Environmental and Social Impact Assessment for the Troilus Mine Project

HYDROLOGICAL REGIME

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Acronyms and Abbreviations

CDA	Canadian Dam Association
CEIA	Canadian Environmental Assessment Agency
CEPA	Canadian Environmental Protection Act
CN	Curve number
CNWA	Canadian Navigable Waters Act
DFO	Department of Fisheries and Oceans Canada
DTM	Digital terrain model
ESIA	Environmental and Social Impact Assessment
GCC	Grand Council of the Crees
HEC	Hydrologic Engineering Center
HMS	Hydrologic Modeling System
JBNQA	James Bay and Northern Quebec Agreement
KWR	Kinematic Wave Routing
LQE	Environment Quality Act
LSA	Local Study Area
MDDEP	Ministry of Sustainable Development, Environment and Parks
MDEP	Ministry of Development, Environment and Parks
MDMER	Metal and Diamond Mining Effluent Regulations
MELCC	Ministry of the Environment and the Fight against Climate Change
MELCCFP	Ministry of the Environment, the Fight against Climate Change, Wildlife and Parks
MNRF	Ministry of Natural Resources and Forestry
NPO	Non-profit organizations
NSE	Nash-Sutcliffe efficiency
PDA	Project Development Area
RMSE	Root mean square error
RSA	Regional Study Area
SCS	Soil Conservation Services
SSP	Shared Socio-economic Pathway
TSF	Tailings Storage Facility
VC	Valued Component

11. Hydrological Regime

11.1 Scope of Assessment

11.1.1 Regulatory Framework

The surface hydrological regime of the Troilus mining project is part of a federal and provincial regulatory context. The Troilus mining project is located in the Eeyou Istchee James Bay territory, in the Northern Quebec administrative region, under the authority of the Eeyou Istchee James Bay Regional Government. It is therefore governed by the James Bay and Northern Quebec Agreement (JBNQA), signed in 1975 between the governments of Canada and Quebec, the Grand Council of the Crees (GCC) and the Northern Quebec Inuit Association.

Among other things, the JBNQA divides the territory into Category I, II and III lands. Category I lands are reserved for the exclusive use of the Crees, while Category II lands, contiguous to Category I lands, are part of the Québec public domain, where the Crees have exclusive hunting, fishing and trapping rights. The Troilus mining project is located on Category III lands, which represent all lands in the territory covered by the Agreement that are not included in Category I or II lands. Mineral rights on these Category III lands belong to the provincial government. However, given the interactions of the site's groundwater with surface water under federal jurisdiction, the design and construction of the project must comply with applicable federal regulations.

11.1.1.1 Federal Regulatory Context

The Canadian Environmental Protection Act (CEPA) ensures that potential impacts on the hydrological regime of industrial projects are rigorously assessed and managed before, during and after mine development. The following regulations apply:

Environmental Emergency Regulation

The purpose of the Fisheries Act is to protect fish habitats and regulate any activity likely to harm the population of aquatic species. It ensures that the potential impacts of industrial projects on fish habitats and aquatic ecosystems are strictly assessed and managed.

Metal and Diamond Mining Effluent Regulations (MDMER)

In order to explicitly cover hydrological aspects, the Canadian Navigable Waters Act (CNWA) must also be taken into account. This Act governs the construction or modification of works (bridges, culverts, dams, dredging, etc.) that could change the flow regime or depth of a navigable watercourse and affect the continuity and safety of navigation. A permit under the CNWA is required for any intervention that could disrupt the natural flow, thus ensuring the protection of both the hydrological regime and navigation uses.

11.1.1.2 Provincial Regulatory Context

The Environmental Quality Act (LQE) requires mining projects to obtain authorizations in compliance with regulations. The main regulations and policies applicable to the surface water protection aspect of the Troilus mining project are as follows:

Regulation respecting water withdrawal and protection

Directive 019 on the mining industry (MDDEP, 2012) provides a frame of reference for monitoring and evaluating annual and summer low flows (Q2-7, Q10-7, Q5-30) at the point of discharge into the receiving environment, as well as the hydrodynamic conditions of the environment.

11.1.2 Influence of Consultation and Engagement

From the outset of the project, Troilus Gold Corp (Troilus) engaged in an extensive consultation and communication process with various project stakeholders, as presented in Chapter 4 of the Environmental and Social Impact Assessment (ESIA) report.

Consultation with the stakeholders concerned enables Troilus to incorporate their expectations and concerns into the project, as well as to deepen our knowledge of the environment by integrating the traditional knowledge of the Cree communities.

As part of the Troilus mining project, consultations were held with land users, Cree communities, surrounding communities, the City of Chibougamau, the Eeyou Istchee James Bay Regional Government, and non-profit organizations (NPOs). These consultations helped identify stakeholder concerns, guide the identification and assessment of potential project impacts, and establish communication between the proponent and stakeholders during project design and implementation.

Table 11.1 presents the concerns raised during consultations with stakeholders. These elements, detailed in the consultation section of the ESIA, illustrate how this feedback influenced and modified the project design to better address the environmental and social issues identified during the impact assessment.

Table 11.1 Summary of key information, Indigenous knowledge and concerns for the project related to the hydrological regime

Topic	Key Information, Indigenous Knowledge and Concerns	Influence on the Assessment	Where information is addressed in the ESIA
Bibou Creek diversion.	Concerns about flood risk and natural flow replication associated with the Bibou Creek diversion.	Addressed in pre-feasibility study (Troilus Mining Project Site-Wide Operational Water Management Plan). Included in potential impact mitigation measures.	Chapter 3 Chapter 4 Chapter 11 WSP, 2024
Pit dewatering.	Concerns about impacts on fish, particularly walleye, at Lake A outlet and downstream. There is a lack of monitoring at the Lake A outlet.	Addressed in pre-feasibility study (Troilus Mining Project Site-wide Operational Water Management Plan.)	Chapter 3 Chapter 4 Chapter 11 WSP, 2024

11.1.3 Potential Impacts, Pathways and Measurable Parameters

The construction, operation and closure phases of the Troilus mining project involve a number of activities that result in changes to the watershed area and land cover, leading to a modification of the spatio-temporal flow distribution over the three phases of the project. This interaction may result in the generation of potential impacts on the hydrological regime during all three phases of the project life cycle. Activities likely to interact with the hydrological regime are listed intable 11.2 . The potential impacts of these activities on the hydrological regime are described in Section 11.4.1.1. The spatial and temporal extent of potential impacts is described in Section 11.1.4.

The identification of potential impacts on the hydrological regime considered concerns raised by stakeholders, which are detailed in Section 11.1.2 . More specifically, the interaction of Troilus mining project activities with the hydrological regime includes watercourse diversion, displacement of water sources, changes in water levels and flows affecting flood and drought indices.

Measurable parameters of the hydrological regime represent changes in water levels and flows in local water bodies and streams, relative to established reference conditions (Section 11.2.2). These changes are directly or indirectly attributable to Troilus mining project activities within the spatio-temporal boundaries presented in Section 11.1.4. The development of an environmental monitoring program for the hydrological regime, throughout the life cycle of the Troilus mining project, will make it possible to assess the measurable parameters of this potential impact on the Valued Component (VC).

TheTable 11.2 presents the pathways and measurable parameters used in the assessment of impacts on the hydrological regime.

Table 11.2 Potential impacts, impact pathways and measurable parameters for the hydrological regime

Potential impact	Impact Pathways	Measurable Parameters and Units of Measurement
Modification of the hydrological regime, including changes in flood and drought indices.	The construction of watercourse diversion (e.g., Bibou Creek [CE2]), a tailings storage facility area (TSF) and waste rock piles, overburden and ore, sedimentation ponds, contact water collection ditches, sumps, etc., strongly influences natural flow, causing annual and seasonal variations in flow and water levels. The diversion of Bibou Creek (CE2) and the discharge of mine effluent during the operation and closure phases will result in a change in the hydrological regime, towards a more regulated regime, which will need to be put into perspective with climate change conditions.	Average monthly, seasonal and annual flow (m^3/s) Percentage change in peak flow amplitude (%) Change in peak flow timing (days) Change in flow volume (%) Flow quantiles for past and future periods (m^3/s)

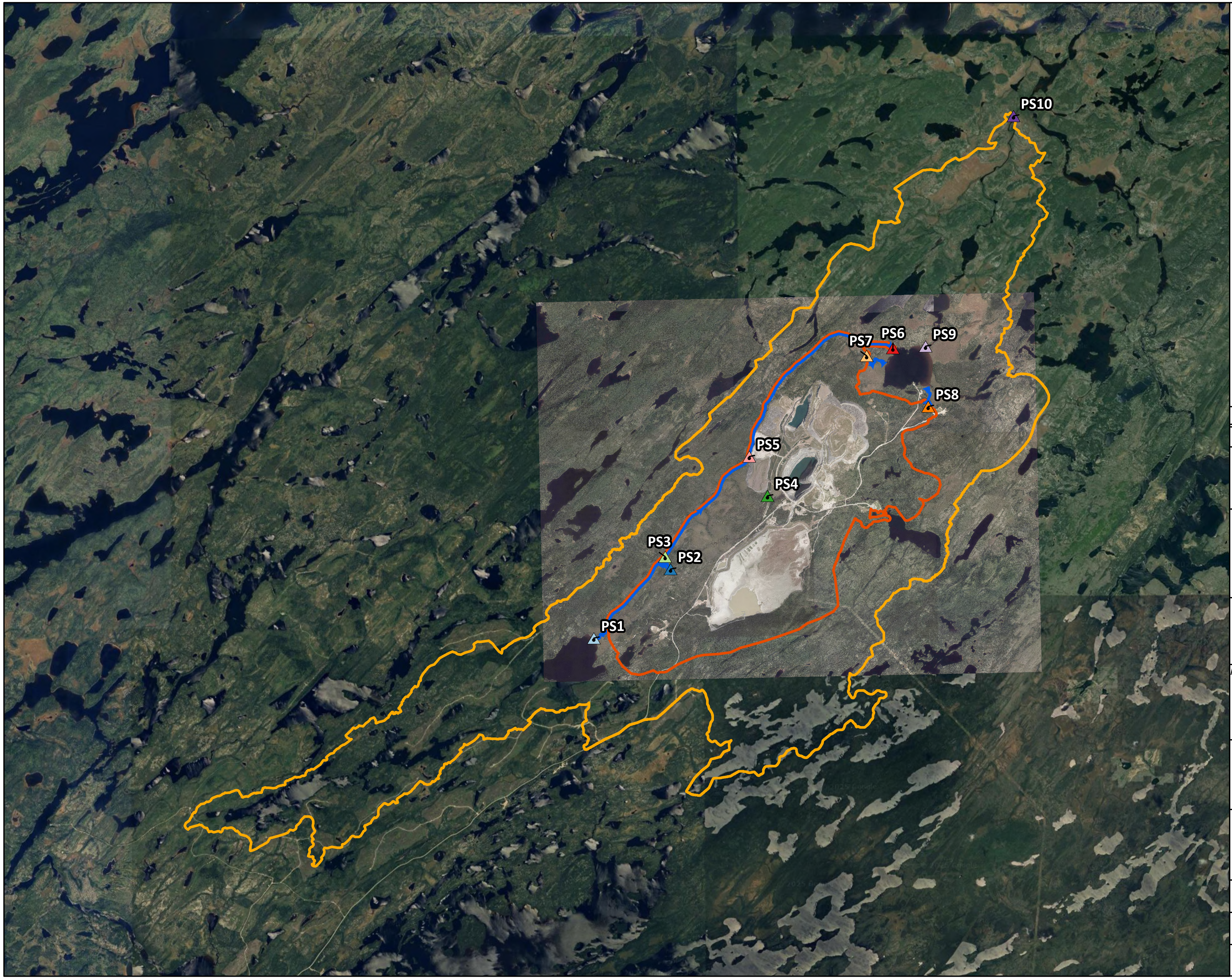
11.1.4 Boundaries

11.1.4.1 Spatial Boundaries

The study area is the spatial framework within which the CV of the hydrological regime of the receiving environment is described and analyzed, and the impacts of the project on it assessed. It comprises the Project Development Area (PDA), the Local Study Area (LSA) and the Regional Study Area (RSA).

The LSA encompasses the PDA and corresponds to the area in which the residual environmental impacts of the project can be predicted or measured with a higher degree of confidence. The LSA corresponds to the sub-basins obtained by accumulating flows on a digital terrain model (DTM). Specifically, the accumulation point on stream CE52, upstream of Lake Boisfort, was chosen to delineate the watershed contributing to this point. In this way, the project watershed is used to identify the hydrological environment representative of the Troilus mining project's interactions with the VC, and the impacts generated on the VC. The LSA therefore represents the spatial extent where it is reasonable to expect potential impacts on water quality and the surface hydrological regime requiring more detailed assessment. Map 11.1 shows the Local Study Area.

The RSA, including the LSA, provides a framework for assessing the cumulative impacts of the project in combination with past, present or future activities. The RSA is used to characterize the VC of the regional hydrological receiving environment located downstream of the LSA. The RSA includes Lake Boisfort, as well as the sub-watersheds downstream of the LSA that drain into Lake Boisfort. Creek CE52-SH1 also drains into Lake Boisfort. In addition, a 2 km buffer zone around the LSA was considered and merged with a watershed delineation to define the RSA, thereby better contextualizing the project's specific impacts and their contribution to regional impacts. Map 11.2 illustrates the extent of the RSA applicable to the VC.



LÉGENDE / LEGEND

- Zone de développement du projet / Project Development Area
- Zone d'étude locale / Local Study Area
- Canal de dérivation / Diversion channel

Points de suivi / Monitoring Points

- PS1 - Exutoire du lac Amont (PE2) / Lake Amont (PE2) Outlet
- PS2 - Exutoire SP01 / SP01 Outlet
- PS3 - Point de rejet de la station de traitement des eaux et SP01 / Water Treatment Facility and SP01 Discharge Point
- PS4 - Exutoire SP02 / SP02 Outlet
- PS5 - Points de rejet de SP02 / SP02 Discharge Point
- PS6 - Jonction du ruisseau Bibou (CE2-SH4) et du Lac A (PE43) / Bibou Creek (CE2-SH4) and Lake A (PE43) Junction Point
- PS7 - Exutoire SP03 / SP03 Outlet
- PS8 - Exutoire SP04 / SP04 Outlet
- PS9 - Exutoire du lac A (PE43) / Lake A (PE43) Outlet
- PS10 - Exutoire du bassin versant (ZEL) / Local Watershed Outlet (ZEL)

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NOTES

RÉFÉRENCES/REFERENCES

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Carte de base: Bing 06 Juin 2023

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CLIENT

Troilus Gold Corp.

PROJET/PROJECT

Étude d'impact sur l'environnement et le milieu social pour le projet de mine Troilus / Environmental and Social Impact Assessement for the Troilus Mine Project

TITRE/TITLE

Zone d'étude locale / Local Study Area

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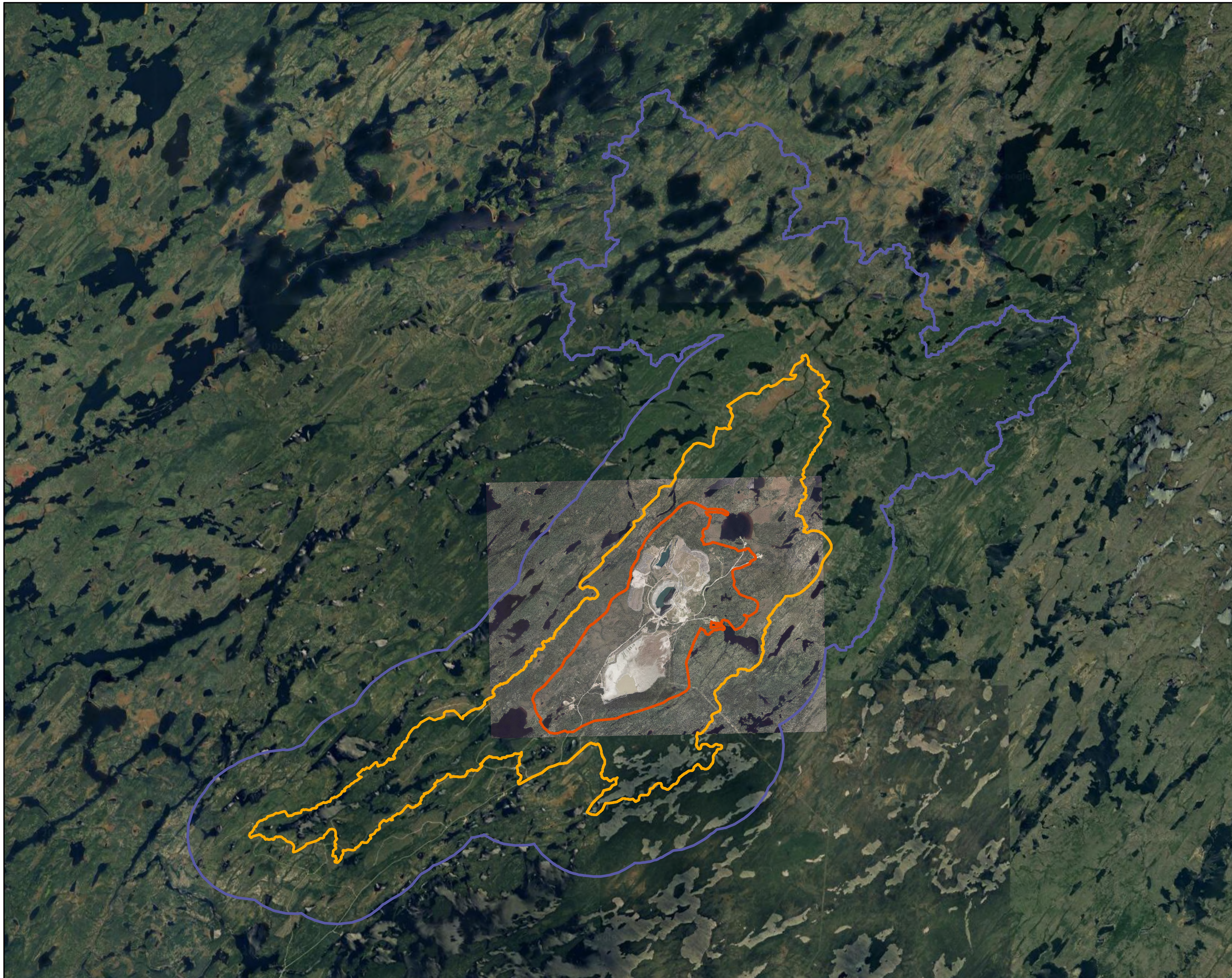

LÉGENDE / LEGEND

- Zone de développement du projet / Project development area
- Hydrologie - Zone d'étude locale / Hydrology - Local Study Area
- Hydrologie - Zone d'étude régionale / Hydrology - Regional Study Area

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RÉFÉRENCES/REFERENCES

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Carte de base: Bing 06 Juin 2023

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CLIENT

Troilus Gold Corp.

PROJET/PROJECT

Étude d'impact sur l'environnement et le milieu social pour le projet de mine Troilus / Environmental and Social Impact Assessment for the Troilus Mine Project

TITRE/TITLE

Zone d'étude régionale / Regional Study Area

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11.1.4.2 Temporal Boundaries

The temporal scope of the assessment includes all phases of the project, from the start of construction to the end of closure. According to the current project schedule, the project phases include:

- Construction (Year -3 to Year -1)
- Operations

  Operations phase 1 (Year 1 to Year 21): milling with ore extraction

  Operations phase 2 (Year 22): milling with no ore extraction
- Decommissioning and closure

  Active closure (Year 22 to Year 24)

  Passive closure (Year 24+)

Chapter 3 of the ESIA (Project Description) provides a detailed description of the activities planned for each phase.

11.1.5 Residual Impacts Characterization

Table 11.3 Characterization of residual impacts on hydrological regime

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual impact	Positive - a residual impact that causes measurable parameters to evolve in a favorable direction for the VC relative to the baseline. Adverse - a residual impact that causes measurable parameters to evolve in an unfavorable direction for the VC in relation to the baseline. Neutral - no net change in measurable parameters for the VC compared with the baseline.
Magnitude	The magnitude of the change in hydrological regime relative to baseline conditions.	No measurable change - No measurable change is observed in the hydrological regime relative to baseline conditions. Low - Slight variations in both peak flow and total volume are observed. However, these variations remain within the range of natural variability. These variations do not affect the accessibility of water resources for existing uses. Moderate - Variations in peak flow and total volume become noticeable, compared with reference conditions. The hydrological regime is modified in such a way as to affect the reliability of water resources for existing users. High - A significant impact on the hydrological regime is observed, with substantial changes in both peak flow and total volume, exceeding natural variability. Peak flow events may become extreme, significantly above or below natural levels. The total volume of water discharged may be considerably altered, rendering the water resource

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
		unsuitable or insufficient for its intended uses well beyond the duration of the project.
Geographic scope	The geographic area in which a residual impact occurs	PDA - residual impacts are limited to the PDA LSA - residual impacts extend to the LSA RSA - residual impacts extend to the RSA
Timing	Considers the timing in the hydrological cycle when the residual impact on the regime occurs	Zero sensitivity - The impact occurs outside critical periods of the hydrological cycle (e.g. during periods of stability or average flow), so that the timing does not significantly affect water resource management or availability. Moderate sensitivity - The impact occurs during a transition phase or a period of moderate sensitivity in the hydrological cycle (e.g., around flood or low-flow periods), without seriously compromising the resilience of the system. High sensitivity - The impact occurs during a critical phase of the hydrological cycle (e.g., during the critical low-flow period, when water supply is vital, or during a major flood), amplifying the adverse impacts on the reliability and accessibility of water resources.
Duration	Time required for the hydrological regime to return to its initial state, or for the residual impact no longer to be measured or perceived.	Short term - The residual impact is limited to a discrete hydrological event (e.g. a storm, a flood or a short-lived anomaly) with a rapid return to reference conditions (e.g. within a few days or weeks). Medium-term - The residual impact extends over several hydrological events or an entire season, with a gradual recovery to reference conditions taking place over several weeks to months. Long term - The residual impact persists well beyond the usual hydrological cycle, modifying the hydrological regime (both peak flow and total volume) over several seasons or years, making recovery to reference conditions unlikely within the usual management timeframe.
Frequency	Identifies the frequency of the residual impact and its occurrence over the course of the project or a specific phase.	Single event Multiple irregular event - occurs at irregular intervals Multiple regular event - occurs at regular intervals Continuous - occurs continuously
Reversibility	This refers to whether the hydrological regime can return to its initial state after project activity ceases.	Reversible - the residual impact is likely to be reversed after completion of the activity and reclamation. Irreversible - the residual impact is unlikely to be reversed.

11.1.6 Significance Definition

Adverse impacts are characterized using the Canadian Impact Assessment Agency (CIAA) ranking system: negligible or low, moderate or high.

- **Negligible or low**: Impacts on the hydrological regime are considered negligible or low when they result in slight variations in peak flow and total volume, which remain within the limits of expected natural variability. These variations occur sporadically and over a limited period, without significantly compromising water management or availability for existing uses. What's more, these impacts are generally concentrated over a limited spatial area and are easily reversible or compensable. Under these conditions, mitigation measures help preserve hydrological equilibrium and maintain reference conditions.
- **Moderate**: Moderate impacts on the hydrological regime are characterized by significant deviations of peak flow and/or total volume from natural conditions. These variations, which may occur occasionally or during specific periods of the hydrological cycle, temporarily compromise water supply reliability for existing users. Although mitigation measures can reduce the magnitude of these impacts, they do not always completely eliminate the induced imbalances, resulting in a measurable modification of the water resource and may temporarily alter its accessibility and quality.
- **High**: High impacts on the hydrological regime are manifested by substantial and persistent changes in peak flow and total volume, far exceeding natural variability. These impacts, often associated with extreme or recurrent hydrological events, have a lasting effect on the reliability and accessibility of the water resource, particularly in sensitive or vulnerable areas (e.g., areas of exclusive indigenous use or ecologically important regions). In such cases, even significant mitigation measures struggle to restore reference conditions, and uncertainty about the effectiveness of such measures remains high, potentially leading to significant environmental, health, social and economic repercussions.

11.2 Existing Conditions

The Valued Component (VC) of the hydrological regime analyzes the potential impacts of the project on the alteration of natural surface water flow. This section provides a description of the VC and existing conditions, as well as a description of the hydrological trends in the environment.

These represent a baseline against which the project's potential, residual and cumulative impacts on the VC can be assessed.

11.2.1 Methods

11.2.1.1 Literature Review

A review of available data and information on hydrometric monitoring and the hydrological context of the environment was carried out. These data were analyzed to provide a description of the existing hydrological environment, establishing a baseline for the VC. The following documents and environmental studies were used as references and primary data sources for the VC description:

- Inmet Mining Corporation. 1996. Environmental monitoring and inspection program submitted to the Ministry of the Environment and Wildlife. Regional directorate of Abitibi-Témiscamingue et Northern Quebec. Troilus Project;
- Ministry of the Environment, the Fight against Climate Change, Wildlife and Parks (MELCCFP). nd. History of hydrometric stations [online], https://www.cehq.gouv.qc.ca/hydrometrie/historique_donnees/
- Troilus Gold Corp - Environment Department. 2021. Post-closure environmental monitoring and inspection program 2020. Submitted to the Ministry of the Environment and Fight against Climate Change. Regional directorate of Abitibi-Témiscamingue et Northern Quebec.. Direction régionale de l'Abitibi-Témiscamingue et du Nord-du-Québec. Québec;
- WSP. 2024. Troilus Project Operational Site-Wide Water Management Plan. Feasibility Study. 61 pages + tables, figures and appendices. N/Ref: 059-2252552002-RevA (Appendix C.14 of the ESIA report);
- Wachiih Resources (Wachiih). 2024a. Hydrology - Baseline Study - Troilus Mine Project. Project Report (Appendix G.1.1 of the ESIA Report);
- Wachiih and Hydro Ressources inc. 2019. Troilus Mine Project-receiving environment baseline - Hydrology. Report prepared for Troilus Gold. 13 p + appendices (Appendix G.1.2 of the ESIA report).

Long-term hydrological data for trend analysis are not available for the RSA. The nearest hydrological gauging station is located in the Broadback River watershed. This station was considered representative of the hydrological characteristics of the study area. The climatic conditions regulating the hydrological system at this location are similar to those at the study site (WSP, 2024). The Broadback station's provincial number is 080809 and its federal number is 03BD002. The station is located at the outlet of Lake Quénonisca, at coordinates 50°44' 44.916''N/76°23' 13.884''W. Hydrometric data are available from 1972 to 2005 and from 2008 to 2024 (MELCCFP, date undetermined).

Five different distributions (normal, log-normal, Gumble, Pearson III and Log-Pearson III) were used to calculate flood indices for return periods of 2, 5, 10, 20, 50 and 100 years. The use of multiple distributions makes it possible to characterize the uncertainties corresponding to the statistical assumptions concerning the distribution governing the hydrological system. Annual maxima were extracted from the time series data to calculate flood indices. A non-parametric Mann-Kendall test was performed to assess trends.
In addition, a parametric least-squares trend test was performed to calculate trend values. The *p-value* measures the probability of obtaining results as extreme as those observed under the null hypothesis; a *p-value* below a significance level (0.05) indicates that the results are statistically significant (i.e., the observed results are unlikely to have occurred by chance, and there is a high probability that the observed impact is real). Thus, these results are considered sufficiently convincing to challenge the null hypothesis and support the existence of an impact or difference in the data.

11.2.1.2 Gauging and Water Level Measurement Campaigns and Methods

Several hydrometric survey campaigns have been carried out between 2019 and 2024, with the aim of characterizing the hydrological regime of the existing environment. Appendices G.1.1 and G.1.2 of the ESIA detail all the hydrometric campaigns carried out to characterize the baseline state of the hydrological environment In 2019, ten hydrometric stations were established in the study area, including eight in streams (HY1, HY2 HY3, HY5, HY6, HY7, HY8 and HY9), station HY4 in Lake A (PE43) and station HY10 in Lake B (PE29). HOBO-type water level probes were used to take measurements at each of the ten stations in the study area. A barometric probe was installed to allow local atmospheric pressure variations to be abstracted from water level measurements (Wachiih and Hydro Resources, 2019).

In 2022, five hydrometric stations were installed by Wachiih Resouces:

- Probe 1: Bibou Creek (CE2)
- Probe 2a: Bibou Creek (SH32)
- Lake Amont probe: Lake Amont (PE2)
- Lake A probe 3: Lake A (PE43)
- Probe 4: Stream SH2

Hydrological data was collected at these stations between 2023 and 2024. Existing velocity measurements, taken with a current meter, were used to calculate flows per cross-section of the watercourses. The aim of these measurements is to refine the level/discharge relationship, by enabling discharge forecasts based on continuously recorded water levels. Water level variation was monitored on Lake A (PE43) and Lake C2 (PE50). Lake A (PE43) was equipped with a Solinst M10 probe, which has been continuously recording water level variations since October 2022. The probe on Lake C2 (PE9) is a maxima gauge measuring the maximum annual level during floods. A survey campaign using a GNSS GPS was used to record the exact positions of the probes (Wachiih, 2024a).

11.2.1.3 Hydrological Modeling

HEC-HMS (Hydrologic Engineering Center - Hydrologic Modeling System) software version 4.5 was used for this hydrological study. The following configurations were applied:

- Soil Conservation Services (SCS) method Curve Number (CN) was applied to model infiltration (loss) of water systems;
- The SCS Unit Hydrograph method was used to determine the amount of runoff generated by a rainfall event, by transforming excess precipitation into surface flows;
- The Kinematic Wave Routing (KWR) method was used to estimate stormwater runoff;
- The recession method was used to approximate base flow;
- The temperature index method was used to estimate snow accumulation and snowmelt;

Several data sources were used to perform hydrological modeling of the environment, including :

- High-resolution 1-meter DTMs from the Ministry of Natural Resources and Forestry (MNRF, 2016) were used to perform sub-basin delineation of the Local Study Area (LSA);
- The hydrological model was calibrated using the flow, temperature and precipitation data given in the Wachiih report (2024a). The measurement period runs from October 2023 to spring 2024;

- The hydrometeorological data used for the simulation were extracted from the Chibougamau-Chapais A station (7 091 405), located at geographic coordinates 49° 46'19 000 N, 74° 31'41 000 W;
- Data used to estimate groundwater recharge and storage were imported from the numerical groundwater flow model detailed in Chapter 13 (Hydrogeology);
- Lake evapotranspiration and evaporation data are taken from Appendix C of the Surface Water Management Plan (WSP, 2024);
- Curve numbers (CN values) were determined in accordance with the site-wide water management plan (see Appendix D, WSP 2024);
- The rating curves estimated by Wachiih (2024a) were used as input to estimate flows as a function of water levels. It should be noted that the rating curves present a high degree of uncertainty, linked to the limited number of observations made per station used to establish the relationship between water level and flow (four to five observations) and the presence of outliers.

The following elements were considered when calibrating the numerical model:

- The model was calibrated using hydrometric data observed at Sonde 2a station, located upstream of pit 87, and at Sonde 3 station, located downstream of the PDA, at the outlet of Lake A (PE43). More specifically, data discretized to daily time over the period from October 2023 to April 2024 were used;
- The calibration procedure consisted in determining the less sensitive parameters from the literature, performing a manual calibration for certain parameters, and using an automatic calibration for sensitive parameters. The entire procedure is detailed in the hydrological modeling report;
- Nash-Sutcliffe efficiency functions (NSE) and root mean square error (RMSE) were used as objective functions for automatic calibration;
- A historical simulation was carried out for the period 2017-2024, and the mean annual cycle of this data was used as a reference for baseline conditions, enabling comparison with the results of the impact assessment.

11.2.2 Existing Conditions

11.2.2.1 Description of Hydrological Regime

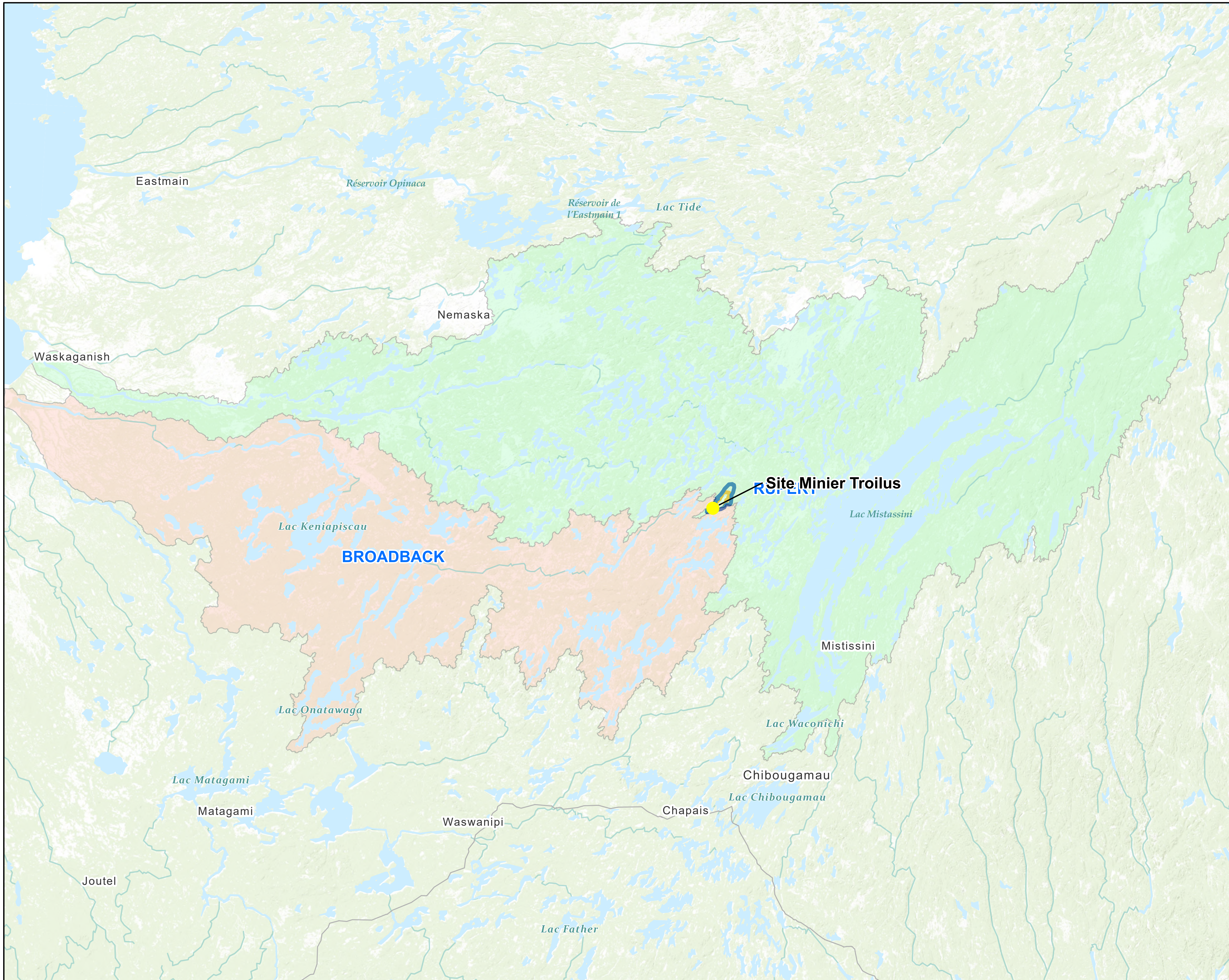
The LSA is mainly located in the Natastan watershed of the Rupert River, with four of these sub-watersheds slightly overtaking the Broadback River watershed (Map 11.3). Similarly, the majority of the RSA lies within the Rupert River watershed, with a slight overflow into the Broadback River watershed to the southwest (Map 11.4). The region's topography is characterized by gentle slopes. The landscape consists of rocky massifs overlying glacial and fluvioglacial terrain, as well as extensive peatlands and wetlands offering a flattened landscape. The surface of the land consists of a sandy fill three to five metres (m) deep. Beneath this layer, to a depth of around 24 m, is a natural soil deposit composed of clay over volcanic bedrock (Inmet Mining Corporation 1996; Tremblay et al., 1995).

The LSA's hydrographic network consists of a chain of lakes beginning with Lake Amont (PE-2) to the southwest, passing through several lakes and bodies of water PE0-63, as well as lakes of particular interest: Lake D1 (PE9), Lake D2 (PE17), Lake C (PE8), Lake B (PE29), Lake B2 (PE33), Lake B3

(PE36), Lake B4 (PE17), Lake A (PE43), Lake A1 (PE48), Lake A2 (PE50) and Lake Hameçon (PE58), before emptying into Lake Boisfort, located some 10 km north of the PDA. Lake Boisfort is located within the RSA. It drains a 387 km^2sub-watershed, of which the mine site valley represents 8%. Map 11.4 shows the location of the main water bodies in the RSA.

A watercourse approximately 8.8 km long links Lake A2 (PE50) to Lake Boisfort. The watercourse leading to the outlet of Lake A (PE43) is meandering, of low flow and varies in width from 3 to 5 m depending on water level. The existing Bibou Creek links Lake Amont (PE2) to Lake A (PE43). Part of the existing creek is a historic diversion channel that carries flow around the Tailing Storage Facility (TSF), pit 87 and pit J. The existing Bibou Creek (CE2) has a drainage area of 31.2 km^2 at its confluence with Lake A (PE43). Bibou Creek (CE2) has a water depth of between 0.3 m and 1.2 m (WSP, 2024). The portion of the stream currently diverted shows signs of erosion, and is between 5 and 7 m wide. From homogeneous segment SH2-12 to SH2-35, Bibou Creek flows through a man-made ditch. The reconstructed stream is rather straight (Wachiih 2024b). The flow facies in the diverted section of stream is predominantly lotic channel type, with a few sill or rapid flow sections (Table 11.4). A new diversion of Bibou Creek (CE2) is planned, to divert runoff from upstream natural watersheds around the Project Development Area (PDA) (WSP, 2024). Chapter 3 and the Water Management Plan (WSP, 2024) detail the proposed diversion of Bibou Creek (CE2).

Map 11.5 shows the sub-basins of the LSA, and the location of water bodies of hydrological interest. Tables 11.13 and 11.14 in Appendix 11.1 list all watercourses and water bodies likely to be affected directly or indirectly by the project, along with their characteristics and the associated LSA subwatershed. The bathymetry of Lakes A and B is shown on Maps 11.6 and 11.7. The bathymetry of Lakes B1 (PE30), B2 (PE33), B3 (PE36), C (PE5), C1 (PE8), C2 (PE9), C3 (PE6), C4 (PE7) and D2 (PE54) is detailed in Appendix 6 of the Wachiih 2024b report, Water Environment and Fish Habitat - Baseline Status - Troilus Mine Project (Appendix G.1.3 of the ESIA).



LÉGENDE / LEGEND

Plan d'eau / Lake

Cours d'eau permanent / Permanent Watercourses

Bassin Versant / Watershed

BROADBACK

RUPERT

RÉV.	DESCRIPTION	AA/MM/JJ	PAR	VÉRIF.
1				

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PROJET/PROJECT

Étude d'impact sur l'environnement et le milieu social pour le projet de mine Troilus / Environmental and Social Impact Assessment for the Troilus Mine Project

TITRE / TITLE

Bassins Versants

BluMetric® Environnement — Stantec

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240433 / 167040485	06/ 17/ 2025	
CONÇU / CHECKED	*RÉVISÉ / VERIFIED*	
S. Markhali	C. Gardois	
DESSINÉ / DRAWN	*Figure No.*	*ED./REV.*
M. Baker	11.3	1

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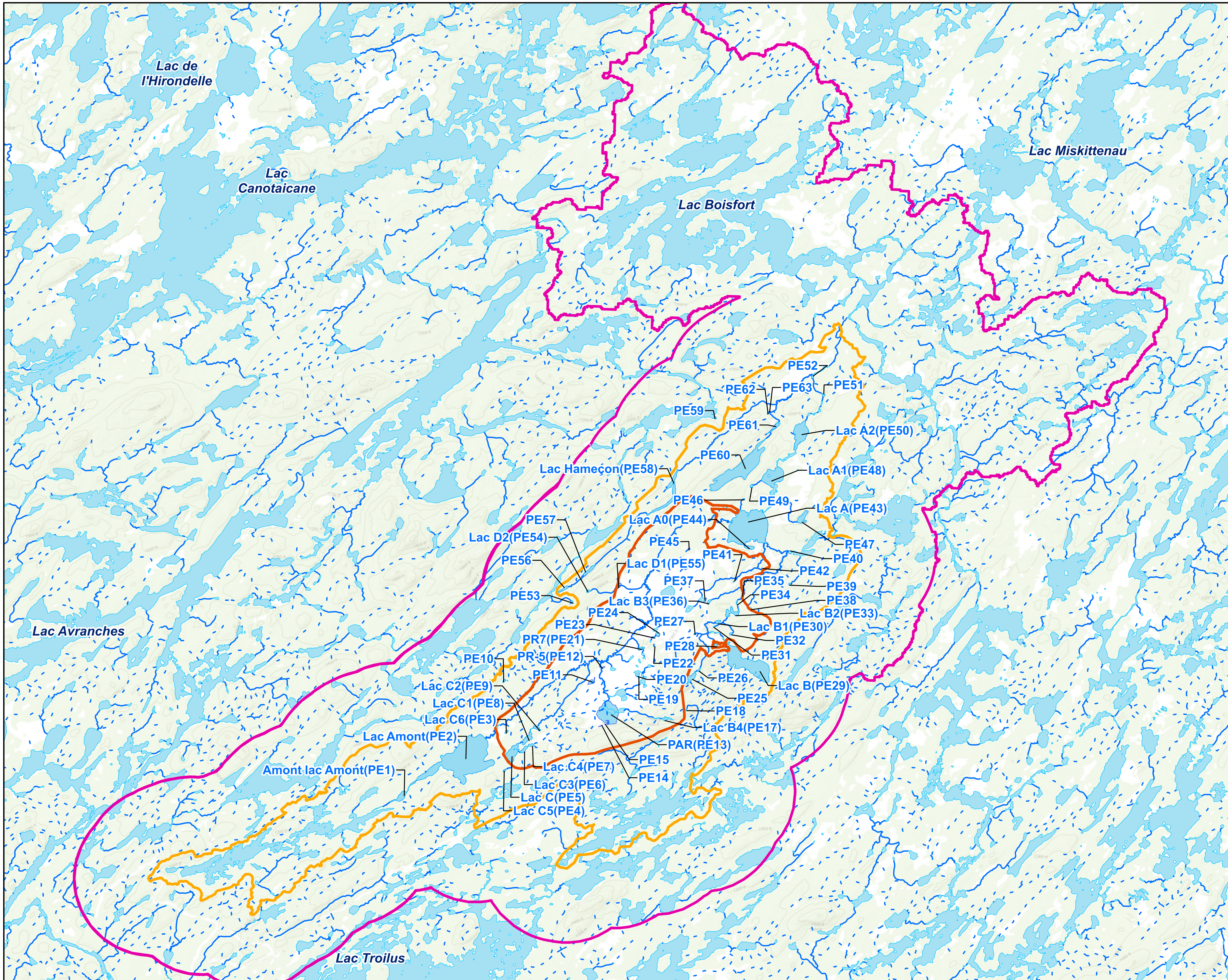

LÉGENDE / LEGEND

- Zone d'étude régionale / Regional Study Area
- Zone d'étude locale / Local Study Area
- Zone de développement du projet / Project Development Area

Cours d'eau naturel / Natural Watercourses

- Permanent (Sens d'écoulement) / Permanent (Flow Direction)
- Intermittent / Intermittent
- Plan d'eau / Lake

RÉV.	DESCRIPTION	AA/MM/JJ	PAR	VÉRIF.
1				

NOTES

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TITRE / TITLE

Plans d'eau et cours d'eau de la zone d'étude locale et de la zone d'étude régionale / Lakes and Watercourses within the Local and Regional Study Areas

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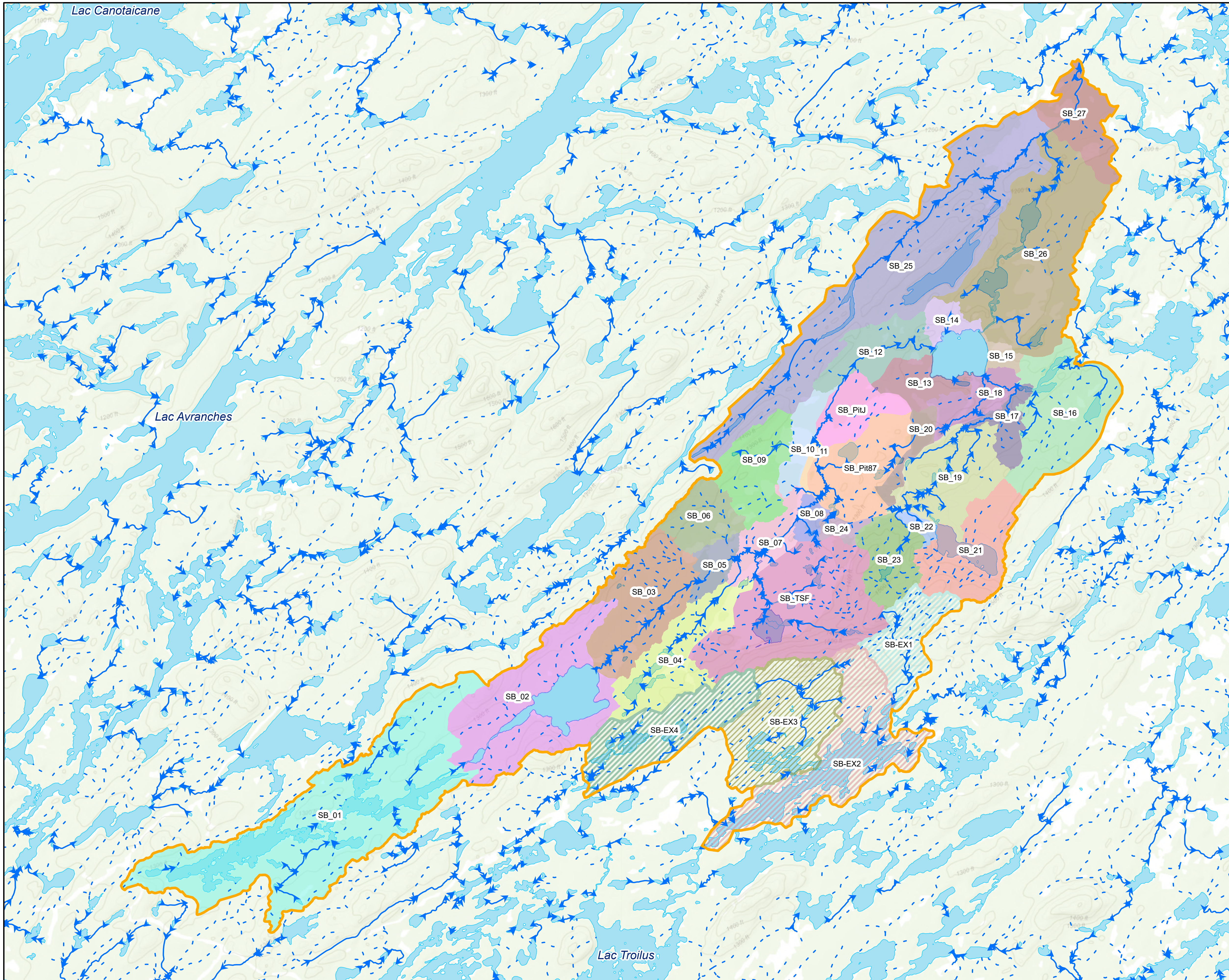

LÉGENDE / LEGEND

Zone d'étude locale / Local Study Area

Cours d'eau naturel / Natural Watercourses

Permanent (Sens d'écoulement) / Permanent (Flow Direction)

Intermittent / Intermittent

Plan d'eau / Lake

Sous-bassins / Subbassins

Rupert (Sous-bassin/Subbassin Natastan)			Broadback
SB_01	SB_11	SB_21	SB-EX1
SB_02	SB_12	SB_22	SB-EX2
SB_03	SB_13	SB_23	SB-EX3
SB_04	SB_14	SB_24	SB-EX4
SB_05	SB_15	SB_25	
SB_06	SB_16	SB_26	
SB_07	SB_17	SB_27	
SB_08	SB_18	SB_Pit87	
SB_09	SB_19	SB_PitJ	
SB_10	SB_20	SB_TSF	

RÉV.	DESCRIPTION	AA/MM/JJ	PAR	VÉRIF.
1				

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TITRE / TITLE

Sous-bassins versants - Zone d'étude locale / Watershed Subbassins - Local Study Area

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DESSINÉ / DRAWN: M. Baker	Figure No. 11.5	ED./REV. 1

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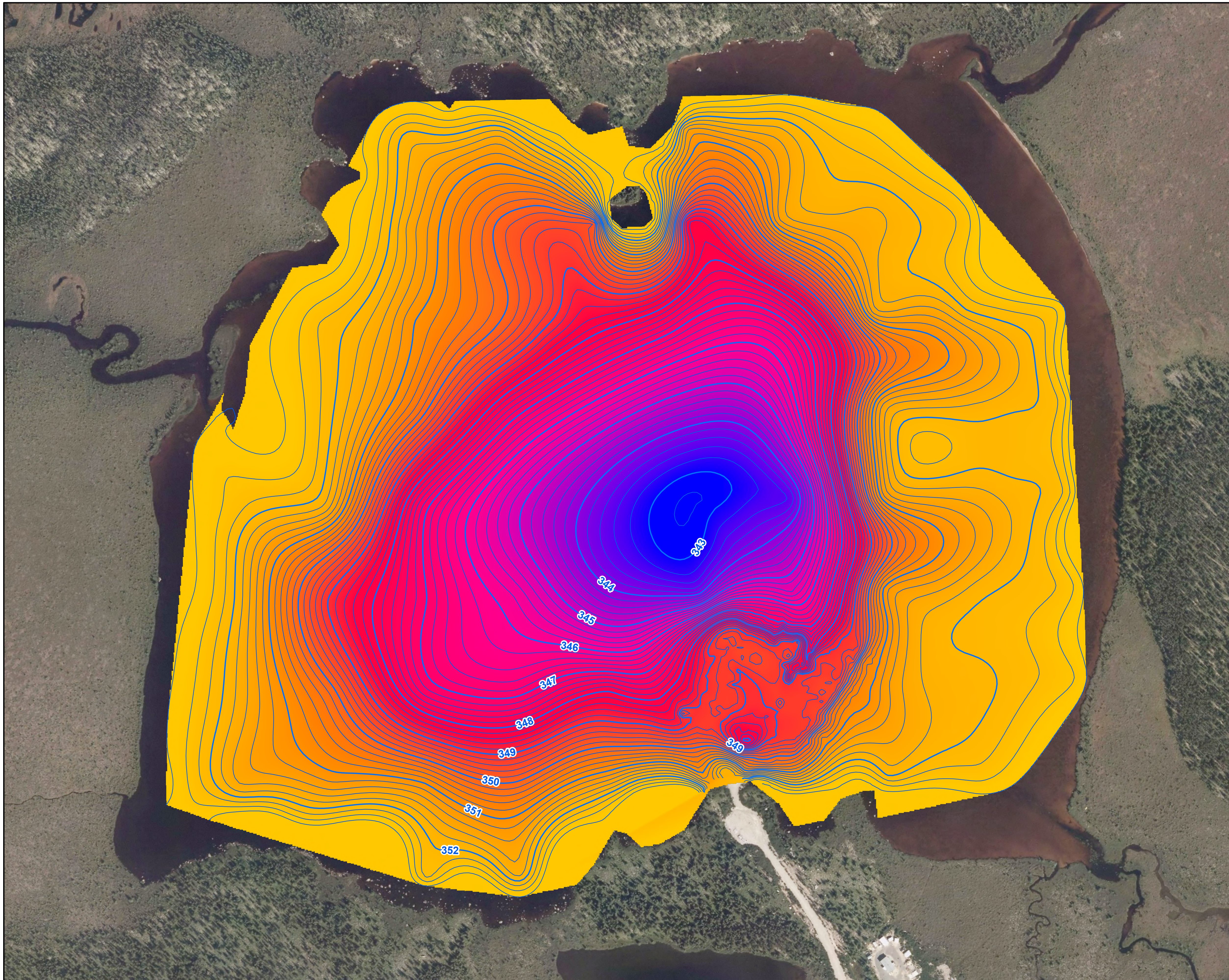

LÉGENDE / LEGEND

352.52
342.95
(Mètres au-dessus du niveau de la mer)
(Meters Above Sea Level)

Courbes de niveau bathymétrique / Bathymetric Contours

Courbes de niveau majeures (1m) / Major contours (1m)

Courbes de niveau intermédiaire (0.2m) / Intermediate Contours (0.2m)

RÉV.	DESCRIPTION	AA/MM/JJ	PAR	VÉRIF.
1				

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Étude d'impact sur l'environnement et le milieu social pour le projet de mine Troilus / Environmental and Social Impact Assessement for the Troilus Mine Project

TITRE / TITLE

Bathymétrie - Lac A (PE43) / Bathymetry - Lake A (PE43)

BluMetric Environnement
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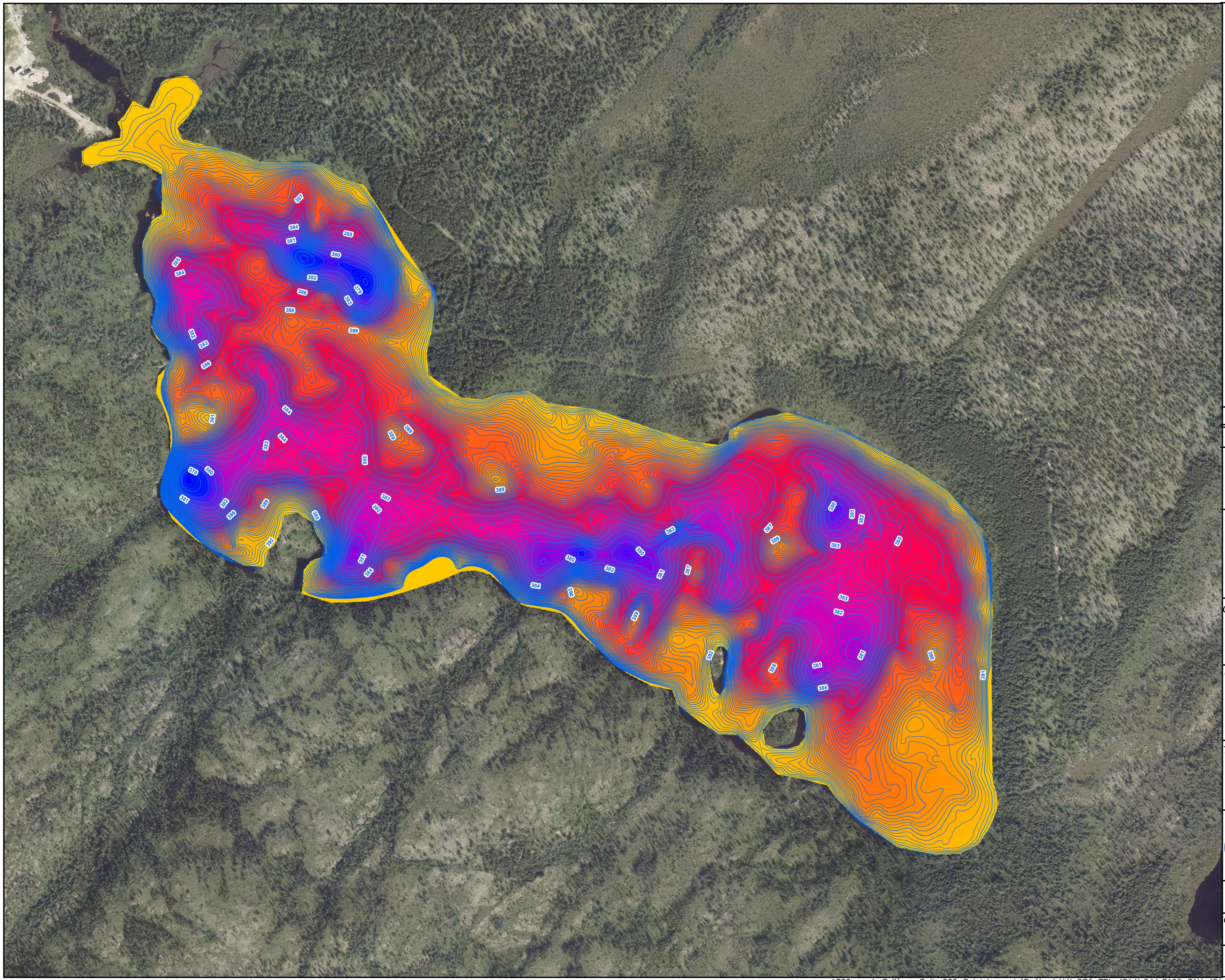

LÉGENDE / LEGEND

392.4
376.8

(Mètres au-dessus du niveau de la mer)
(Meters Above Sea Level)

Courbes de niveau bathymétrique / Bathymetric Contours

- Courbes de niveau majeures (1m) / Major contours (1m)
- Courbes de niveau intermédiaire (0.2m) / Intermediate Contours (0.2m)

RÉV.	DESCRIPTION	AA/MM/JJ	PAR	VÉRIF.
1				

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Étude d'impact sur l'environnement et le milieu social pour le projet de mine Troilus / Environmental and Social Impact Assessement for the Troilus Mine Project

TITRE / TITLE

Bathymétrie - Lac B (PE29) / Bathymetry - Lake B (PE29)

BluMetric® Environnement — Stantec

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DESSINÉ / DRAWN M. Baker	*Figure No.* 11.7	*ED./REV.* 1

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11.2.2.2 Hydrological Regime : Observations

Hydrological and meteorological data collected from 1982 to 2023 constitute the basic reference for the local and regional hydrological regime of the environment. These are supplemented by hydrometric observations made in the LSA. Map 11.8 shows the location of all hydrometric monitoring stations in the LSA from 2019 to 2023. Figure 11.1 shows average monthly precipitation and temperature data from 1982 to 2023 at the Chibougamau-Chapais weather station, located approximately 135 km from the study site. An environmental monitoring and inspection program was conducted between 1996 and 2010, collecting water level and flow data at various locations on the site. These data were not used, as their duration is insufficient for statistical analysis, and flows are influenced by the activities of the former mine.

A campaign to collect hydrometric data at HY1, HY2, HY3, HY4, HY5, HY6, HY7, HY8, HY9 and H10 was carried out in 2019 (Wachiih and Hydro Ressources inc., 2019). The results of this campaign are detailed in Table 11.4. No further data were collected at these stations.

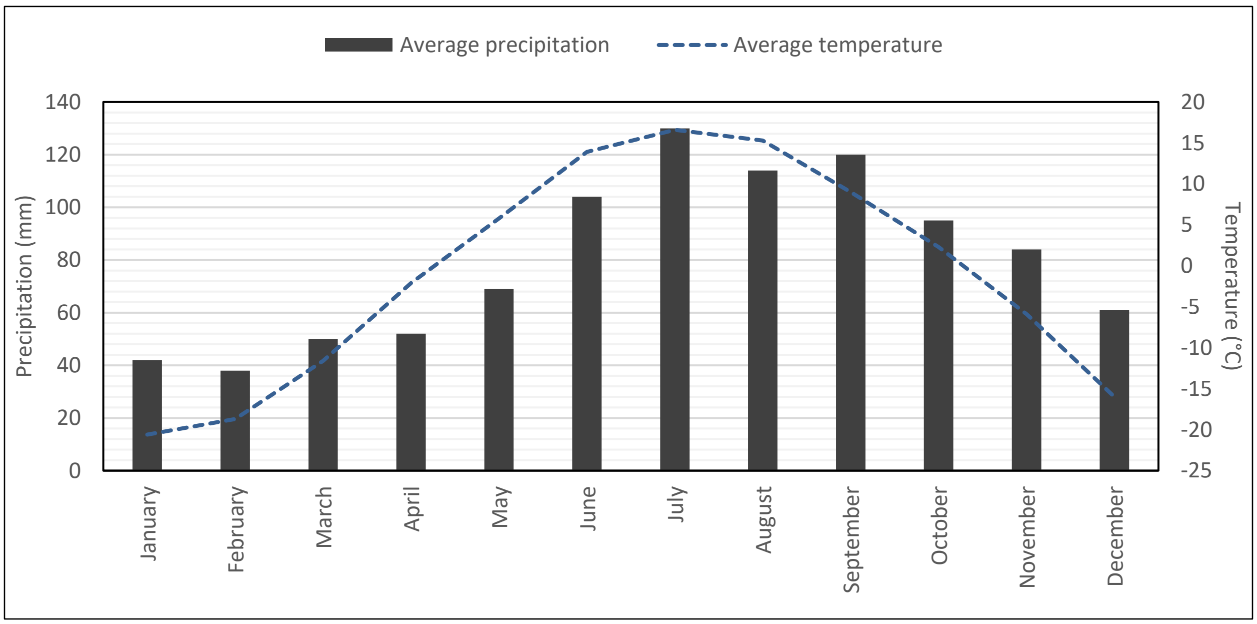


Figure 11.1 Average monthly precipitation and temperature 1982-2023 Source: WSP, 2024.

The mean annual cycle of water levels was recorded during the years 2023 and 2024 using five probes: Sonde Lake Amont, Sonde 1, Sonde 2a, Sonde 3 Lake A Exutoire and Sonde 4 (Map 11.8). The mean annual water level cycle refers to the typical seasonal variation in water levels observed in a body of water. It is influenced by various factors such as precipitation, snowmelt, evaporation and anthropogenic regulation (i.e., water abstraction).

Figure 11.2 summarizes the seasonal flows measured at the 5 gauging stations in 2023, while Figure 11.3 details the variation in mean daily water levels recorded at the five stations.

Table 11.4 Flows measured at stations HY1 to HY10 in 2019

Station	Location	Flow rate (m^3/s)
HY1	Watercourse [CE52-SH1]	0.16
HY2	Stream [CE58-SH4]	0.22
HY3	Stream upstream of Lake A2 [PE50]	0.84
HY4	Lake A [PE43]	N/A*
HY5	Watercourse [CE57-SH1]	0.05
HY6	Stream [CE2-4-SH1]	0.57
HY7	Stream [CE114-SH4]	0.06
HY8	Stream [CE35-1-SH1]	0.32
HY9	Bibou brook [CE2-SH11]	1.03
HY10	Lake B [PE29]	N/A*

*Stations located in lakes, flow measurements not applicable.

Source: Wachiih and Hydro Ressources inc. 2019.

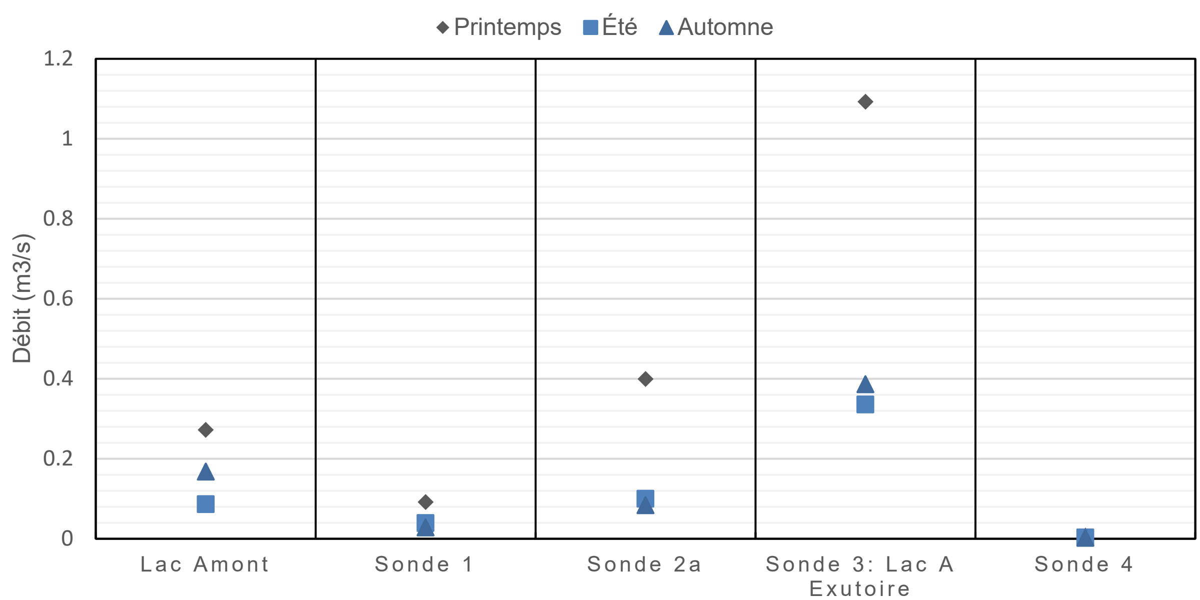


Figure 11.2 Seasonal mean flow (m^3/s) 2023 measured at the five hydrometric stations

Source: Wachiih, 2024.

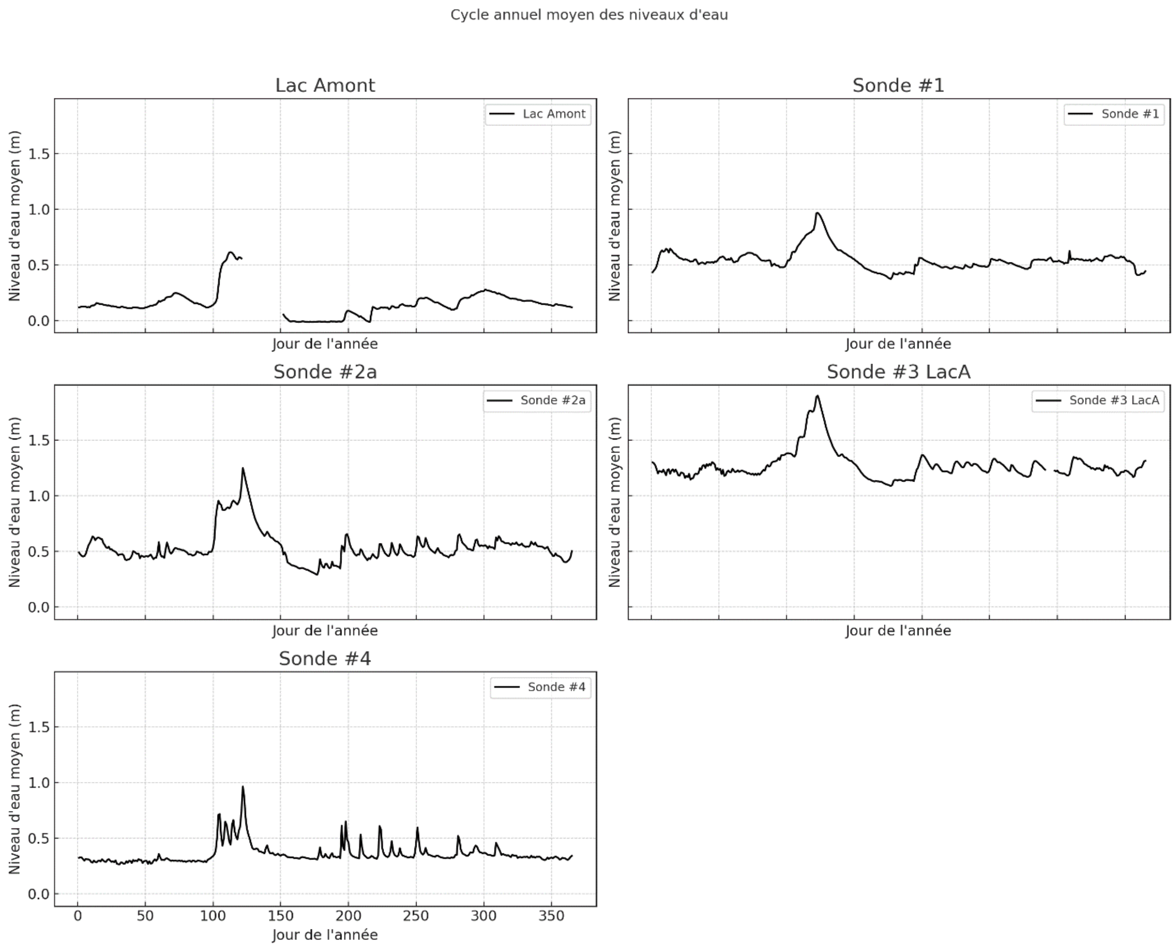
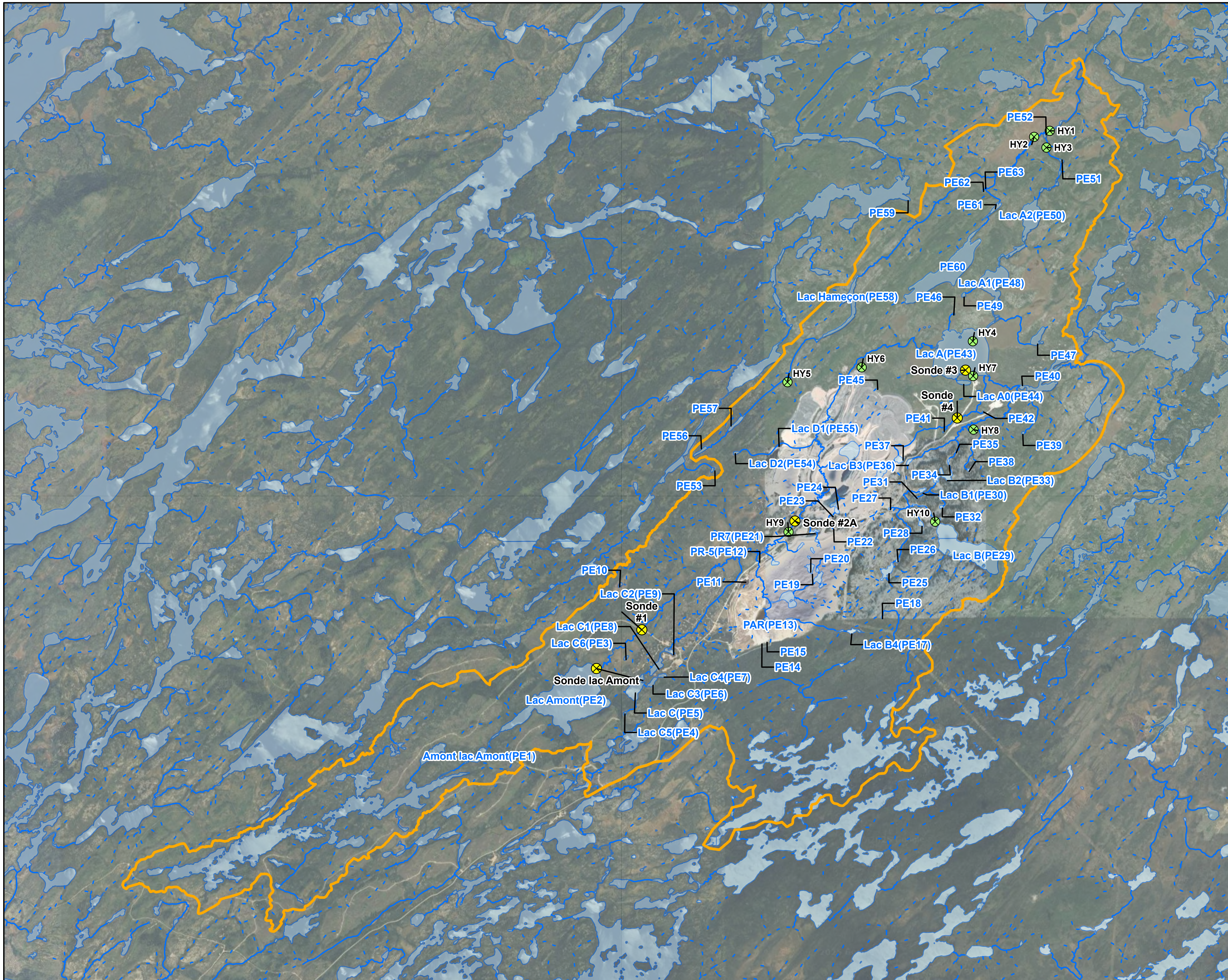


Figure 11.3 Average daily water level measured at the five hydrometric stations.



LÉGENDE / LEGEND

- Zone d'étude locale / Local Study Area
- Stations hydrologiques / Hydrological Stations
- Sonde à niveau d'eau / Water Level Survey Point

Cours d'eau naturel / Natural Watercourses

- Permanent / Permanent
- Intermittent / Intermittent
- Plan d'eau / Lake

RÉV.	DESCRIPTION	AA/MM/JJ	PAR	VÉRIF.
1				

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Étude d'impact sur l'environnement et le milieu social pour le projet de mine Troilus / Environmental and Social Impact Assessment for the Troilus Mine Project

TITRE / TITLE

Stations hydrométriques (2019-2024) - Zone d'étude locale
Hydrometric Stations (2019-2024) - Local Study Area

BluMetric Environnement — Stantec

NO. PROJET / PROJECT NO. 240433 / 167040485	*DATE* 06/ 17/ 2025	
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Figure 11.4 shows the mean annual cycle of the hydrograph at the Broadback gauging station. Peak flow occurs around mid-May, corresponding to spring freshet. The abrupt change between the low flow of the winter period and the high, rapid flow of spring demonstrates the region's sensitivity to flooding and spring freshet. The possibility of flooding due to the rain-snow event is another risk factor, particularly in the context of climate change. Flow gradually decreases during the rest of spring and summer, while a noticeable rise in the curve is observed during the autumn months, corresponding to the rainy season from September to November.

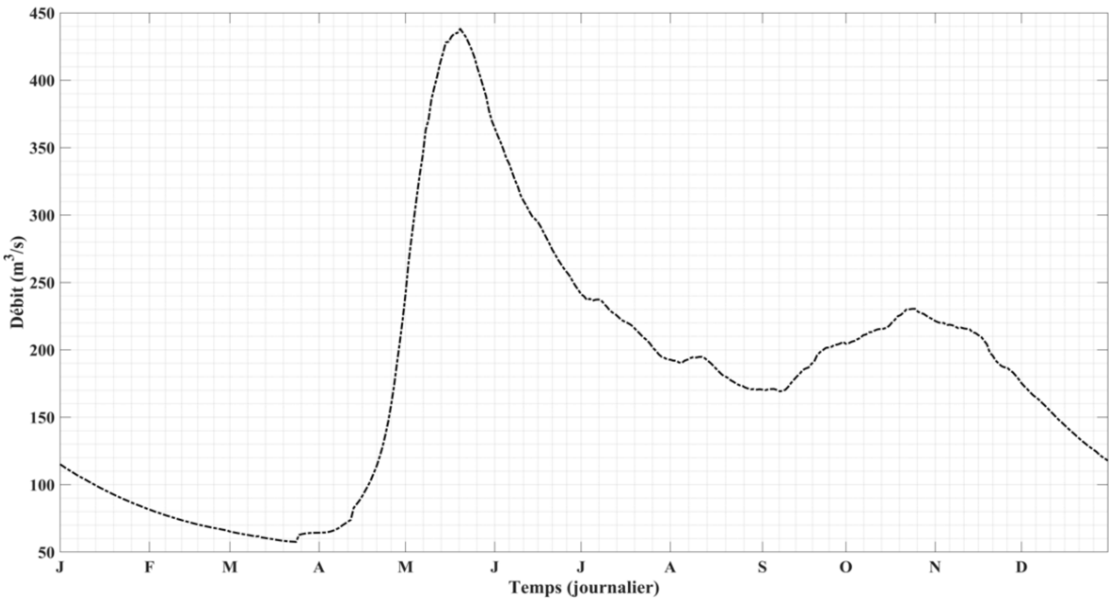


Figure 11.4 Broadback station mean annual cycle hydrograph (1972 to 2024)

Figure 11.5 shows the results for five distributions and the 95% confidence interval. The normal and Pearson III distributions show better fits, particularly for larger return periods and extreme floods. The results for the various flood indices are presented in Table 11.5, and the uncertainty associated with the distribution fit is shown in Figure 11.6. It can be seen that as the flood magnitude increases, so does the uncertainty.

Table 11.5 Broadback River flood indices (m^3/s) estimated for different return periods

Return period	Distribution				
	Normal (m^3/s)	Log-normal (m^3/s)	Gumble (m^3/s)	Pearson III (m^3/s)	LP III (m^3/s)
2 years	493.95	473.31	474.67	487.84	451.60
5 years	607.43	614.01	626.50	605.24	599.14
10 years	666.75	703.65	727.02	670.16	715.32
20 years	715.74	787.36	823.44	725.66	841.79
50 years	770.87	893.55	948.24	790.21	1030.21
100 years	807.63	972.19	1041.77	834.48	1192.35

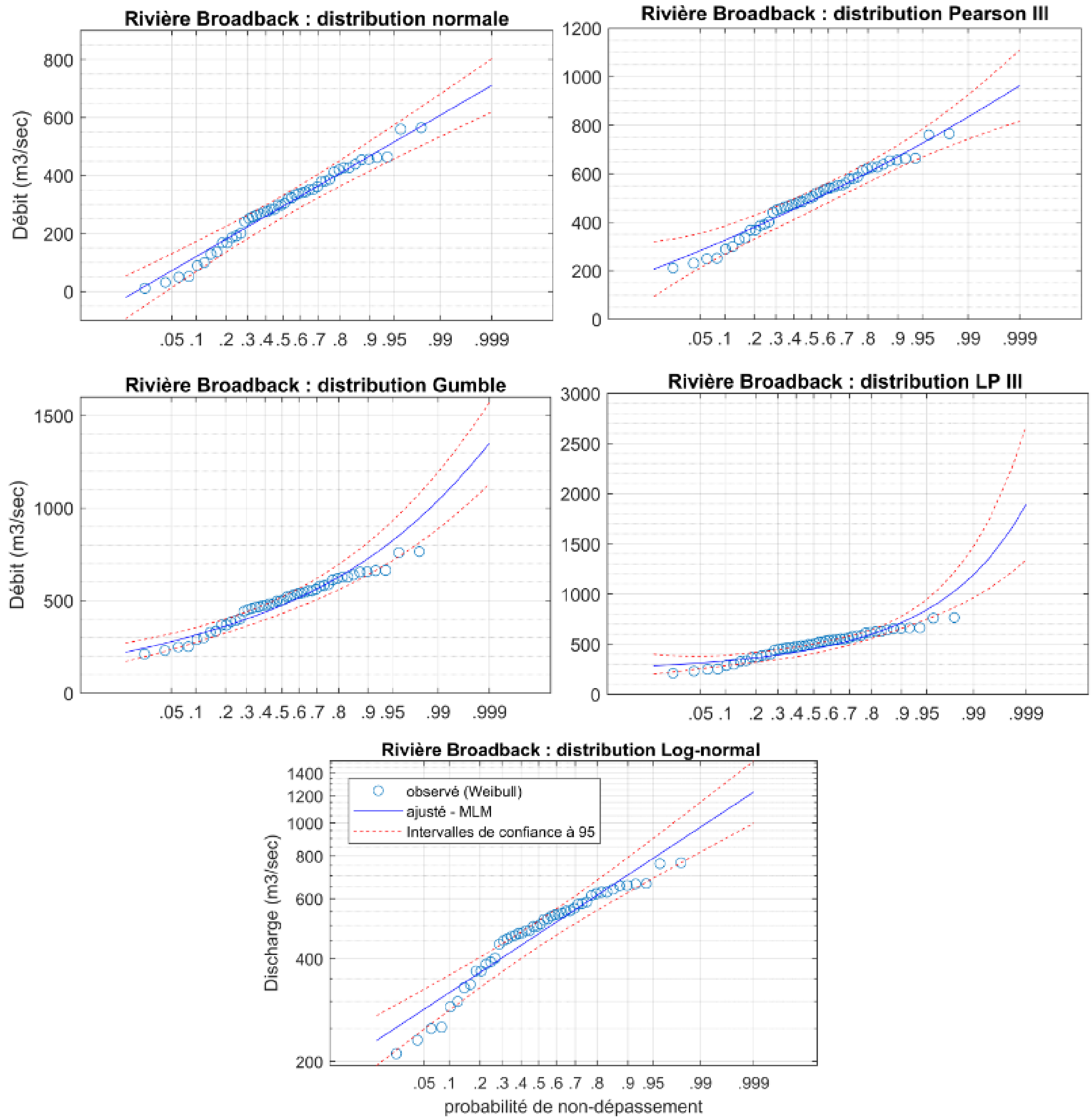


Figure 11.5 Distribution curves for the probability of not exceeding flood levels on the Broadback River (normal probability scale with 95% confidence interval)

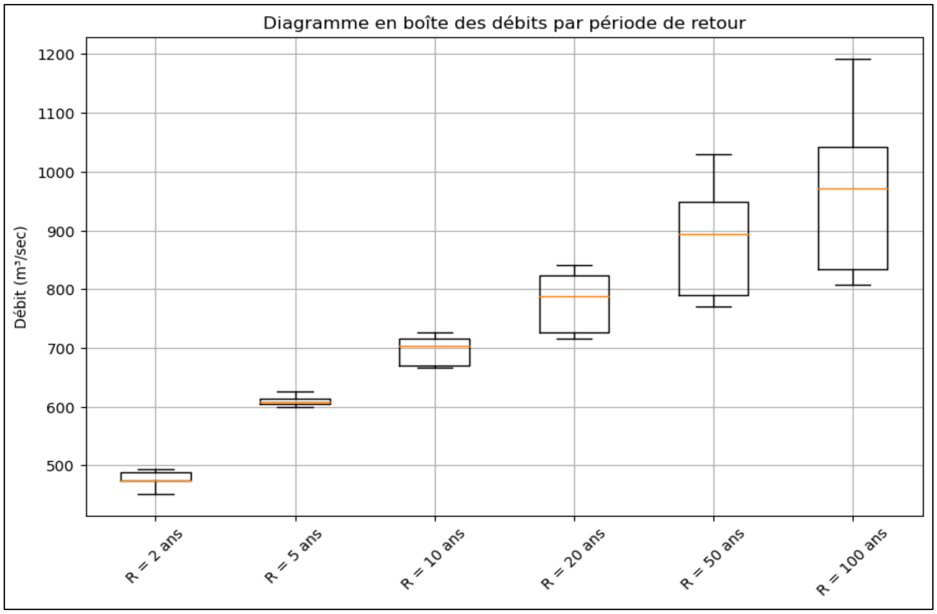


Figure 11.6 Uncertainty of distribution curves for different flood indices

Figures 11.7 to 11.11 show seasonal trend analyses for the Broadback station. Since this station is located in the same hydroclimatic region as the project area, it is reasonable to expect similar behavior in terms of flow trends for the hydrological environment of the RSA. A non-parametric Mann-Kendall test was performed to assess the statistical significance of a monotonic trend.

Figure 11.7 shows the flow hydrograph measured from 1973 to 2023. A statistically significant upward trend of 0.0032 m^3/s/day is observed for the entire period. This indicates an increase in flow over the study period, which could be partly attributed to climatic variations in the region, resulting in a higher snowmelt rate. A similar behavior is observed for winter discharge (Figure 11.8), where a statistically significant increase of 0.0026 m^3/s/d was observed. Furthermore, Figure 11.9 shows an even greater increase in the spring discharge trend (0.0064 m^3/s/d), which is twice as high as the annual trend. No significant trend was observed for the summer months (Figure 11.10), and a weak positive trend was observed for the autumn months (Figure 11.11). It can be seen that the main contribution to the annual trend comes from the spring months, followed by the winter months, and that rising temperatures or a change in precipitation patterns are the main drivers of this evolution. Although the study of probable causes is beyond the scope of this environmental description, it should be noted that, given the non-stationary nature of climatic factors, the trends presented cannot be extrapolated to future climatic conditions without rigorous statistical assumptions.

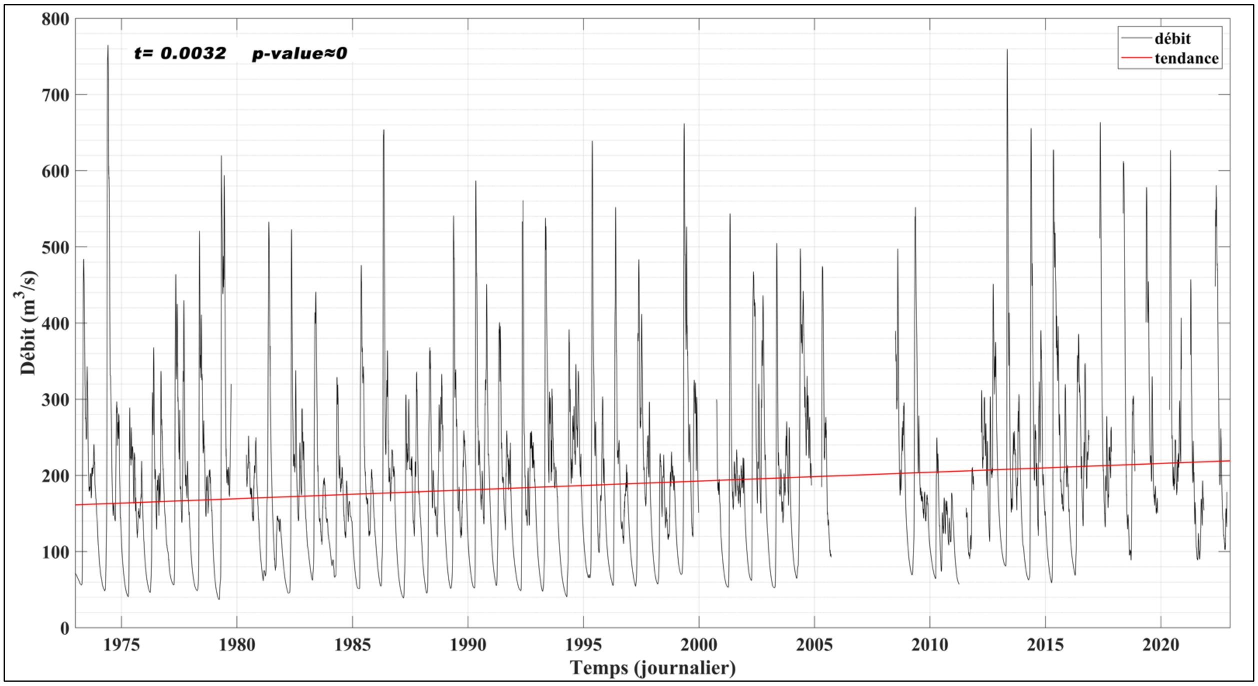


Figure 11.7 Annual trend and p-value observed at Broadback station

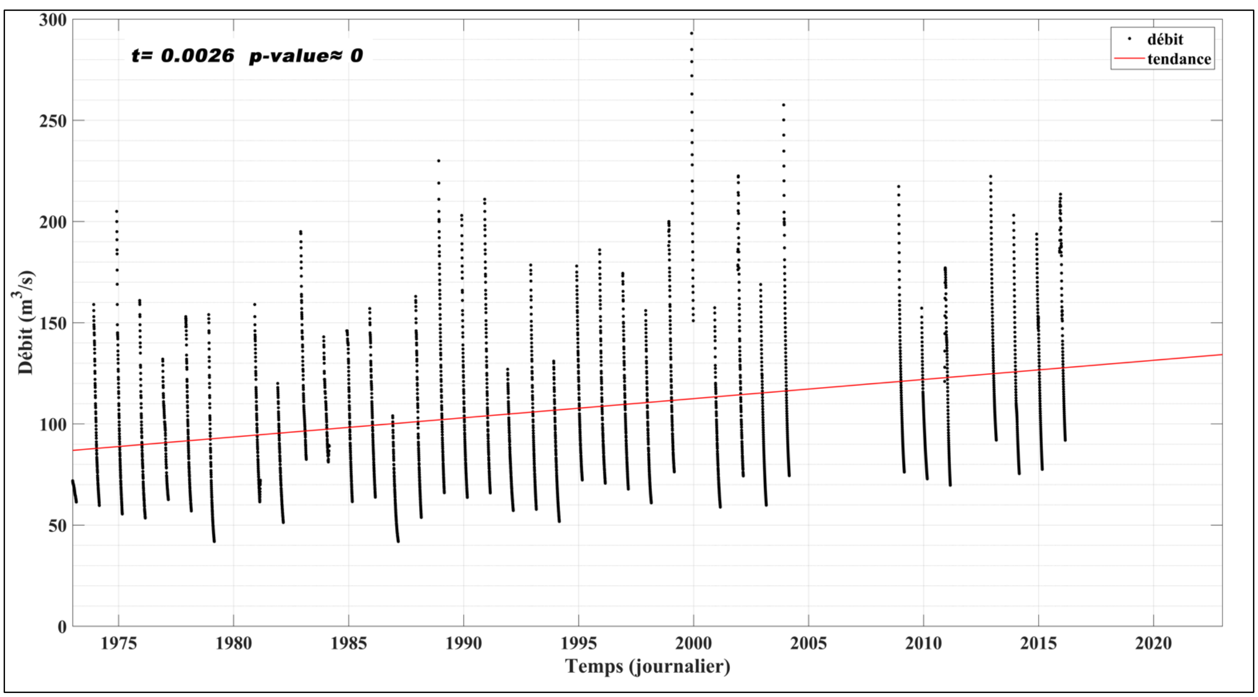


Figure 11.8 Winter trend and p-value observed at Broadback station

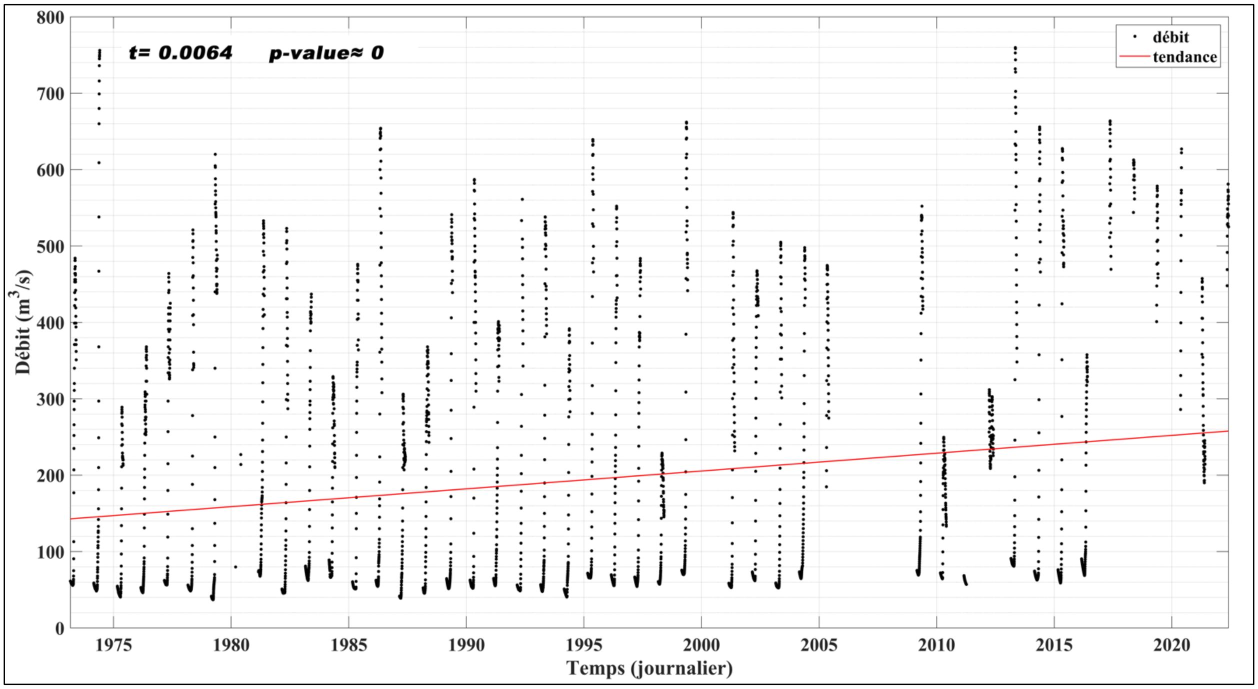


Figure 11.9 Spring trend and p-value observed at Broadback station

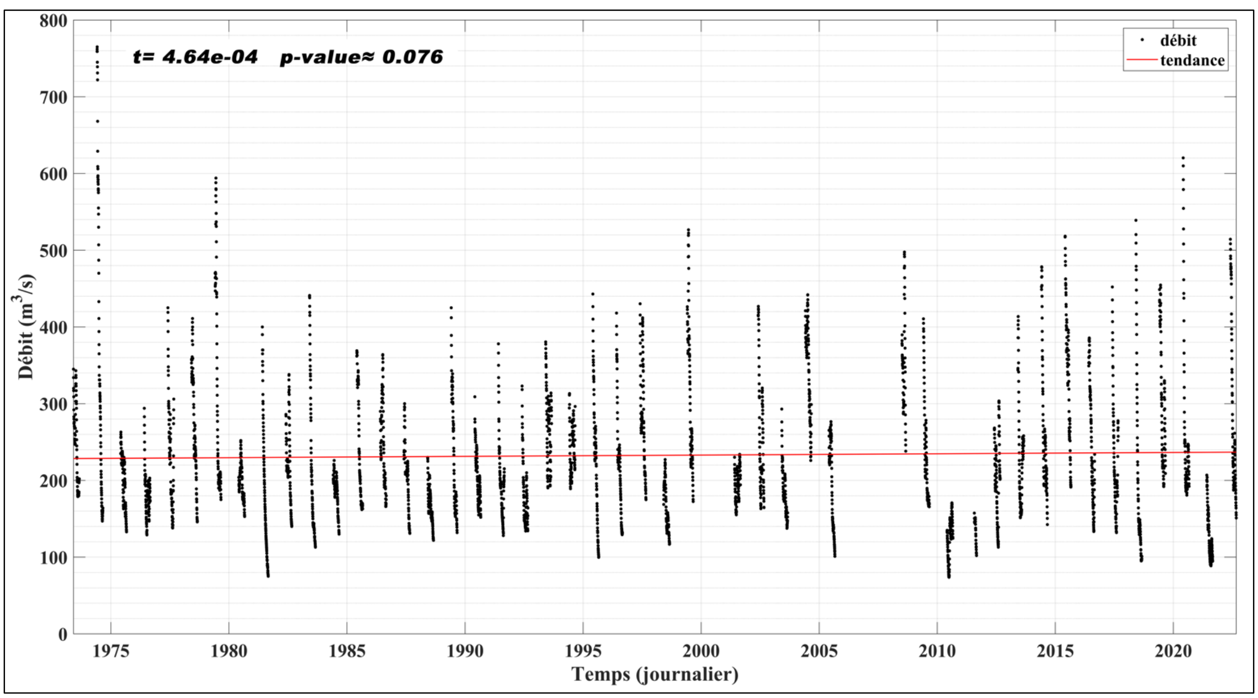


Figure 11.10 Summer trend and p-value observed at Broadback station

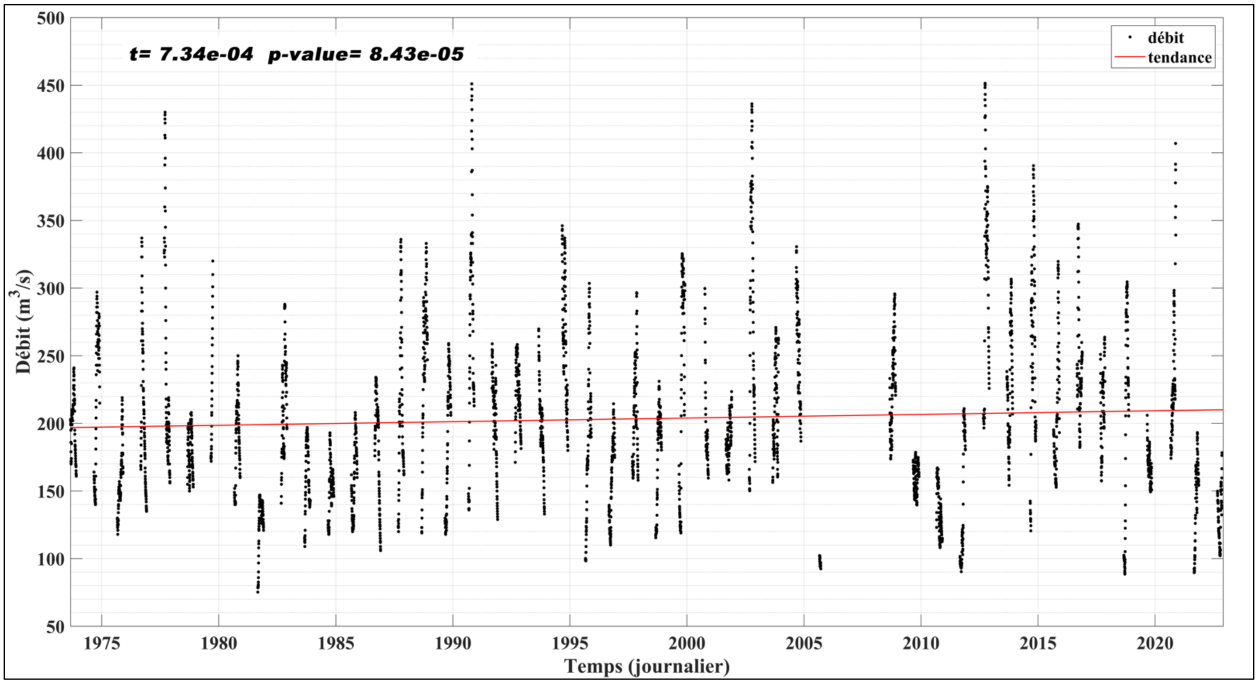


Figure 11.11 Autumn trend and p-value observed at Broadback station

11.2.2.3 Hydrological Regime: Modeling

Hydrological modelling using HEC-HMS software was used to simulate basic hydrological conditions in the environment over the historical period from 2017 to 2024. The LSA was also delineated by sub-watershed. Table 11.6 details the hydrological characteristics (peak flow and observed mean annual volume) associated with selected hydrological elements of the numerical model. Figure 11.12 shows the simulated hydrograph of the annual cycle of these hydrological elements.

The results of the hydrological regime simulation reveal considerable variability between the hydrological elements of the environment. More specifically, drainage areas vary from 0.1 km² in sub-basin SB_11 to 10.4 km² in sub-basin SB_01 (Map 11.5). The peak flows of the hydrological elements range from 3 m³/s at Junction 1 and the outlet of Lake Amont, to 20.1 m³/s at the outlet of the LSA ('watershed outlet'). This is the main outflow from the environment, and the simulated mean annual volume is the highest in the environment, at 59,037 × 10³ m³. All results are detailed in the hydrological modelling technical report (Appendix H.4).

The hydrological component of the Lake A outlet is particularly important for assessing the project's impacts on the hydrological regime, since it represents the receiving environment downstream of the PDA. More specifically, the peak flow (12.8 m³/s) and mean annual volume (42,783.25 × 10³ m³) for this element are significant (Table 11.6 and Figure 11.12). We also observe a concordance in the peak discharge of the various elements towards the end of May, corresponding to the spring flood period (Figure 11.12). The simulated peak flow is observed at the outlet of Lake Amont, as being slightly earlier. Lake Amont (PE2) is located upstream of Bibou Creek (CE2).

For more information on modeling assumptions, limitations and results, please refer to the hydrological modeling technical report (Appendix H.4).

Table 11.6 Summary of daily simulation for the historical period (2017-2024)

Hydrological Element	Description	Coordinates (UTM E/N m)	Peak Flow (m^3/s)	Average Annual Volume (1000 m^3)
Lac Amont outlet	On Bibou Creek	532851/ 5 647 523	3.0	15 916.5
Junction 1	On Bibou Creek Between SB_03 and SB_05	534748/ 5 649 230	3.0	18 967.5
Junction 2	On Bibou Creek Between SB_05 and SB_07	535493/ 5 649 627	3.6	20 851.2
Probe 2A	On Bibou Creek	536629/ 5 650 378	4.6	23 095.3
Junction 13	On Bibou Creek In SB_10, west of pit 87	536757/ 5 651 275	6.1	26 412.9
Junction 11	On Bibou Creek, Outflow to lake A	539 284/ 5 653 581	7.1	28 700.6
Lake A outlet	Lake A outlet	540066/ 5653914	12.8	42 783.3
Watershed outlet	LSA watershed outlet	542035/ 5 658 976	20.1	59 037

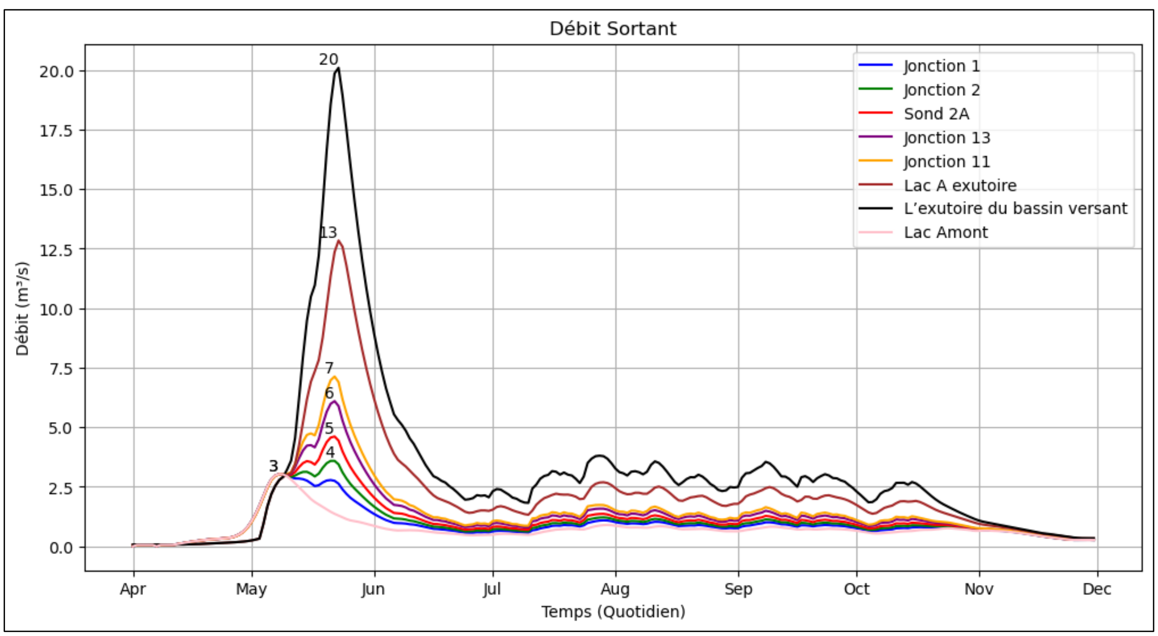


Figure 11.12 Average annual cycle hydrograph for hydrological elements in Table 11.6

11.3 Project Interactions with Hydrological Regime

TheTable 11.7 identifies, for each potential impact, the activities likely to interact with the VC and result in the identified impact. These interactions are indicated by a check mark (potential impact) or a dash (not applicable) and are discussed in detail in Section 11.4, in the context of pathways, standard and project-specific mitigation or enhancement measures, and residual impacts.

Table 11.7 Project interaction with the hydrological regime

Activities	Potential Impact
	Modification of hydrological regime
Construction	
Labour, equipment and materials transport to the site.	-
Vehicles and equipment operation and maintenance within the PA.	-
Tree cutting, vegetation clearing, soil stripping and earthworks.	√
Handling and use of explosives, including blasting	√
Construction of temporary and permanent buildings, including wastewater treatment system and drinking water collection and distribution system.	√
Construction of mining infrastructures such as stockpiles, pits and the raising of tailings management facility.	√
Construction of roads and preparation of construction surfaces including the crushing of material used for construction. Relocation of a section of the access road and the power line.	√
Construction of water management systems including ditches, diversion channel, sedimentation ponds and the water treatment plant.	√
Dewatering of natural water bodies and pits, lowering water level in tailings management facility and management of contact water.	√
Diversion of Bibou Creek (CE2).	√
Management of waste materials, including hazardous waste.	-
Purchases of goods and services	-
Employment	-
Relocation of power line	√
Operations	
Labour, equipment and materials transport to the site.	-
Vehicles and equipment operation and maintenance within the PA.	-
Handling and use of explosives, including blasting	√
Ore extraction from pits including drilling and hauling of waste rock.	√
Ore, waste rock and tailings storage.	√
Ore processing including conveyor, crushing, loading and hauling on site.	√
Transportation of concentrate to a smelter or a wharf.	-
Management and treatment of water on the mine site and to the environment, including drainage and contact water.	√
Progressive reclamation of disturbed areas.	√
Management of waste materials, including hazardous waste.	-
Purchases of goods and services	-

Activities	Potential Impact
	Modification of hydrological regime
Employment	-
Decommissioning and Closure	
Labour, equipment and materials transport to the site.	-
Vehicles and equipment operation and maintenance within the PA.	-
Decommissioning, dismantling and disposal of buidings and equipmment.	√
Pits flooding, surface and groundwater management.	√
Reclamation of disturbed areas, including earthwoks, placement of overburden and revegetation.	√
Management of waste materials, including hazardous waste.	-
Purchases of goods and services	-
Employment	-

NOTES :
√ = Possible interaction
- = No interaction

The following activities are not likely to interact with the hydrological regime and are not considered in the rest of the assessment:

- The transportation of labour, equipment and goods to the site, as well as the transportation of concentrate to the smelter, will be carried out by trucks or other vehicles, presenting no interaction with the hydrological regime of the environment;
- The circulation and maintenance of vehicles and heavy machinery on the site will be carried out via transport routes and roadways. Road transport will be carried out on the surface and has no potential to interact with the hydrological regime of the environment;
- The management of residual materials, including hazardous residual materials, over the life cycle of the project will comply with a management plan that will be put in place. Domestic wastewater from the camp and industrial sectors will be channelled to treatment plants located in the camp sector. Anticipated wastewater treatment flows will be virtually identical to drinking water requirements. Solid and hazardous residual materials will be collected on site, then transported for off-site treatment and disposal. Section 3.8 of Chapter 3 details all the logistics and considerations associated with managing the project's residual materials;
- The purchase of goods and services, as well as the employment of labour, have no interaction with the hydrological regime of the environment.

11.4 Assessment of Residual Impacts on Hydrological Regime

11.4.1 Modification of the Hydrological Regime

The project's water management plan includes an analysis of the environment's water balance and regime (WSP, 2024). The measures implemented will be designed to ensure uninterrupted surface water flow, and minimize disruptions to the water balance of the environment. However, certain activities taking place during the construction, operation and closure phases of the project are likely to modify the hydrological regime in the LSA and RSA of the VC. More specifically, the development of various infrastructures and the management of mine tailings may result in disruptions to runoff dynamics, as well as to the spatio-temporal distribution of flow in local streams and water bodies.

11.4.1.1 Project Pathways

Construction

During the construction phase, without the implementation of mitigation measures, several project activities (TTable 11.7) are likely to have an impact on the hydrological regime in the LSA. These activities may result in a change in runoff, evapotranspiration, evaporation, infiltration characteristics, watershed surface area changes, point source discharges and stream modifications and realignments in the LSA.

These activities include :

- Construction of on-site water management systems including diversion channels, drainage ditches, sedimentation ponds and the industrial water treatment plant. This activity modifies the natural flow of watercourses and may affect the spatio-temporal distribution of runoff and hydrological variables such as actual evapotranspiration, snowmelt and accumulation, infiltration and base flow. The development of ditches could also present a flood risk for a flood greater than the 100-year flood (design);
- The development of mining infrastructure, such as pits and tailings facilities, can directly modify land use, drainage areas, including wetlands and water bodies. These changes may affect infiltration potential and surface runoff. This can influence peak flows and volumes observed during precipitation and snowmelt events;
- Construction of permanent and temporary buildings may require earthworks and excavation. These activities include clearing and brushing, soil stripping and terracing. These activities can modify the water flow regime on the site. More specifically, they can affect drainage areas, increasing runoff and flooding potential while reducing infiltration and evapotranspiration due to increased impermeability and reduced vegetation cover;
- Dewatering natural water bodies and pumping water into the tailings facility could affect the spatio-temporal distribution of runoff and aquifer levels, thereby altering the local water balance;
- The diversion of the access road and construction of the site's road infrastructure involve soil excavation, earthworks and environmental redevelopment. In addition, the access road diversion crosses several watercourses and wetlands. As a result, culverts will be installed at the crossing points of the access road and local watercourses, to mitigate encroachment on watercourses and wetlands. The construction of new hydraulic structures (sedimentation basins, ditches for contact water and clean water, berms) can potentially generate a risk of flooding and modify surface drainage patterns. Altering the flow of water over the PDA project's encroachment area can lead to changes in the surface area, water balance and hydrological regime of the area's sub-watersheds;
- The diversion of Bibou Creek (CE2) is designed to maintain the existing hydraulic connectivity between the lakes upstream and downstream of the site. The SW pit, and the widening of pits 87 and J, block the path of Bibou Creek (CE2) and its existing diversion channel. However, the diversion of

Bibou Creek (CE2) could result in a change in the local water balance by altering the natural dynamics of local water flow, as well as groundwater recharge;

- The use and handling of explosives, including blasting, can modify the topography of the environment through soil reworking, and affect the process of water infiltration. As a result, this could affect the spatio-temporal distribution of runoff, the local water balance, and the surface areas of the local sub-watersheds.

Operations

The operations phase will mainly involve drilling, blasting, ore and waste rock extraction, and the transportation of mine waste rock. These activities modify the topographic surface of the environment, and thus the properties and parameters specific to the hydrological regime. Consequently, they could affect the spatio-temporal distribution of runoff, the local water balance, and the surface areas and characteristics of the environment's sub-watersheds:

- These activities include: water management and treatment at the mine site and in the environment, as well as tailings management, are included in the site's water management plan for the operational phase. This plan includes the construction of several infrastructures (diversion channels, drainage systems, pits, pumps, sedimentation basins), as well as the regulation of mine effluent and sedimentation basin water discharge to the environment. Site water management could modify the hydrological regime, for example through retention in drainage sumps and ditches, and pumping from sedimentation basins;
- Progressive restoration of disturbed areas will help restore the natural state of the environment. Activities associated with the restoration of disturbed areas will progressively modify land use, runoff and infiltration coefficients, until a spatio-temporal flow distribution consistent with reference conditions is achieved;
- Ore processing, including conveying, crushing, handling and transport to the site, requires a water supply, obtained by pumping from various sources, such as Lake A (PE43), and from sedimentation basins. Ore processing also involves the recirculation of contact water within the water management system. These activities modify the hydrological regime by altering the water balance of surface waters and impacting on the interaction between surface water and groundwater;
- Ore, waste rock and tailings disposal activities could directly modify the topography and land cover types of the PDA, including wetlands and water bodies. These changes may influence the infiltration potential of precipitation events and surface runoff. This may affect the peak flows and volumes observed during precipitation and snowmelt events;
- The construction and expansion of open pits could influence water flows in the watershed. These developments can alter the distribution of flows between surface water and groundwater, notably by disrupting natural groundwater recharge and drainage conditions. These changes can modify surface runoff, both during low-flow and flood periods, and affect the overall dynamics of the basin.

Closure

The site closure phase includes building dismantling, infrastructure closure and site restoration. These activities have the potential to interact with the hydrological regime of the environment. More specifically :

- The dismantling of buildings and equipment will be planned in accordance with the post-operational restoration process. This work includes the removal of pumps from the tailings facility, thus promoting the natural flow of water towards the receiving environment. These activities therefore have the potential to impact the hydrological regime and modify the local water balance;
- Surface water management during the closure phase is included in the site's water management plan (WSP, 2024). This plan details the regulation of mine effluent and sedimentation pond water discharge to the environment. Most of the existing drainage ditches will be progressively decommissioned, and a new network of drainage structures will be put in place for the closure phase. This new network will incorporate, among other things, specific features designed to create aquatic habitats. In addition, the closure of ditches and the reduction in the use of existing pumping systems will result in a gradual transition to gravity-fed surface water flow. The decommissioning of most of the collector ditches will encourage the regeneration of reference conditions for the hydrological regime, and thus presents a potential for altering it;
- Pits 87, X22 and J will be flooded by groundwater and local runoff. This flooding of the pits results in the creation of water bodies while maintaining water connectivity. The flooding of the pits will create additional sources of evaporation, modifying the local water balance;
- Site restoration will consist mainly of reprofiling and capping with reclamation materials. These activities will include grading the site, spreading overburden and revegetating the site. These activities modify land use, slopes, and water runoff and infiltration coefficients, thus affecting the spatio-temporal distribution and peak flow of the environment.

11.4.1.2 Mitigation and Enhancement Measures

Throughout the project, a number of mitigation measures will be implemented with a view to ensuring continuous surface water flow, and minimizing disruption to the water balance and users of the environment. These measures include :

- The use of hydraulic design criteria established in accordance with the provincial government's Directive 019 for the mining industry (MDDEP, 2012) and the Canadian Dam Association's dam safety recommendations (Canadian Dam Association, CDA, 2013; CDA, 2019);
- Road crossings will be installed to ensure continuous flow through the Bibou Creek diversion channels (CE2). On the DC1 channel, arched culverts will be designed to improve fish passage;
- Eight sumps will be installed over the life of the mine. These sumps will be designed to handle, either by storage or pumping, a 100-year flood event;
- Surface and groundwater monitoring stations will be set up to collect data on water quantity and quality for regulatory compliance prior to discharge to the receiving environment;

- The Bibou Creek diversion channel (CE2), designed from the outset with natural materials and an adapted geometry, will perform its diversion function over the long term, preserving flow continuity and flood management. At the end of operations, an emergency spillway will be installed on the tailings storage facility to control the water level towards an outlet channel directed towards the receiving environment. The spillway will be operated in such a way as to be able to respond to extreme flooding scenarios without risk to the safety of the tailings impoundment dykes. Overburden, waste rock and tailings piles will be covered and reprofiled to promote efficient, erosion-resistant drainage paths;
- Ditches and sumps will be reconfigured and integrated into the closure drainage plan.

11.4.1.3 Project Residual Impacts

Analytical Assessment Techniques

The analysis of impacts on the hydrological regime was carried out using several analytical methods and tools. A hydrological model was set up using HEC-HMS 4.12 software, along with a water balance and statistical analyses. Appendix H.4 of the ESIA details all the methods used to assess the hydrological regime of the LSA. Flow and water level surveys of the LSA were used to assess the reference state of the existing environment (detailed in Section 11.2). This reference state corresponds to conditions prior to the development and operation phases of the project. As such, it was used as the basis for assessing the project's residual impacts on the VC during the construction and operating phases.

The assessment of the project's residual impacts on the VC also includes an analysis of anticipated impacts in response to climate change. The impacts of climate change have been integrated into the development of a future climate scenario, coupled with the hydrological model. A climate normal for the period 2021-2050 was used, based on the Shared Socio-economic Pathway (SSP) 2-4.5 emissions scenario for daily temperature and precipitation data (WSP, 2024).

The results of the water balance model, developed using GoldSim™ software by WSP (WSP, 2024), were used to account for daily variations in mine effluent volumes during the operational phase. The water balance model integrates the pits, tailings facility, sedimentation ponds, ore processing plant and water management infrastructure.

To assess the impact of the project on the hydrological regime, three main flow characteristics were examined: peak flow (m^3/s), total annual volume (m^3) and summer-fall flow (m^3/s). Analysis of peak flow allows us to assess the variability of floods over the life of the project. Annual volume represents the water availability of the hydrological system. Assessing annual volume allows us to determine the impact of mining operations on the hydrological regime. More specifically, this indicator shows any significant change in the hydrological regime, which could result in insufficient water for aquatic habitats and ecosystems. This parameter must be analyzed in conjunction with low-water flow. The latter provides additional information on observed variations in the hydrological regime.

Several points of interest within the LSA were selected for analytical evaluation. These points were selected based on their potential sensitivity to interactions with project activities (TTable 11.7) taking place during the construction and operation phases. The three flow characteristics of these points were analyzed. Any variation of an order of± 10% or more from the reference period is considered significant (Department of Fisheries and Oceans Canada [DFO], 2013).

For monitoring points (Map 11.1) during high-flow periods (spring freshet), when daily or point flows are forecast to exceed the long-term reference hydrograph by more than 10%, a detailed flood risk analysis is automatically triggered. In concrete terms, this involves :

- Comparing simulated flood flows (e.g. 24 h flood, 100-year return period) with channel capacity;
- Assessing the risk of bank overtopping, erosion and scouring;
- Classify the residual impact (low, moderate, high) according to the extent of exceedance of natural variability.

Conversely, during the low-flow period (summer-fall), when maintaining minimum flows is crucial for aquatic habitat and water supply, a predicted drop in daily or average flows of more than 10% relative to reference conditions requires verification of environmental flow compliance:

- Check projected flows against established minimum thresholds (ecological guides or hydrological methods);
- Check that these thresholds are respected throughout the low-flow period;
- Assign a local residual impact on surface water quantity if thresholds are not met;
- Consider mitigation or adaptation measures to preserve ecosystem health and resource reliability.

This two-pronged approach ensures that both high-flow flood risk and low-flow water stress are taken into account.

Construction

During the construction phase, a series of activities - such as deforestation, excavation of overburden and vegetation, and the use of explosives - will directly modify the land surface and disrupt natural drainage patterns. Although drainage solutions will be designed and implemented, a change in the hydrological regime is expected.

Two monitoring points have been selected to assess the anticipated residual impact during the construction phase compared to baseline conditions:

- The confluence of the diversion channel (during the construction phase) and Bibou Creek (CE2) at Lake A (PE43): This point is monitored to assess the influence of any significant change in the hydrological regime, as it is the main outlet for the western part of the watersheds draining into Lake A;
- Lake A outlet (PE43): this point represents the role of Lake A (PE43) in the potential restoration of flows to reference conditions. It enables us to assess the extent to which Lake A (PE43) mitigates changes to the hydrological regime.

Figure 11.13 compares the mean annual cycle flow at the end of the construction period with that of the reference period for the first point selected.

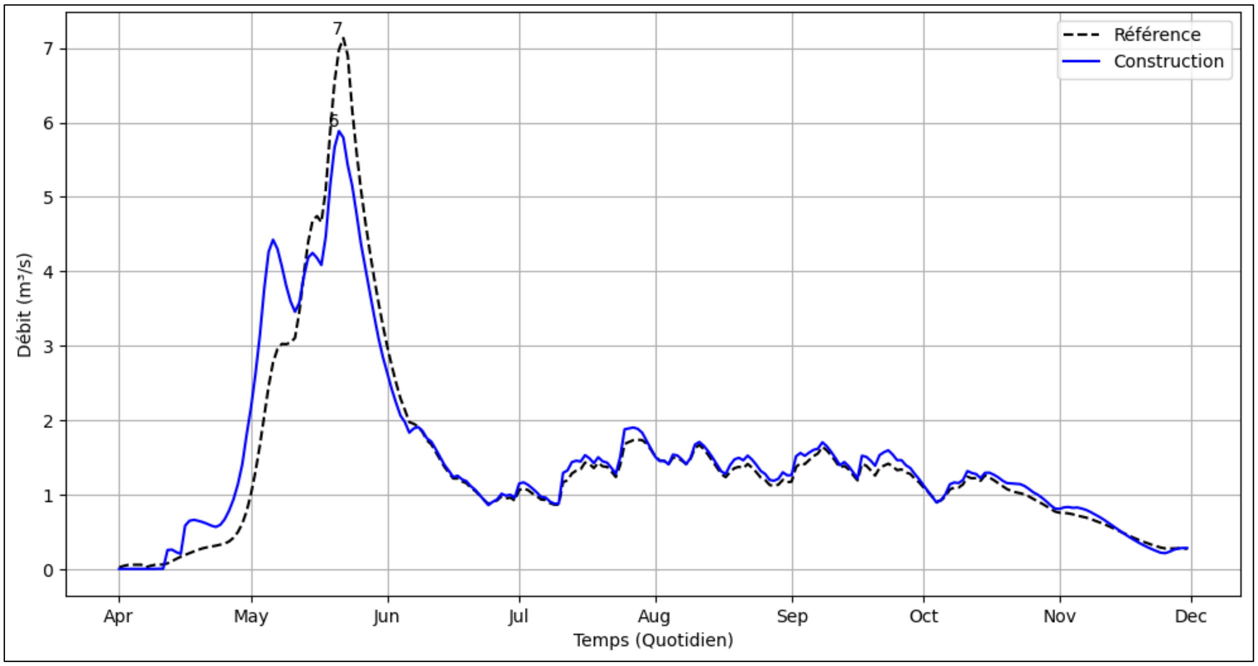


Figure 11.13 Average annual cycle of anticipated flow at the confluence of Bibou Creek (CE2-SH46) at Lake A (PE43)

Key observations:

- Peak flow reduction: the peak flow of the scenario representative of the construction phase will be reduced by 14% compared with reference conditions, i.e. 7 m^3/s for reference conditions, compared with 6 m^3/s during the construction phase. These results suggest that the mitigation measures and water management infrastructures implemented during the construction phase will temper the high flows;
- Summer-fall flows: Overall, daily flows in both scenarios are similar beyond July. However, daily flows during the construction phase will be slightly higher in late summer and into fall.

Activities planned during the construction phase of the project will result in a reduction in peak flows, as well as an increase in base flows. This suggests that the mitigation measures to be put in place will contribute to the attenuation of flood peaks and help maintain flows during drier periods.

Figure 11.14 compares the mean annual cycle flow at the end of the construction period with that of the reference period for the second selected point, the outlet of Lake A.

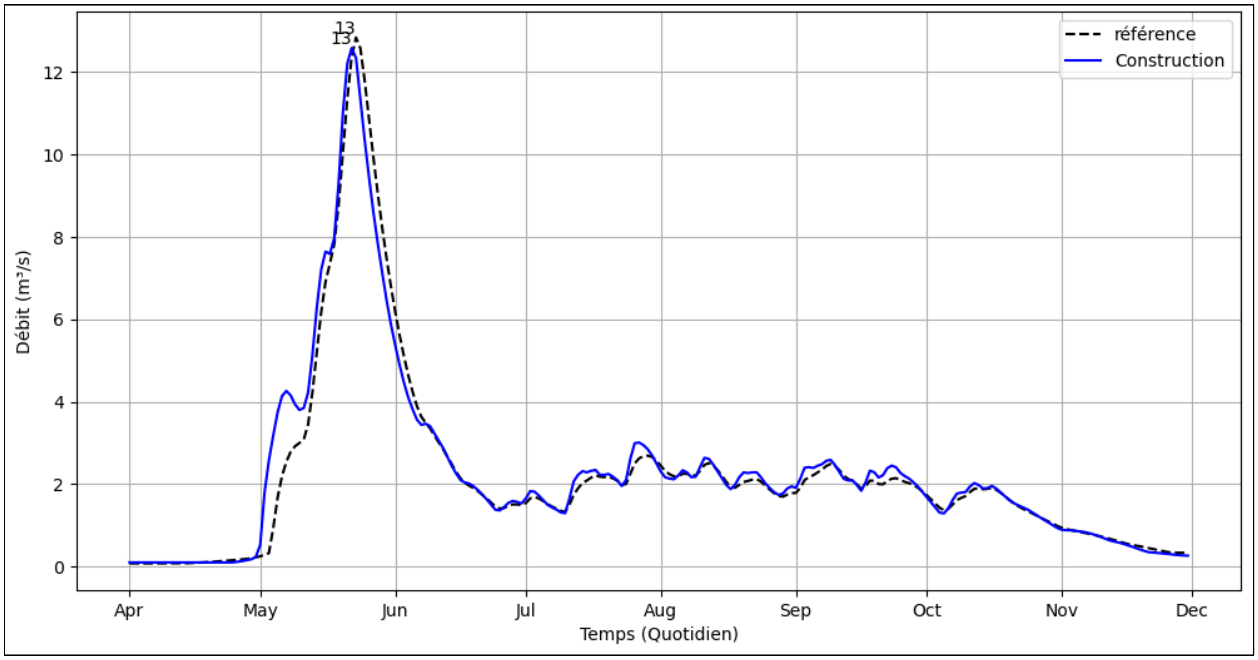


Figure 11.14 Average annual cycle flow at Lake A outlet (PE43)

Key observations:

- Reduction in peak flow: the peak flow of the scenario representative of the construction phase will be reduced by 7.7% compared with reference conditions, i.e., by 13.1 m^3/s for reference conditions, compared with 12.09 m^3/s estimated during the construction phase;
- Summer-fall flow: a trend similar to Figure 11.13 is observed in the base flows of both scenarios. Slightly higher flows are anticipated during the construction phase, due to the controlled discharge rate;
- During the construction phase, the anticipated flood flow at the outlet of Lake A (PE43) will be slightly lower than that estimated for the reference state. More specifically, the timing of peak flows appears to be slightly advanced, while base flow remains unchanged. This observation suggests that infrastructure changes during this phase will slightly reduce flood peaks, without significantly altering the behavior of the hydrological regime.

The table 11.8 presents a comparison of average annual water volumes, estimated at the two selected monitoring points. Note that the anticipated variations are less than 10%, indicating that no significant change will occur in mean annual water volumes.

Table 11.8 Average annual volume (1000 m^3) at selected monitoring points

Monitoring points	Reference scenario	Construction scenario	Variation (%)
Junction of diversion channel (under construction) and Bibou Creek (CE2) at Lake A (PE43)	28 700.5	30 782.05	7.25
Lake A outlet (PE43)	42 783.25	44 994.3	5.17

Table 11.9 shows the percentage change in estimated summer-fall flow for the construction scenario compared to the reference scenario. The anticipated variation is less than 10%, indicating that no significant change in the hydrological regime is expected.

Table 11.9 Low-water flows (m^3/s) at selected hydrological elements

Monitoring points	Reference scenario	Construction scenario	Percentage change (%)
Confluence of diversion channel (under construction) and Bibou Creek (CE2) at Lake A (PE43)	1.25	1.32	5.63
Lake A outlet (PE43)	1.88	1.95	3.30

Operation

Tables 11.10 and 11.11 present the estimated water balance results for the historical simulation and the simulation including climate change for the first year and the Year 21 of operation. These tables provide key hydrological indicators at watershed monitoring points, including peak flow (m^3/s) and mean annual volume (1000 m^3).

Table 11.10 Peak flows (m^3/s) at selected monitoring points

	Status Quo Scenario		Scenario including Climate Change	
Monitoring points	Year 1	Year 21	Year 1	Year 21
Upstream lake outlet (PE2)	3.3	3.3	2.7	2.7
SP01 outlet	0.4	0.4	0.4	0.4
Water treatment plant discharge point and SP01 (on diversion channel [CE2])	3.5	3.3	3.2	2.8
SP02 outlet	1.0	1.0	1.0	1.0
SP02 discharge point (on diversion channel [CE2])	4.3	4.3	4.3	3.9
Junction of Bibou Creek (CE2-SH4) and Lake A (PE43)	4.7	4.7	4.3	4.2
Outlet SP03	n/a	1.0	n/a	1.0
Outlet SP04	1.0	1.0	1.0	1.0
Lake A outlet (PE43)	10.7	10.9	9.6	9.7
Watershed outlet (LSA)	18.7	18.1	16.2	17.0

Table 11.11 Average annual volume (1000 m^3) at selected monitoring points

	Status Quo Scenario		Scenario including Climate Change	
Monitoring points	Year 1	Year 21	Year 1	Year 21
Upstream lake outlet (PE2)	15 860.15	15 860.15	17 292.35	17 292.35
Outlet SP01	3922.55	2816.65	4181.75	2989.45
Water treatment plant discharge point and SP01 (on diversion channel [CE2])	21 900.5	20 794.55	23 762.8	23 074.75
SP02 outlet	7992.0	6134.4	8121.6	6825.6
SP02 discharge point (on diversion channel [CE2])	31 823.25	28 844.1	33 946.7	31 956.5
Junction of Bibou Creek (CE2-SH4) and Lake A (PE43)	32 942.7	29 899.75	35 087.0	33 110.5
Outfall SP03	n/a	4536.0	n/a	4060.8
Outfall SP04	3024.0	3024.0	4017.6	4017.6
Lake A outlet (PE43)	46 026.95	46 269.4	50 059.1	48 121.45
Watershed outlet (LSA)	64 035.35	62 530.6	67 484.1	67 419.65

Figure 11.15 shows the mean annual cycle of flow estimated at the junction of Bibou Creek (CE2-SH46) and the diversion channel to Lake A (PE43).

Key observations:

- High variability is anticipated between Years 1 and 21 of the operation phase and baseline conditions. This variability is mainly due to flow regulation. Specifically, water will be channelled through sedimentation basins, which will modulate flow by attenuating floods. These sedimentation basins will act as a buffer, retaining water during peak precipitation events, resulting in a significant reduction in anticipated peak flows during the construction phase (4.22-4.70 m^3/s) compared to the peak flow estimated at 7.13 m^3/s for the reference scenario;
- The results of the climate change scenario simulations suggest a significant shift in spring flood peak amplitudes compared with historical simulations. Spring floods will occur earlier in the season and will be characterized by lower intensity. This is due to an earlier snowmelt period and lower snow accumulation, contributing to a lower water input to the system during the peak runoff period.

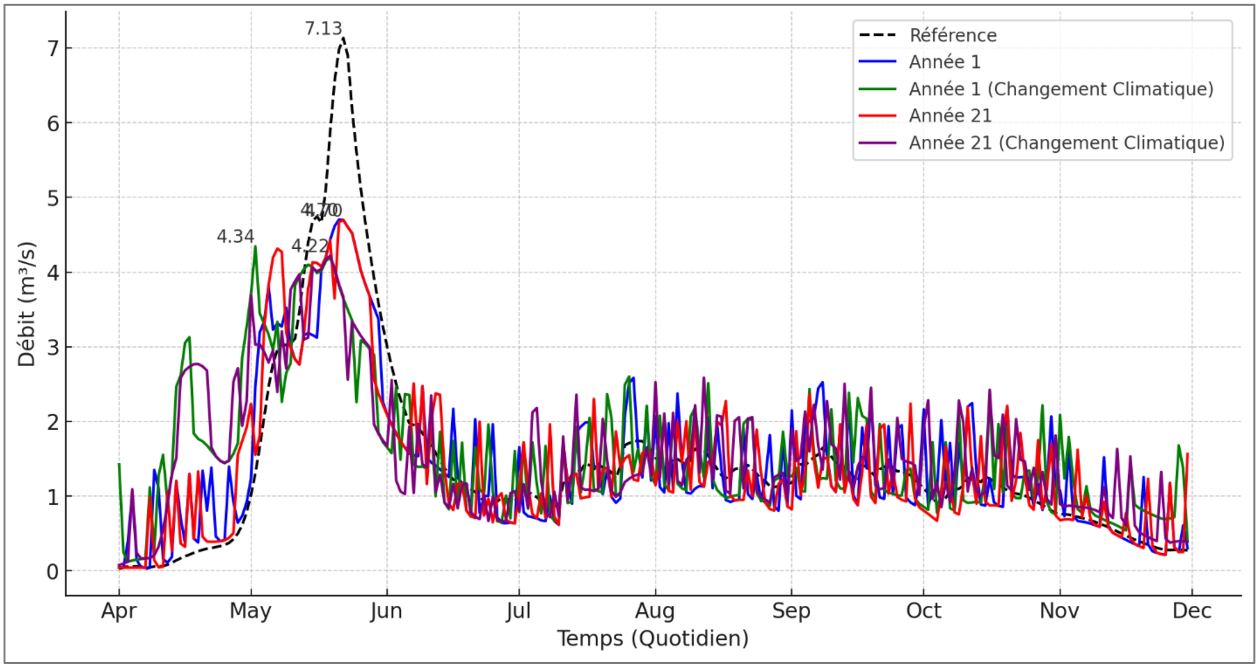


Figure 11.15 Mean annual cycle flow at the junction of Bibou Creek (CE2-SH46) and Lake A (PE43)

Figures 11.16 to 11.17 compare the distribution of the evaluated scenarios with the conditions for the reference state. A deviation at the upper quantiles is observed, reflecting the variability in the distributions of estimated peak flows between Years 1 and 21 of the operation phase. Scenarios including climate change predictions show a more pronounced deviation from the reference state, illustrating the influence of climatic conditions on the variability of estimated flows.

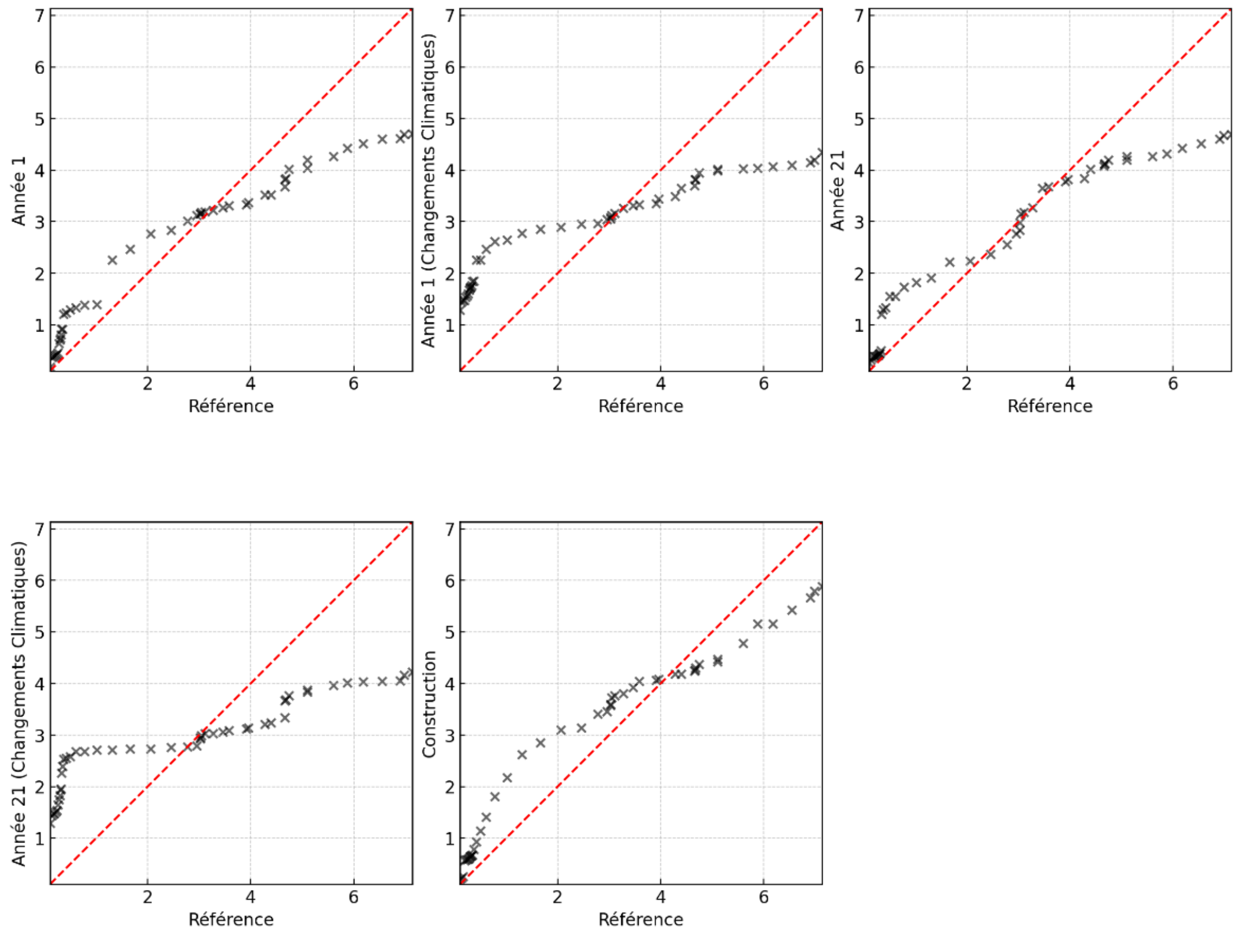


Figure 11.16 Quantile-quantile diagram at the Bibou Creek junction (CE2-SH46, spring)

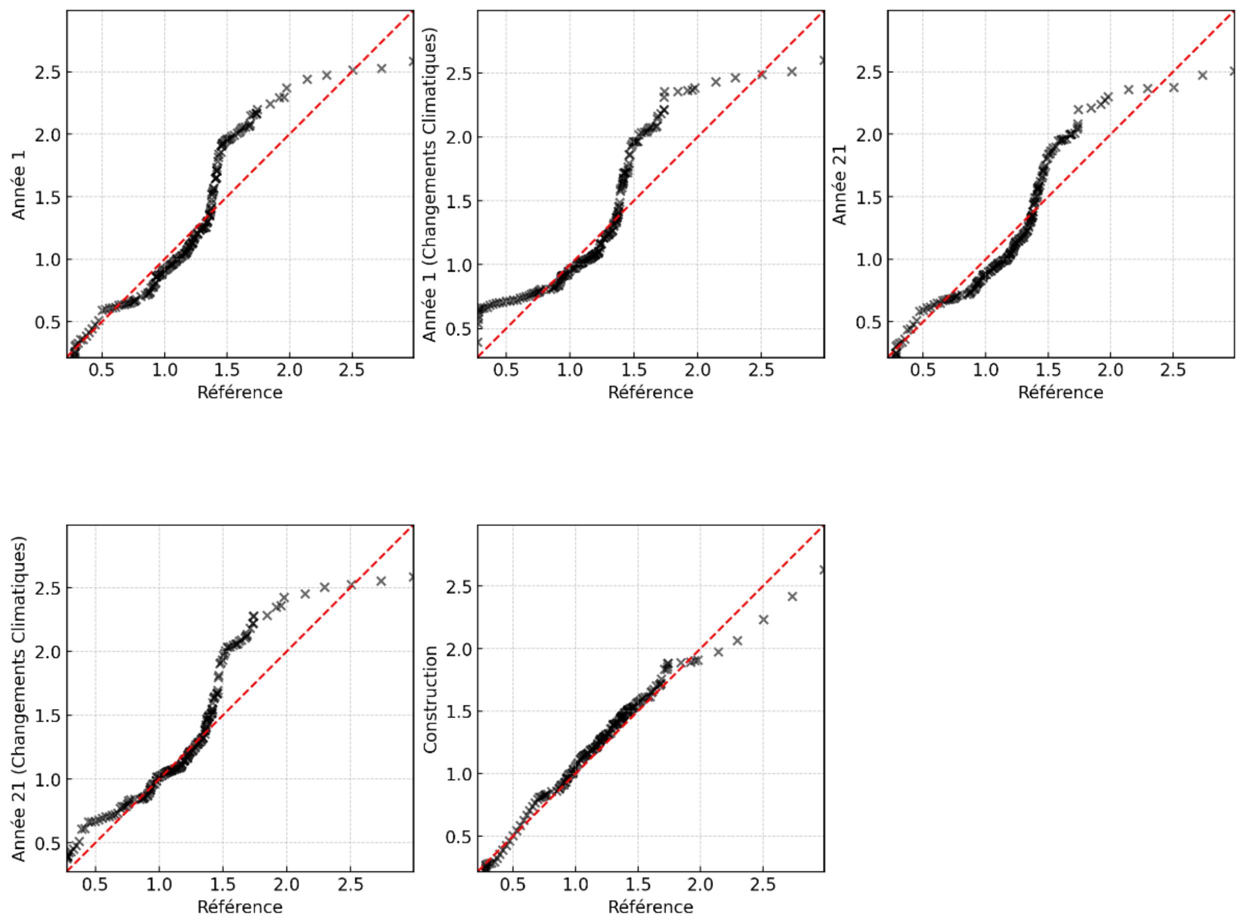


Figure 11.17 Quantile-quantile diagram at the Bibou Creek junction (CE2-SH46, summer-fall)

Figure 11.18 shows the hydrographs of the mean annual cycle at the outlet of Lake A (PE43) generated for the four scenarios. These hydrographs show little anticipated variability in peak flows and hydrograph profiles in the operational phase, compared with reference conditions:

- Lake A (PE43) attenuates the influence of sedimentation basins on the hydrological regime, as a more natural behavior is observed compared to Figure 11.15;
- Peak flows in the operation phase scenarios (Year 1 and Year 21) will remain lower than those observed under baseline conditions, indicating that upstream flow regulation will have an impact on overall flow;
- Climate change scenarios show an earlier snowmelt and a reduction in estimated peak flows.

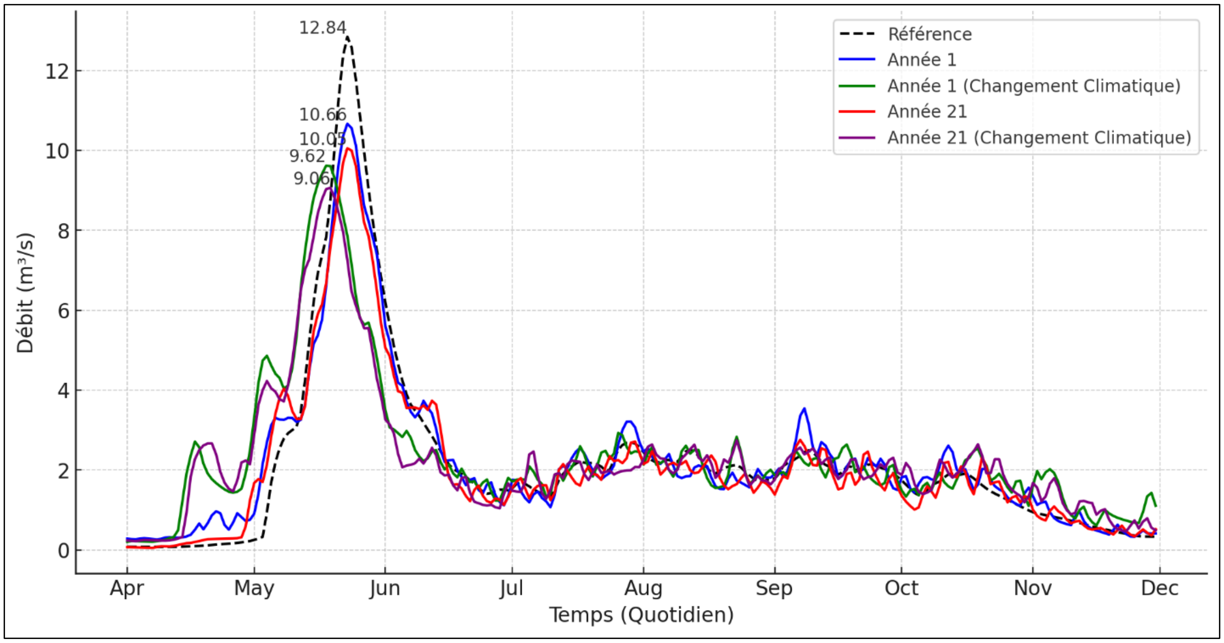


Figure 11.18 Hydrographs of mean annual discharge cycle at Lake A outlet (PE43)

Figures 11.19 and 11.20 compare the distribution of estimated flows for all scenarios with those for the reference state:

- Generally speaking, the distribution of estimated summer-fall flows is similar to those observed in the reference condition for the lower quantiles. Increased variability is observed at the upper quantiles across all seasons, corresponding to the peak flows of the scenarios;
- In spring, an increase in the variability of estimated flows can be observed between Years 1 and 21 of the operation phase;
- The scenarios, including predictions due to climate change, show a more pronounced deviation at the lower and upper quantiles compared with the reference state, illustrating the influence of climatic parameters on the variability of estimated flows in these scenarios.

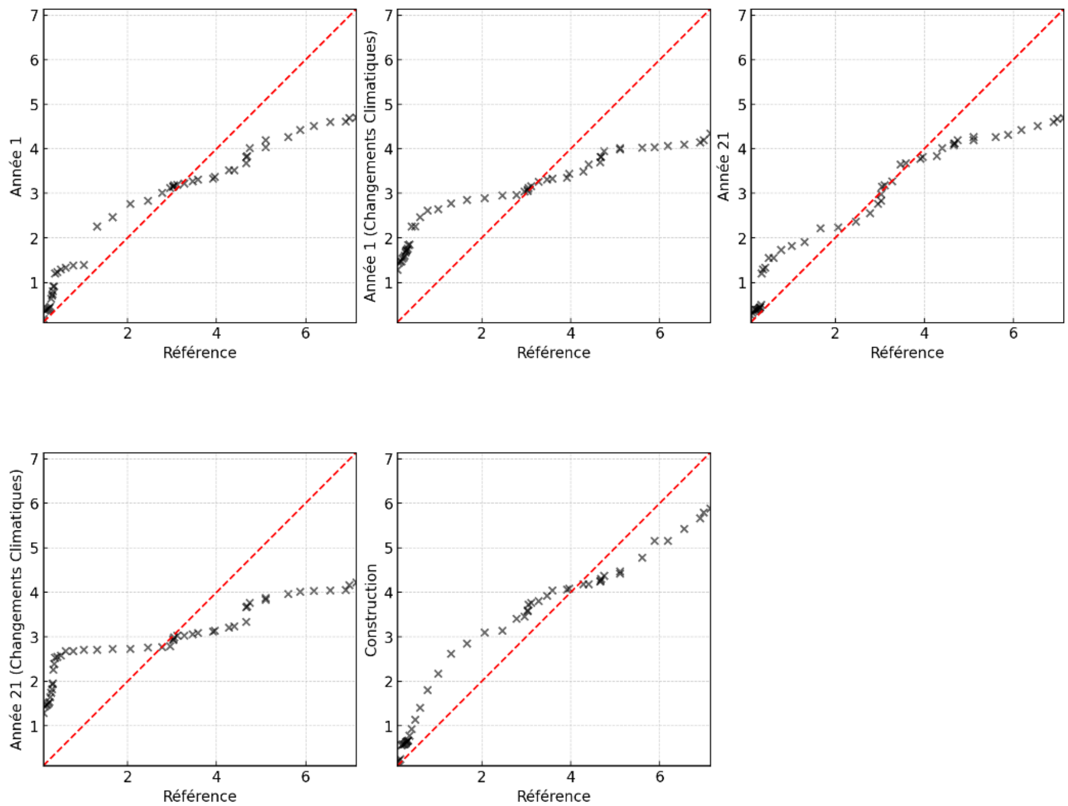


Figure 11.19 Quantile-quantile graph at Lake A outlet (PE43, spring)

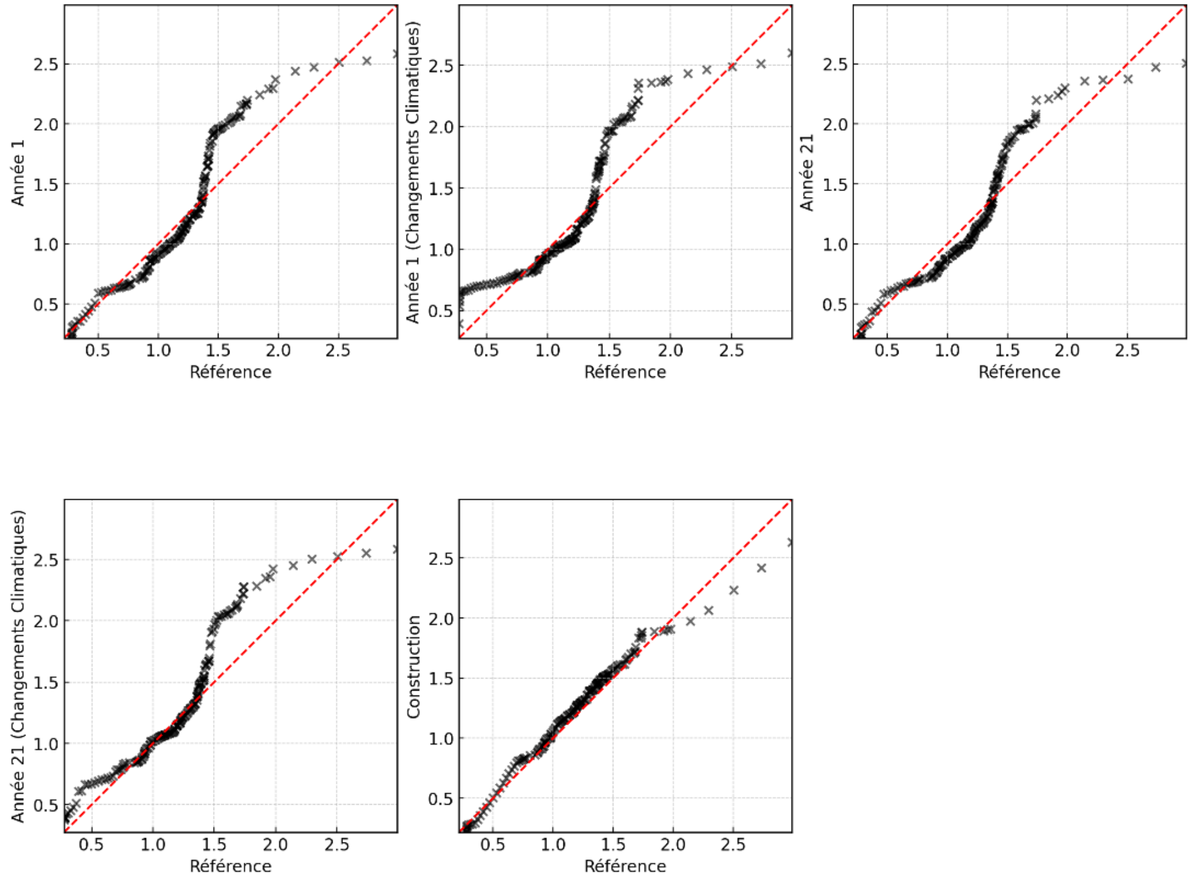


Figure 11.20 Quantile-quantile graph at Lake A outlet (PE43, summer-fall months)

Figure 11.21 shows the mean annual hydrograph at the LSA outlet for the four scenarios:

- A pronounced flow peak can be observed at the end of May. This peak reaches 20.10 m^3/s in the scenario representing reference conditions. The scenarios representative of Years 1 and 21 of the operation phase, show anticipated peak flows that are lower than reference conditions, with a maximum flow of around 18.66 m^3/s for year 1 and 17.33 m^3/s for year 21;
- Climate change is influencing the hydrological regime, with attenuated and earlier peak floods. This is illustrated by a peak discharge of 16.28 m^3/s for Year 1 and a similar trend for Year 21 (Figure 11.21).

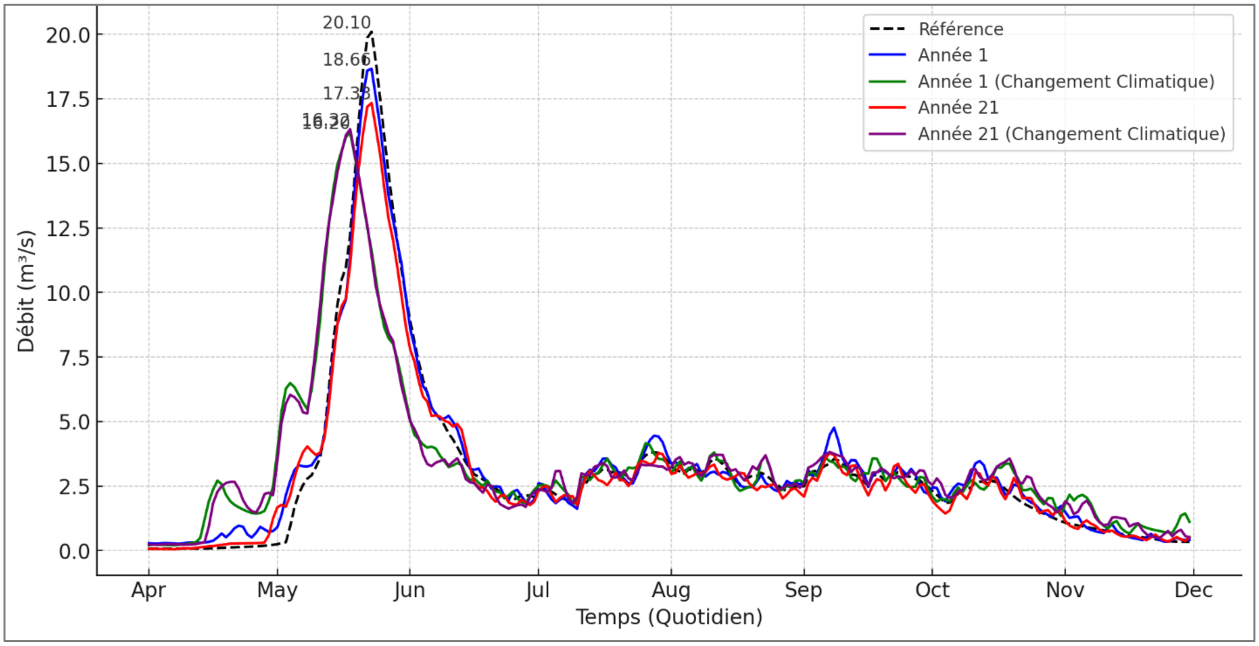


Figure 11.21 Hydrographs of the mean annual discharge cycle at the LSA outlet

Figures 11.22 and 11.23 compare the distributions of the scenarios in relation to reference conditions:

- As in the previous figures, in spring, slight variability is observed at the lower quantiles, particularly at the scenarios including climate change. In summer-fall, these variations are observed at the upper quantiles, corresponding to the changes observed during peak flows.

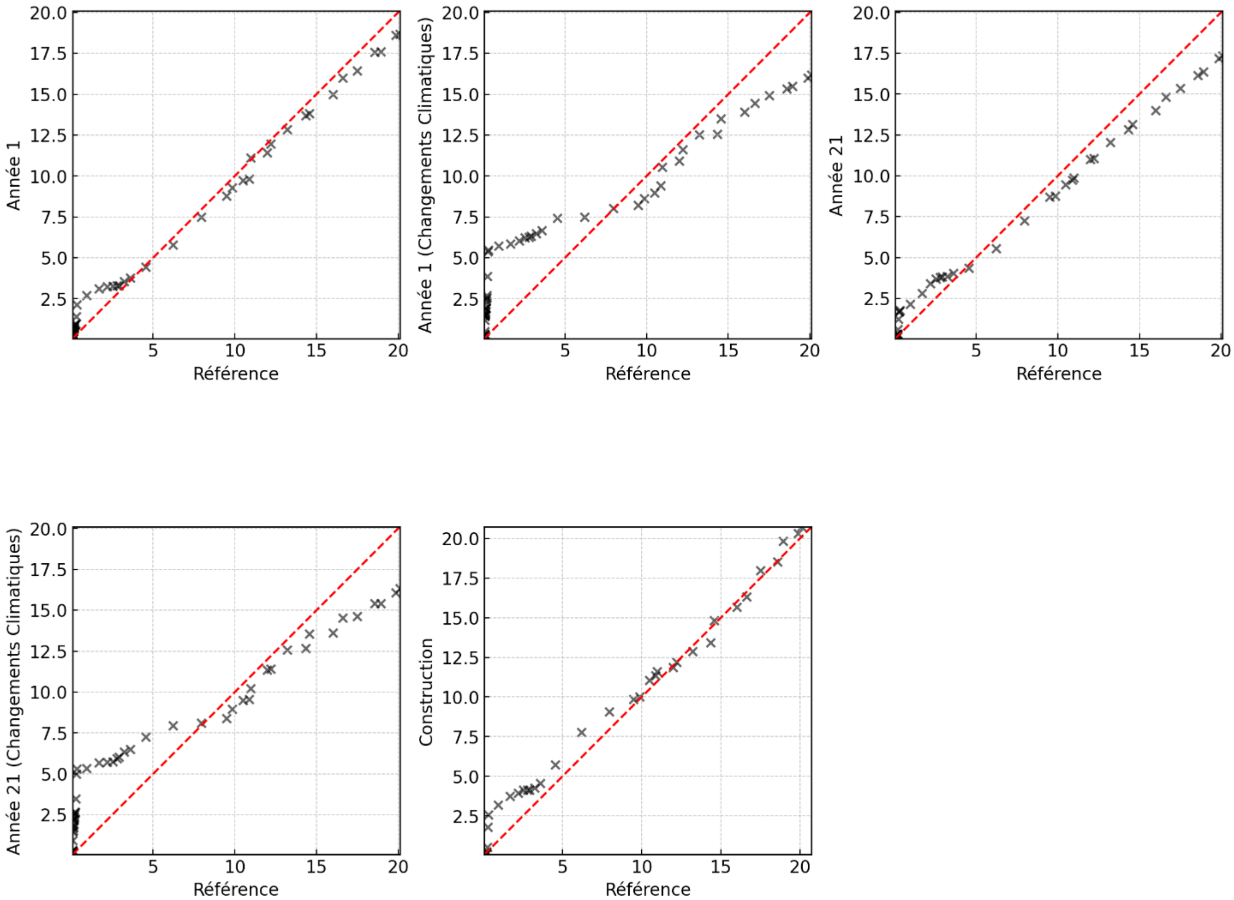


Figure 11.22 Quantile-quantile graph at LSA outlet (spring month)

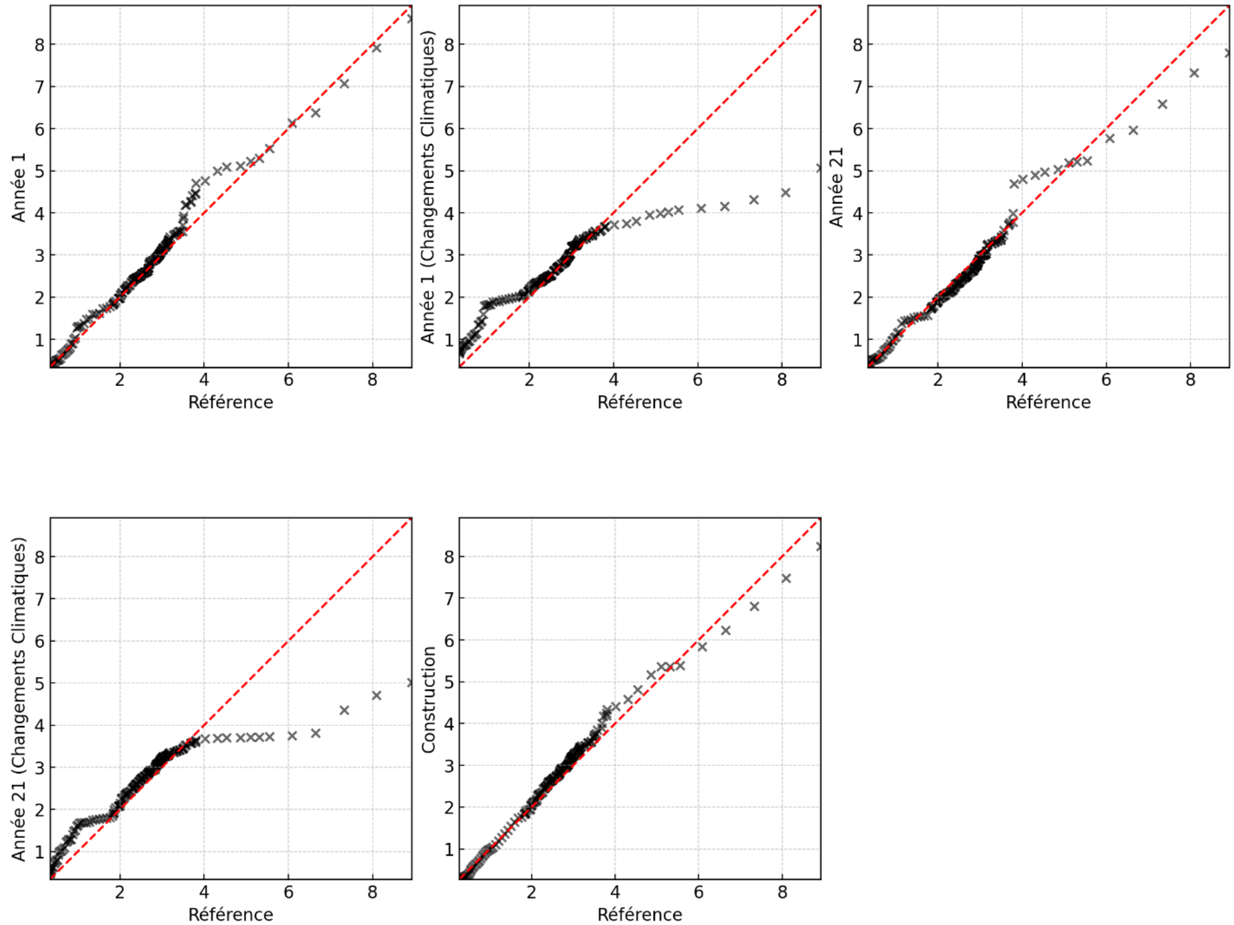


Figure 11.23 Quantile-quantile graph at LSA outlet (summer-fall months)

Figure 11.24 shows the percentage change in estimated peak flow at the various monitoring points in the LSA, compared with the reference state of the existing environment.

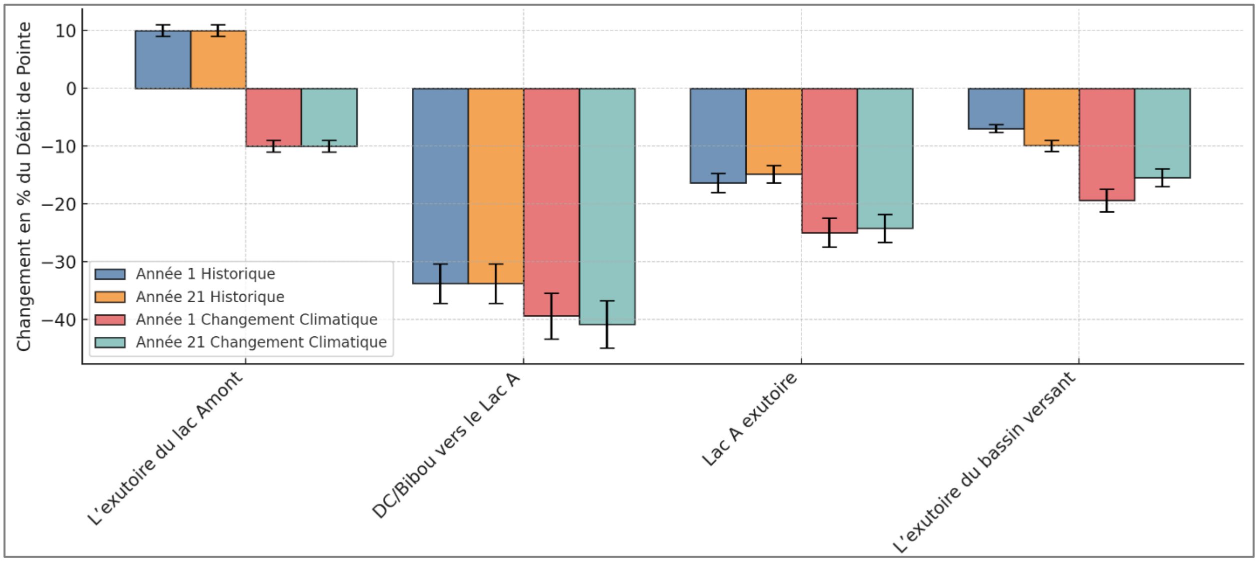


Figure 11.24 Variations (%) in peak flows for each of the four scenarios

At the monitoring point upstream of the LSA (at the outlet of Lake Amont [PE2]):

- Peak flows increase slightly (≈ 10%) in all reference scenarios, suggesting a limited change in flows, probably due to variations in groundwater recharge;
- For scenarios associated with climate change, a slight decrease is anticipated, probably due to a higher evaporation rate.

At the junction of Bibou Creek (CE2-SH4) with Lake A (PE43):

- Anticipated peak flows are greatly reduced (≈ -35%), indicating a significant regularization of flows thanks to the sedimentation basins, which will play a buffering role by attenuating floods;
- For climate change scenarios, the reduction in anticipated peak flow is greater than for business-as-usual scenarios.

At Lake A outlet (PE43)

- This trend continues at the outlet of Lake A (PE43), where reductions in anticipated peak flow remain significant (-10% to -15%), although less marked than at Bibou Creek (CE2);
- For the climate change scenarios, the reduction in anticipated peak flow is greater than for the status quo scenarios, as we saw earlier.

Finally, at the watershed outlet (LSA):

- Decreases in anticipated peak flows at the Lake A outlet (PE43) persist (-5% to -10%), although they are less pronounced than at upstream monitoring points;
- It should be noted that, in all cases, the flow rate shows a decreasing trend, and no further analysis of the project's potential impact on high water is required.

Figure 11.25 shows the percentage change in total estimated volume at the various monitoring points in the LSA, compared with the reference state of the existing environment.

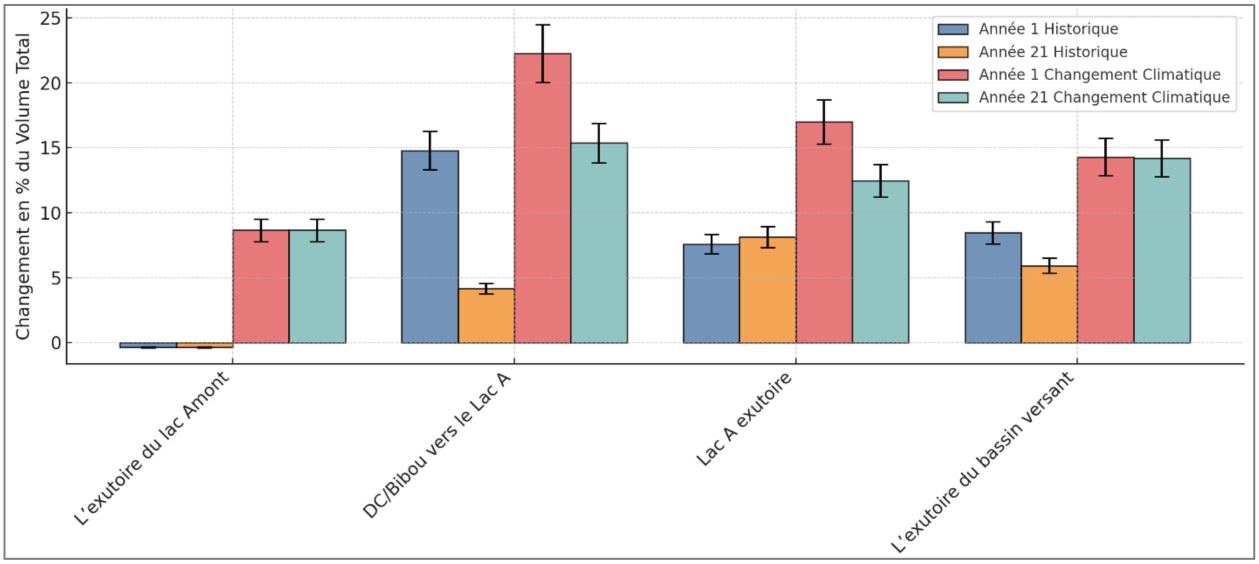


Figure 11.25 Rate of change (%) in total volumes estimated at the various LSA monitoring points compared with the reference state

At the monitoring point upstream of the LSA (at the outlet of Lake Amont [PE2]):

- Small variations are anticipated for all scenarios, indicating that upstream flows will remain unchanged overall;
- An increase of less than 10% is estimated for the scenarios associated with climate change, corresponding to a negligible variation.

At the junction of Bibou Creek (CE2-SH4) with Lake A (PE43):

- A 15% increase in total volume is estimated for the Year 1 status quo scenarios, due to the impact of activities planned during the operation phase, such as pit dewatering and mine effluent discharge;
- However, this estimate remains below 10% for Year 21, indicating a negligible change in anticipated volume for this scenario;
- As seen, the climate change scenario shows a significant variation (>10%) in anticipated volume at this location.

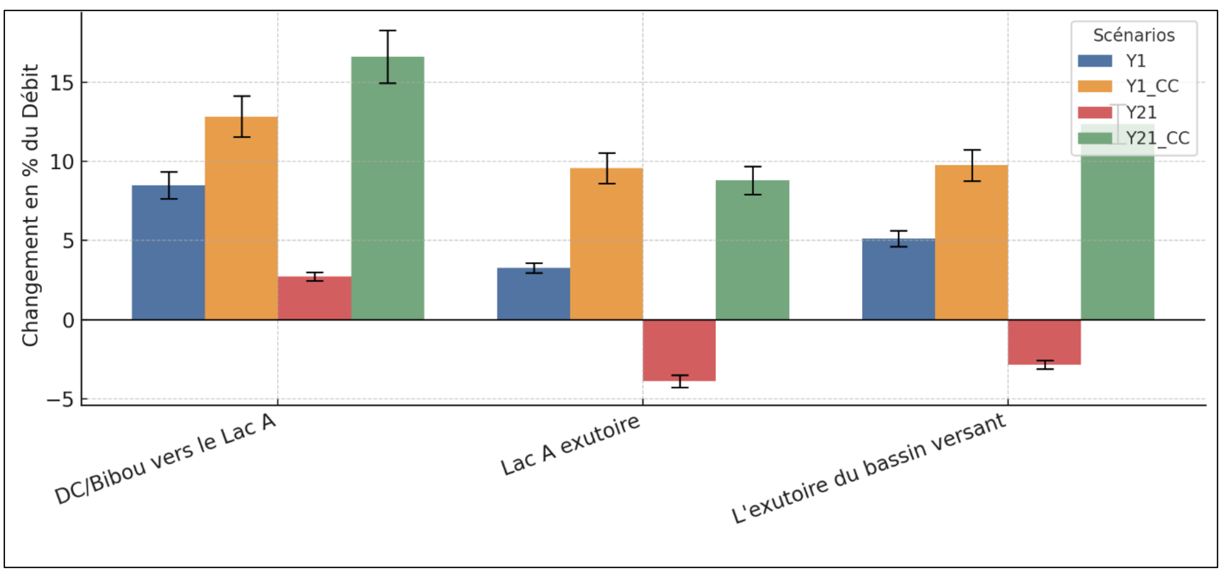
Lake A outlet (PE43) :

- The total volume anticipated for business-as-usual scenarios will increase with a percentage change of less than 10%;
- Rates of change are more pronounced in scenarios associated with climate change.

Finally, at the watershed outlet (LSA) :

- Estimated total volume will increase slightly (~<10%), but to a lesser extent than at the Lake A outlet (PE43), indicating that, while flow regulation influences total discharge, its impact will gradually diminish downstream;
- As for flow, the variation in total volume shows a positive trend (increase) and, consequently, the project does not imply any problem of water availability, even considering the impact of climate change.

Figure 11.26 shows the percentage change in summer-fall (low-water) flow estimated at the various monitoring points in the LSA, compared with the reference state of the existing environment for Years 1 and 21. Lake Amont is not shown here, as no significant change in summer-fall flow was observed for this point.



CC: Climate change

Figure 11.26. Rate of change (%) in anticipated low-flow discharge at various LSA monitoring points compared with the reference state

- The anticipated rate of change remains below the 10% threshold at all monitoring points evaluated in the absence of climate change, indicating that the project's impact on anticipated low-flow discharge for these scenarios will be negligible;
- However, when the impacts of climate change are taken into account, the corresponding scenario estimates show a significant increase in low-flow discharge (>10%) for some points and scenarios;

- Unlike the previous cases for peak flow and total volume, the scenario for Year 21 shows decreases; however, since they remain below 10%, no significant impact on low flows (summer-fall) is anticipated.

The main changes anticipated at the end of operations are a decrease in peak flows and an increase in summer-fall flows. These impacts are attributable to mining operations, water treatment systems and changes in hydrological parameters.

The anticipated change in the hydrological regime (residual impact) associated with the project shows variations between the various monitoring points analyzed upstream and downstream of the PDA. The results for the Upstream Lake outlet (PE2) show a minor change. This monitoring point shows slight, negligible variations in estimated flow. A significant change is anticipated at the junction of Bibou Creek (CE2-SH4) with Lake A (PE43). At the outlet of Lake A (PE43), a significant change is expected. This point is influenced by upstream water retention caused by planned mining activities and the water management systems in place. The monitoring point at the watershed outlet (LSA) shows a moderate change. This anticipated impact is characterized by slight variations in peak flow and an increase in total volume.

Changes in the hydrological regime will continue unabated during the operational phase. However, some impacts occurring during this phase may persist beyond the mine operation and closure phase (e.g., changes in watershed area due to construction work). This persistence of the anticipated residual impact results from the alteration of the water retention structures of the environment. Long-term changes in hydrological parameters affecting infiltration, groundwater levels and the water flow network could persist after site closure.

Closure

The closure phase of the project includes site restoration. This will include several activities to mitigate long-term changes to the hydrological regime. Progressive reclamation will include dismantling mining infrastructure, reconfiguring watercourses and revegetating the site to restore natural flow patterns wherever possible.

A variation in flows and water storage capacity is expected, persisting beyond the closure phase. The change in hydrological regime is mainly due to the transition from an actively regulated hydrological system to a more natural regime. In addition, pit flooding and reclaimed areas will modify local hydrology while restoring natural flow paths. These impacts will be mainly concentrated in the directly disturbed zone (PDA), particularly around the old pits and redirected watercourses. The impacts of revegetation and site restoration on the VC will be felt gradually, and will be subject to seasonal variability and interactions between groundwater and surface water.

Although some hydrological functions may be restored, flooding of pits, modification of drainage pathways and changes in evaporation processes constitute semi-permanent modifications to the local water balance. As a result, the residual impact of the altered hydrological regime will mainly take the form of an anticipated reduction in peak flows and an increase in water retention.

Based on WSP's technical note (2024), the filling of pits X22, 87 and J (≈ 312 Mm^3) is expected to last from 9 to 23 years, with the most likely window being between 11 and 15 years if 25-50% of the mean annual flow of Bibou Creek is diverted. The water level will then reach the overflow elevation (363.1 m ASL) and begin to return flow to Lake A and downstream Bibou Creek. During flooding, the diversion will induce a proportional reduction in Bibou Creek flows. However, once the lake is in a steady state, the large storage capacity will produce a more regular flow regime.

Due to the lack of data to characterize the hydrological parameters of water bodies resulting from pit flooding, and the absence of specific data related to operational management during the closure phase, a quantitative VC assessment could not be carried out for this phase of the project. However, expert knowledge and established hydrological principles suggest that the presence of a large water body generally results in a more regularized flow regime. Consequently, the results of the operational phase suggest a likelihood of observing a flattened hydrograph, characterized by reduced peak flows and increased low flows, compared to the hydrological conditions of the reference state.

Changes in the hydrological regime can also have ecological consequences, particularly for aquatic life and riparian vegetation. Reduced peak flows and increased water retention can alter flow velocity, sediment transport and temperature regimes, resulting in less favourable conditions for sensitive fish species. Similarly, changes in the timing and magnitude of flows can influence the composition and distribution of riparian vegetation. Prolonged water retention or altered humidification and drying cycles can disrupt the health of wetland ecosystems. These ecological impacts must be considered in conjunction with hydrological assessments to ensure the long-term sustainability of aquatic and terrestrial habitats.

11.4.2 Summary of Project Residual impacts

Table 11.12 summarizes the anticipated residual impacts of the project on the hydrological regime. The adverse impacts can be summarized as follows:

- Modification of flow patterns : Alteration of anticipated peak flows and water volumes, leading to changes in local hydrological regimes, both upstream and downstream;
- Disturbance of natural drainage systems: Diversion of watercourses and modification of flow paths, which would alter the regional water balance;
- Increased water retention: As a result of the planned mining infrastructure and treatment systems, increased water retention will alter infiltration and evaporation dynamics;
- Impact differentiated by site: More pronounced impacts are anticipated at strategic points (e.g. DC/Bibou to Lake A) with significant reductions in peak flows, while other areas, such as Lake Amont, will experience smaller variations;
- Semi-permanent alterations : Some alterations, such as flooding of mining pits and changes in drainage patterns, may persist beyond the operating period, with lasting effects on the hydrological balance;
- Transition to a modified hydrological regime : The gradual transformation from a controlled hydrological system to a more natural state will remain incomplete, leaving residual impacts that will influence the quality and regulation of water flows over the long term.

Table 11.12 Anticipated residual impacts of the project on the hydrological regime

Residual impact	Residual Impact Characterization							
	Project phase	Direction	Magnitude	Geographic extent	Timing	Duration	Frequency	Reversibility
Changes in hydrological regime	C	P	L	PDA	NS	MT	C	I
	O	A	M	LSA	MS	LT	C	I
	D	A	M	LSA	MS	LT	C	I

Project phase :
C: Construction
O: Operation
D: Decommissioning and Closure

Direction :
P: Positive
A: Adverse

Magnitude :
N: No Measurable Change
L: Low
M: Moderate
H: High

Geographical extent :
PDA: Project Development Area
LSA: Local Assessment Area
RSA: Regional assessment Area

Timing :
NS: No sensitivity
MS: Moderate sensitivity
HS: High sensitivity

Duration :
ST : Short term
MT: Medium-term
LT : Long term

N/A Not applicable

Frequency :
S : Single event
IR : Irregular event
R: Regular event
C : Continuous

Reversibility :
R : Reversible
I : Irreversible

11.5 Prediction Confidence

The assessment of the reference state of the environment, as well as the input data for the hydrological model, are based on the results of hydrometric campaigns carried out by Wachiih from 2019 to 2024 (Appendices G.1.1 and G.1.2 of the ESIA).

Hydrological modeling of the environment was carried out using recognized empirical methods (SCS Curve Number and SCS Unit Hydrograph methods), combined with historical climate data from the Chibougamau-Chapais regional station. Confidence in the results obtained is judged to be moderate to cautious, given the uncertainties associated with the input data, the assumptions applied and the limited availability of data for numerical model calibration. Several conservative assumptions have been adopted. The limited availability of observed hydrometric data restricts the ability to calibrate the model accurately. Uncertainties also remain regarding the representation of snowmelt processes and future climate projections. The full set of assumptions, limitations and uncertainties are presented in the sector report in Appendix H.4.

Despite these limitations, the model provides an adequate representation of existing average hydrological conditions and is a relevant tool for analyzing hydrological trends at the project scale.

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Appendix 11.1 List of watercourses and bodies of water likely to interact with the project

Table 11.13 List of watercourses

Sub-basin	Segment name	Facies	Type of flow	Total length (km)
SB_02	CE2-1 - SH1	--	Intermittent	0.507 988
	CE2-10 - SH2	Current flat	Permanent	0.143 437
	CE2-5 - SH2	Lenticular flat	Intermittent	1.190 66
	CE2-6 - SH2			0.536 592
	CE2-10 - SH3			0.898 629
	CE1-1 - SH1			0.033 529
	CE2-5 - SH1			0.048 753
	CE2-6 - SH1			0.016 617
	CE2-2 - SH1			0.010 871
	CE2-4 - SH1			0.014 647
	CE2-8 - SH1			0.024 939
	CE2-9 - SH1			0.015 37
	CE2-9 - SH2			0.185 956
	CE2-10 - SH1	Lenticular flat	Permanent	0.136 064
	CE0 - SH1	Fast	Permanent	0.094 25
SB_03	CE2 - SH3	--	Permanent	0.542 59
	CE2-12 - SH1	Flat current	Intermittent	0.234 09
	CE10 - SH1		Permanent	0.037 576
	CE10 - SH4	Lenticular flat	Permanent	0.413 041
	CE10-8 - SH2		Permanent	0.159 173
	CE10-10 - SH1		Intermittent	0.339 394
	CE10-11 - SH1		Intermittent	0.136 848
	CE10 - SH5		Permanent	0.644 568
	CE10-9 - SH1		Intermittent	0.220 911
	CE2-13 - SH3		Permanent	0.062 716
	CE2-17 - SH5		Permanent	0.118 406
	CE2-17 - SH7		Permanent	0.021 52
	CE10-8 - SH3		Permanent	0.056 08
	CE10 - SH3		Permanent	0.303 6
	CE10 - SH2		Permanent	0.117 326
	CE10-5 - SH1		Permanent	0.074 278
	CE2 - SH4	Fast	Permanent	0.397 559
	CE2 - SH2			0.461 667
	CE2 - SH6	Threshold	Permanent	0.079 93
	CE2 - SH1	Lentic channel	Permanent	1.777 65
	CE2 - SH5			0.109 621
	CE10-3 - SH1	Wetlands	--	0.384 184
	CE10-1 - SH1			0.149 865
	CE2-17 - SH3			0.179 959

Sub-basin	Segment name	Facies	Type of flow	Total length (km)
	CE10 - SH6	--	Permanent	0.711 43
SB_04	CE7-1 - SH10	Wetland	--	0.068 384
	CE9-4 - SH1			0.134 919
	CE7-4 - SH2			0.067 808
	CE9 - SH3	Lentic channel	Permanent	1.324 36
	CE9 - SH1			1.078 67
	CE9 - SH2			0.026 91
	CE7-1 - SH3			0.237 943
	CE4 - SH1	Flat current	Intermittent	0.300 726
	CE6 - SH1	Lenticular dish	Permanent	0.066 139
	CE5 - SH1			0.075 94
	CE7 - SH1			0.043 465
	CE8 - SH1			0.075 138
	CE9-6 - SH9			0.111 42
	CE9-6 - SH7			0.167 118
	CE7-1 - SH6			0.081 811
	CE9-6 - SH10			0.044 112
	CE7-5 - SH1			0.169 846
	CE7-1 - SH1			0.053 446
	CE8-1 - SH1		Intermittent	0.122 655
	CE5-1 - SH1			0.016 475
	CE5-1 - SH2			0.069 982
SB_05	CE2-23 - SH1	Wetlands	--	0.288 105
	CE2-21 - SH1			0.339 531
	CE2 - SH9	Lentic channel	Permanent	0.922 944
	CE2 - SH7			0.399 647
	CE2-24 - SH1			0.274 753
	CE2-24 - SH2	Flat lens	Permanent	0.667 527
	CE2-23 - SH2			0.023 346
	CE2 - SH8	Threshold	Permanent	0.078 011
	CE2 - SH6			0.079 93
SB_06	CE2-28 - SH1	Wetlands	--	
	CE2-24 - SH2	Lentic flat	Permanent	0.667 527
	CE2-25 - SH4		Permanent	0.366 35
	CE2-24 - SH3		Intermittent	0.228 832
	CE2-25 - SH3		Permanent	0.053 889
	CE2-25 - SH2		Intermittent	0.381 193
	CE2-25 - SH1		Intermittent	0.410 865
SB_07	CE2-29 - SH1	Wet environment	--	0.190 22
	CE2-34 - SH2			0.221 413
	CE2-34 - SH1			0.165 072

Sub-basin	Segment name	Facies	Type of flow	Total length (km)
	CE9 - SH3	Lentic channel	Permanent	1.324 36
	CE2 - SH9			0.922 944
	CE2 - SH11			1.436 76
	CE2 - SH10			0.399 198
	CE2 - SH13	Lotic channel	Permanent	0.419 209
	CE2 - SH15			0.283 871
	CE12 - SH1	Lenticular flat	Permanent	0.163 733
	CE2-38 - SH1			0.056 012
	CE2-35 - SH4			0.426 425
	CE2-32 - SH1		Intermittent	0.114 882
	CE12 - SH2			0.112 936
	CE2 - SH16	Culvert	Permanent	0.033 354
	CE2 - SH12	Rapid	Permanent	0.096 213
	CE2 - SH14			0.094 165
SB_08	CE21-1 - SH1	--	Intermittent	0.027 378
	CE21 - SH8	Wet environment	--	0.027 753
	CE2-34 - SH1			0.165 072
	CE21 - SH10	Lentic channel	Permanent	0.228 769
	CE21 - SH11			0.442 962
	CE21 - SH12			0.660 676
	CE21-2 - SH1			0.084 896
	CE2 - SH13	Lotic channel	Permanent	0.419 209
	CE21 - SH2	Flats	Permanent	0.080 037
	CE21 - SH6	Lens dish	Permanent	0.079 916
	CE21 - SH3			0.095 85
	CE21 - SH5			0.007 201
	CE21 - SH7			0.004 441
	CE21 - SH9			0.025 685
	CE21 - SH1	Gully	Permanent	0.043 899
	CE21 - SH4			0.004 86
SB_09	CE2-35 - SH1	Wetlands	--	0.232 481
	CE2-35 - SH2	Lentic flat	Permanent	0.780 522
	CE2-35 - SH3			0.078 229
	CE2-35 - SH4			0.426 425
	CE54 - SH1		Intermittent	0.753 519
SB_10	CE2 - SH18	Pond	Permanent	0.027 318
	CE21 - SH12	Lentic channel	Permanent	0.660 676
	CE2 - SH33	Lotic channel	Permanent	0.115 507
	CE2 - SH31			0.556 878
	CE2 - CE2			0.259 326
	CE2 - SH29			0.086 925

Sub-basin	Segment name	Facies	Type of flow	Total length (km)
	CE2 - SH28			0.019 133
	CE2 - SH27			0.027 376
	CE2 - SH19			0.174 714
	CE2 - SH22			0.067 167
	CE2 - SH21			0.098 01
	CE2 - SH25			0.373 499
	CE2-39 - SH1	Lenticular flat	Intermittent	0.503 991
	CE2 - SH23	Culvert	Permanent	0.036 452
	CE2 - SH26			0.026 183
	CE2 - SH16			0.033 354
	CE2 - SH34	Fast	Permanent	0.023 096
	CE2 - SH32			0.007 064
	CE2 - SH17	Threshold	Permanent	0.012 454
	CE2 - SH20			0.183 787
	CE2 - SH24			0.057 565
SB_11	CE2-39 - SH1	Lenticular flat	Intermittent	0.503 991
	CE21 - SH12	Lentic channel	Permanent	0.660 676
SB_12	CE2-43 - SH2	Wetland	--	0.198 855
	CE2-41 - SH2			0.037 861
	CE2 - SH46	Lentic channel	Permanent	0.966 668
	CE2 - SH44	Lotic channel	Permanent	0.457 304
	CE2 - SH42			0.134 11
	CE2 - SH40			0.041 034
	CE2 - SH38			0.050 537
	CE2 - SH36			0.492 968
	CE2 - SH35			0.167 256
	CE2-40 - SH4			0.027 189
	CE2-42 - SH3	Flat lenticular	Intermittent	0.038 24
	CE2-40 - SH2		Intermittent	0.035 712
	CE2-42 - SH5		Permanent	0.136 803
	CE2-43 - SH1		Permanent	0.016 467
	CE2 - SH45	Fast	Permanent	0.182 091
	CE2 - SH43			0.098 01
	CE2 - SH41			0.137 108
	CE2 - SH39			0.015 254
	CE2 - SH37			0.014 855
	CE2 - SH34			0.023 096
SB_13	CE43-4 - SH4	Wetlands	--	0.116 294
	CE43-5 - SH1	--	Intermittent	0.376 989
	CE44 - SH1	Flat lenticular	Permanent	0.038 592
	CE43-4 - SH2			0.023 879

Sub-basin	Segment name	Facies	Type of flow	Total length (km)
	CE43-4 - SH1	Lentic channel	Permanent	0.552 173
SB_14	CE43 - SH1	Lentic channel	Permanent	0.349 735
SB_17	CE35-6 - SH1	Wetland	--	0.227 566
	CE35-4 - SH1	--	Permanent	0.163 512
	CE35 - SH4	Pond	Permanent	0.098 283
	CE35 - SH11	Lentic channel	Permanent	0.410 351
	CE35 - SH5			0.076 696
	CE35 - SH3			0.970 692
	CE35 - SH9	Lotic channel	Permanent	0.070 334
	CE35 - SH10			0.006 63
	CE35 - SH8			0.104 912
	CE35 - SH7			0.016 326
	CE35 - SH6			0.302 182
SB_18	CE35 - SH11	Lentic channel	Permanent	0.410 351
	CE40 - SH4			0.018 145
	CE40 - SH5	Lotic channel	Permanent	0.191 026
	CE40 - SH1			0.461 664
	CE40 - SH3	Common dish	Permanent	0.069 279
	CE40 - SH2			0.120 378
	CE43-1 - SH2	Lenticular flat	Permanent	0.486 481
	CE43-1 - SH4			1.435 83
	CE43-1 - SH1			0.508 428
	CE43-3 - SH2			0.056 362
	CE43-1 - SH3			0.092 332
SB_19	CE32 - SH2	Wet environment	--	0.028 958
	CE35-1 - SH1	--	Permanent	0.893 006
	CE35-1 - SH2		Intermittent	0.621 723
	CE35-2 - SH1		Intermittent	0.318 656
	CE29 - SH2	Basin	Permanent	0.087 561
	CE29 - SH3			0.091276
	CE29 - SH7			0.115 4
	CE34 - SH2			0.027 593
	CE30 - SH2	Waterfall	Permanent	0.166 132
	CE34 - SH3			0.056217
	CE35 - SH1			0.265348
	CE35 - SH3	Lentic channel	Permanent	0.970 692
	CE35 - SH2			0.021 157
	CE29 - SH1	Lotic channel	Permanent	0.049 459
	CE29 - SH6			0.274 658
	CE29 - SH8			0.139 851
	CE29 - SH10			0.014 607

Sub-basin	Segment name	Facies	Type of flow	Total length (km)
	CE29 - SH12			0.157 246
	CE29 - SH9			0.103 968
	CE29 - SH13			0.178 567
	CE30 - SH1			0.169 477
	CE36 - SH3	Flat lenticular	Intermittent	0.848 935
	CE27 -SH1	Flat lenticular	Intermittent	0.042 969
	CE36 - SH1	Flat lenticular	Intermittent	0.041 113
	CE26 -SH6	Flat lenticular	Permanent	0.148 199
	CE28 -SH1	Flat lenticular	Permanent	0.376 838
	CE26 -SH8	Flat lenticular	Permanent	0.133 83
	CE26 -SH5	Flat lenticular	Permanent	0.097 417
	CE26 -SH4	Flat lenticular	Permanent	0.050 581
	CE26 -SH7	Fast	Permanent	0.019 147
	CE29 - SH4	Fast	Permanent	0.025 497
	CE29 - SH5	Fast	Permanent	0.030 133
	CE29 - SH11	Fast	Permanent	0.014 737
	CE33 - SH1	Fast	Permanent	0.079 42
	CE34 - SH1	Fast	Permanent	0.056 52
SB_20	CE37-1 - SH1	Wetlands	--	0.074 083
SB_20	CE43-1 - SH1	Lentic flat	Permanent	0.508 428
SB_20	CE43-2 - SH1	Lentic flat	Intermittent	0.072 717
SB_21	CE29-1 - SH1	--	Intermittent	1.100 25
SB_21	CE29-2 - SH1	--	Intermittent	0.594 991
SB_21	CE29-3 - SH1	--	Intermittent	0.130 812
SB_22	CE28 -SH1	Flat lens	Permanent	0.376 838
SB_23	CE26-2 - SH1	Wetland	--	0.887 864
SB_23	CE25-8 -SH1	--	Intermittent	0.209 879
SB_23	CE25-3 -SH1	--	Intermittent	0.569 399
SB_23	CE25 -SH1	--	Permanent	0.069 683
SB_23	CE26 -SH3	Pond	Permanent	0.017 633
SB_23	CE26 -SH1	Waterfall	Permanent	0.547 751
SB_23	CE26 -SH2	Lotic channel	Permanent	0.534 872
SB_23	CE26 -SH4	Lentic flat	Permanent	0.050 581
SB_24	CE23-3 - SH6	Wetland	--	0.107 476
SB_24	CE23-1 - SH7	Wetland	--	0.053 35
SB_24	CE23-3 - SH8	Wetland	--	0.025 04
SB_24	CE22 - SH1	Lentic channel	Permanent	0.039 56
SB_24	CE23-1 - SH8	Lentic flat	Intermittent	0.165 91
SB_24	CE22 - SH2	Lentic flat	Intermittent	0.024 296
SB_24	CE22 - SH4	Lentic flat	Intermittent	0.026 33
SB_24	CE22 - SH6	Lentic flat	Intermittent	0.063 818

Sub-basin	Segment name	Facies	Type of flow	Total length (km)
	CE22 - SH7			0.046 827
	CE23-1 - SH6		Permanent	0.091 836
	CE23-1 - SH5			0.030 457
	CE23-1 - SH3			0.060 571
	CE23-1 - SH1			0.029 46
	CE23-3 - SH5			0.079 667
	CE23-3 - SH7			0.026 502
	CE24-1 - SH1			0.039 702
	CE23 - SH1	Culvert	Permanent	0.032 187
	CE23-1 - SH4	Rapid	Permanent	0.015 128
	CE23-1 - SH2			0.164 73
SB_25	CE58-2 - SH1	Wetlands	--	0.244 589
	CE58-1 - SH1			0.631 679
	CE57-4 - SH1			0.273 791
	CE57-2 - SH1			0.190 577
	CE58-11 - SH3			0.186 714
	CE58-10 - SH3			0.077 812
	CE58-13 - SH1			0.095 615
	CE61- SH1	--	Permanent	0.995 177
	CE63 - SH1			0.005 857
	CE56 - SH1			0.456 305
	CE60 - SH1			0.249 836
	CE60 - SH2			0.090 357
	CE62 - SH1			0.030 759
	CE63-1 - SH1			0.029 666
	CE61- SH1			0.995 177
	CE58-10 - SH1			0.625 157
	CE58-11 - SH1			0.120 62
	CE58-11 - SH2	--	Intermittent	0.220 094
	CE58-10 - SH2			0.216 923
	CE58 - SH4	Lentic channel	Permanent	5.422 6
	CE58 - SH1			0.079 004
	CE58 - SH2			0.625 35
	CE57 - SH2			0.144 586
	CE57 - SH3			0.534 694
	CE57 - SH4			0.112 564
	CE58 - SH3	Lotic channel	Permanent	0.434 825
	CE57 - SH5			0.241 049
	CE57 - SH1			1.133 93
	CE60-1 -SH1	Lenticular flat	Intermittent	0.418 489
	CE60-1 -SH2	Lenticular flat	Permanent	0.040 647

Sub-basin	Segment name	Facies	Type of flow	Total length (km)
	CE57-6 - SH1			1.584 88
	CE60-1 -SH3			0.051 658
SB_26	EC50-2 - SH1	Wet environment	--	0.335 097
	EC48-5 - SH2			0.164 732
	CE48-2 - SH2			0.227 318
	CE48-4 - SH2			0.142 761
	CE47-2 - SH1			0.177 157
	CE52 - SH1	--	Permanent	2.260 59
	CE47 - SH1			1.279 14
	CE49 - SH1			0.278 514
	CE50-4 - SH1	--	Intermittent	0.526 457
	EC50-5 - SH1			0.133 485
	EC50-3 - SH1			0.758 099
	CE48-4 - SH1			0.496 159
	CE48-5 - SH1			0.776 176
	CE48-2 - SH1			1.157 61
	CE48-3 - SH1			0.397 89
	CE48-1 - SH1			0.213 402
	CE47-3 - SH1			1.098 12
	EC50 - SH2	Lentic channel	Permanent	0.322 506
	EC50 - SH4			0.348 451
	CE43 - SH1			0.349 735
	CE43 - SH2			0.388 202
	CE43 - SH3			0.142 607
	CE43 - SH4			0.623 196
	CE48 - SH1			0.280 069
	CE48 - SH3			0.539 599
	CE58 - SH4			5.422 6
	CE51 - SH1	Fast	Permanent	0.507 352
	CE50 - SH1			0.137 267
	EC50 - SH3			0.043 687
	EC50 - SH5			0.103 977
	EC48 - SH2			0.032 458
	CE48 - SH4			0.071 095
SB_27	CE52 - SH1	--	Permanent	2.260 59
SB_Pit87	CE24-1 - SH4	Waterfall	Permanent	0.013 711
	CE24-1 - SH5	Running flat	Permanent	0.125 438
	CE24-1 - SH2	Lenticular dish	Permanent	0.044 077
	CE24-1 - SH3			0.047 842
	CE24-1 - SH1			0.039 702
	CE23 - SH1	Culvert	Permanent	0.032 187

Sub-basin	Segment name	Facies	Type of flow	Total length (km)
SB_PitJ	CE2 - SH31	Lotic channel	Permanent	0.556 878
SB_TSF	CE13-1 - SH2	Wetland	--	0.091 861
	CE9-10 - SH2			0.211 288
	CE9-9 - SH3			0.019 217
	CE7-1 - SH10			0.068 384
	CE13-15 - SH1	--	Intermittent	0.126 531
	CE13-13 - SH1			0.496 902
	CE13-11 - SH1			0.185 507
	CE13-12 - SH1			0.019 648
	CE13-16 - SH1			2.271 65
	CE13-9 - SH1			1.050 28
	CE13-8 - SH4			0.625 414
	CE9-9 - SH1	Cascade	Permanent	0.024 44
	CE9-6 - SH5			0.015 759
	CE17-1 - SH1	Flat current	Intermittent	0.384 805
	CE17-1 - SH2	Current flat	Intermittent	0.355 209
	CE13-1 - SH1	Current flat	Intermittent	0.502 978
	CE17 - SH3	Flat current	Permanent	0.406 273
	CE17 - SH2			0.327 68
	CE13-3 - SH1			1.699 11
	CE9-9 - SH2			0.018 942
	CE9-6 - SH4			0.014 433
	CE9-6 - SH6			0.023 837
	CE17 - SH4	Flat lens	Permanent	0.250 971
	CE9-6 - SH7			0.167 118
	CE9-10 - SH1			0.122 646
	CE9-6 - SH2			0.114 109
	CE9-8 - SH2			0.020 327
	CE9-7 - SH3			0.021 299
	CE9-9 - SH6			0.052 683
	CE9-6 - SH3			0.090 101
	CE17 - SH1			0.592 893
	CE13-14 - SH1	Flat lenticular	Intermittent	0.885 416
	CE13-14 - SH2			0.105 862
	CE13-6 - SH2			0.039 752
	CE13-8 - SH2			0.039 762
	CE17-3 - SH1			0.034 05

Table 11.14 List of water bodies

Sub-basin	Name	Surface area (ha)	Max. depth (m)	Average depth (m)
SB_2	Upstream lake Upstream (PE1)	0.274 562	--	--
	Upstream lake (PE2)	4.653 62	4.7	1.7
SB_3	Lake C6 (PE3)	0.490 427	3.5	2.8
	PE10	0.405485	--	--
SB_4	Lake C5 (PE4)	0.362 023	--	--
	Lake C (PE5)	9.581 64	8.5	2.8
	Lake C3 (PE6)	1.618 36	4.1	1.8
	Lake C4 (PE7)	0.786 532	3.2	1.8
	Lake C1 (PE8)	4.05262	4.3	2.9
	Lake C2 (PE9)	1.172 29	1.9	1.2
SB_8	PR-7 (PE 21)	0.914 108	--	--
SB_9	Lake D2 (PE54)	0.529 939	3	1.2
	Lake D1 (PE55)	1.491 73	10	2.7
SB_13	Lake A0 (PE44)	1.892 59	2.3	1.2
	PE45	0.17326	--	--
SB_14	PE46	0.126 427	--	--
SB_16	PE39	0.274 562	--	--
SB_17, SB_18	PE40	0.685 856	--	--
SB_18	PE41	0.078 48	2.7	2.1
	PE42	0.042959	--	--
SB_19	PE27	0.148 743	--	--
	Lake B1 (PE30)	0.906 253	2.15	0.92
	Lake B2 (PE33)	4.567 77	4.18	1.8
	PE31	0.100 689	2	1.5
	PE32	0.365 921	7.1	3.5
	Lake B3 (PE36)	0.813 813	1.8	1.2
	PE38	0.227 94	--	--
	PE34	0.313 403	--	--
	PE35	0.040 84	--	--
SB_20	PE 37	0.445 647	--	--
SB_19, SB_21, SB_22	Lake B (PE29)	49.366 19	17	11
SB_22	PE 28	0.869 742	4.3	2.1
SB_23	PE 25	3.605 96	--	--
	PE26	0.322 093	--	--
SB_24	PE 22	0.017 064	4.1	3.1
	PE23	0.127 9	--	--
SB_25	PE 56	1.427 02	--	--
	PE57	3.188 87	--	--

Sub-basin	Name	Surface area (ha)	Max. depth (m)	Average depth (m)
	Lake Hameçon (PE58)	10 998	--	--
	PE60	51.049 099	--	--
	PE61	2.001 4	--	--
	PE62	0.117 943	--	--
	PE63	0.070 927	--	--
SB_26	PE 47	4.897 66	--	--
	Lake A1 (PE48)	20.323 9	--	--
	PE49	0.556 781	--	--
	Lake A2 (PE50)	18.022 8		
	PE51	0.551 016	--	--
	PE52	0.465 044	--	--
SB_Pit87	PE24	0.939 721	--	--
SB_PitJ	PE45	0.173 26	--	--
SB_TSF	PE 13	25.770 399	--	--
	Lake B4 (PE17)	0.955 953	4.7	2.5
	PE18	0.085 767	--	--
	PAR (PE 14)	0.098 908	--	--
	PE15	0.051 924	--	--
	PE19	0.065 622	--	--
	PE20	0.827 871	--	--
SB_12, SB_13, SB_14, SB_15, SB_18	PE 43	81.558 99	10	5