Appendix 5.3.5B
Tailings Storage Facility Seepage Sensitivity Analysis

February 6, 2014

File No.:VA101-457/6-A.01
Cont. No.:VA14-00025

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

Mr. Nigel Fisher
Manager Environment
New Gold Inc.
Suite 1800, Two Bentall Centre
555 Burrard Street
Vancouver, BC, V7X 1M9

Dear Nigel,

Re: Blackwater Project - Tailings Storage Facility (TSF) Seepage Sensitivity Analysis

1. GENERAL

Knight Piésold Ltd. (KP) has completed engineering studies and developed the design of the mine waste and water management facilities for the Blackwater Gold Project (the project).

As a component of these studies, a Base Case 'best estimate' of the seepage flow through the Tailings Storage Facility (TSF) embankment dam was calculated and reported for the TSF Site D Embankment Dam and the TSF Site C Embankment Dam. A description of the Base Case seepage estimates undertaken to date can be found in the Appendix C1 of the 'Mine Waste and Water Management Design Report (Knight Piésold Ltd., 2013a).

KP has undertaken further sensitivity analyses at the request of New Gold with the purpose of investigating the sensitivity of the estimated seepage flows for a reasonable range of hydraulic conductivity for the foundation and embankment materials.

This letter presents the results of the tailings seepage estimate sensitivity analyses undertaken for the TSF embankments.

2. BASE CASE SEEPAGE ESTIMATE

The Base Case seepage estimates were completed for steady-state conditions based on the maximum TSF configuration at Year 17 of the mine life (end of process plant operations).

The material parameters of each of the subsurface units modelled in the analysis were based on published values supported by site investigations to derive a reasonable best estimate value. Hydraulic conductivity functions for partially saturated soils were estimated based on material type using functions available in the analysis software package. The estimated material parameters were compared with in-situ and laboratory permeability testing of samples obtained from site investigations wherever possible.

The material parameters used in the Base Case seepage estimate are presented in Table 1.

Table 1 – Material Parameters used in the Base Case Seepage Estimate

Material Type	Saturated or Unsaturated	Saturated Hydraulic Conductivity (K_{sat}, m/s) [4]	Anisotropy Ratio (K_V:K_H)	Remark
Sand and Gravel	Saturated or Unsaturated	1E-04	1.0	In-situ Material
Overburden	Saturated	5E-08	1.0	In-situ Material
Completely Weathered Bedrock	Saturated	5E-08	1.0	In-situ Material
Fractured Bedrock	Saturated	4E-07	1.0	In-situ Material
Fresh Bedrock	Saturated	1E-07	1.0	In-situ Material
Zone S (Core Zone)	Saturated or Unsaturated	1E-08	1.0	Embankment Fill Material
Zone F	Saturated or Unsaturated	1E-05	1.0	Embankment Fill Material
Zone T	Saturated or Unsaturated	1E-04	1.0	Embankment Fill Material
Zone C (Waste Rock)	Saturated or Unsaturated	1E-05	1.0	Embankment Fill Material
Consolidated Tailings	Saturated or Unsaturated	5E-08	0.1	Tailings
Unconsolidated Tailings	Saturated or Unsaturated	5E-08	0.1	Tailings

The Base Case seepage estimate was undertaken by dividing the TSF into three sections: the north abutment, main embankment, and south abutment as shown on Figure 1. The main embankment section extended from TSF Site C through TSF Site D and beyond the Environmental Control Dam (ECD). A representative cross section of the TSF Site D Main Dam embankment is provided on Figure 2.

The seepage model provided an estimate of the unit seepage rate (per linear meter of embankment) through each representative cross section of the TSF embankment.

The following Base Case tailings seepage estimates were determined:

- Total tailings seepage through the embankments and foundation of the TSF Site D Dam = 55 L/s
- Total tailings seepage recovered at the ECD via the interception trenches and drainage system = 53 L/s, and
- Unrecoverable seepage = approximately 2 L/s.

The foundation seepage values derived from the Base Case 'best estimate' seepage modelling were consistent with those determined from a 3-D numerical model (Modflow) of the project (Knight Piésold Ltd., 2013c).

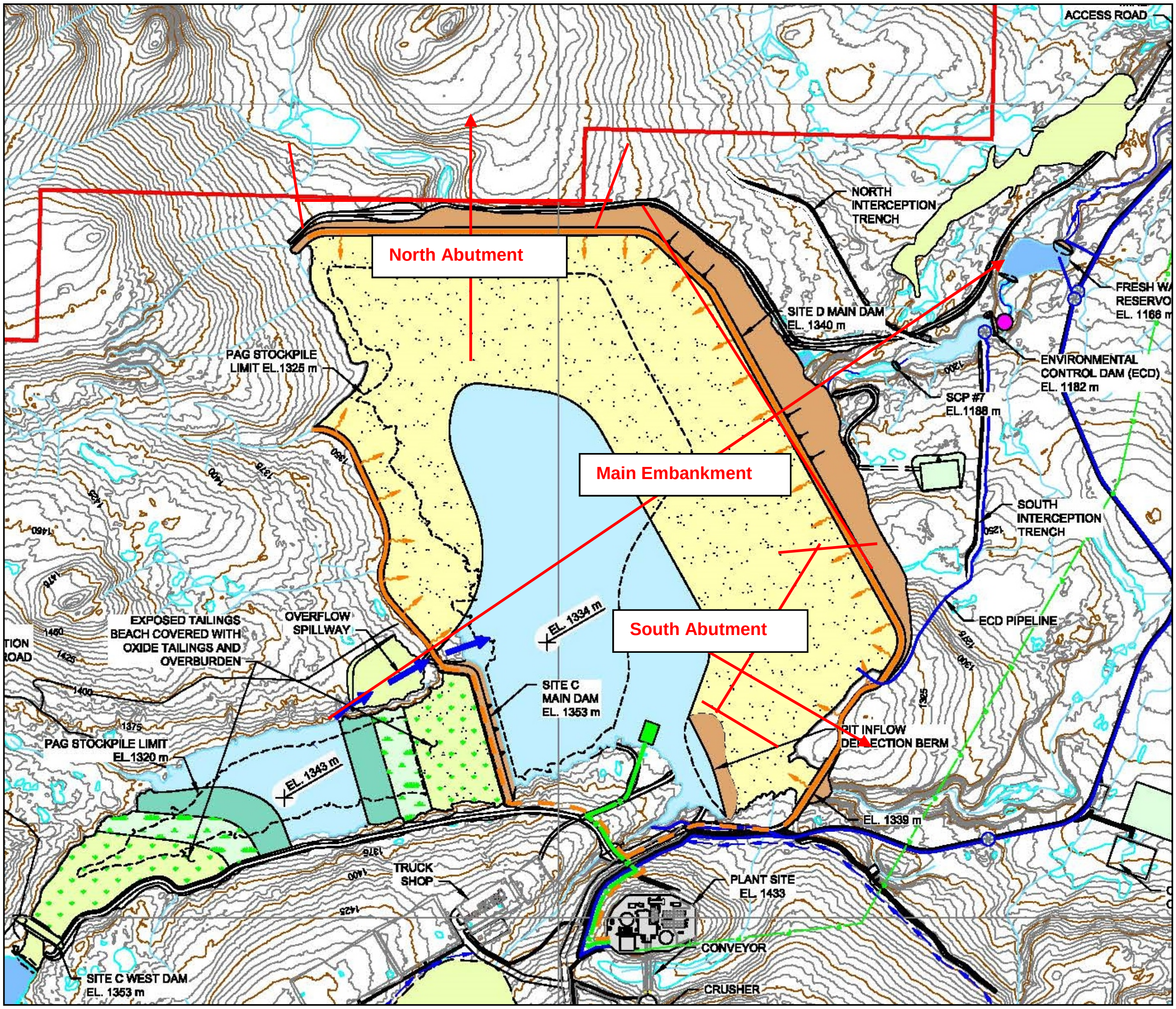


Figure 1 – TSF Seepage Analyses Arrangement

3. SEEPAGE ESTIMATE SENSITIVITY ANALYSIS METHODOLOGY

The seepage estimate sensitivity analyses were also undertaken using SEEP/W ® software for the Site D Main Dam. The model geometry used for the sensitivity analyses remained unchanged from the Base Case analysis.

The sensitivity of the seepage estimate was investigated by varying the saturated hydraulic conductivity of the foundation materials and the TSF dam core. The material parameters of the tailings materials or other dam construction materials were not varied as part of this analysis.

The sensitivity analyses were undertaken by investigating the change in the seepage estimate when a single parameter was varied in isolation. Parameters were varied for the following units:

- Sand and Gravel Unit
- Overburden Unit
- Completely Weathered Bedrock Unit
- Fractured Bedrock Unit, and
- TSF Dam Core Unit (Zone S).

A maximum and minimum (upper and lower bound) saturated hydraulic conductivity for each unit were chosen based on variability in each unit that might be expected based on published values and available laboratory and in-situ permeability test data. The selected values for the sensitivity analyses are summarized in Table 2 and the results of the sensitivity analyses for each material type are presented in the following sections.

Table 2 – Upper and Lower Bound Material Parameters used in Sensitivity Analyses

Material Type	Saturated Hydraulic Conductivity (K_{sat}, m/s)		
	Lower Bound	**Base Case**	**Upper Bound**
Sand and Gravel	1E-05	1E-04	5E-04
Overburden	1E-09	5E-08	1E-06
Completely Weathered Bedrock	1E-09	5E-08	1E-07
Fractured Bedrock	1E-07	4E-07	1E-06
Fresh Bedrock	1E-08	1E-07	1E-07
TSF Dam Zone S (Core Zone)	1E-08	1E-08	1E-07

4. SENSITIVITY ANALYSIS RESULTS

The following sections provide a description of the sensitivity model runs undertaken to estimate the seepage from the TSF Site D Dam for each of the material units. The seepage estimates provided include the cumulative seepage expected from the main embankment and the north and south abutments. The seepage estimate is reported by means of the following metrics:

- Total Seepage (L/s) – Indicates the total tailings seepage that is expected to permeate through the embankment dam and foundation along the entire length of the Site D Dam.
- Unrecoverable Seepage (L/s) – Indicates the total tailings seepage that is expected to be unrecoverable and could reach the watershed downstream of the TSF with the planned seepage controls (e.g. cut-off trench and ECD) in place. The values exclude the portion of the total seepage that will be recovered in the interception trenches and ECD, and returned to the TSF.
- Unrecoverable Seepage as a Percentage of Total Seepage (%) – Indicates the proportion of unrecoverable seepage relative to the total seepage originating from the TSF Site D. This is considered a useful metric to evaluate the effectiveness of the water management features such as the interception trenches and ECD.

4.1 Sensitivity To ‘Sand and Gravel’ Variation

The ‘Sand and Gravel’ unit modelled in the seepage analysis represents the surficial Glaciofluvial deposits encountered across the site. This unit was encountered as course grained glacicofluvial material and fine grained glaciofluvial material (Knight Piésold Ltd., 2013b). The course grained material was classified as GM-GP and SM-SP using the UCSC classification system, and the fine grained material was classified as SP-SM. The unit is expected to be of relatively high permeability compared to the underlying ‘Overburden’.

The saturated hydraulic conductivity for the ‘Sand and Gravel’ unit was varied from 1E-5 m/sec (which indicates a predominantly sandy material) to 5E-4 (predominantly gravelly material with minimal fines). The results of the sensitivity analysis for the Sand and Gravel unit are presented in Figure 3.

The total seepage estimate was moderately sensitive to variation in the saturated hydraulic conductivity of the ‘Sand and Gravel’ unit. The total seepage was estimated to increase to approximately 68 L/sec in the upper bound condition and decrease to 27 L/sec in the lower bound condition.

The unrecoverable seepage was insensitive to variation in the permeability of the ‘Sand and Gravel’ unit. The total unrecoverable seepage was estimated to be approximately 5% of the total seepage (< 2 L/s) for the lower bound and 3% of the total seepage (or 2 L/s) for the upper bound.

4.2 Sensitivity To ‘Overburden’ Variation

The ‘Overburden’ unit modelled in the seepage analysis represents the material encountered below the more recently deposited ‘Sand and Gravel’ unit and overlying the bedrock profile. The ‘Overburden’ unit consists of low-permeability subgrade (LPS) as described in the geotechnical characterization of the TSF site (Knight Piésold Ltd., 2013b), and is considered less permeable than the ‘Sand and Gravel’ unit. The LPS material includes glacial till deposits (SM-SC and GM-GC by UCSC classification), glaciolacustrine deposits (ML-CL), and reworked regolith (GC to CL).

The lower and upper bound saturated hydraulic conductivity values for the ‘Overburden’ unit was taken as 1E-9 m/sec and 1E-6 m/sec, respectively. These values represent lower and upper bound limits based on the laboratory and in-situ test data and previous experience in similar overburden materials. A saturated hydraulic conductivity value of 1E-6 m/sec would represent a material with very little fines, which is inconsistent with the geotechnical characterization of the site. The geotechnical characterization identified foundation materials with abundant fines and only discontinuous lenses of interglacial sand and gravel (Knight Piésold Ltd., 2013b). The results of the sensitivity analysis for the ‘Overburden’ unit are presented on Figure 4.

The total seepage estimate was very sensitive to varying the saturated hydraulic conductivity of the ‘Overburden’ unit. The total seepage was estimated to increase to approximately 200 L/s in the upper bound condition and decrease to 27 L/s in the lower bound condition.

The total unrecoverable seepage was moderately sensitive to variation in the permeability of the overburden once the overburden permeability exceeded 1E-7 m/sec. The total unrecoverable seepage was estimated to be approximately 12% of the total seepage (or 3 L/s) for the lower bound and 4% of the total seepage (or 8 L/s) for the upper bound.

4.3 Sensitivity To ‘Completely Weathered Bedrock’ Variation

The ‘Completely Weathered Bedrock’ unit modelled in the seepage analysis comprises a layer of weathered bedrock material (insitu regolith) overlying a fractured bedrock unit and a fresh bedrock unit (Knight Piésold Ltd., 2013b). The ‘Completely Weathered Bedrock’ unit is expected to have a lower saturated hydraulic conductivity than the less weathered material due to the alteration of the rock mass during the weathering process.

The lower and upper bound saturated hydraulic conductivities for the ‘Completely Weathered Bedrock’ unit was taken as 1E-9 m/sec and 1E-7 m/sec respectively. These values represent a reasonable range of results that were obtained from the in-situ permeability testing undertaken during the site investigation program in the bedrock profile.

The results of the sensitivity analysis for the ‘Completely Weathered Bedrock’ unit are presented on Figure 5.

The total seepage estimate was slightly sensitive to variation in the weathered bedrock saturated hydraulic conductivity. The total seepage was estimated to increase to approximately 57 L/s in the upper bound condition and decrease to less than 45 L/s in the lower bound condition.

The unrecoverable seepage was relatively insensitive to variation in the permeability of the completely weathered bedrock profile. The total unrecoverable seepage was estimated to be approximately 7% of the total seepage (or 3 L/s) for the lower bound and 4% of the total seepage (or 2 L/s) for the upper bound.

4.4 Sensitivity To ‘Fractured Bedrock’ Variation

The ‘Fractured Bedrock’ unit modelled in the seepage analysis represents a zone of fractured bedrock material between the weathered profile and the fresh (less fractured) bedrock material. The ‘Fractured Bedrock’ material is expected to be higher permeability than the ‘Fresh Bedrock’ unit.

The lower and upper bound saturated hydraulic conductivities for the ‘Fractured Bedrock’ unit was taken as 1E-7 m/sec and 1E-6 m/sec respectively. These values represent a reasonable range of values that was obtained from the in-situ permeability testing undertaken during the site investigation program.

The results of the sensitivity analysis for the ‘Fractured Bedrock’ unit are presented on Figure 6

The total seepage estimate is slightly sensitive to variation in the Fractured Bedrock saturated hydraulic conductivity. The total seepage was estimated to increase to approximately 65 L/s in the upper bound condition and decrease to approximately 50 L/s in the lower bound condition.

The unrecoverable seepage was relatively insensitive to variation in the permeability of the fractured bedrock profile. The total unrecoverable seepage was estimated to be approximately 5% of the total seepage (< 3 L/s) for the lower bound and 6% of the total seepage (4 L/s) for the upper bound.

4.5 Sensitivity To ‘Zone S’ (TSF Dam Core) Variation

The Zone S (core zone) for the dam is to be constructed with a selected well graded reworked (compacted) glacial till material. The permeability of the Zone S is expected to be approximately 1E-08 m/sec, however variation in fill sources and compaction quality may result in an increase or decrease in the permeability of this zone.

The sensitivity of the Zone S has been investigated by varying the saturated hydraulic conductivity from 1E-08 m/sec to 1E-07 m/sec. The lower bound was conservatively set equal to the base case, however it is possible to have a lower saturated hydraulic conductivity in the TSF dam core zone depending on material quality and compaction. The results of the sensitivity analysis for the ‘Zone S’ are provided on Figure 7.

The total seepage was very sensitive to variation in the permeability of the ‘Zone S’ unit. The total seepage was estimated to increase to approximately 120 L/s in the upper bound condition and remain at 55 L/s for the lower bound.

The unrecoverable seepage estimate was generally insensitive to an increase in the ‘Zone S’ Core zone permeability. The total unrecoverable seepage was estimated to be approximately 4% of the total seepage (or 2 L/s) for the lower bound and 4% of the total seepage (or 5 L/s) for the upper bound.

5. SUMMARY OF RESULTS

The seepage sensitivity analyses undertaken for the project comprised evaluating the sensitivity of the seepage estimate by individually varying the saturated hydraulic conductivity of the foundation materials and the Zone S embankment material. A summary of the results of the sensitivity analyses is included in Table 3.

Table 3 – Upper and Lower Bound and Base Case Seepage Estimates

Sensitivity Analyses	Lower Bound	Base Case	Upper Bound
Unit	**Total Seepage (L/s)**		
Sand and Gravel	27	55	68
Overburden	27	55	200
Completely Weathered Bedrock	45	55	57
Fractured Bedrock	50	55	65
TSF Dam Zone S	55 (1)	55	120
Unit	**Unrecoverable Seepage (L/s)**		
Sand and Gravel	< 2	2	2
Overburden	3	2	8
Completely Weathered Bedrock	3	2	2
Fractured Bedrock	< 3	2	4
TSF Dam Zone S	2	2	5
Unit	**Unrecoverable Seepage as a Percentage of Total (%)**		
Sand and Gravel	5	4	3
Overburden	12	4	4
Completely Weathered Bedrock	7	4	4
Fractured Bedrock	5	4	6
TSF Dam Zone S	4	4	4

NOTES:
1. LOWER BOUND WAS SET EQUAL TO THE BASE CASE; HOWEVER IT IS POSSIBLE TO HAVE A LOWER SATURATED HYDRAULIC CONDUCTIVITY IN THE CORE ZONE DEPENDING ON MATERIAL QUALITY AND COMPACTION.

The analyses indicated that the total seepage estimate was most sensitive to variation in the saturated hydraulic conductivity of the ‘Overburden’ unit and to a lesser extent the Zone S (Core Zone) unit. The total seepage estimate was found to be slightly sensitive to variation in the saturated hydraulic conductivity of the bedrock profile and ‘Sand and Gravel’ unit.

Overall, the unrecoverable seepage was generally less sensitive than the total seepage estimate to variation in the saturated hydraulic conductivity. Similar to total seepage, unrecoverable seepage was most sensitive to the saturated hydraulic conductivity of the Overburden unit and to a lesser extent the Zone S unit.

A maximum and minimum saturated hydraulic conductivity for each unit was chosen based on variability that could be expected based on published values and available laboratory and in-situ permeability test data. A worst case (upper board) and best case (lower bound) seepage estimate were computed for these ranges.

The worst case (upper bound) seepage estimate for all the analyses completed was a total seepage of 200 L/s, with approximately 8 L/s unrecoverable (4%). This is compared to the best case (lower bound) estimate of 27 L/s total seepage and less than 2 L/s total unrecoverable seepage (7%). The worst case estimate of 200 L/s was an outlier compared to the other estimates, and was based on a hydraulic conductivity for the Overburden that is inconsistent with the geotechnical characterization of the site.

The unrecoverable seepage percentage is considered to be a useful metric to evaluate the effectiveness of the water management features such as the interception trenches and ECD. These features are considered to be robust seepage management features that are relatively unaffected by a reasonable range of hydrogeologic variability. A reasonable sensitivity case was not encountered that would prevent the vast majority of the total seepage to be captured downstream and recycled to the TSF.

Moreover, the base case hydraulic conductivity values are believed to most represent the conditions present in the subsurface materials below the TSF and provide the most reasonable estimate of total and unrecoverable seepage from the facility. Those values should be used in assessing the environmental effects of seepage from the Blackwater TSF. Note that additional seepage control measures (e.g. recovery wells, additional cut off trenches and hydraulic barriers) could be installed if required to reduce the amount of unrecoverable seepage. These additional contingency measures for seepage control are described in the Feasibility Study and EA.

6. CLOSURE

This letter presents the results of the seepage sensitivity analysis undertaken for TSF embankment dam for the Blackwater Gold Project. We trust the information contained herein meets your needs at this time. Should you require any additional information, please do not hesitate to contact the undersigned.

Yours truly,

KNIGHT PIESOLD LTD.

PROFESSIONAL
PROVINCE OF
Feb 6, 2014
D. D. FONTAINE
36202
BRITISH COLUMBIA
ENGINEER

Signed: for
Angus Robb, MEngSc, EIT
Project Engineer

Reviewed:
Daniel Fontaine, P.Eng.
Senior Engineer

for

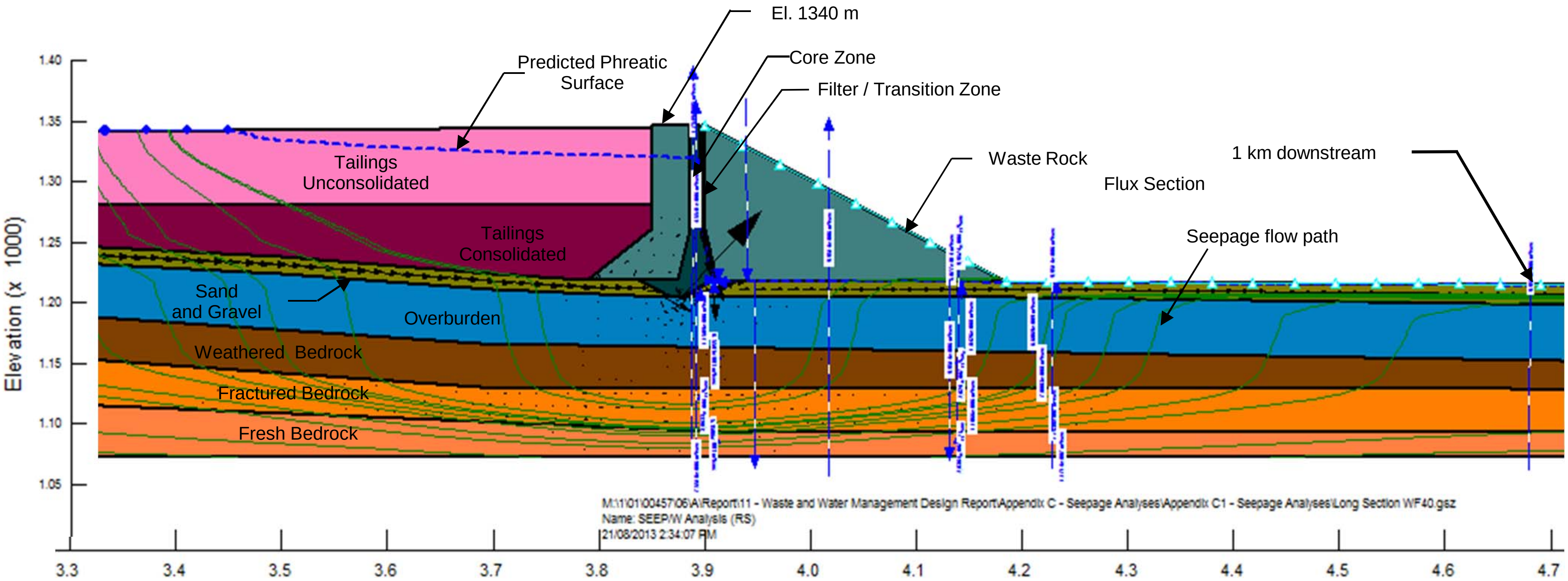
Approved:
Ken Brouwer, P.Eng.
President

Attachments:

Figure 2 Rev 0	TSF Site D Main Dam – Main Embankment Section
Figure 3 Rev 0	TSF Seepage Sensitivity Analysis – 'Sand and Gravel' Sensitivity
Figure 4 Rev 0	TSF Seepage Sensitivity Analysis – 'Overburden' Sensitivity
Figure 5 Rev 0	TSF Seepage Sensitivity Analysis – 'Completely Weathered Bedrock' Sensitivity
Figure 6 Rev 0	TSF Seepage Sensitivity Analysis – 'Fractured Bedrock' Sensitivity
Figure 7 Rev 0	TSF Seepage Sensitivity Analysis – 'Core Zone S' Sensitivity

References:

Knight Piésold Ltd., 2013a. Mine Waste and Water Management Design Report (VA101-457/6-11).
Knight Piésold Ltd., 2013b. Geotechnical Characterization Report (VA101-457/6-8).
Knight Piésold Ltd., 2013c. Numerical Groundwater Modelling Report (VA101-457/6-13).



NOTES:

1. LOCATION OF PHREATIC SURFACE PREDICTED FROM STEADY STATE SEEPAGE ANALYSIS.

0	06FEB'14	ISSUED WITH LETTER	ACR	DDF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

BLACKWATER GOLD PROJECT

TAILINGS STORAGE FACILITY
TSF SITE D MAIN DAM
MAIN EMBANKMENT SECTION

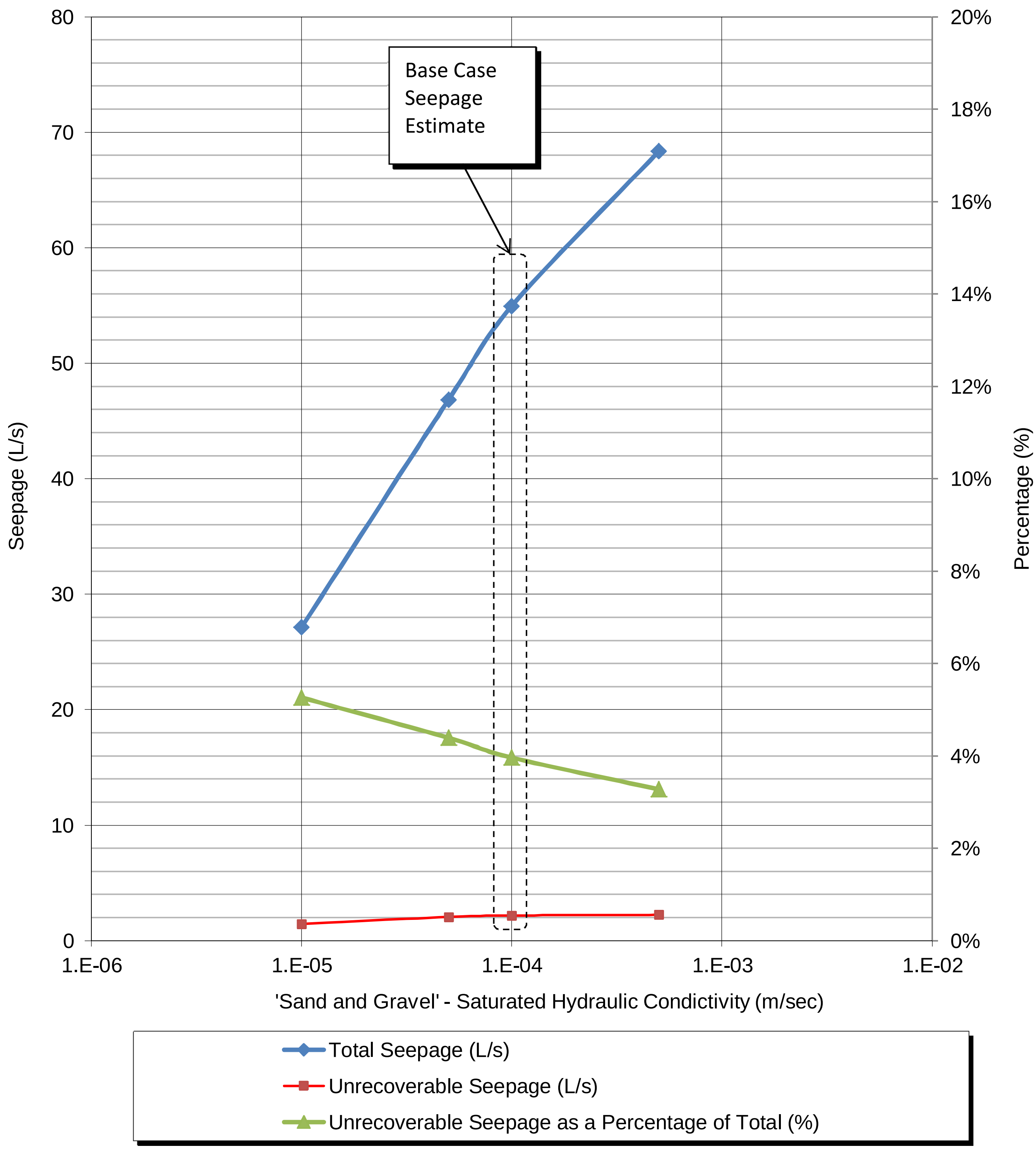
Knight Piésold CONSULTING

P/A. NO. VA101-457/6

REF NO. VA14-00025

FIGURE 2

REV 0



NOTES:
1. THE SENSITIVITY RUN MODELS THE EFFECT THAT VARYING PERMEABILTY OF THE 'SAND AND GRAVEL ' UNIT HAS ON THE TOTAL TAILINGS SEEPAGE ESTIMATE

0	06FEB'13	ISSUED WITH LETTER	ACR	DDF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NEW GOLD INC.

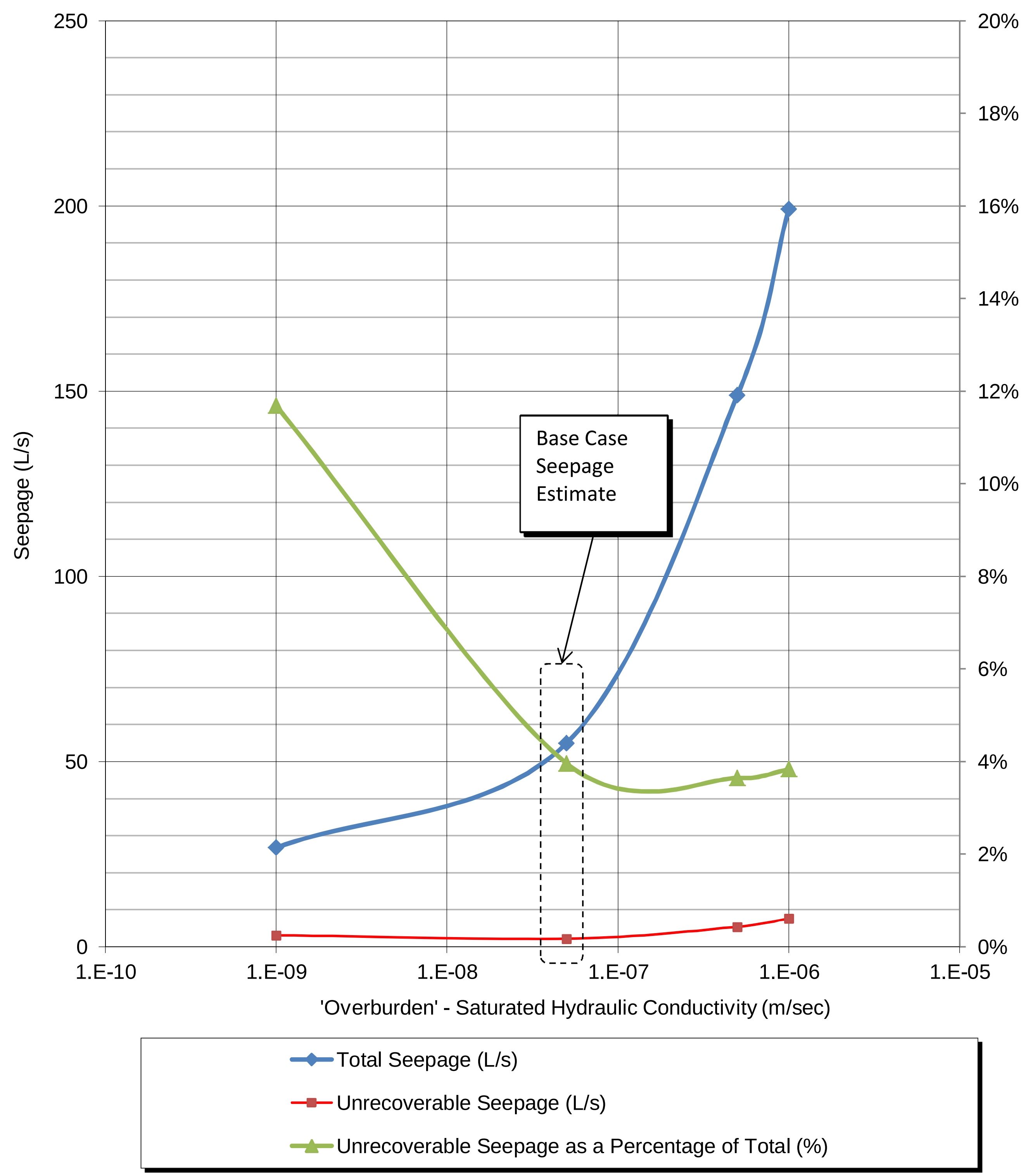
BLACKWATER GOLD PROJECT

TSF SEEPAGE SENSITIVITY ANALYSIS
'SAND AND GRAVEL' SENSITIVITY

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-457/6	VA14-00025

FIGURE 3 REV 0



NOTES:

1. THE SENSITIVITY RUN MODELS THE EFFECT THAT VARYING PERMEABILTY OF THE 'OVERBURDEN' UNIT HAS ON THE TOTAL TAILINGS SEEPAGE ESTIMATE

NEW GOLD INC.

BLACKWATER GOLD PROJECT

TSF SEEPAGE SENSITIVITY ANALYSIS
'OVERBURDEN' SENSITIVITY

Knight Piésold CONSULTING

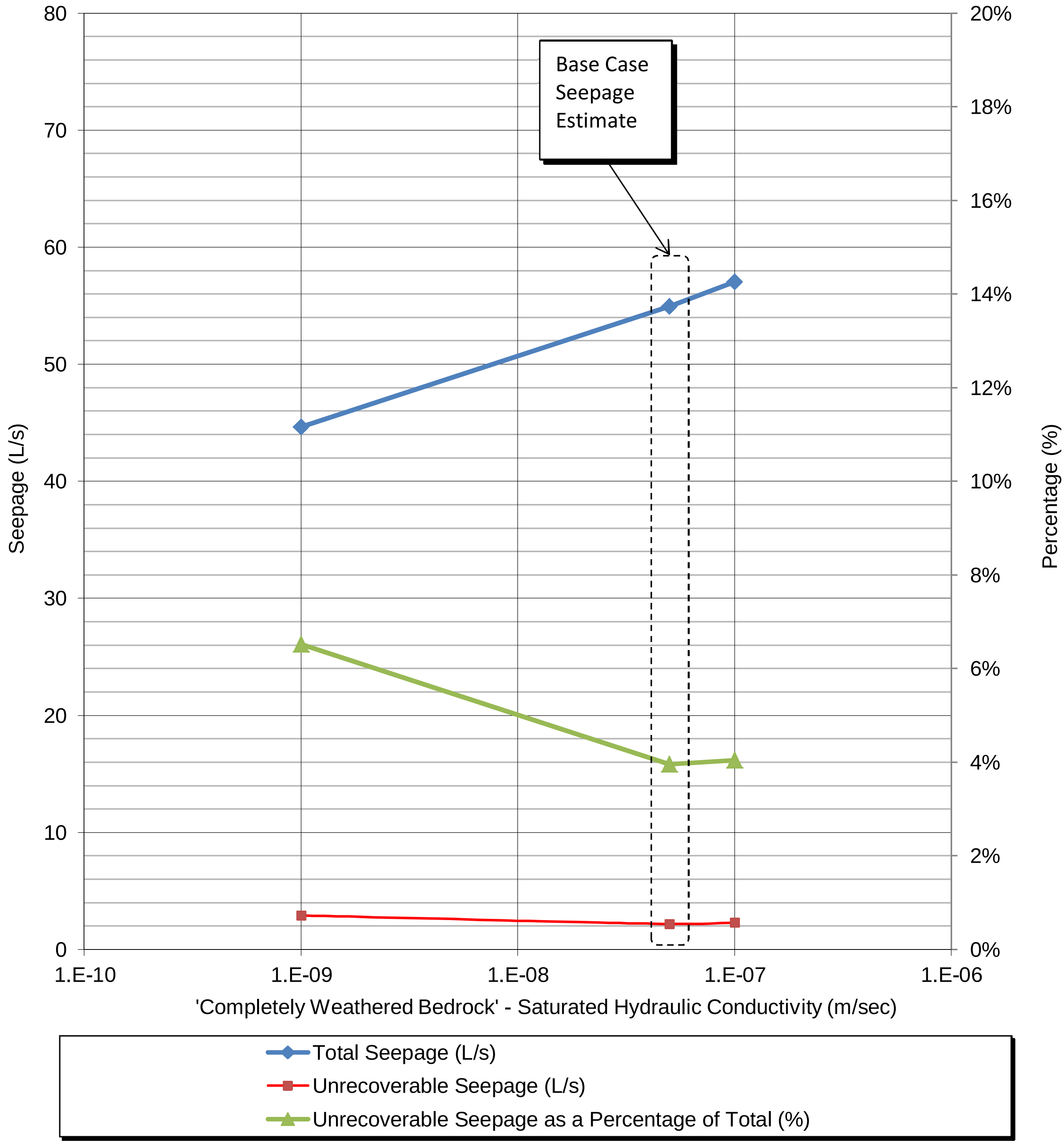
P/A NO. VA101-457/6

REF. NO. VA14-00025

FIGURE 4

REV 0

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	06FEB'13	ISSUED WITH LETTER	ACR	DDF	KJB



NOTES:

1. THE SENSITIVITY RUN MODELS THE EFFECT THAT VARYING PERMEABILTY OF THE WEATHERED BEDROCK HAS ON THE TOTAL TAILINGS SEEPAGE ESTIMATE

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	06FEB'13	ISSUED WITH LETTER	ACR	DDF	KJB

NEW GOLD INC.

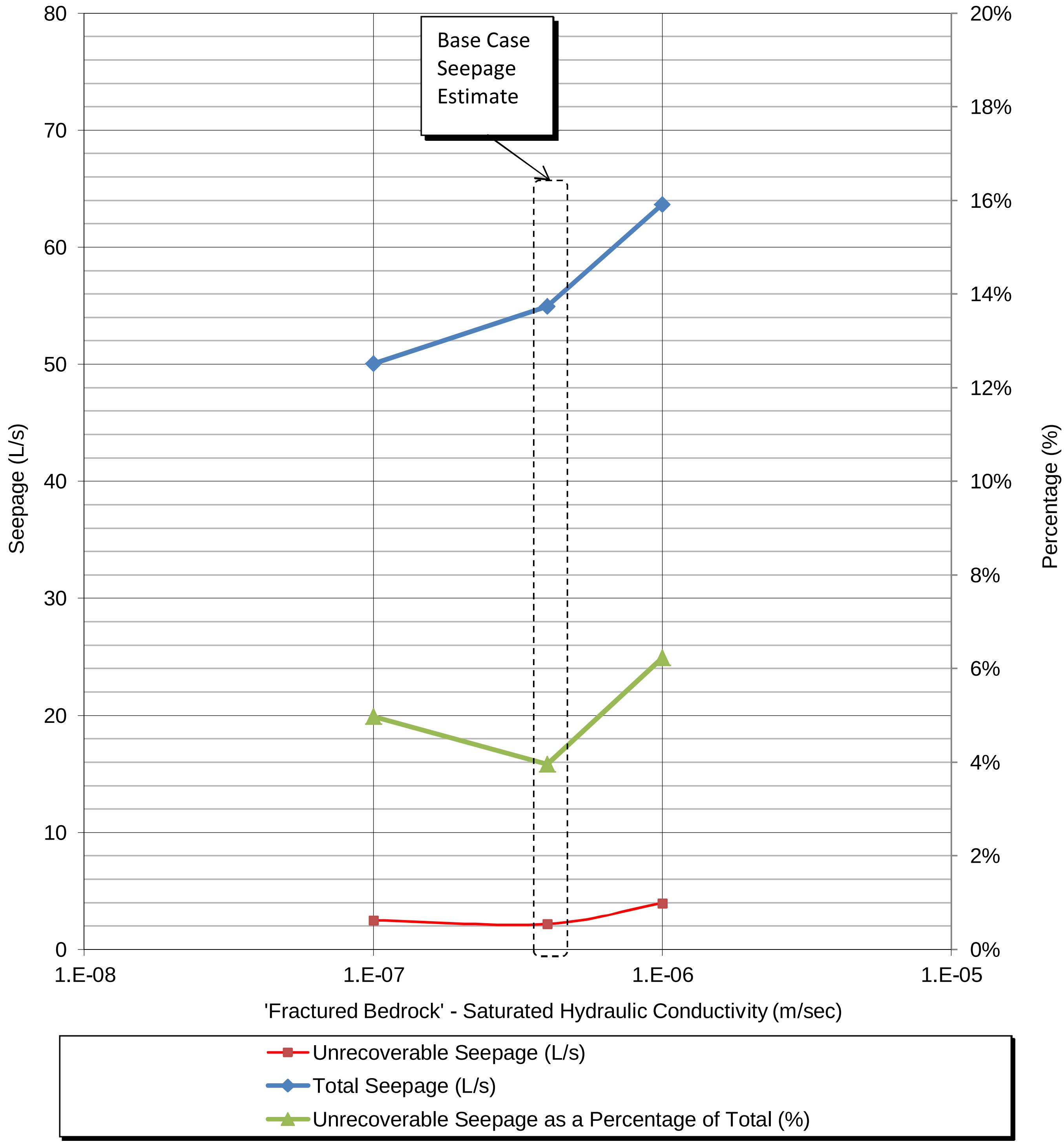
BLACKWATER GOLD PROJECT

TSF SEEPAGE SENSITIVITY ANALYSIS
'COMPLETELY WEATHERED BEDROCK' SENSITIVITY

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-457/6	VA14-00025

FIGURE 5 REV 0



NOTES:
1. THE SENSITIVITY RUN MODELS THE EFFECT THAT VARYING PERMEABILTY OF THE FRACTURED BEDROCK HAS ON THE TOTAL TAILINGS SEEPAGE ESTIMATE

NEW GOLD INC.

BLACKWATER GOLD PROJECT

TSF SEEPAGE SENSITIVITY ANALYSIs
'FRACTURED BEDROCK' SENSITIVITY

Knight Piésold CONSULTING

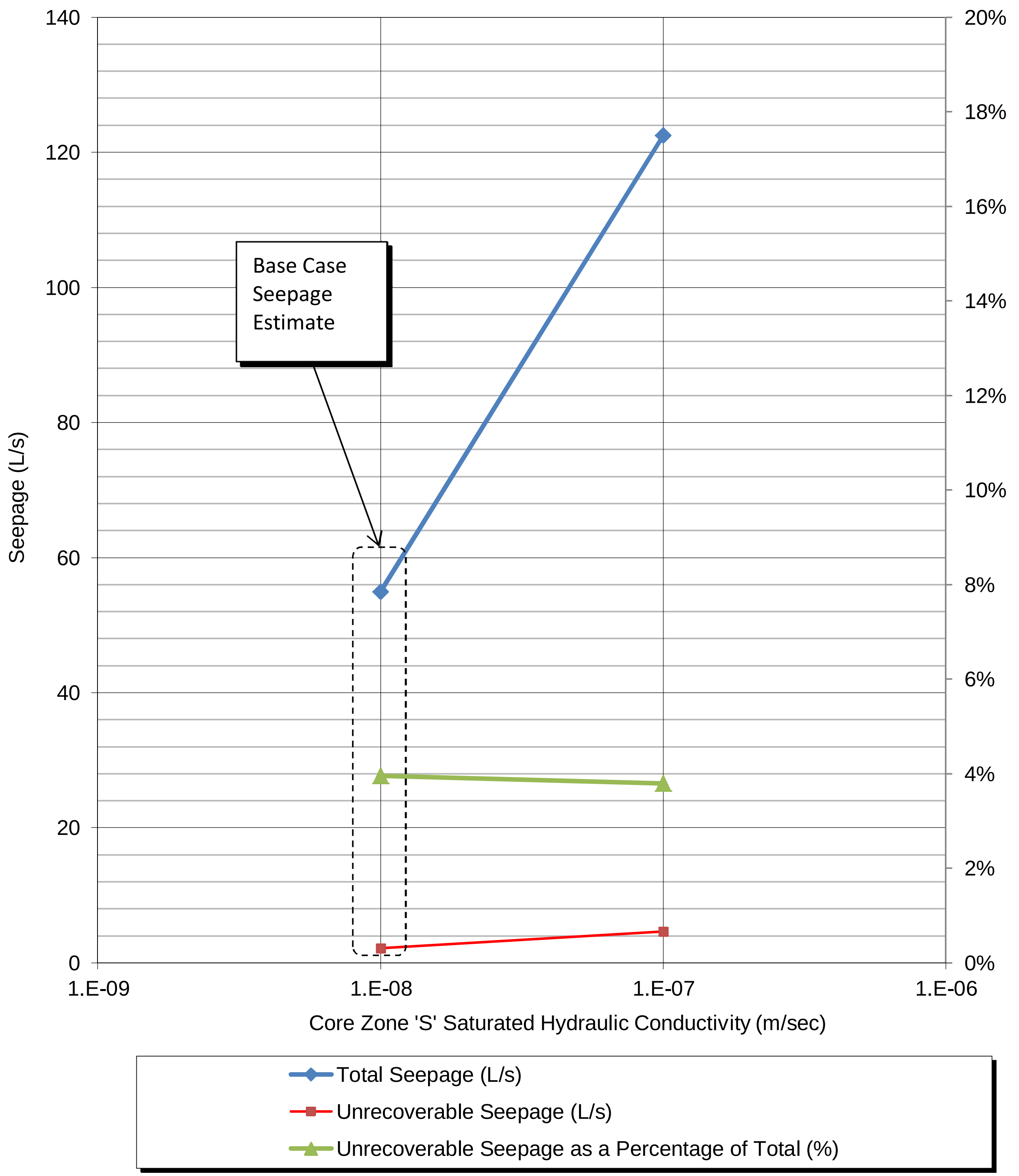
P/A NO. VA101-457/6

REF. NO. VA14-00025

FIGURE 6

REV 0

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	06FEB'13	ISSUED WITH LETTER	ACR	DDF	KJB



NOTES:
1. THE SENSITIVITY RUN MODELS THE EFFECT THAT VARYING PERMEABILTY OF THE 'CORE ZONE' UNIT HAS ON THE TOTAL TAILINGS SEEPAGE ESTIMATE

NEW GOLD INC.

BLACKWATER GOLD PROJECT

TSF SEEPAGE SENSITIVITY ANALYSIS
'CORE ZONE S' SENSITIVITY

Knight Piésold CONSULTING

P/A NO. VA101-457/6 | REF. NO. VA14-00025

FIGURE 7 REV 0

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	06FEB'13	ISSUED WITH LETTER	ACR	DDF	KJB