

Potential Impacts of High-Speed Rail on the Moira River Watershed

Alto High-Speed Rail Project — Environmental Impact Assessment

Alto HSR Citizen Research Initiative · altohsrcitizenresearch.ca · March 2026

1. Executive Summary

This analysis evaluates the potential environmental effects of the proposed Alto High-Speed Rail (HSR) Project on the Moira River Watershed. The Alto project proposes approximately 1,000 kilometres of HSR connecting Toronto and Québec City. Both corridors currently under study between Ottawa and Peterborough traverse the Moira River Watershed. This assessment focuses specifically on the watershed impacts within Hastings County and adjacent portions of Lennox and Addington and Frontenac counties.

The Moira River Watershed encompasses approximately 2,860 km² in southeastern Ontario, flowing from the Canadian Shield highlands near Madoc southward to the Bay of Quinte at Belleville. Administered by the Quinte Conservation Authority, the watershed supports diverse aquatic and terrestrial ecosystems, provides municipal drinking water, and serves as a critical corridor for migratory species. Belleville City Council, in its February 23, 2026 motion opposing the southern corridor, specifically cited impacts to 'prime agricultural land, Moira watershed and some densely-populated residential areas.'

The northern corridor follows a direct alignment across the Canadian Shield through Lanark, Frontenac, and Hastings counties, broadly paralleling Highway 7. The southern corridor swings from Ottawa southwest through Perth/Smiths Falls, then through portions of Lanark, Frontenac, Leeds and Grenville, Lennox and Addington, and Hastings counties before veering north to Peterborough. The study corridor passes approximately 10 km north of Belleville.

Both corridors present significant environmental risks to the watershed. The northern corridor poses greater risks to headwater ecosystems, groundwater recharge, and upland forest habitat in the upper watershed. The southern corridor presents more direct threats to the Moira River mainstem and floodplain, Provincially Significant Wetlands, prime agricultural land, and species at risk in the mid-to-lower watershed.

Assessment Parameter	Northern Route	Southern Route
Watershed Overlap Zone	Upper watershed (Madoc headwaters)	Mid/lower watershed (Foxboro–Plainfield)
Terrain Within Watershed	Canadian Shield bedrock, drumlin, forest	Agricultural floodplain, settlement areas
Watercourse Interactions	Headwater tributaries, Moira Lake area	Moira River mainstem, floodplain
Wetland Areas at Risk	Chapman's Creek complex (indirect)	Latta Marsh, floodplain wetlands (direct)
Groundwater Recharge Impact	High (kame moraine disruption)	Moderate
Species at Risk Overlap	3 species (upper watershed)	7 species (mainstem and floodplain)
Agricultural Land Impact	Minimal (Shield terrain)	High (prime agricultural land)
Communities Affected	Madoc, Tweed area	Foxboro, Halloway, Plainfield, Chatterton
Overall Watershed Risk Rating	Moderate	Moderate–High

2. Project Description

2.1 Project Overview

The Alto HSR Project is managed by the Crown corporation Alto, with the Cadence consortium as private development partner. The project proposes approximately 1,000 km of dedicated electrified track connecting Toronto and Québec City, with intermediate stations at Peterborough, Ottawa, Montréal, Laval, and Trois-Rivières. Trains will operate at up to 300 km/h on fully grade-separated, fenced track requiring a minimum curve radius of approximately 7 km. The estimated cost is \$60–\$90 billion (2024 dollars). The full network is projected for completion by approximately 2043. The project is in a pre-construction phase running through 2029–2030, with the Ottawa–Montréal segment constructed first.

2.2 Route Alternatives — Intersection with the Moira River Watershed

2.2.1 Northern Route — Upper Watershed

The Northern Route follows a direct alignment across the Canadian Shield through Lanark, Frontenac, and Hastings counties, broadly paralleling Highway 7. Within the Moira watershed, it traverses the upper headwaters zone near Madoc, where the Moira River system originates in Precambrian bedrock terrain with mixed forest, drumlin formations, and sparse settlement. The Municipality of Centre Hastings has advocated for a future station at Madoc.

2.2.2 Southern Route — Mid-to-Lower Watershed

The Southern Route swings from Ottawa through Perth/Smiths Falls, cutting through Lanark, Frontenac, Lennox and Addington, and Hastings counties before veering north to Peterborough. Within the watershed, the study corridor passes approximately 10 km north of Belleville, potentially affecting communities in the mid-to-lower watershed where the Moira River is a well-established watercourse with an extensive regulatory floodplain. These include Foxboro, Halloway, Plainfield, and Chatterton. On February 23, 2026, Belleville City Council unanimously opposed the southern route, citing impacts to ecosystems, environmentally-sensitive areas, prime agricultural land, and the Moira watershed. On February 25, 2026, the local MP issued a statement opposing both routes based on unresolved environmental and community concerns.

2.3 Construction and Project Timeline

The development phase runs through 2029–2030. Construction will proceed in phases over 8–10 years for each segment, with the Ottawa–Montréal segment first, followed by the Ottawa–Peterborough segment that intersects the Moira watershed. The full network is targeted for completion by approximately 2043. Alto aims to follow existing corridors where possible to limit impacts.

3. Moira River Watershed — Baseline Conditions

3.1 Watershed Geography

The Moira River Watershed drains approximately 2,860 km², flowing from Canadian Shield highlands near Madoc to the Bay of Quinte at Belleville. The watershed spans a striking physiographic gradient: the northern reaches lie on Precambrian bedrock with thin soils, forest cover, and cold-water headwater streams; the central and southern reaches transition to limestone plains, glacial till, and deep agricultural soils.

3.2 Hydrology

Mean annual discharge at Belleville (Station 02HL003) is approximately 24.5 m³/s. The Moira River is susceptible to ice-jam flooding in late winter and spring freshet flooding. The watershed contains 14 sub-basins, 26 named tributaries, and over 180 km of permanent watercourses. Groundwater recharge through the kame moraine between Tweed and Madoc provides critical baseflow, sustaining cold-water tributaries and summer flows. The most extensive regulatory floodplain occurs between Foxboro and Belleville, directly within the Southern Route corridor.

3.3 Ecological Features

Ecological Feature	Description	Watershed Zone	Route Overlap
Moira Lake and Headwaters	Lake and cold-water stream system	Upper (Madoc)	Northern
Skootamatta River Headwaters	Cold-water Brook Trout habitat, ANSI	Upper	Northern
Thomasburg Forest	Mature mixed forest, 120+ year stands, ANSI	Upper–Mid	Northern
Chapman's Creek Wetland	580 ha marsh/swamp, PSW	Upper–Mid	Northern (nearby)
Stoco Lake Fen Complex	Rare calcareous fen, PSW	Upper	Northern (nearby)
Moira River Mainstem (Foxboro–Plainfield)	Walleye, Bass, Muskie fishery	Mid–Lower	Southern
Latta Marsh	340 ha riverine wetland, PSW	Mid	Southern
Moira River Floodplain	Regulatory floodplain, riparian forest	Mid–Lower	Southern

3.4 Species at Risk

Species	Status (SARA / SCA 2025)	Watershed Habitat	Route Overlap	Risk
Blanding's Turtle	Threatened	Wetland, upland nesting (throughout)	Both	High
Eastern Whip-poor-will	Threatened	Semi-open Shield forest (upper)	Northern	Moderate
Butternut Tree	Endangered	Riparian, forest edge (throughout)	Both	High
Barn Swallow	Threatened	Open foraging, farm structures	Both	Moderate
Lake Sturgeon	Endangered	Mainstem spawning (mid–lower)	Southern	High
Eastern Meadowlark	Threatened	Agricultural fields (mid–lower)	Southern	Moderate
Silver Shiner	Threatened	Clear warm stream reaches (mid)	Southern	Moderate

4. Impact Assessment — Northern Route (Upper Watershed)

The Northern Route traverses the upper Moira River Watershed through Canadian Shield terrain near Madoc, along the Highway 7 corridor.

4.1 Headwater Streams

The corridor crosses multiple headwater tributaries draining into Moira Lake and the upper Moira River. These small, cold-water streams are sensitive to sedimentation. Thin Shield soils offer limited infiltration, so construction runoff travels rapidly to watercourses. However, the headwater position means impacts remain localised and do not directly affect the mainstem downstream.

4.2 Groundwater Recharge

This is the Northern Route's most significant watershed-level impact. The corridor traverses the kame moraine and drumlin complexes between Tweed and Madoc, regionally important recharge zones sustaining baseflow throughout the Moira system. Bedrock blasting could alter fracture-flow groundwater systems delivering cold-water inputs to Moira Lake. Tunnel or deep-cut construction through drumlins may intercept shallow groundwater, and temporary dewatering could create drawdown cones affecting wells and surface features.

4.3 Terrestrial Ecosystems

A fenced, grade-separated corridor through Shield forest would fragment habitat between Thomasburg Forest ANSI, Stoco Lake wetlands, and Chapman's Creek PSW. Interior forest supporting Eastern Whip-poor-will would be reduced. Chapman's Creek (580 ha) could experience indirect impacts from altered drainage and construction disturbance.

4.4 Aquatic Ecosystems

Headwater streams support Brook Trout, sensitive to sedimentation and thermal change. The Skootamatta River headwaters ANSI lies within or near the corridor. Blanding's Turtle habitat is present in the upper watershed wetlands.

4.5 Impact Summary — Northern Route

Watershed Impact	Construction	Operation	Overall
Headwater Stream Quality	Moderate–High	Low	Moderate
Groundwater Recharge / Baseflow	High	Moderate	High
Wetland Function (indirect)	Moderate	Low–Moderate	Moderate
Forest / Shield Habitat	High	N/A (permanent)	High
Wildlife Corridors	High	High	High
Aquatic Habitat (tributaries)	Moderate	Low	Moderate
Species at Risk (3 species)	Moderate	Low–Moderate	Moderate
Bedrock Blasting / Vibration	High	N/A	Moderate

5. Impact Assessment — Southern Route (Mid-to-Lower Watershed)

The Southern Route traverses the Moira watershed's most productive zone: the agricultural floodplain and settlement lands between Foxboro and Plainfield, approximately 10 km north of Belleville.

5.1 Moira River Mainstem

The corridor crosses or approaches the Moira River mainstem in the Foxboro–Plainfield reach. Bridge construction would require in-water work generating sediment, flow disruption, and habitat disturbance. The regulatory floodplain here is the watershed's most extensive. Flood-proofed embankments could displace flood storage, increasing upstream stages. The Moira's susceptibility to ice-jam flooding compounds this risk.

5.2 Wetland Impacts

The corridor intersects or approaches Latta Marsh (340 ha PSW). Impacts could include direct construction disturbance or indirect effects from altered drainage. Additional floodplain wetlands between Foxboro and Plainfield are also at risk. With 65–70% of the watershed's pre-settlement wetlands already lost, any further loss is ecologically significant.

5.3 Agricultural Land and Communities

The corridor traverses prime agricultural land in Thurlow Ward and Hastings County. The fenced HSR line would divide farmland, create dead-end roads, and permanently alter watershed communities, with no local stops. Foxboro, situated directly on the Moira River, and surrounding communities serve as stewards of the watershed landscape.

5.4 Aquatic Ecosystems and Species at Risk

The Foxboro–Plainfield reach supports Walleye, Smallmouth Bass, Muskellunge, and Endangered Lake Sturgeon. Seven species at risk overlap this corridor (vs. three for the Northern Route). Blanding's Turtle nesting and Eastern Meadowlark habitat are present. Mainstem crossings, floodplain disturbance, and wetland impacts make regulatory permitting significantly more complex.

5.5 Impact Summary — Southern Route

Watershed Impact	Construction	Operation	Overall
Moira River Mainstem Quality	High	Low–Moderate	Moderate–High
Flood Regime / Floodplain	Moderate	High	High
Wetland Function (Latta + floodplain)	High	Moderate–High	High
Agricultural Land	High	High (permanent)	High
Riparian Habitat	High	N/A (permanent)	High
Aquatic Habitat (mainstem)	High	Moderate	High
Species at Risk (7 species)	High	Moderate–High	High
Community / Watershed Stewardship	High	Moderate	Moderate–High

6. Comparative Analysis — Watershed Impacts

The matrix below compares both routes' effects specifically within the Moira River Watershed, assuming standard mitigation.

Watershed Impact	Northern	Southern	Greater Impact
Headwater / Tributary Quality	Moderate	Low	Northern
Mainstem River Quality	Low	Moderate–High	Southern
Groundwater Recharge / Baseflow	High	Moderate	Northern
Flood Regime	Low	High	Southern
Wetland Impacts	Moderate (indirect)	High (direct)	Southern
Forest / Upland Habitat	High	Moderate	Northern
Agricultural Land	Low	High	Southern
Riparian / Floodplain	Low	High	Southern
Aquatic Ecosystems	Moderate	High	Southern
Species at Risk	Moderate (3 spp)	High (7 spp)	Southern
Wildlife Corridors	High	Moderate	Northern
Community Disruption	Moderate	High	Southern

The Southern Route presents higher watershed risk in 8 of 12 categories, concentrated on the Moira's most ecologically productive zone: the mainstem, floodplain, and surrounding agricultural and wetland landscape. The Northern Route's impacts concentrate on the upper headwaters, where groundwater recharge disruption is the principal concern. While recharge impacts could propagate downstream through reduced baseflow, they are more amenable to monitoring and adaptive management than the Southern Route's direct mainstem and floodplain disturbance.

7. Mitigation Framework

7.1 General Watershed Protection (Both Routes)

- Erosion and Sediment Control: Multi-barrier systems conforming to the GGH Conservation Authorities guideline (2006), with continuous turbidity monitoring at all watershed watercourse crossings.
- Stormwater Management: Post-construction water balance targets maintaining pre-development runoff volumes and quality; Low Impact Development measures maximised.
- Species at Risk: Pre-construction surveys for all 14 documented species. Avoidance plans with MNRF/ECCC. Offsetting at 2:1 (Threatened) or 3:1 (Endangered) within the Moira watershed.
- Wildlife Crossings: Dedicated structures at intervals determined by corridor-specific wildlife movement mapping, essential given the fully fenced design.

7.2 Northern Route — Upper Watershed

- Groundwater Protection: Grouting and waterproofing in kame moraine/drumlin construction. Monitoring network (20+ wells) established one year pre-construction. Adaptive triggers at 2% baseflow reduction.
- Bedrock Management: Controlled blasting to minimise fracture propagation. Continuous vibration monitoring at cold-water streams and wetlands.
- Wildlife Corridors: Large-span underpasses (30+ m) and vegetated overpasses connecting Thomasburg Forest, Chapman's Creek, and Stoco Lake complexes.

7.3 Southern Route — Mid-to-Lower Watershed

- Floodplain Compensation: All displaced storage compensated at 1.5:1 ratio. Hydraulic modelling including ice-jam dynamics must confirm no increase in flood stages.
- Lake Sturgeon Protection: Avoidance of spawning (May–July) and staging (Sept–Nov) periods. Bubble curtains and real-time hydroacoustic monitoring with automatic work stoppages.
- Latta Marsh Protection: Elevated structures with 40+ m pier spacing if alignment intersects PSW. Wetland offsetting at 3:1 within the watershed.
- Agricultural Mitigation: Grade-separated farm crossings. Road over/underpasses at all public crossings. Federal expropriation compensation for severed land.

8. Monitoring and Adaptive Management

A watershed-specific monitoring program shall begin one year pre-construction and continue 10+ years post-operations.

Component	Parameters	Frequency	Duration
Surface Water Quality	TSS, turbidity, nutrients, temperature, DO	Continuous / Monthly	Construction + 10 yr
Groundwater	Water table, baseflow contributions	Continuous	Construction + 10 yr
Moira River Flow	Discharge, flood stages, ice dynamics	Continuous	Construction + 10 yr
Fish Community	Species, abundance, spawning	Semi-annual	Pre-constr. + 10 yr
Benthic Invertebrates	Biomass, diversity, tolerance	Annual	Pre-constr. + 10 yr
Wetland Hydrology	Water levels, hydroperiod	Continuous	Pre-constr. + 15 yr
Species at Risk	Population surveys, nesting	Annual (seasonal)	Pre-constr. + 10 yr
Wildlife Crossings	Usage by species	Continuous (camera)	Years 1–10 ops
Agricultural Impacts	Drainage, soil, crop yield	Annual	Construction + 5 yr

An Environmental Monitoring Committee — comprising Alto, the Quinte Conservation Authority, provincial and federal agencies, and the Mohawks of the Bay of Quinte — shall oversee the program.

9. Cumulative Effects on the Moira River Watershed

Cumulative pressures on the watershed include agricultural intensification, rural development, existing transportation infrastructure (Highways 401, 7, 62), and climate change. Climate projections indicate increased winter rainfall and flood frequency, compounding the Southern Route's floodplain risks and the Northern Route's baseflow reduction effects.

With 65–70% of pre-settlement wetlands already lost, any additional loss undermines watershed resilience. Net positive wetland outcomes through offsetting ratios exceeding 1:1 are essential. Highway 401 construction is instructive: it bisected rural lands but provided local access. The Alto HSR line would be a fenced corridor with no stops between Ottawa and Peterborough, producing watershed impacts without commensurate local benefits.

10. Conclusions and Recommendations

- Both routes present significant impacts to the Moira River Watershed, but differ in nature and severity. The Northern Route affects the upper headwaters; the Southern Route affects the mid-to-lower watershed's most ecologically productive and hydrologically significant zone.
- The Northern Route presents a lower overall watershed risk profile. Its principal impacts — groundwater recharge disruption and forest fragmentation near Madoc — are significant but more amenable to monitoring and adaptive management than the Southern Route's direct disturbance of the Moira River mainstem, floodplain, and wetlands.
- The Southern Route poses higher risks to the watershed's most sensitive features: the mainstem between Foxboro and Plainfield, the regulatory floodplain, Latta Marsh, Lake Sturgeon habitat, and prime agricultural land sustaining watershed communities.
- Municipal opposition from Belleville City Council, citing Moira watershed impacts specifically, reflects local consensus that the Southern Route presents unacceptable risks to this watershed system.
- If the Northern Route is selected, groundwater protection must be the overriding priority, with comprehensive monitoring and adaptive management to prevent cascading baseflow reductions throughout the watershed.
- If the Southern Route is selected, floodplain compensation (including ice-jam modelling), Lake Sturgeon protection, and wetland offsetting must be demonstrated as feasible before construction authorisation.
- Regardless of route, a minimum 10-year watershed monitoring program is essential. The Quinte Conservation Authority and Mohawks of the Bay of Quinte shall be partners in monitoring and stewardship.
- Given the 10-km corridor width and absence of a final alignment, detailed site-specific watershed studies must accompany corridor narrowing.

11. References

11.1 Federal Legislation

Impact Assessment Act (S.C. 2019, c. 28, s. 1). Government of Canada.
Fisheries Act (R.S.C., 1985, c. F-14). Department of Fisheries and Oceans.
Species at Risk Act (S.C. 2002, c. 29). Environment and Climate Change Canada.
Migratory Birds Convention Act, 1994 (S.C. 1994, c. 22). Government of Canada.
Canadian Navigable Waters Act (R.S.C., 1985, c. N-22). Transport Canada.
Bill C-15, Fall Economic Statement Implementation Act, 2025.

11.2 Provincial Legislation

Endangered Species Act, 2007, S.O. 2007, c. 6 (as amended by Bill 5, 2025). Government of Ontario.
Species Conservation Act, 2025 (enacted, not yet proclaimed). Government of Ontario.
Ontario Water Resources Act, R.S.O. 1990, c. O.40. Government of Ontario.
Conservation Authorities Act, R.S.O. 1990, c. C.27. Government of Ontario.
Provincial Policy Statement, 2020. Government of Ontario.

11.3 Moira River Watershed Studies

Quinte Conservation Authority. (2008). Moira River Watershed Plan. Belleville, ON.
Quinte Conservation Authority. (2012). Moira River Floodplain Mapping Study. Belleville, ON.
Quinte Conservation Authority. (2022). Moira River Watershed Report Card. Belleville, ON.
Quinte Conservation Authority. (2024). Updated Regulation Limit Mapping. Belleville, ON.
Quinte Conservation Authority. (2021). Climate Change Strategy for the Quinte Watershed. Belleville, ON.

11.4 Species at Risk

COSEWIC. (2016). Assessment – Blanding's Turtle in Canada. Ottawa.
ECCC. (2020). Recovery Strategy – Lake Sturgeon, Great Lakes–Upper St. Lawrence. Ottawa.
ECCC. (2018). Recovery Strategy – Blanding's Turtle, Great Lakes / St. Lawrence. Ottawa.

11.5 Municipal and Stakeholder Positions

City of Belleville. (2026, Feb 23). Council Motion Opposing Southern Route. Belleville, ON.
Township of South Frontenac. (2026, Feb 4). Council Motion Rejecting Southern Corridor. Sydenham, ON.
Kramp-Neuman, S., MP. (2026, Feb 25). Statement Opposing Both Route Corridors.

ALTO's CEO confirms: environmental field surveys were just beginning during the consultation period

On CBC Ottawa Morning on March 25, 2026 — one day before the consultation closed — ALTO's CEO Martin Imbleau stated publicly: "We intend to file the initiation of the [environmental assessment] process later this year. So we need to look at and to have some sampling in dangerous species. Are there any concerns on the wildlife that we're not aware of?" He confirmed environmental field surveys were commencing "this week."

This admission confirms that the ecological baseline information this assessment identifies as absent — aquatic species distribution, groundwater-dependent ecosystem mapping, fish passage assessment, and SARA-listed species surveys across the Moira watershed — was still being assembled as the consultation closed. The recommendations in Section 10 that baseline information must be completed before any route decision are corroborated by ALTO's own CEO.

Source: CBC Ottawa Morning, March 25, 2026. [cbc.ca/listen/live-radio/1-100-ottawa-morning/clip/16205093](https://www.cbc.ca/listen/live-radio/1-100-ottawa-morning/clip/16205093)