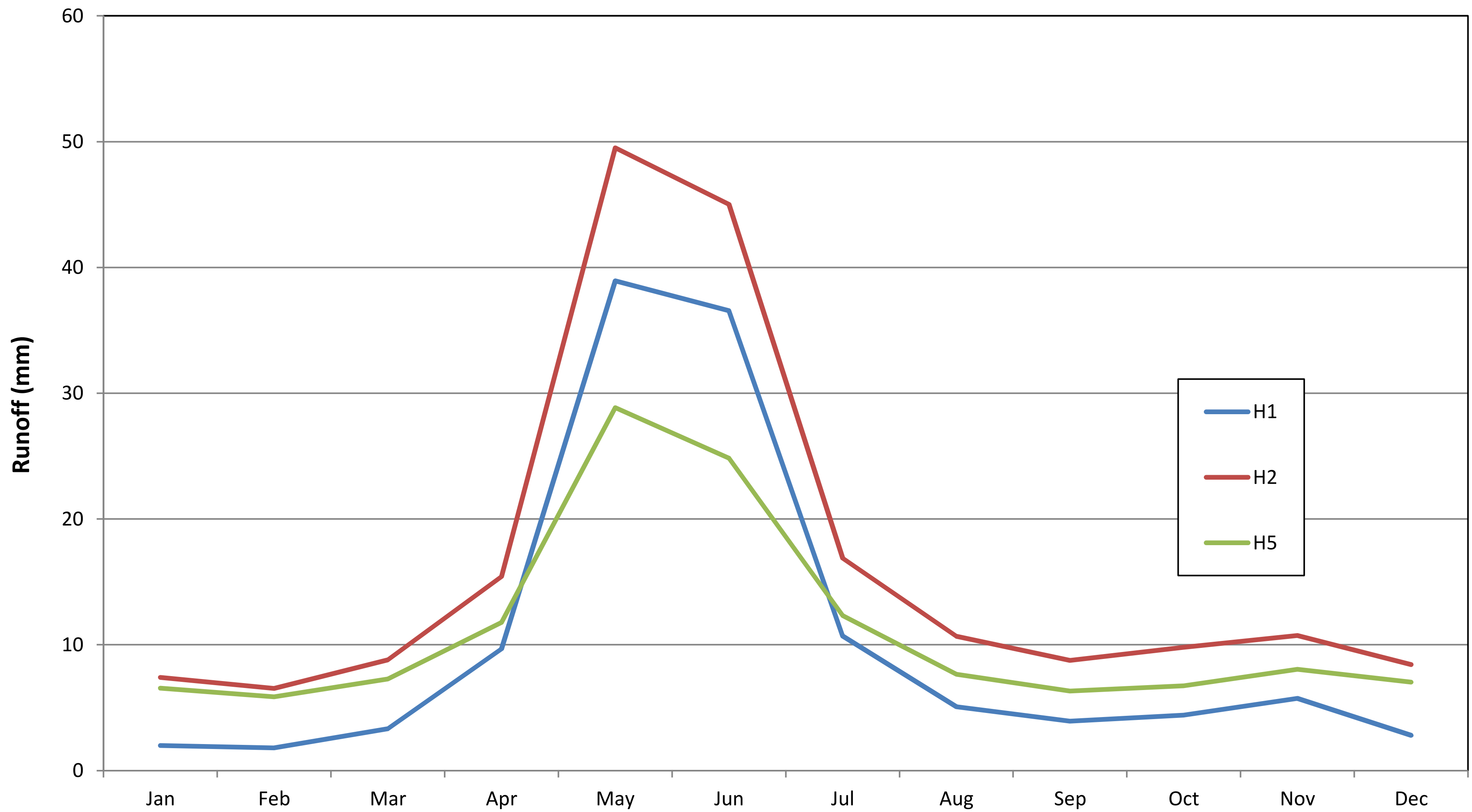
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 3.20

REV 0



NEW GOLD INC.

BLACKWATER GOLD PROJECT

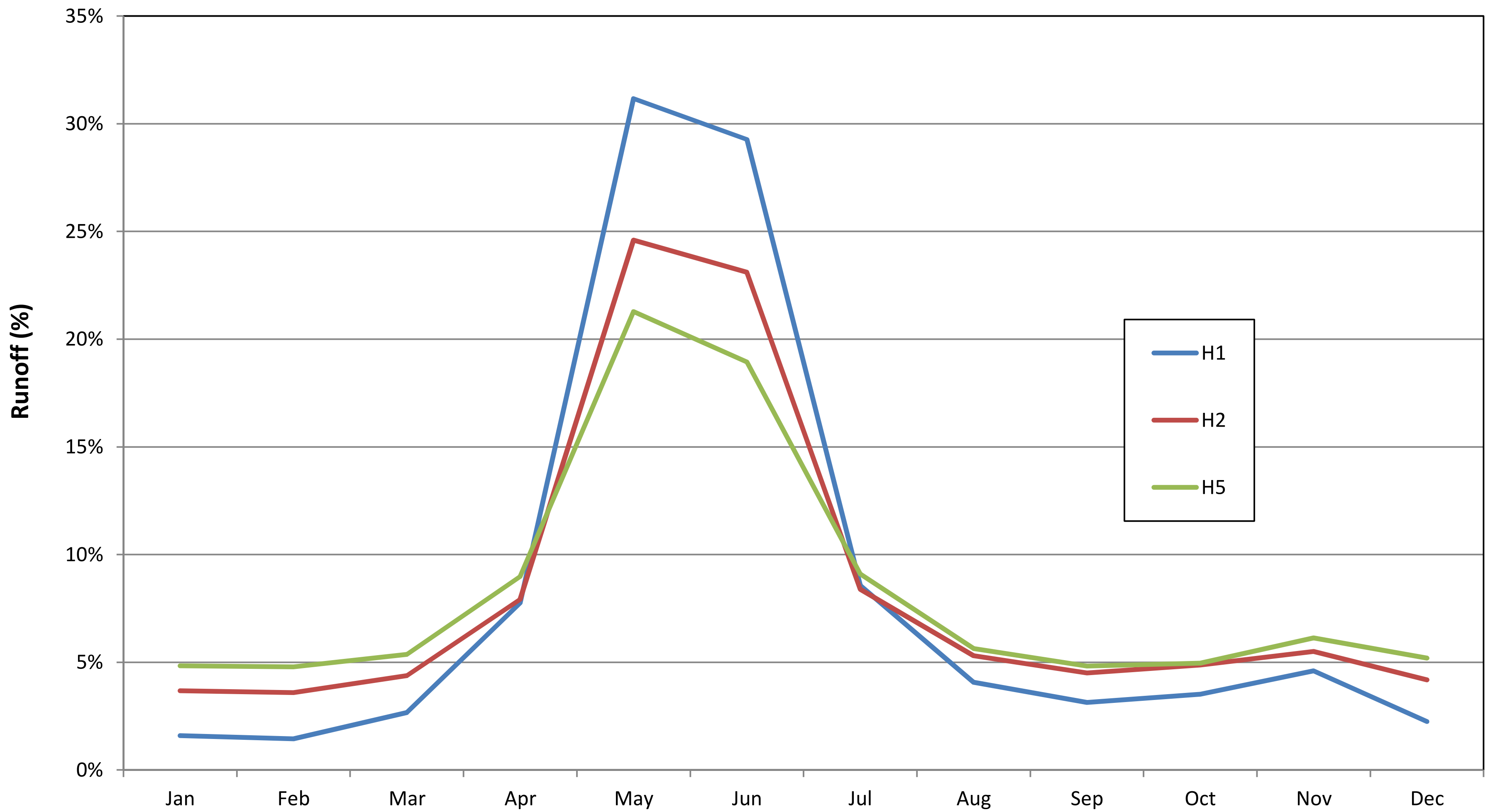
H1, H2, H5
MEAN MONTHLY RUNOFF

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-457/6	12

FIGURE 3.21	REV 0

0	31OCT'31	ISSUED WITH REPORT VA101-00457/6-12	BW	JGC	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



0	31OCT'31	ISSUED WITH REPORT VA101-00457/6-12	BW	JGC	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

H1, H2, H5
PERCENTAGE OF MEAN ANNUAL RUNOFF

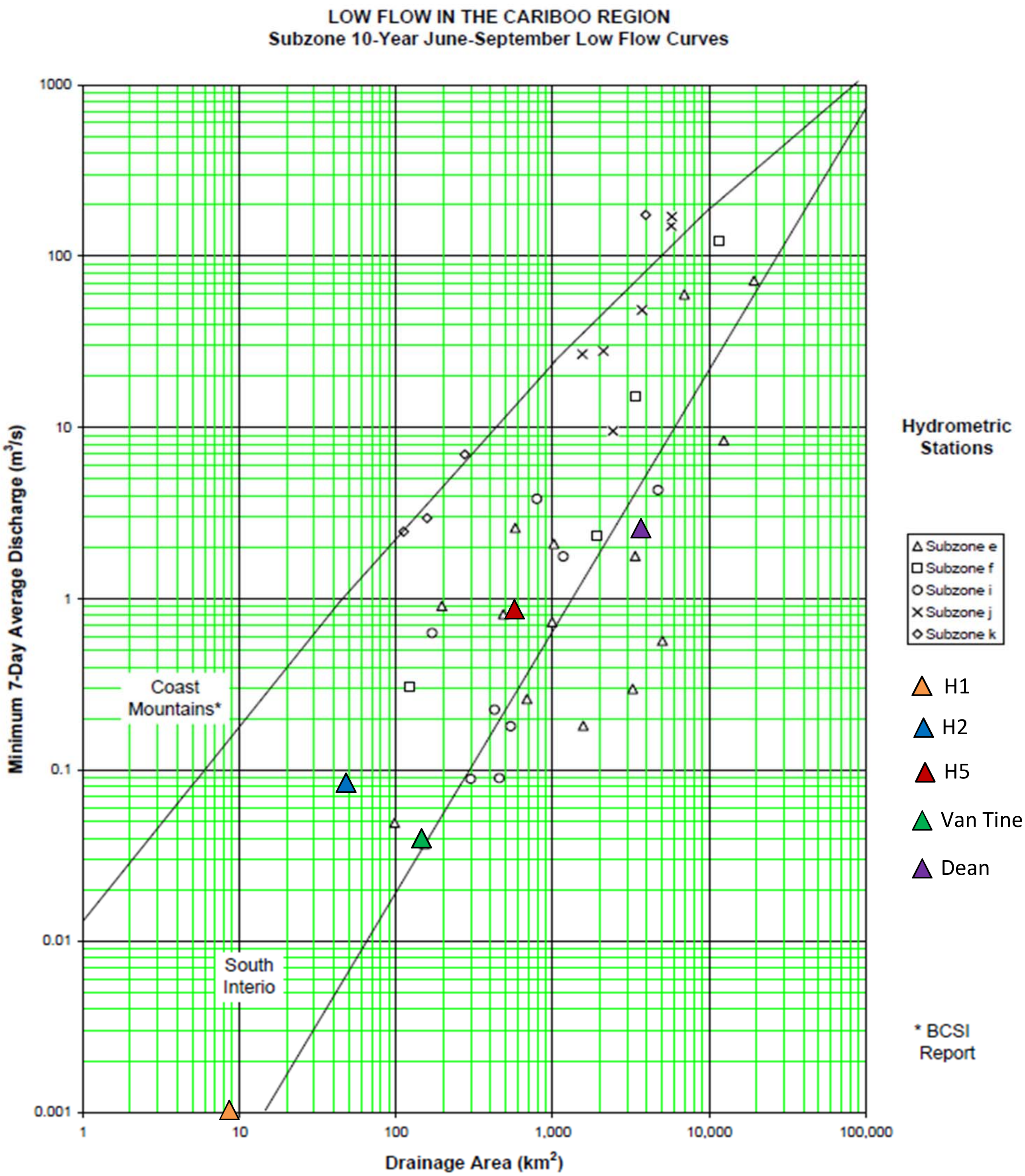
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 3.22

REV 0



NOTES:
1. REGIONAL RELATIONS FROM OBEDKOFF (1999)
2. H1, H2 AND H5 DISCHARGE DERIVED FROM LFA ANALYSIS UTILIZING LONG-TERM SYNTHETIC DISCHARGE SERIES

NEW GOLD INC.

BLACKWATER GOLD PROJECT

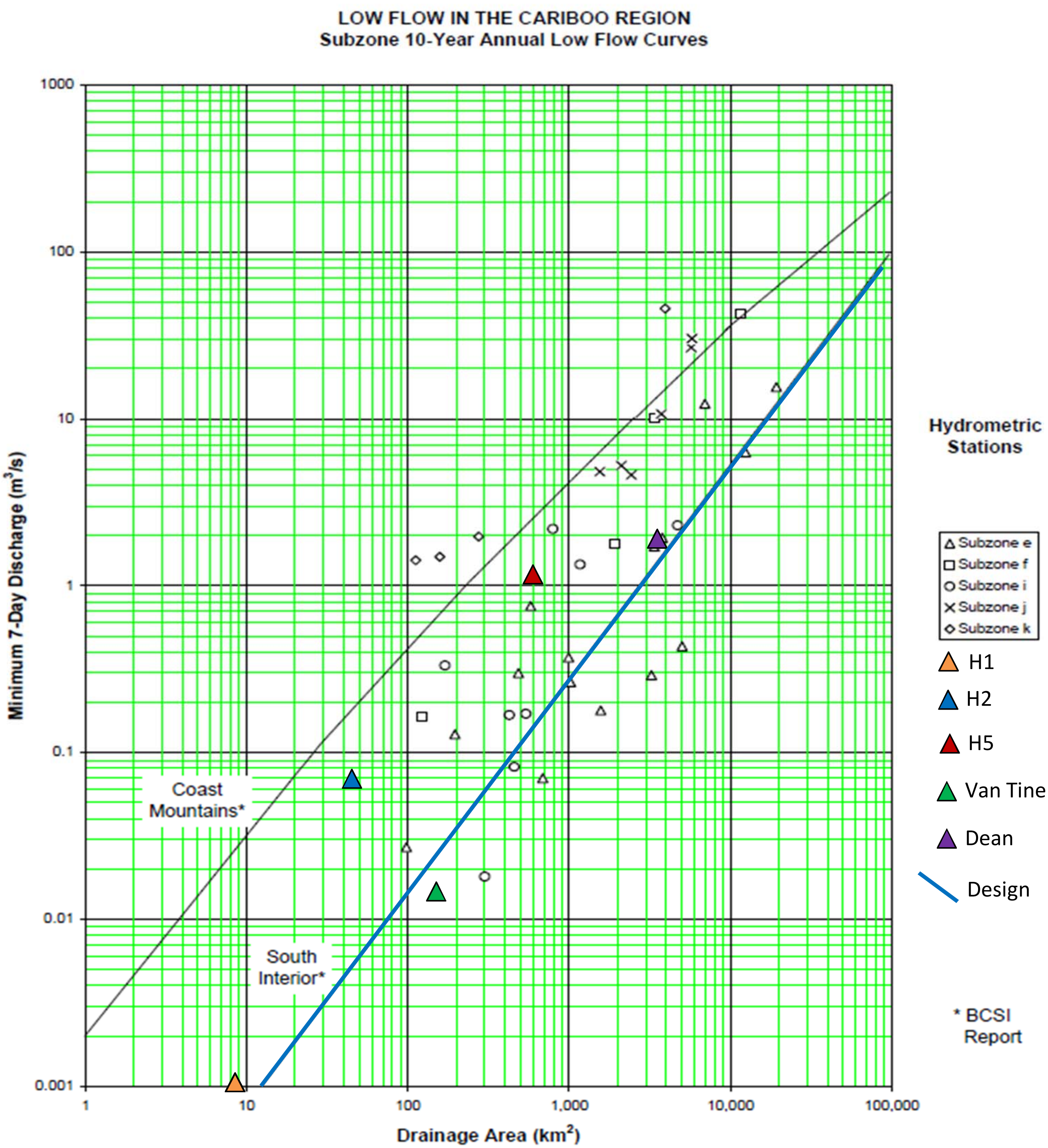
7-DAY SUMMER LOW FLOWS

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-457/6	12

FIGURE 3.23 REV 0

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	31OCT'13	ISSUED WITH REPORTVA101-00457/6-12	CMB	JGC	JGC



NOTES:
1. REGIONAL RELATIONS FROM OBEDKOFF (1999)
2. H1, H2 AND H5 DISCHARGE DERIVED FROM LFA ANALYSIS UTILIZING LONG-TERM SYNTHETIC DISCHARGE SERIES.

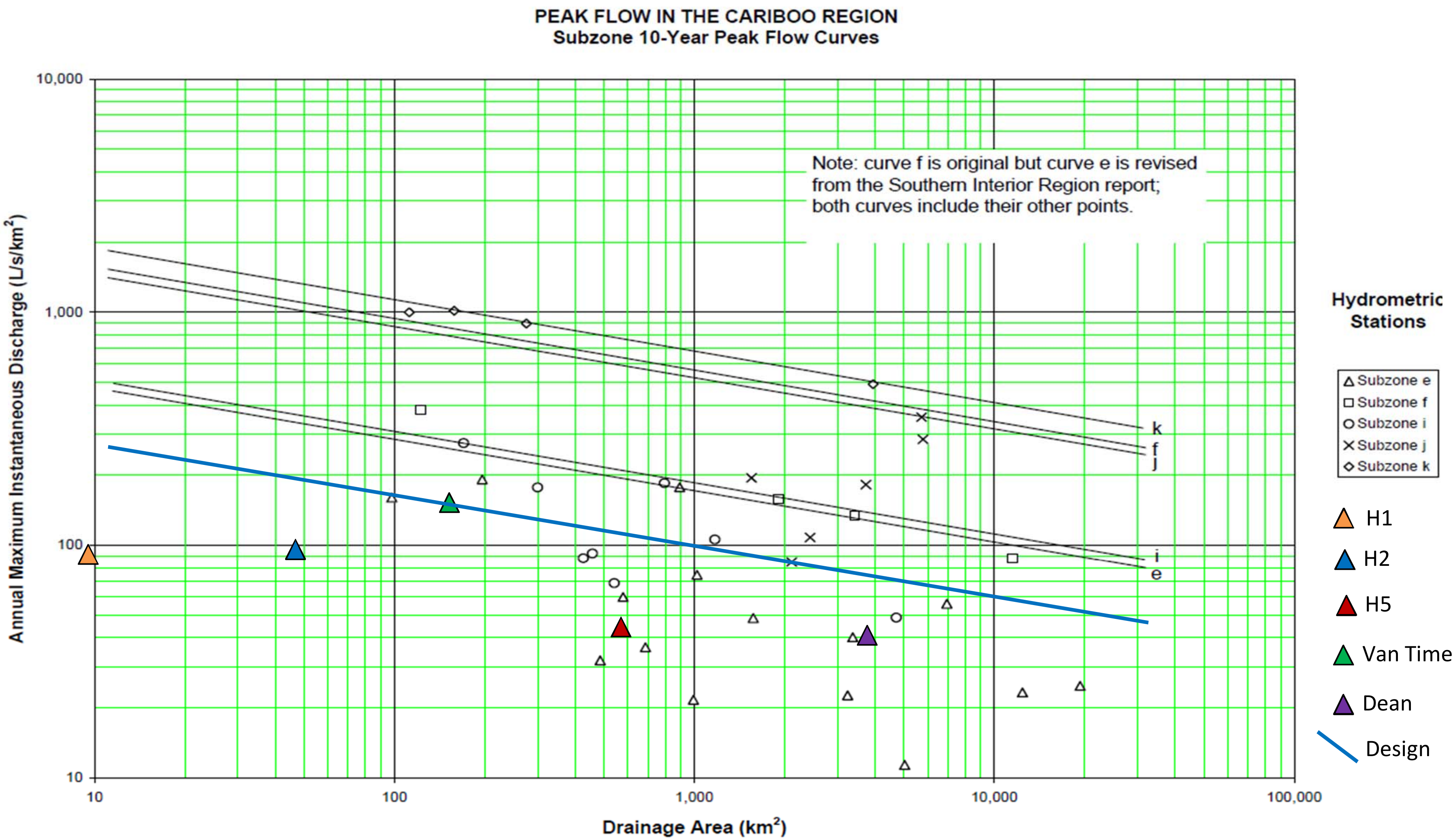
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	CMB	JGC	JGC

NEW GOLD INC.

BLACKWATER GOLD PROJECT

7-DAY WINTER LOW FLOWS

Knight Piésold CONSULTING	P/A NO. VA101-457/6	REF. NO. 12	
	FIGURE 3.24		REV 0



NOTES:

1. REGIONAL RELATIONS FROM OBEDKOFF (1999).
2. DRAINAGE AREA OF H1 IS LESS THAN 10 km^2.

0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	CMB	JGC	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

PEAK FLOWS

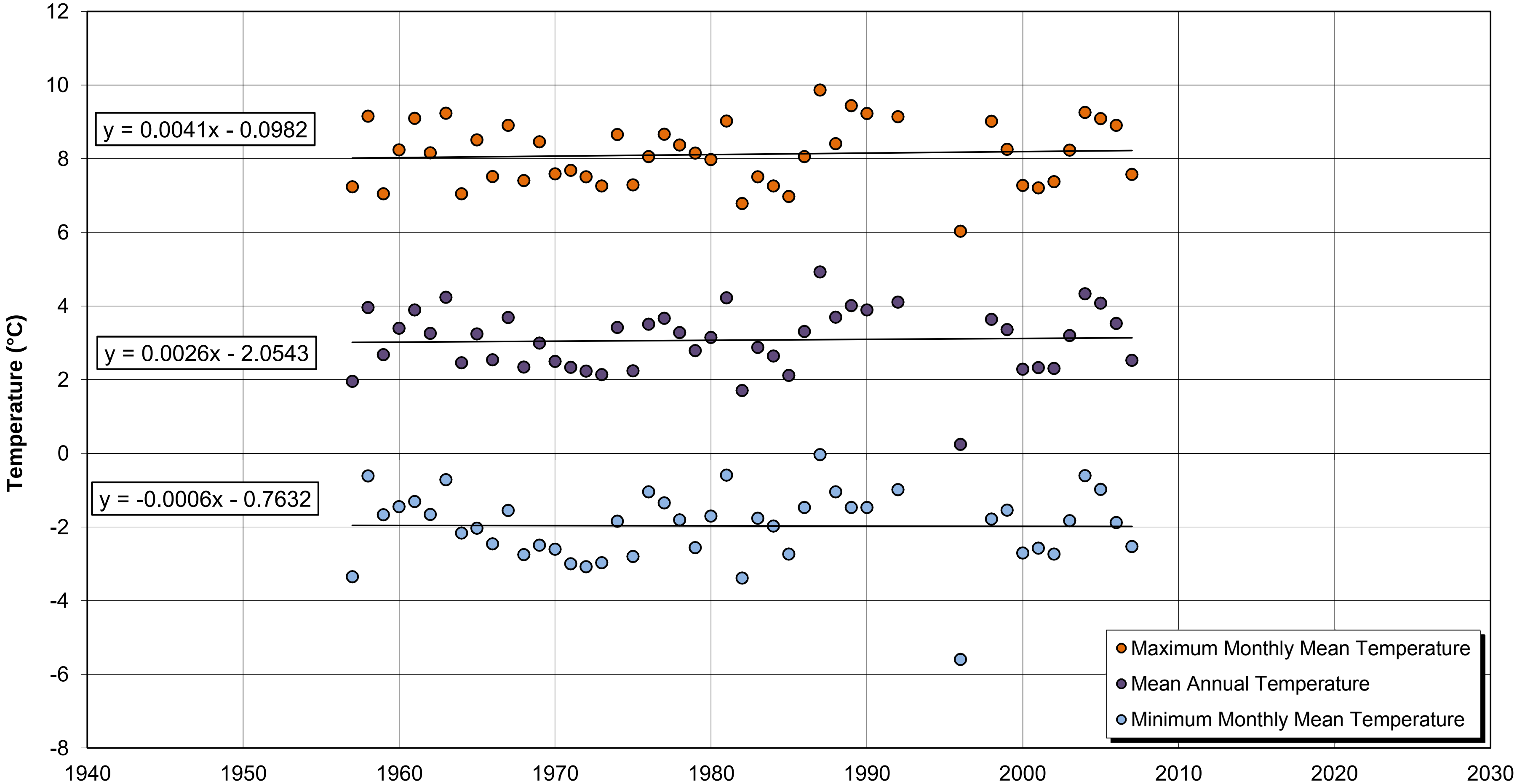
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 3.25

REV 0



NOTES:
1. YEARS WITH MISSING MONTHS WERE IGNORED.
2. NONE OF THE TRENDLINES WERE SIGNIFICANT AT A 10% LEVEL OF SIGNIFICANCE.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC

NEW GOLD INC.

BLACKWATER GOLD PROJECT

OOTSA TEMPERATURE TRENDS

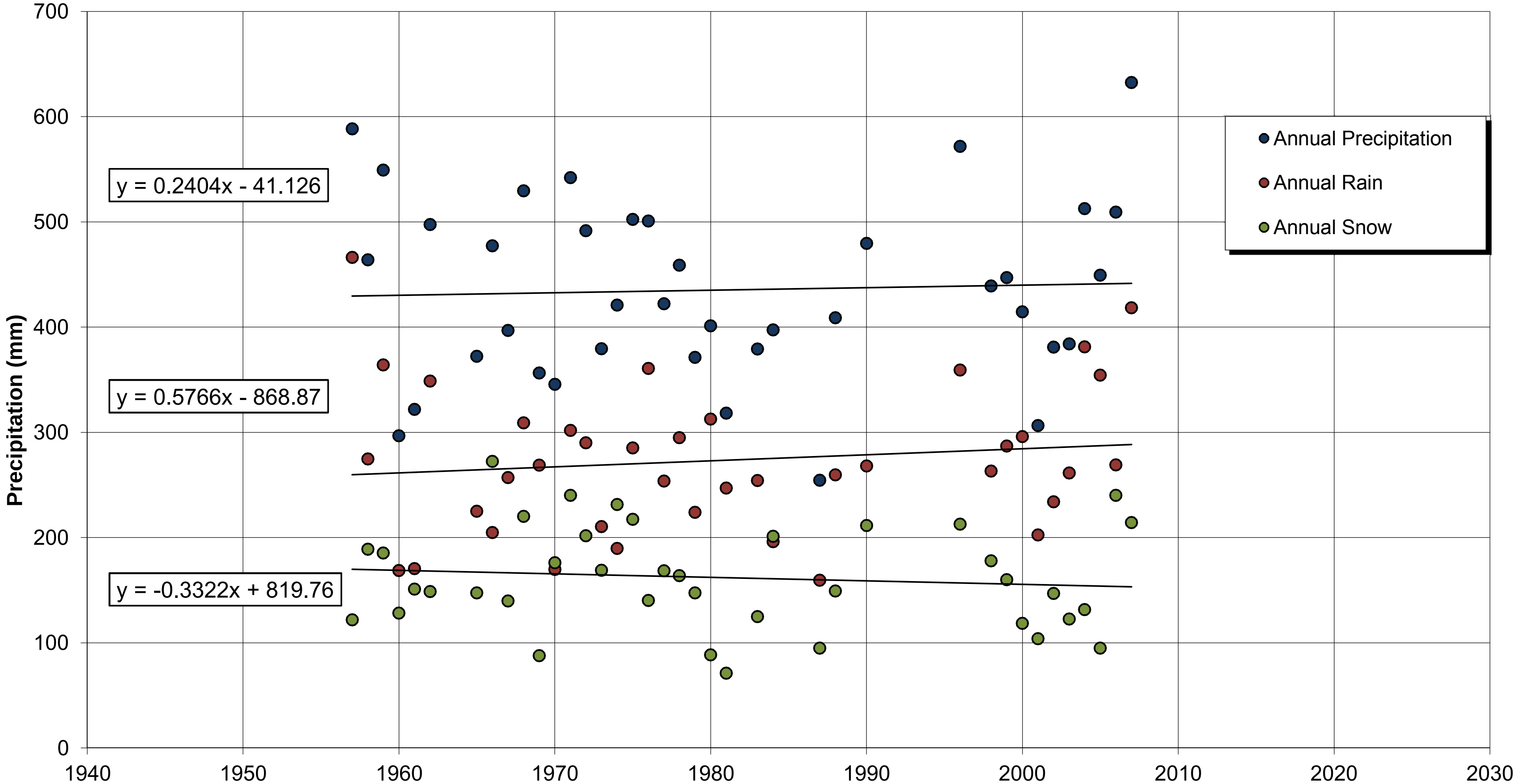
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 5.1

REV 0



NOTES:
1. YEARS WITH MISSING MONTHS WERE IGNORED.

0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

OOTSA PRECIPITATION TRENDS

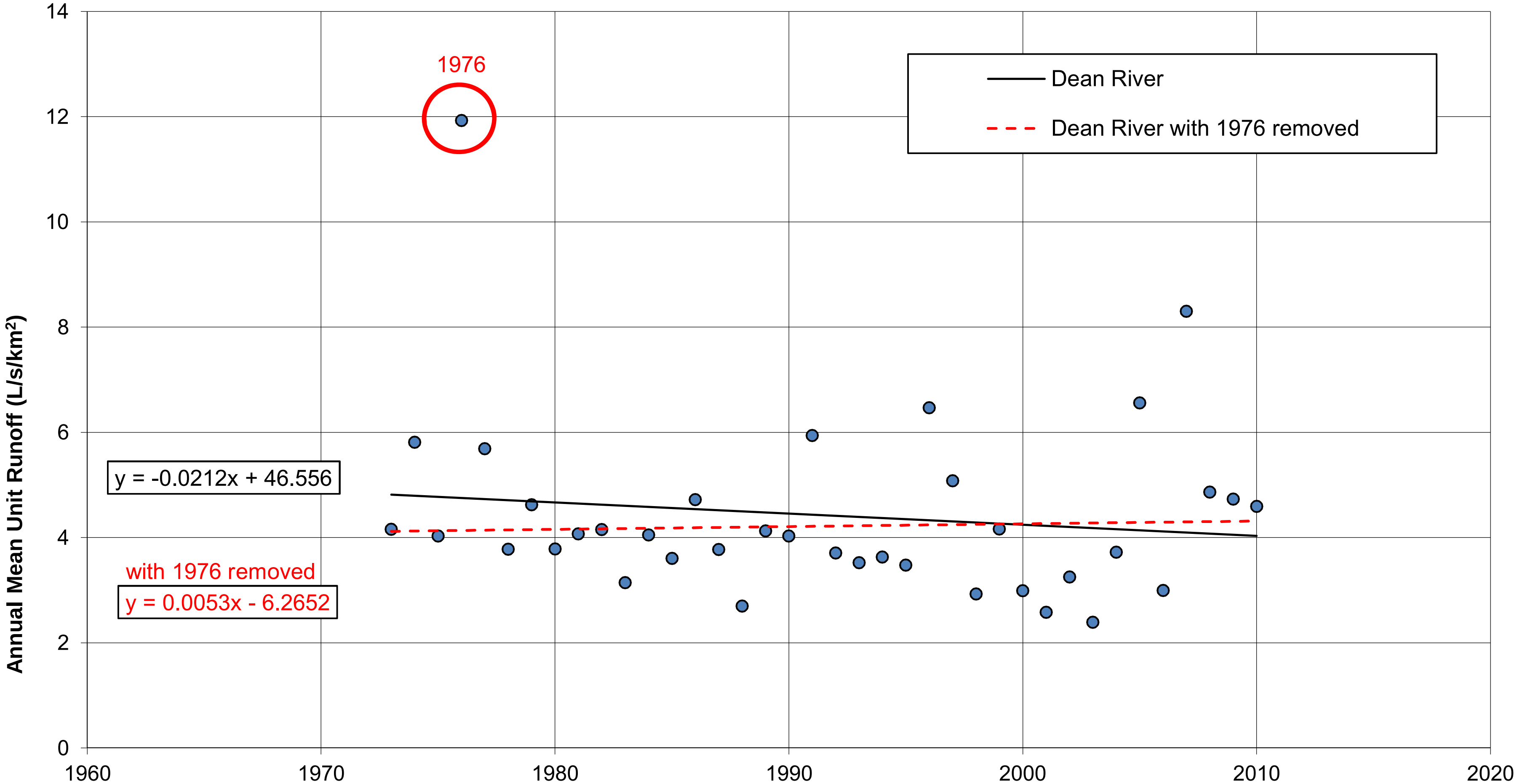
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 5.2

REV 0



NOTES:
1. THE TRENDS ARE NOT SIGNIFICANT AT A 10% SIGNIFICANCE LEVEL.
2. 1976 IS A HIGH OUTLIER.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC

NEW GOLD INC.

BLACKWATER GOLD PROJECT

DEAN RIVER ANNUAL FLOW TRENDS

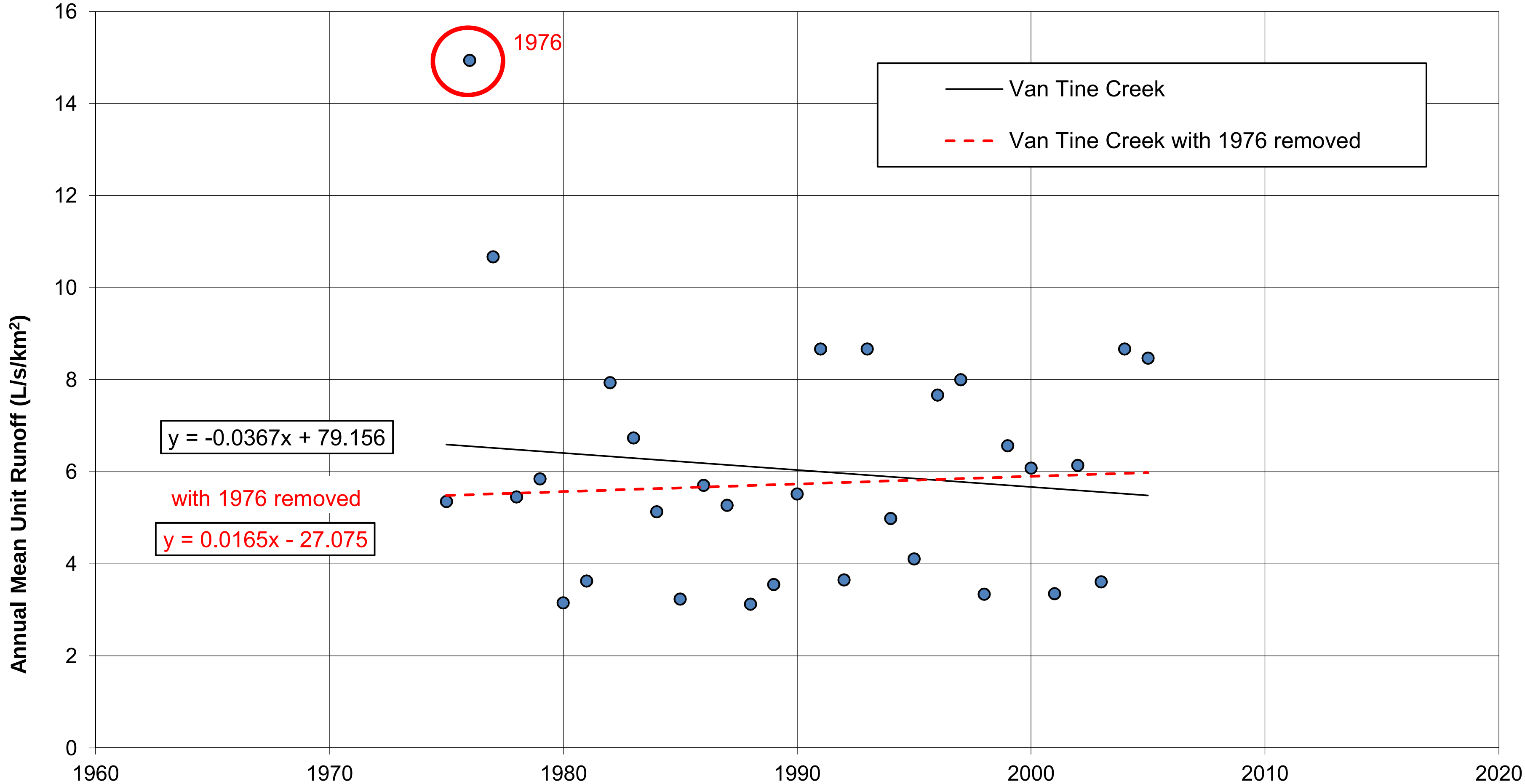
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 5.3

REV 0



NOTES:
1. THE TRENDS ARE NOT SIGNIFICANT AT A 10% SIGNIFICANCE LEVEL.
2. 1976 IS A HIGH OUTLIER.

0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

VAN TINE CREEK ANNUAL FLOW TRENDS

Knight Piésold CONSULTING

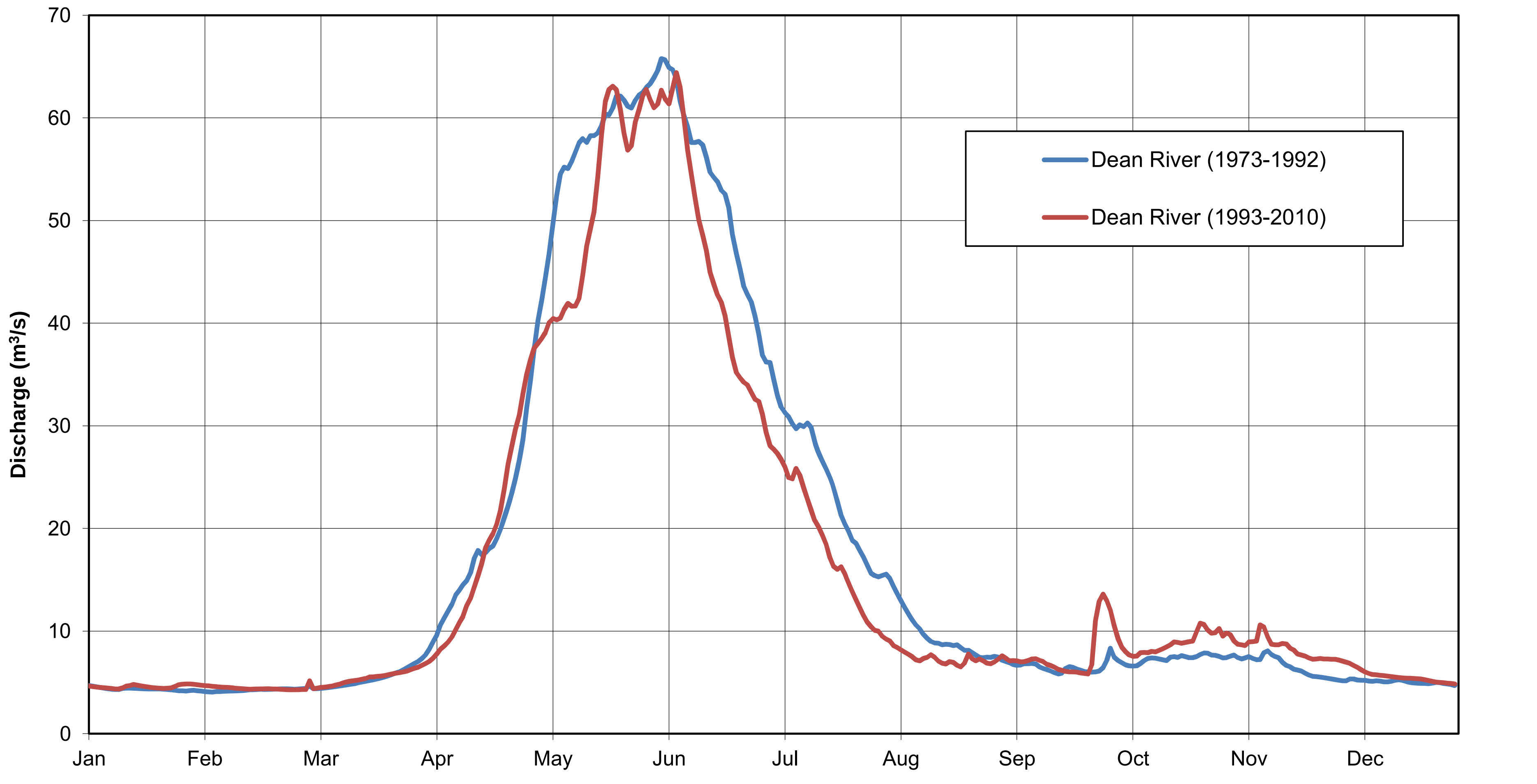
P/A NO. VA101-457/6

REF. NO. 12

FIGURE 5.4

REV 0

M:\1\01\00457\06\A\Data\Task 802- Hydromet\Rev 0\Meteorology\[Climate Change.xls]Daily avg discharge 5.5 Print 16/10/2013 11:27 AM



0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

DEAN RIVER AVERAGE HYDROGRAPHS

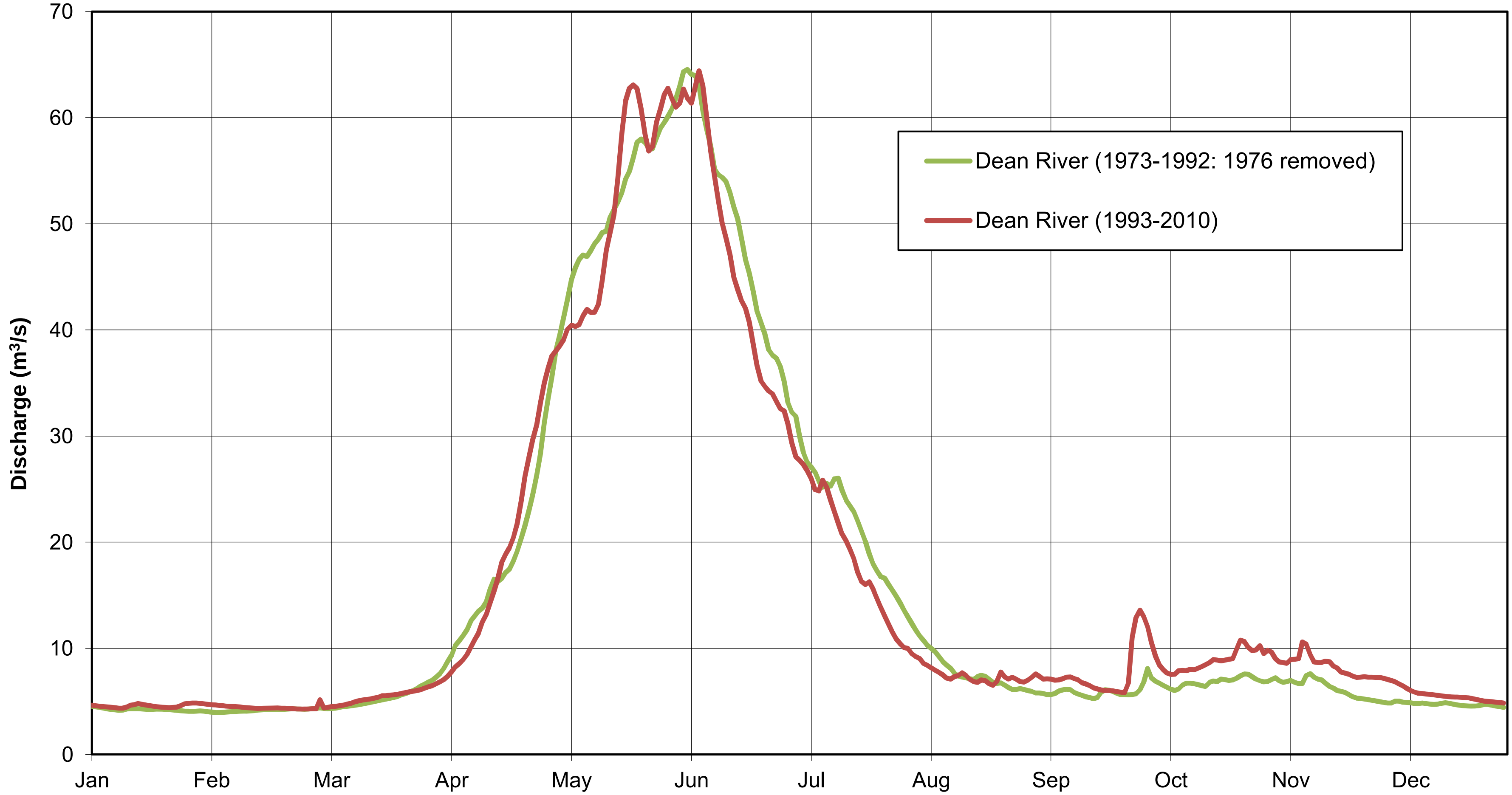
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 5.5

REV 0



0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

DEAN RIVER AVERAGE HYDROGRAPHS

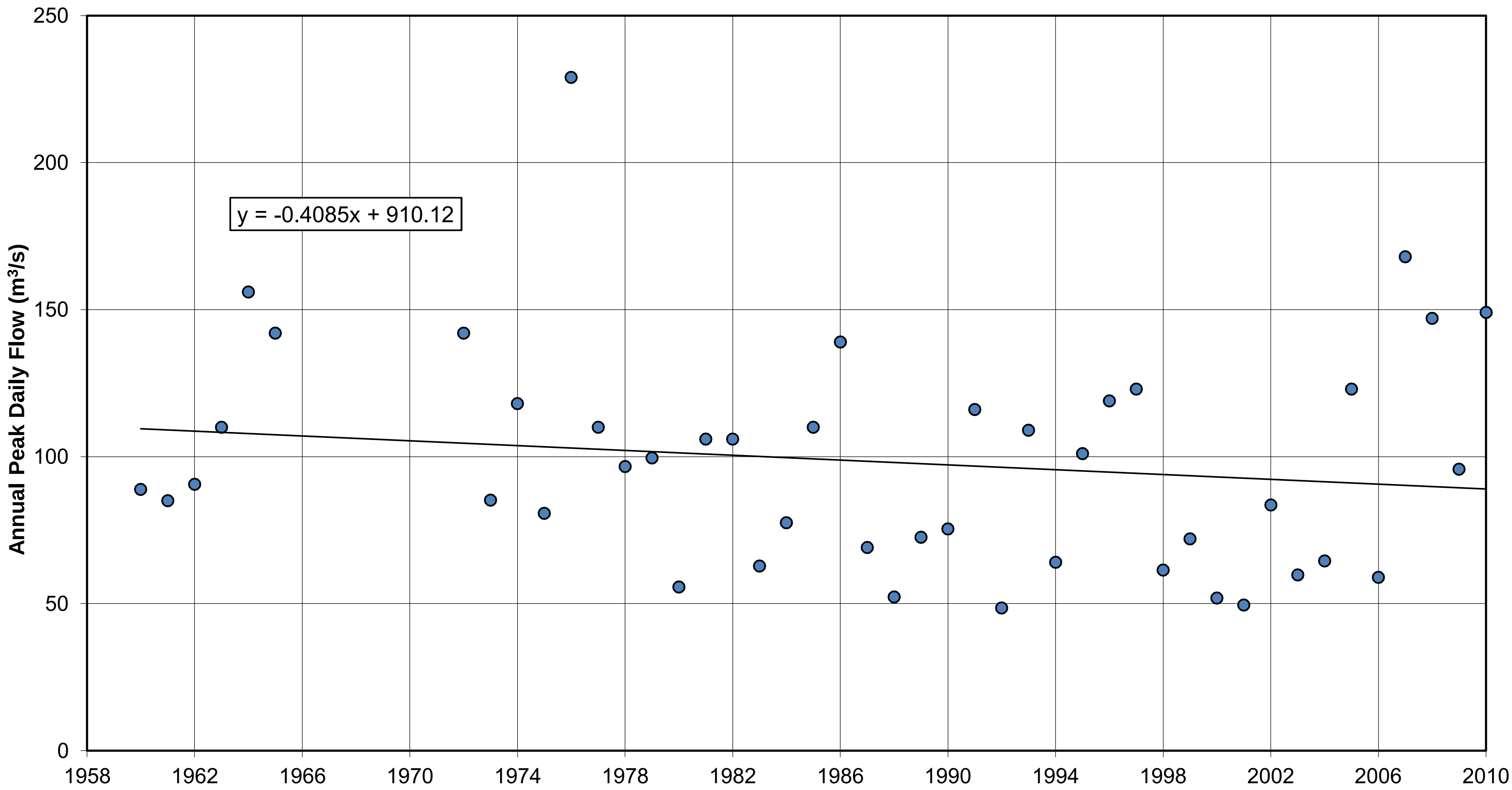
Knight Piésold CONSULTING

P/A NO. VA101-4576

REF. NO. 12

FIGURE 5.6

REV 0



0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

DEAN RIVER ANNUAL PEAK FLOW TRENDS

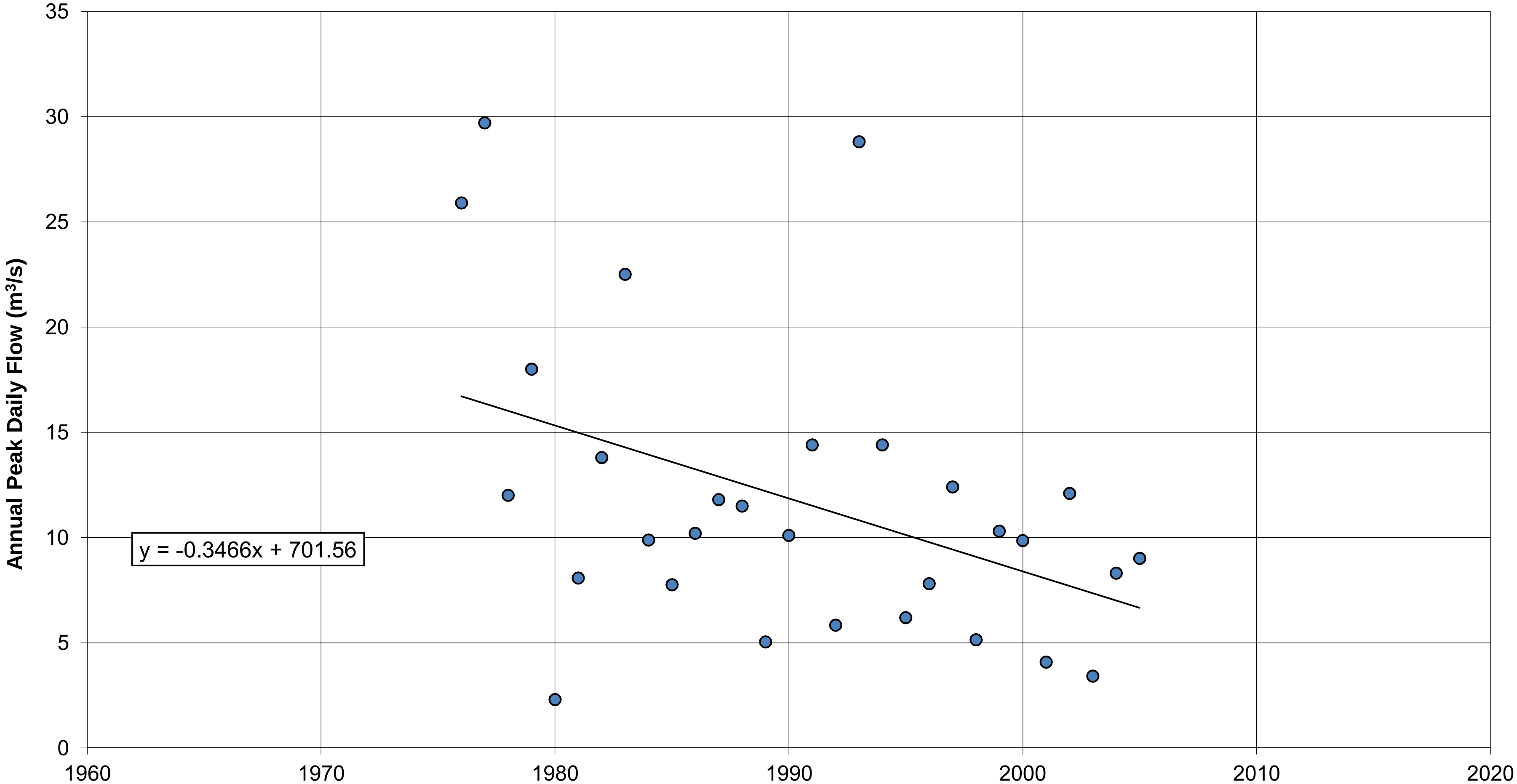
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 5.7

REV 0



NOTES:
1. THE TRENDS ARE IS SIGNIFICANT AT A 5% SIGNIFICANCE LEVEL.

0	31OCT'13	ISSUED WITH REPORT VA101-00457/6-12	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

VAN TINE CREEK ANNUAL PEAK FLOW TRENDS

Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 12

FIGURE 5.8

REV 0

Knight Piésold CONSULTING

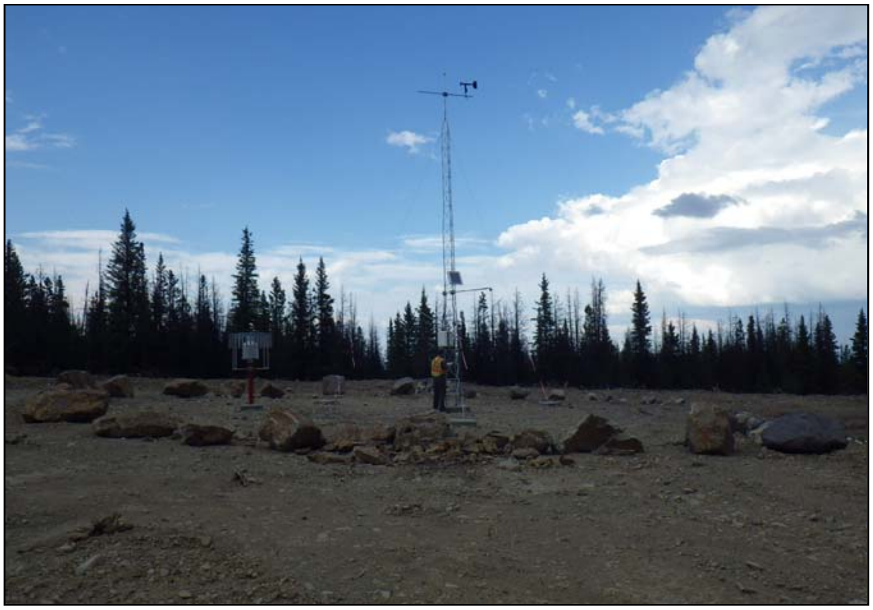


PHOTO 1 – Blackwater High Climate Station (20/Aug/2012)

PHOTO 2 – Blackwater Low Climate Station (06/Mar/2012)

Knight Piésold CONSULTING

PHOTO 3 – H1 Frozen (01/Feb/2012)

PHOTO 4 – H1 High Flow (26/May/2011)

NEW GOLD INC.
BLACKWATER GOLD PROJECT

PHOTO 5 – H1 Measuring Winter Flows (11/Dec/2012)

PHOTO 6 – H2 Normal Flow Conditions (17/May/2012)

NEW GOLD INC.
BLACKWATER GOLD PROJECT

PHOTO 7 – H2 Winter Flow Measurements (15/Jan/2013)

PHOTO 8 – H4B Normal Flow Conditions (17/Oct/2012)

NEW GOLD INC.
BLACKWATER GOLD PROJECT

PHOTO 9 – H4B Winter Measurements (06/Mar/2012)

PHOTO 10 – H4B Winter Measurements (16/Jan/2013)

PHOTO 11 – H5 Extremely High Flows (26/May/2011)

PHOTO 12 – H5 Winter Measurements (17/Jan/2013)

NEW GOLD INC.
BLACKWATER GOLD PROJECT

PHOTO 13 – H6 Typical Flows (16/Oct/2012)

PHOTO 14 – H6 Winter Flows (14/Jan/2013)

PHOTO 15 – H7 Typical Flows (08/May/2012)

PHOTO 16 – H7 Winter Flows (12/Dec/2012)

APPENDIX A

RATING CURVES AND DISCHARGE MEASUREMENTS

(Pages A-1 to A-14)

Knight Piésold CONSULTING

TABLE A1

NEW GOLD INC.
BLACKWATER GOLD

STATION H1
MEASURED DISCHARGE SUMMARY

22/02/2013 8:44

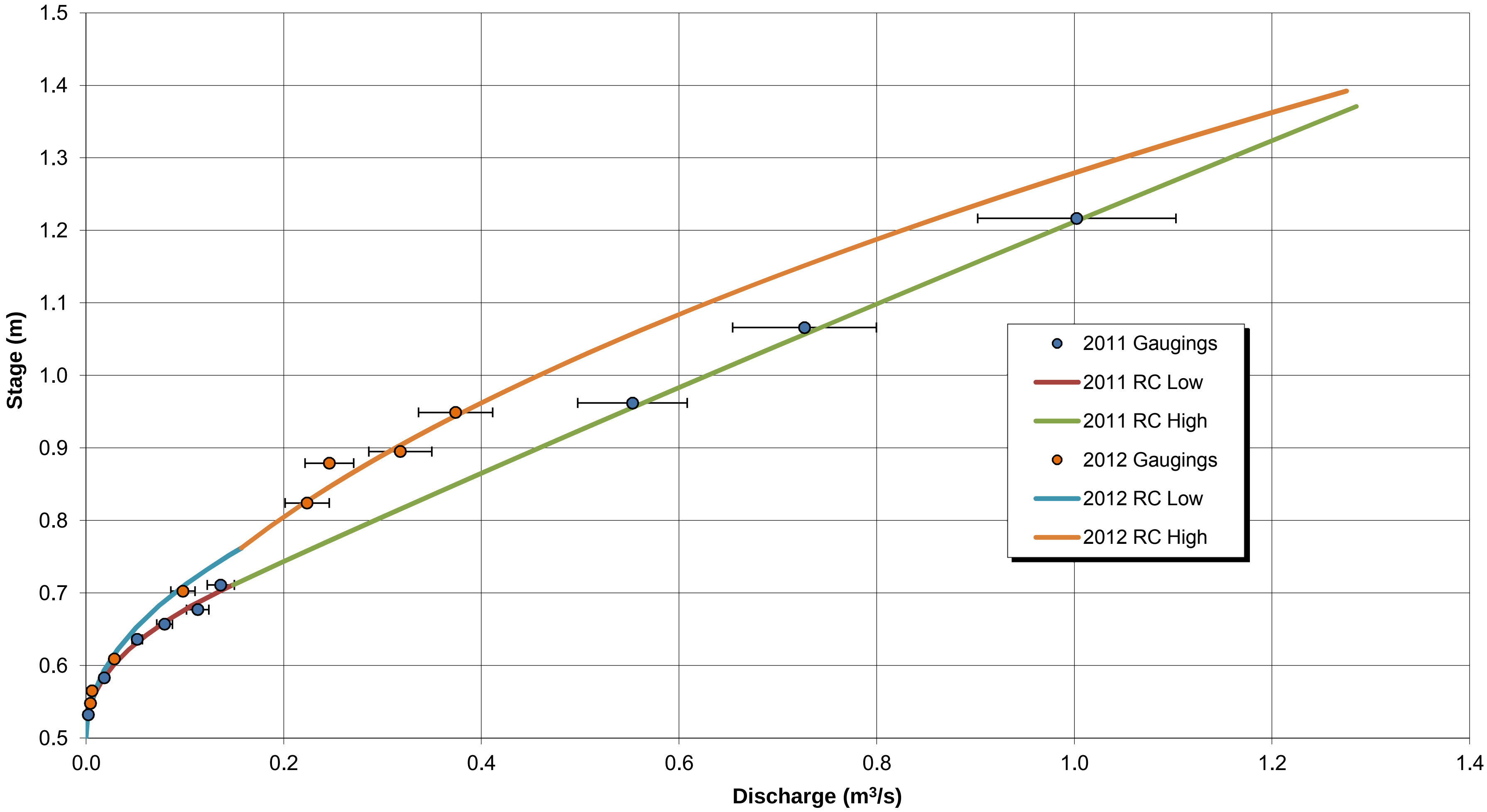
Date	Avg Discharge (m^3/s)	Flow Error %	Stage (m)
19-May-11	0.55	10%	0.990
26-May-11	1.00	10%	1.245
2-Jun-11	0.73	10%	1.094
16-Jun-11	0.14	10%	0.739
23-Jun-11	0.11	10%	0.705
7-Jul-11	0.08	10%	0.685
18-Aug-11	0.02	10%	0.611
21-Sep-11	0.00	10%	0.560
29-Sep-11	0.05	10%	0.664
14-May-12	0.32	10%	0.923
23-May-12	0.37	10%	0.977
31-May-12	0.25	10%	0.907
5-Jun-12	0.22	10%	0.852
14-Jun-12	0.10	13%	0.731
24-Jul-12	0.03	10%	0.637
21-Aug-12	0.01	10%	0.593
18-Sep-12	0.005	10%	0.576

M:\1\01\00457\04\A\Data\Task 0800 - 2012 Baseline Data\Hydrology\H1\[H1_RC and Hydrograph - BW.xlsm]Table A1

NOTES:

1. AVERAGE DISCHARGE IS THE AVERAGE OF THE MEASUREMENTS TAKEN ON THAT DAY.
2. THIS TABLE DOES NOT SHOW ANOMALOUS GAUGINGS IGNORED IN THE RATING DEVELOPMENT.

1	31JAN13	ISSUED WITH REPORT VA101-457/4-1	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



NOTES:
1. 2012 POINTS SHOW A POSSIBLE BACK WATER EFFECT AT HIGHER FLOWS

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	31JAN13	ISSUED WITH REPORT	BW	CMB	JGC

NEW GOLD INC.

BLACKWATER GOLD PROJECT

H1 RATING CURVE

Knight Piésold CONSULTING

P/A NO. VA101-457/4

REF. NO. 1

FIGURE A1

REV 1

Knight Piésold
CONSULTING

TABLE A2

NEW GOLD INC.
BLACKWATER GOLD PROJECT

STATION H2
MEASURED DISCHARGE SUMMARY

Print Feb/22/13 8:46:18

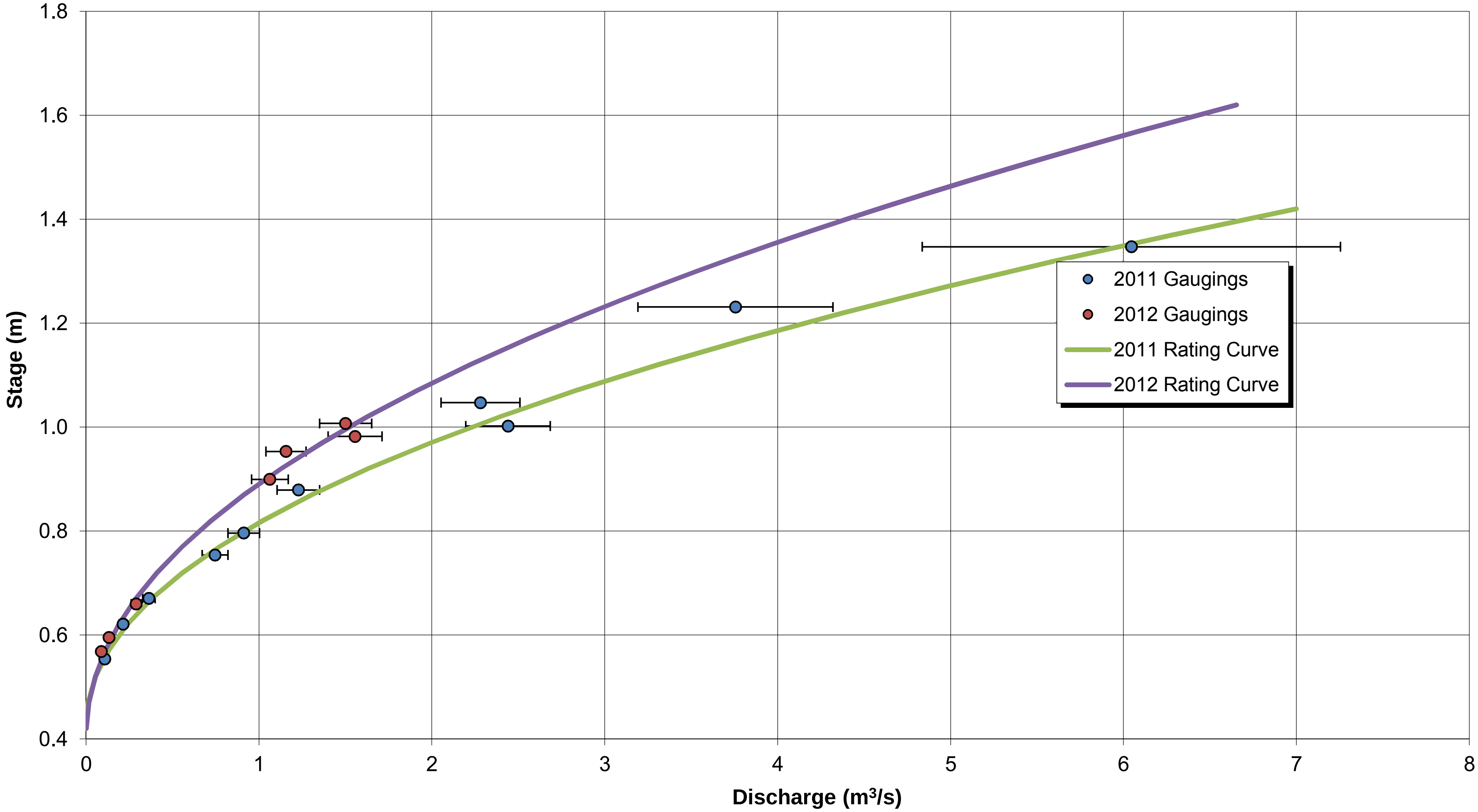
Date	Avg Discharge (m^3/s)	Flow Error %	Stage (m)
19-May-11	2.44	10%	0.982
26-May-11	6.05	20%	1.327
2-Jun-11	3.76	15%	1.211
10-Jun-11	2.28	10%	1.027
16-Jun-11	1.23	10%	0.859
23-Jun-11	0.91	10%	0.776
7-Jul-11	0.75	10%	0.734
18-Aug-11	0.21	10%	0.601
21-Sep-11	0.11	10%	0.534
29-Sep-11	0.36	10%	0.651
24-May-12	1.16	10%	0.933
31-May-12	1.56	10%	0.962
6-Jun-12	1.50	10%	0.987
14-Jun-12	1.06	10%	0.880
24-Jul-12	0.29	10%	0.640
21-Aug-12	0.13	10%	0.575
18-Sep-12	0.09	10%	0.548

M:\1\01\00457\04\A\Data\Task 0800 - 2012 Baseline Data\Hydrology\H2\[H2_RC and Hydrograph - BW.xlsm]Table A2

NOTES:

1. THE AVERAGE DISCHARGE IS THE AVERAGE OF THE MEASUREMENTS TAKEN ON THAT DATE.
2. THIS TABLE DOES NOT SHOW ANOMALOUS GAUGINGS IGNORED IN THE RATING DEVELOPMENT

1	31JAN13	ISSUED WITH REPORT VA101-457/4-1	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



1	31JAN13	ISSUED WITH REPORT	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

H2 RATING CURVE

Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 1

FIGURE A2

REV 1

Knight Piésold CONSULTING

TABLE A3

NEW GOLD INC.
BLACKWATER GOLD PROJECT

STATION H3
MEASURED DISCHARGE SUMMARY

Print Feb/22/13 8:47:23

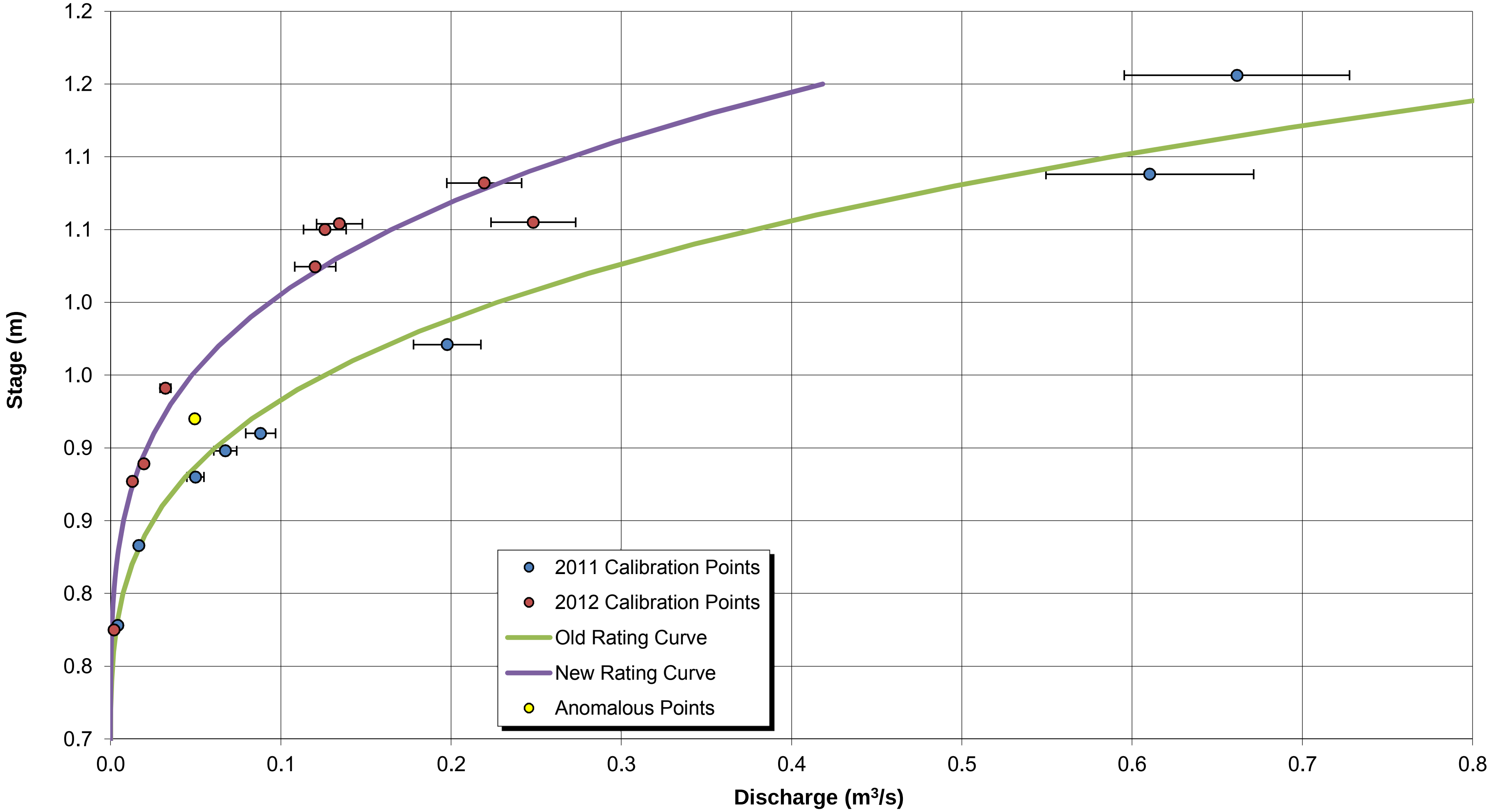
Date	Avg Discharge (m^3/s)	Flow Error %	Stage (m)
19-May-11	0.662	10%	1.156
2-Jun-11	0.610	10%	1.088
10-Jun-11	0.198	10%	0.971
16-Jun-11	0.088	10%	0.910
23-Jun-11	0.050	10%	0.880
7-Jul-11	0.067	10%	0.898
18-Aug-11	0.017	10%	0.833
21-Sep-11	0.004	10%	0.778
29-Sep-11	0.049	10%	0.920
11-May-12	0.126	10%	1.050
18-May-12	0.248	10%	1.055
24-May-12	0.220	10%	1.082
1-Jun-12	0.134	10%	1.054
7-Jun-12	0.120	10%	1.025
28-Jun-12	0.032	10%	0.941
25-Jul-12	0.020	10%	0.889
22-Aug-12	0.013	10%	0.877
19-Sep-12	0.002	10%	0.775

M:\1\01\00457\04\A\Data\Task 0800 - 2012 Baseline Data\Hydrology\H3\[H3_RC and Hydrograph - BW.xlsm]Table A3

NOTES:

1. THE AVERAGE DISCHARGE IS THE AVERAGE OF THE MEASUREMENTS TAKEN ON THAT DATE.
2. THIS TABLE DOES NOT SHOW ANOMALOUS GAUGINGS IGNORED IN THE RATING DEVELOPMENT.

1	31JAN13	ISSUED WITH REPORT VA101-457/4-1	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



NOTES:
1. RATING SHIFT IDENTIFIED AS OCCURING ON AUGUST 30

1	31JAN13	ISSUED WITH REPORT	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC

BLACKWATER GOLD PROJECT

H3 RATING CURVE

Knight Piésold CONSULTING

P/A NO. VA 101-457/6

REF. NO. 1

FIGURE A3

REV 1

Knight Piésold
CONSULTING

TABLE A4

NEW GOLD INC.
BLACKWATER GOLD PROJECT

STATION H4B
MEASURED DISCHARGE SUMMARY

Print Feb/22/13 8:48:38

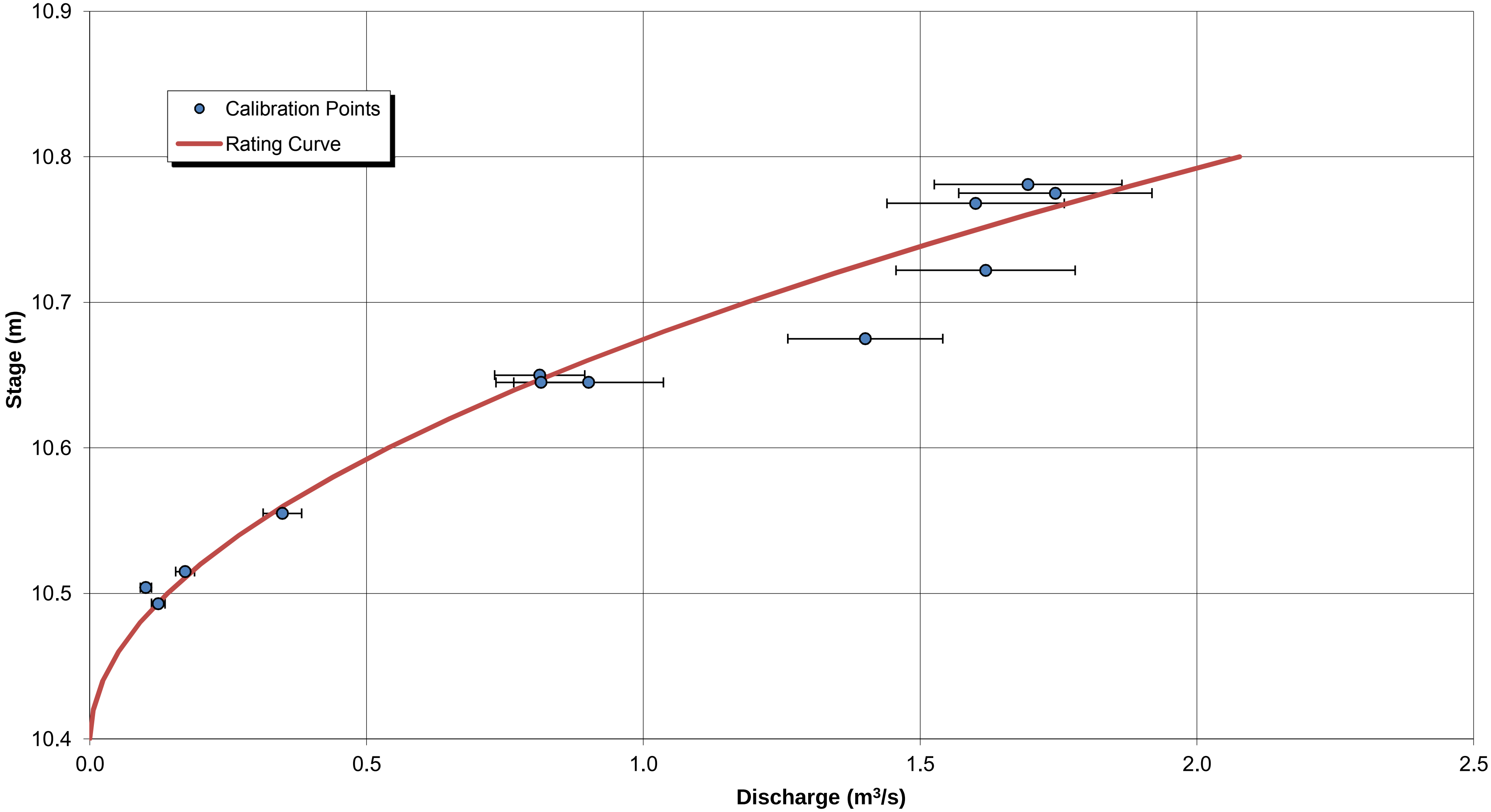
Date	Avg Discharge (m^3/s)	Flow Error %	Stage (m)
9-May-12	1.40	10%	10.675
17-May-12	1.70	10%	10.781
31-May-12	1.74	10%	10.775
7-Jun-12	1.62	10%	10.722
12-Jun-12	1.60	10%	10.768
21-Jun-12	0.81	10%	10.65
27-Jun-12	0.82	10%	10.645
27-Jun-12	0.90	15%	10.645
24-Jul-12	0.35	10%	10.555
21-Aug-12	0.17	10%	10.515
18-Sep-12	0.12	10%	10.493
17-Oct-12	0.10	10%	10.504

M:\1\01\00457\04\A\Data\Task 0800 - 2012 Baseline Data\Hydrology\H4B\[H4B_RC and Hydrograph - BW.xlsm]Table A4

NOTES:

1. THE AVERAGE DISCHARGE IS THE AVERAGE OF THE MEASUREMENTS TAKEN ON THAT DATE.
2. THIS TABLE DOES NOT SHOW ANOMALOUS GAUGINGS IGNORED IN THE RATING DEVELOPMENT.
3. THERE ARE TWO SEPARATE POINTS FOR THE 27TH OF JUNE AS ONE WAS COMPLETED WITH AN OTT ADC.

1	31JAN13	ISSUED WITH REPORT VA101-457/4-1	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	31JAN13	ISSUED WITH REPORT	BW	CMB	JGC

NEW GOLD INC.

BLACKWATER GOLD PROJECT

H4B RATING CURVE

Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 1

FIGURE A4

REV 1

Knight Piésold
CONSULTING

TABLE A5

NEW GOLD INC.
BLACKWATER GOLD PROJECT

STATION H5
MEASURED DISCHARGE SUMMARY

Print Feb/22/13 8:50:08

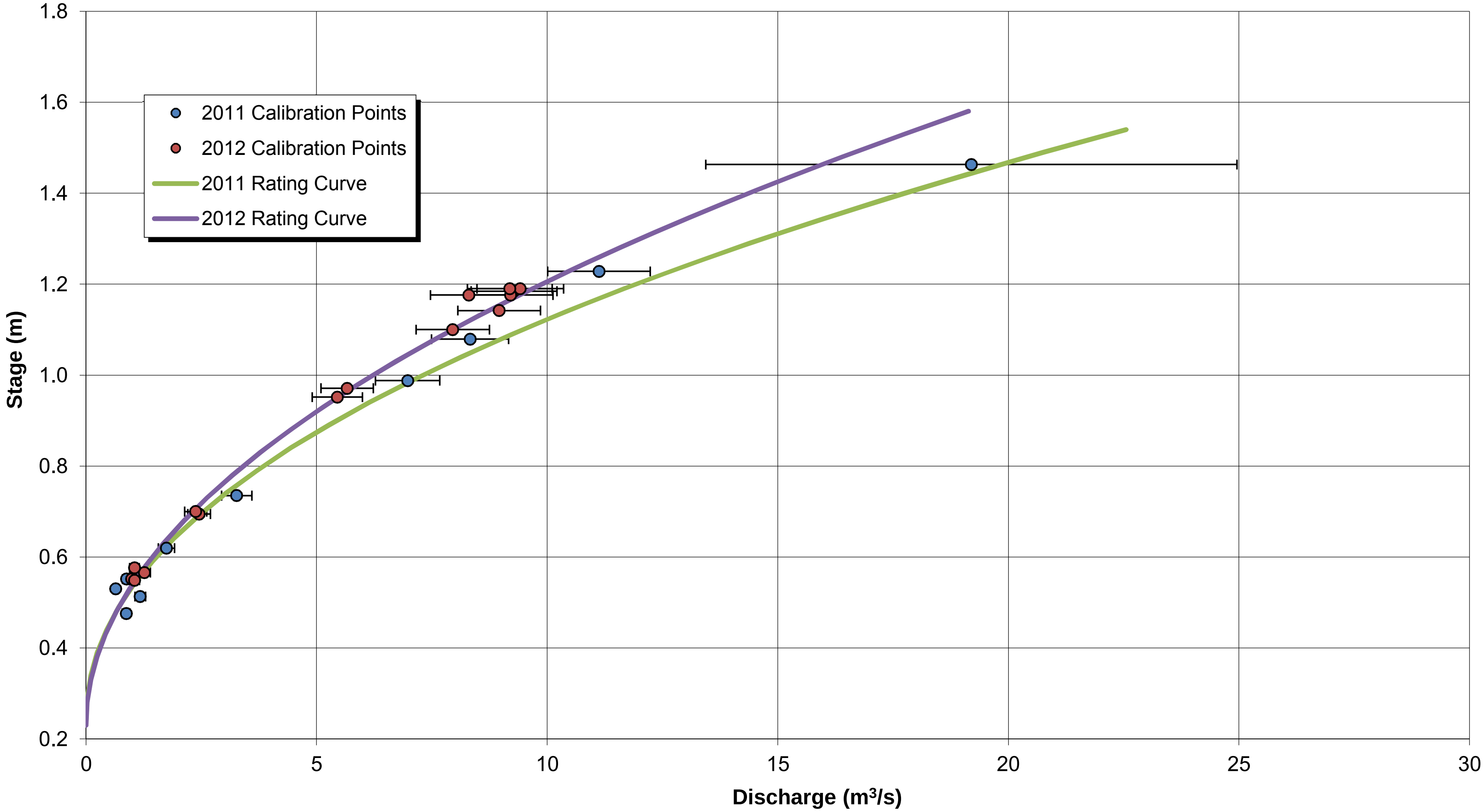
Date	Avg Discharge (m^3/s)	Flow Error %	Stage (m)
28-Mar-11	0.87	10%	0.476
19-Apr-11	1.18	10%	0.513
10-Jun-11	19.20	30%	1.463
16-Jun-11	11.13	10%	1.228
23-Jun-11	8.33	10%	1.079
7-Jul-11	6.98	10%	0.988
18-Aug-11	3.27	10%	0.735
21-Sep-11	0.65	10%	0.530
28-Sep-11	1.74	10%	0.620
12-Dec-11	0.88	10%	0.552
1-Feb-12	0.99	10%	0.552
6-Mar-12	1.05	10%	0.549
11-Apr-12	1.27	10%	0.566
11-May-12	7.95	10%	1.100
18-May-12	8.96	10%	1.142
25-May-12	9.28	10%	1.185
1-Jun-12	9.20	10%	1.176
1-Jun-12	8.30	10%	1.176
8-Jun-12	9.42	10%	1.190
8-Jun-12	9.19	10%	1.190
22-Jun-12	5.66	10%	0.971
29-Jun-12	5.45	10%	0.952
26-Jul-12	2.45	10%	0.695
23-Aug-12	2.38	10%	0.700
20-Sep-12	1.05	10%	0.576

M:\1\01\00457\04\A\Data\Task 0800 - 2012 Baseline Data\Hydrology\H5\[H5_RC and Hydrograph - BW.xlsm]Table A5

NOTES:

1. THE AVERAGE DISCHARGE IS THE AVERAGE OF THE MEASUREMENTS TAKEN ON THAT DATE.
2. THIS TABLE DOES NOT SHOW ANOMALOUS GAUGINGS IGNORED IN THE RATING DEVELOPMENT.
3. THERE ARE TWO SEPARATE POINTS FOR THE 1ST AND 8TH OF JUNE AS ONE WAS COMPLETED WITH AN OTT ADC

1	31JAN13	ISSUED WITH REPORT VA101-457/4-1	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



1	31JAN13	ISSUED WITH REPORT	BW	CMB	-JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

H5 RATING CURVE

Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 1

FIGURE A5

REV 1

Knight Piésold CONSULTING

TABLE A6

NEW GOLD INC.
BLACKWATER GOLD PROJECT

STATION H6
MEASURED DISCHARGE SUMMARY

Print Feb/22/13 8:52:14

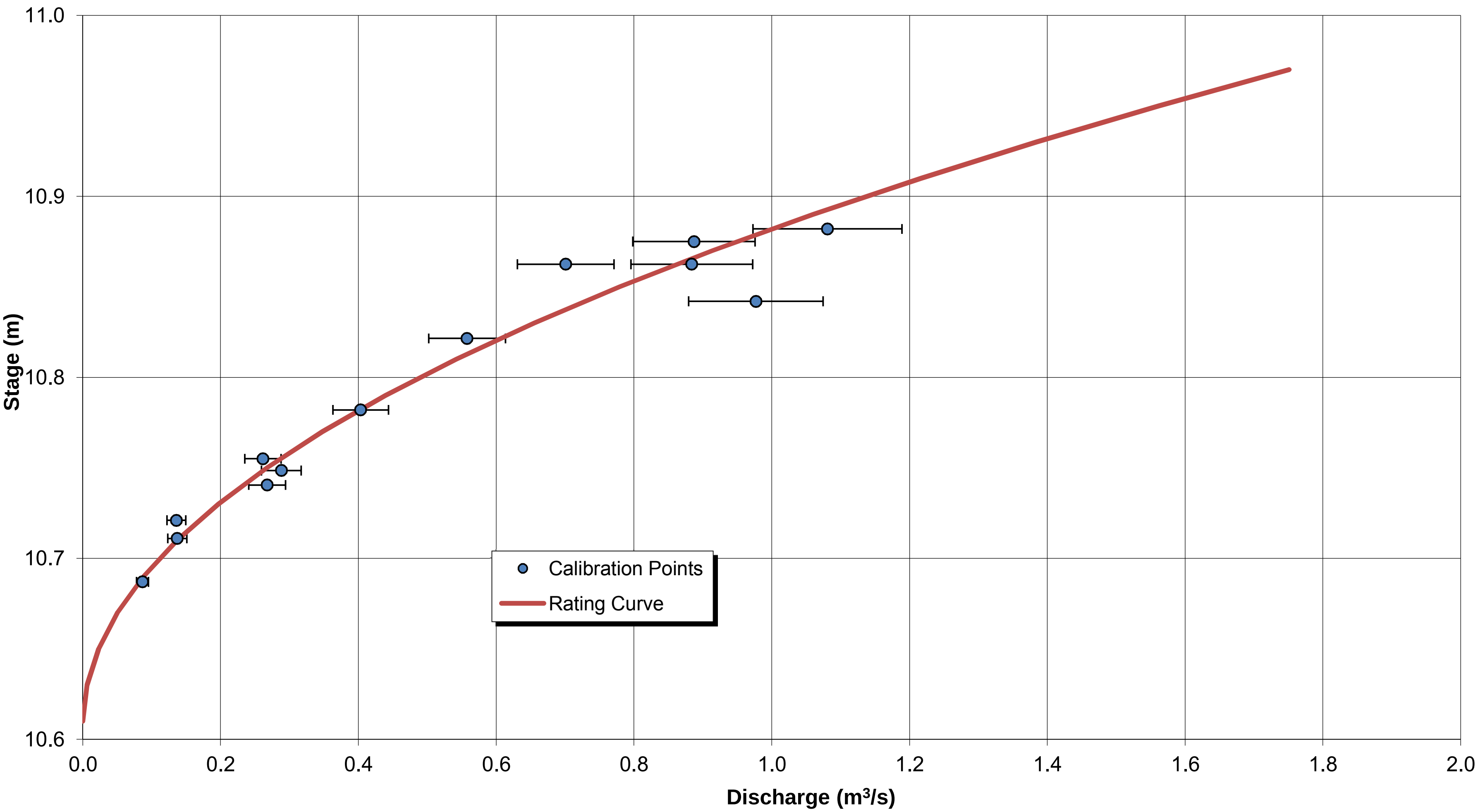
Date	Avg Discharge (m^3/s)	Flow Error %	Stage (m)
9-May-12	0.89	10%	10.875
16-May-12	1.08	10%	10.882
23-May-12	0.98	10%	10.842
30-May-12	0.88	10%	10.863
30-May-12	0.70	10%	10.863
5-Jun-12	0.56	10%	10.822
11-Jun-12	0.40	10%	10.782
21-Jun-12	0.26	10%	10.755
27-Jun-12	0.29	10%	10.749
23-Jul-12	0.27	10%	10.741
21-Aug-12	0.14	10%	10.721
17-Sep-12	0.09	10%	10.687
16-Oct-12	0.14	10%	10.711

M:\1\01\00457\04\A\Data\Task 0800 - 2012 Baseline Data\Hydrology\H6\[H6_RC and Hydrograph - BW.xlsm]Table A6

NOTES:

1. THE AVERAGE DISCHARGE IS THE AVERAGE OF THE MEASUREMENTS TAKEN ON THAT DATE.
2. THIS TABLE DOES NOT SHOW ANOMALOUS GAUGINGS IGNORED IN THE RATING DEVELOPMENT.
3. THERE ARE TWO SEPARATE POINTS FOR THE 1ST AND 8TH OF JUNE AS ONE WAS COMPLETED WITH AN OTT ADC.

1	31JAN13	ISSUED WITH REPORT VA101-457/4-1	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



NEW GOLD INC.

BLACKWATER GOLD PROJECT

H6 RATING CURVE

Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 1

FIGURE A6

REV 1

1	31AN13	ISSUED WITH REPORT	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE A7

NEW GOLD INC.
BLACKWATER GOLD PROJECT

STATION H7
MEASURED DISCHARGE SUMMARY

Print Feb/22/13 8:53:16

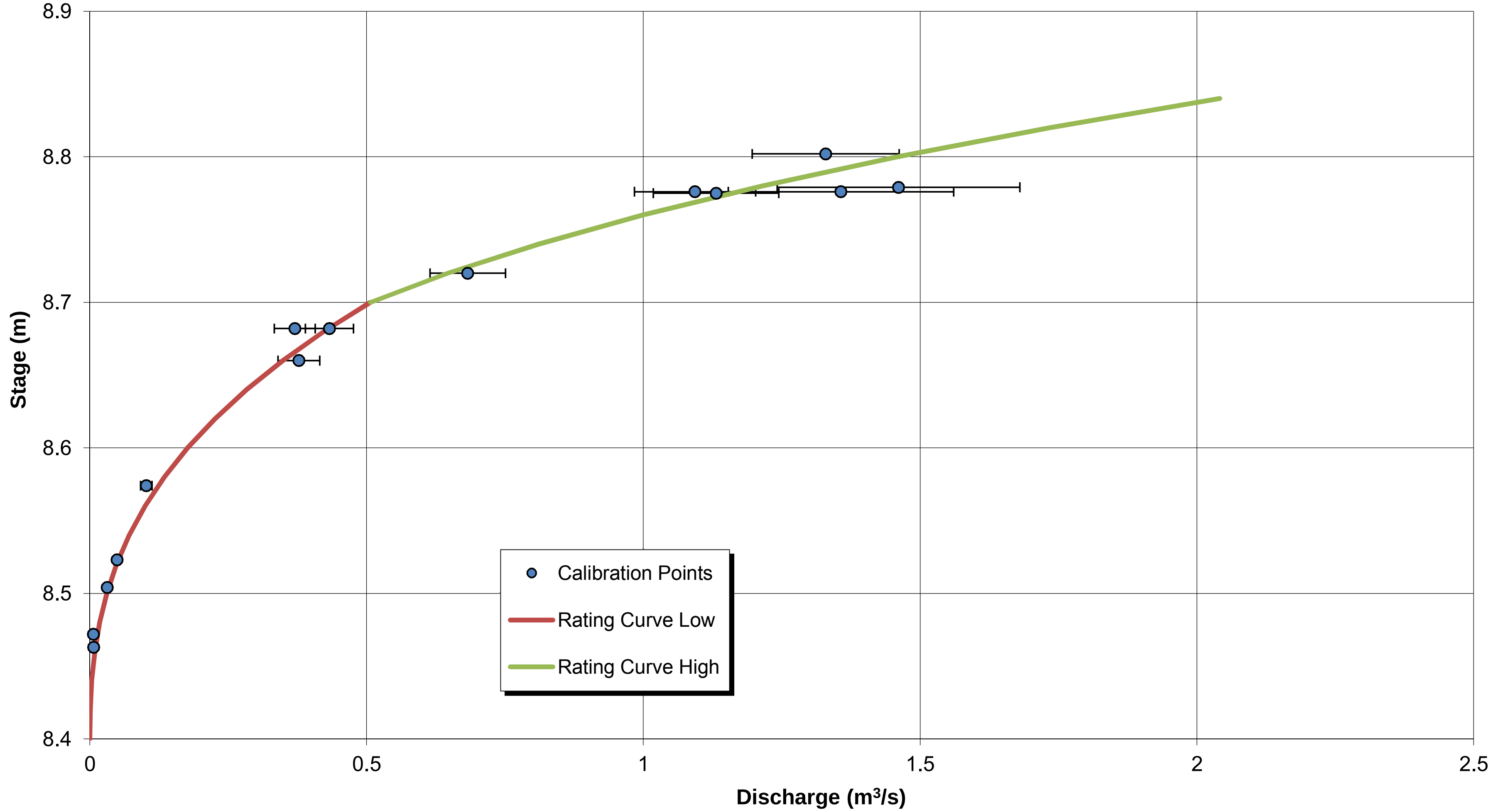
Date	Avg Discharge (m^3/s)	Flow Error %	Stage (m)
8-May-12	1.33	10%	8.752
22-May-12	1.46	15%	8.729
30-May-12	1.36	15%	8.726
30-May-12	1.09	10%	8.726
5-Jun-12	1.13	10%	8.725
11-Jun-12	0.68	10%	8.67
21-Jun-12	0.38	10%	8.61
27-Jun-12	0.37	10%	8.632
27-Jun-12	0.43	10%	8.632
23-Jul-12	0.10	10%	8.524
20-Aug-12	0.03	10%	8.454
17-Sep-12	0.01	10%	8.413
17-Oct-12	0.01	15%	8.422
6-Nov-12	0.05	10%	8.473

M:\1\01\00457\04\A\Data\Task 0800 - 2012 Baseline Data\Hydrology\H7\[H7_RC and Hydrograph - BW.xls]Table A7

NOTES:

1. THE AVERAGE DISCHARGE IS THE AVERAGE OF THE MEASUREMENTS TAKEN ON THAT DATE.
2. THIS TABLE DOES NOT SHOW ANOMALOUS GAUGINGS IGNORED IN THE RATING DEVELOPMENT.
3. THERE ARE TWO SEPARATE POINTS FOR THE 27TH OF JUNE AS ONE WAS COMPLETED WITH AN OTT ADC.

1	31JAN13	ISSUED WITH REPORT VA101-457/4-1	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



NEW GOLD INC.

BLACKWATER GOLD PROJECT

H7 RATING CURVE

Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. 1

FIGURE A7

REV 1

1	31JAN13	ISSUED WITH REPORT	BW	CMB	JGC
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D