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Prowind

Catalog of Community Concerns

A. Concerns Addressable with Project-Specific Data and Documentation

These are claims that can be directly addressed using measurable facts, project plans, and regulatory documents. They relate to elements of the project that are documented through studies, contracts, or engineering specifications and can be clearly demonstrated to the public.

B. Concerns That Require Reference to Independent Research and Scientific Studies

These concerns go beyond site-specific data and are best addressed using findings from peer-reviewed studies, government reports, and independent technical assessments. They often involve broader topics such as health, wildlife, or long-term energy performance.

C. Concerns Rooted in Personal Values or Community Sentiment

These are expressions of opinion, distrust, or emotion. They may not be resolved through data alone, but should be met with respectful dialogue, transparency, and a commitment to listening and responding to community voices.

1. We don’t want them
2. “Sunset is taken away”
3. “Prowind is bad for the community”
4. "Farmers that allow turbines don't care for their neighbors"
5. “Why is there a meeting on Foldens Line” (instead of Beachville)

“We don’t want them”

We understand that some residents are fundamentally opposed to wind development. Our approach is to be transparent, responsive, and informative. We aim to show how the project benefits the local economy and supports energy transition goals. We offer information and respond to feedback throughout the process.

“Sunset is taken away”

One residents have expressed concern about changes to their view. We recognize that visual impact is a subjective and personal issue. For those who raise it, we are offering visibility simulations and maps to provide a clear picture of what the view from their property will be. We also ensure turbines are sited with appropriate setbacks.

“Prowind is bad for the community”

We’ve heard general distrust of big developers. In response, we emphasize that Prowind has operated in Oxford County for over a decade and works in partnership with a local co-op and local suppliers. Our intent is to be present, accountable, and transparent. We are open to any request for financial or operational information that helps reinforce trust.

“Farmers that allow turbines don't care for their neighbors”

We recognize that turbine development can create tensions between neighbors. We are encouraging open discussion and making it clear that participation in the project is voluntary and subject to regulated siting rules. Many landowners choose to participate because of their interest in renewable energy, farm income diversification, and climate responsibility. We are also willing to consider benefits to the closest neighbors to recognize the involuntary visual participation.

“Why is there a meeting on Foldens Line” (instead of Beachville)

A few residents questioned the meeting location. We chose Foldens Hall based on space availability, accessibility, and prior use for similar public meetings. We’re open to holding future sessions in other nearby communities to ensure broader participation and engagement.

Bower Hill Wind Project – Community Information Series

Report A1: Land Use of a Vestas V162 Wind Turbine

Summary

There's a common claim that a single wind turbine uses up to 4 acres of farmland. This is not accurate. For the Vestas V162 model, total permanent land use per turbine is under 1 acre—about 0.76 acres to be precise. This includes the foundation, crane pad, and access road.

Actual Permanent Land Use Breakdown

Component	Dimensions	Area (m²)	Area (acres)
Foundation	25 m diameter	491 m²	0.12 acres
Crane Pad	24 m × 24 m	576 m²	0.14 acres
Access Road	5 m × 400 m	2,000 m²	0.49 acres
Total		3,067 m²	~0.76 acres

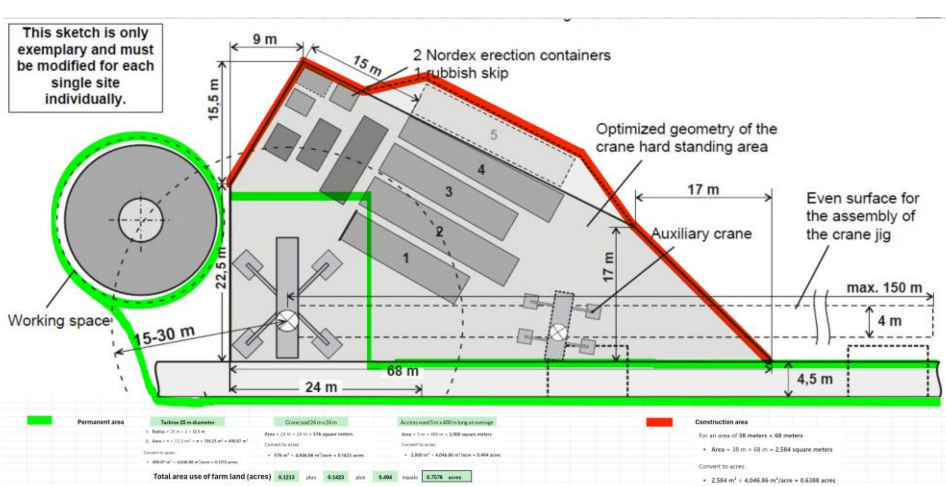
Agricultural Considerations

Turbine siting is guided by Agricultural Impact Assessments (AIA), required under provincial policy. For the Bower Hill project:

- AIA Phase 1 has been completed and submitted under Ontario Ministry of Agriculture, Food, and Agribusiness (OMAFA) guidelines.
- Sites were chosen away from specialty crop areas and in locations with lower soil classification, existing infrastructure access, and minimal agricultural investment.
- The selected lands meet Independent Electricity System Operator (IESO) standards for development in Prime Agricultural Areas.

Conclusion

Wind turbines use far less land than often claimed. For Bower Hill, each turbine permanently occupies less than 1 acre—just 20% of the commonly stated 4 acres. This careful planning reflects a strong commitment to agricultural stewardship.



Bower Hill Wind Project – Community Information Series

Report A2: Landowner Protection from Wind Turbine Decommissioning Costs

Background

Some community members have expressed concern that landowners hosting wind turbines will be responsible for decommissioning costs once the turbines are retired. While the concern is understandable, it is not supported by the actual lease agreements or financial safeguards in place.

Lease Agreement Protections

Landowners are explicitly protected from decommissioning obligations in their lease agreements. All responsibilities and costs for dismantling the turbine, removing infrastructure, and restoring the land lie with the developer.

Decommissioning Costs and Financial Safeguards

A recent cost assessment for removing 34 Vestas V162 turbines estimates a net decommissioning cost of approximately $2.57 million, or about $75,629 per turbine. This includes all major activities, such as dismantling equipment, removing foundations, access roads, and restoring agricultural land.

To ensure these costs are covered, the developer must provide financial security. The current agreement includes a Letter of Credit (LoC) of $40,000 per turbine, based on a third-party evaluation by DNV. However, we are considering increasing this to $100,000 per turbine to align with updated cost estimates and provide a margin of safety.

Ongoing Monitoring

Decommissioning costs are reviewed and adjusted periodically to reflect inflation, market conditions, and new data. This ensures landowners remain protected for the full life of the project.

Options for Financial Security

Two mechanisms are being considered to ensure adequate funds are available for decommissioning:

- A third-party guaranteed Letter of Credit issued at the start of operations.
- A sinking fund, gradually built over 20 years, dedicated solely to decommissioning.

Conclusion

Landowners will not be liable for wind turbine decommissioning costs. Lease agreements and financial securities are designed specifically to prevent that outcome. The Bower Hill project includes measures—such as a potential increase in the Letter of Credit—to ensure that these obligations are met responsibly and transparently.

Bower Hill Wind Project – Community Information Series

Report A3: Wind Turbine Size and Noise

Do Bigger Wind Turbines Mean More Noise?

One of the common concerns about wind energy is noise. But what actually causes the sound from a wind turbine—and does a larger turbine mean more noise?

What Creates Wind Turbine Noise?

Wind turbines generate two types of sound: mechanical and aerodynamic.

- Mechanical noise comes from internal parts like the gearbox or generator, though modern turbines have significantly reduced this.
- Aerodynamic noise is caused by wind flowing over the blades, often heard as a soft whooshing sound.

How Is Noise Monitored?

In Ontario, all wind turbines—regardless of size—must meet strict noise limits. Developers conduct detailed noise assessments using models approved by the Ministry of the Environment. Once turbines are operating, their sound levels are tested to ensure compliance. The sound limit at the nearest non-participating residence is 40 decibels (dBA)—comparable to a quiet library or ambient rural sound.

Do Bigger Turbines Mean More Noise?

Not necessarily. While larger turbines have more capacity, they usually rotate more slowly and are mounted higher above ground. This design can reduce the amount of sound that reaches nearby homes. Larger turbines are engineered to be as quiet—or quieter—than smaller models.

Same Regulations Apply

All turbines must meet the same 40 dBA noise limit at non-participating homes, whether they produce 2 MW or 6 MW. Modern wind turbines are not only more efficient—they're also designed to be quieter.

In Ontario, all wind turbines—regardless of size—must meet strict noise regulations. Developers are required to conduct detailed acoustic assessments using Ministry of the Environment–approved modeling techniques prior to construction. After installation, compliance testing is carried out to verify that turbines meet the regulated limit of 40 decibels (dBA) at the nearest non-participating residence—comparable to a quiet library or rural background sound.

At the Gunn's Hill Wind Farm, a full 12-month noise monitoring program was conducted using calibrated and verified equipment under the supervision of the Ministry of the Environment. Noise levels were measured at various receptor locations, and the data confirmed full compliance with provincial standards. The final analysis was reviewed and certified by qualified professionals.

We intend to follow the same rigorous process at the Bower Hill Wind Farm, ensuring that all noise assessments, measurements, and reporting meet provincial requirements and are transparently shared with regulators.

Bower Hill Wind Project – Community Information Series

Report A4: Wind Turbine Leases and Property Mortgages

Overview

Some have suggested that signing a wind turbine lease could prevent landowners from refinancing or selling their farms. This concern is not supported by real-world experience or legal precedent. At Gunn's Hill Wind Farm, two farms changed ownership during the project's operation with no issues related to the turbine lease.

Turbine leases are registered on title much like utility easements. They grant access and operating rights to the developer for a defined area around the turbine and road, without limiting the landowner's ability to use or finance the rest of the property.

Lenders are familiar with these types of registrations. If needed, a subordination agreement ensures that the mortgage takes precedence over the lease in any financial restructuring. These agreements are standard practice and routinely handled by developers and banks.

Legal and Financial Summary

- The lease is registered on title as a Charge of Lease, confirming the developer's easement rights but not imposing a lien or mortgage on the land.
- These rights apply only to the turbine area, crane pad, and access road—typically less than one acre.
- Registration on title is necessary for project financing and is a standard legal requirement for utility-scale infrastructure.
- Landowners maintain full rights to refinance or sell the property. Subordination agreements are available and commonly used.
- New owners take over the lease and continue receiving land use payments.
- Lease language includes decommissioning responsibilities to ensure the land is restored at the end of the project.

Best Practices for Landowners

- Review all lease documents with legal counsel.
- Request a subordination agreement early if you plan to refinance.
- Confirm the lease defines access areas clearly and includes infrastructure removal obligations.

Conclusion

Wind turbine leases do not prevent landowners from borrowing, refinancing, or selling their land. These agreements are common in utility development and are structured to respect and preserve landowner rights. Experience at Gunn's Hill and other projects confirms these leases are fully compatible with normal agricultural use and financial flexibility.

Bower Hill Wind Project – Community Information Series

Report A5: Why Ontario Needs More Electricity Generation

Overview

Some groups have claimed Ontario does not need more electricity and that new wind projects are unnecessary. This is not supported by planning data from the Independent Electricity System Operator (IESO), which manages Ontario's electricity grid. In fact, due to rising demand, nuclear retirements, and the need for reliability, Ontario faces a supply gap in the near term. New generation—including renewables—is required.

Installed Capacity Is Not Reliable Capacity

Ontario has about 37,200 MW of installed capacity, but this includes resources that do not always operate at full power. Wind and solar are intermittent and contribute less during peak times. Even nuclear and gas plants undergo maintenance and outages. Effective or 'firm' capacity is lower than the total nameplate figure.

Demand Is Rising Rapidly

The IESO forecasts that peak demand will rise from ~23,000 MW today to ~27,000 MW by 2030 due to electric vehicles, heat pumps, and industrial growth. Ontario is also shifting to a dual-peak system—requiring reliability in both summer and winter.

Upcoming Retirements and Reserve Margins

The retirement of the Pickering Nuclear Generating Station (3,100 MW) by 2026 and refurbishment outages at other nuclear plants will remove critical supply. At the same time, the IESO requires a 20% reserve margin above peak demand. By 2030, this means Ontario needs more than 32,000 MW of reliable capacity—well above current firm levels.

What Ontario Is Doing About It

To address this, Ontario is procuring new resources:
- ~2,200 MW of wind, solar, and battery storage through LT2 procurements.
- 3,600 MW of short-term gas and storage contracts through capacity auctions.
- A 300 MW small modular reactor (SMR) at Darlington by 2030.
- Refurbishments and life extensions for existing nuclear assets.

Firm Capacity Projection Without New Builds

If no new generation capacity is added, Ontario's firm available capacity by 2030 is projected to fall well below the required threshold.

- Installed nameplate capacity today is approximately 37,200 MW, but firm (reliable) capacity is significantly lower due to maintenance, retirements, and derating factors.
- By 2030, peak demand is projected at 27,000 MW, with a required firm capacity of about

32,400 MW to maintain a 20% reserve margin.

• Key losses include:
 – Retirement of the Pickering Nuclear Generating Station (~3,100 MW) by 2026
 – Temporary outages from Darlington and Bruce Power refurbishments (1,000–2,000 MW)
 – Reduced contributions from aging gas and hydro units
 – Derating of intermittent resources like wind and solar

• Estimated firm capacity by 2030 without new builds: ~24,000 to 25,000 MW

This leaves an anticipated shortfall of 7,000 to 8,000 MW—highlighting the critical importance of new generation investments, including wind, solar, storage, and nuclear.

Conclusion

Ontario's electricity needs are growing, and current capacity will not be enough—especially as older plants retire. The IESO has made it clear: new generation is required to maintain reliability and meet future demand. Claims to the contrary ignore the realities of grid planning and system reliability.

Bower Hill Wind Project – Community Information Series

Report A6: Do Wind Turbines Produce Enough Energy to Pay for Themselves?

Overview

The suggestion that wind turbines never generate enough energy to cover their own costs is inaccurate and not supported by financial or operational data. Wind energy projects in Ontario and beyond are developed, financed, and operated in competitive markets without government subsidies. Past projects like Gunn's Hill and future developments such as Bower Hill show clear economic viability through energy production, cost management, and financial performance.

1. Operational Viability of Existing Projects (e.g., Gunn's Hill)

The Gunn's Hill Wind Farm has operated for nearly a decade under the former FIT program. It has consistently generated enough revenue to:

- Meet its financing obligations
- Pay for full-service maintenance through third-party providers
- Cover administration and insurance costs
- Support local community funds and scholarships
- Provide distributions to its ownership group, including community and Indigenous partners

Financial statements confirm sustained positive net income, with the majority of operational expenditures going to external vendors. Despite being built under a fixed-price power purchase agreement, it continues to generate reliable cash flow and good investor returns.

2. New Projects Must Compete Without Subsidy

Unlike older FIT projects, new wind farms in Ontario now compete under the IESO's LT2 procurement framework and submit competitive proposals.

Projects must:

- Submit competitive bids
- Cover all capital and operating costs
- Offer electricity at or below prevailing market benchmarks
- Share revenues with landowners and community partners
- Provide a reasonable return to investors

No developer would pursue a project like the 36 MW Bower Hill Wind Farm unless its projected annual production of about 120,000 MWh at a price that was sufficient to repay capital, fund operations, and deliver investor returns.

3. Wider Market Trends Reinforce the Case

Across North America and Europe:

- Wind energy remains one of the lowest-cost sources of new electricity generation

• Major private buyers, including data centers and manufacturers, contract directly with wind farms—without public incentives
• Institutional investors continue to support wind projects for their stable, long-term returns

• The IESO only accepts the most competitive bids to stabilize their power needs

The notion that wind farms proceed without being able to cover their costs contradicts the basic economics of infrastructure investment.

4. Conclusion

Wind turbines do generate enough energy to pay for themselves. Projects developed under earlier programs, such as FIT, have proven this through long-term performance and financial results. New projects must meet even higher financial standards under competitive procurement programs. The idea that wind turbines fail to cover their costs is not supported by industry practice or investor behavior.

Bower Hill Wind Project – Community Information Series

Report A7: Is Wind Energy “Dirty”?

Overview

Some opposition groups claim that wind energy is 'dirty' and gas is 'clean.' These claims confuse basic facts about fuel use, lubricant maintenance, and lifecycle emissions. Modern turbines like the Vestas V162 use only 90–150 litres of lubricants annually—none of which are burned for power. Wind’s total lifecycle emissions are among the lowest of any electricity source.

1. Turbine Oil Use and Maintenance

A Vestas V162 6.2 MW turbine uses:
• ~50 L/year of gearbox oil (397 L changed every 8 years)
• 30–60 L/year of hydraulic fluids
• 10–40 L/year of auxiliary insulating fluids

Total: ~90–150 L/year. These fluids are continuously monitored and changed only when needed, extending service life and reducing waste.

2. Wind vs. Gas – Carbon Impact

• Onshore wind: 7–12 g CO_2-eq/kWh
• Natural gas (combined cycle): 410–490 g CO_2-eq/kWh

That means each kWh from wind avoids over 400 g of CO_2 compared to gas—making wind one of the cleanest large-scale generation sources.

Studies have shown that the carbon footprint from manufacturing, transporting, installing, and maintaining a wind turbine is typically offset within about 7 months of operation. After this point, the turbine continues to produce zero-emission electricity for the remainder of its 20–30 year lifespan. This was confirmed by research published in Nature Energy and the International Renewable Energy Agency (IRENA), which found that modern wind turbines can repay their energy and carbon 'debt' within the first year of operation, with many achieving this in less than 7 months.

Conclusion

Wind turbines use small amounts of maintenance fluids and emit almost no greenhouse gases during operation. Their total lifecycle emissions are 40 to 70 times lower than those of natural gas, and the environmental impact of their manufacturing, transportation and construction is typically offset in 7 - 12 months. Wind remains one of the cleanest and most efficient large-scale power generation sources available today. Claims that wind energy is 'dirty' do not align with the data and overlook its significant carbon-saving potential.

Bower Hill Wind Project – Community Information Series

Report A8: Is OCEC a Local Co-operative in Oxford County?

Overview

Some have questioned whether the Oxford Community Energy Co-operative (OCEC) qualifies as a local community Co-op. The answer is yes—OCEC is firmly rooted in Oxford County by its membership, investments, leadership, and operations. The co-op meets or exceeds common benchmarks used to define local ownership and control.

1. Local Ownership and Investment

• 67 of OCEC's 164 investors (41%) are residents of Oxford County
• These local investors have contributed $3.2 million, or 38.9% of total equity for the Gunn's Hill wind project
• Among 106 shareholders, 43 (40.6%) are from Oxford

These numbers exceed typical community investment thresholds, where 25–30% local equity is seen as a strong local base.

2. Community Membership and Local Presence

• OCEC has 229 members, many of whom are active in the Oxford community
• Office located in Woodstock, Ontario
• Member of the Woodstock Chamber of Commerce
• 4 of 8 directors reside in Oxford County
• Recruitment has consistently focused on local members

3. Projects and Benefits in Oxford County

• The Gunn's Hill Wind Farm and solar projects are located in Oxford County
• Land lease payments, taxes, and community funding remain within the county
• OCEC manages the community benefit fund for Cedar Creek rehabilitation
• All AGMs and board meetings are held locally

4. Governance and Local Procurement

• Democratic structure: one vote per member
• Local representation on board ensures Oxford interests are considered
• Accounting, legal, and audit services sourced from Oxford County-based firms
• Supplies and consumables purchased locally

Conclusion

OCEC meets every reasonable test of being a local co-operative in Oxford County. With nearly 40% local ownership, deep community roots, and operations centered in the county, OCEC remains a strong model of citizen-led investment in renewable energy.

Bower Hill Wind Project – Community Information Series

Report A9: Follow the Money – Where Gunn's Hill Revenue Goes

Overview

At a recent opposition meeting, attendees were encouraged to 'follow the money' to determine whether Gunn's Hill Wind Farm is a genuinely local project. We welcome that advice—because when you look at where the money actually goes, the answer is clear: **this is a community-driven project**, and **no money flows to outside corporations or private equity firms.**

Let's look at where the money goes.

Where the Revenue Goes

In 2024, the Gunn's Hill Wind Farm's revenue was allocated as follows:

• 19.9% – Interest payments on long-term project financing
• 10.3% – Operations and maintenance services (paid to Siemens Gamesa and other third-party providers)
• 3.5% – Lease payments to landowners
• 3.2% – Insurance coverage
• 3.9% – Management fees shared between OCEC, Prowind, and the First Nations partner
• 0.4% – Community benefit fund and bursaries
• 0.3% – Administrative and professional services (e.g., legal, office, utilities)
• 28.8% – Distributions to the ownership partners OCEC, Prowind, and the First Nations partner

2. Distributions by Ownership Share

The net revenue was distributed to the project's ownership group as follows:

• 49.4% – Oxford Community Energy Co-op (OCEC)
• 40.6% – Prowind Inc.
• 10.0% – First Nations partner (9211560 Canada Ltd.)

3. Clarifying Prowind's Role

All partners, including Prowind, receive distributions based strictly on their investment. Management fees are paid for services rendered. Prowind receives a larger share (2.8% of total revenue) because it is responsible for project operations, regulatory compliance, and technical oversight and staffing. OCEC receives 1% and the First Nations partner 0.2%—these fees reflect the services performed, not profit-taking.

Conclusion

This ownership model—combining a professional developer, a local co-operative, and a First Nations entity—is designed for transparency, fairness, and long-term community benefit. When you follow the money, you find that it stays here in Oxford County, supporting local jobs, local investors, and local causes.

Report B3: Bird Mortality and Wind Energy — Understanding the Real Impact

Overview

Wind energy often draws criticism for its impact on bird populations. While turbines can cause fatalities, peer-reviewed research shows that their overall contribution to bird mortality is minimal compared to other human-related threats. In fact, wind turbines account for less than 0.01% of all bird deaths linked to human activity.

According to large-scale studies by the Smithsonian Conservation Biology Institute and the U.S. Fish and Wildlife Service:

- For every bird killed by a wind turbine,

- ~6 die from communication towers
- ~28 from power lines
- ~200 from vehicles
- ~600 from buildings
- ~2,400 from free-roaming cats

These studies emphasize that while turbine impacts must be responsibly managed, they are a small part of a much larger issue.

1. Bird Mortality Monitoring in Ontario

In Ontario, wind developers are required to conduct three years of post-construction bird mortality monitoring under Regulation 359/09. This includes:

- Monitoring a subset of turbines (minimum 30% or 20 turbines – in our case at all turbines)
- Biweekly surveys from May to October; raptor checks through November
- Scavenger and observer bias corrections
- Ministry oversight, with additional years required if thresholds are exceeded

Findings across Ontario wind farms show:

- 1–3 birds per turbine per year (mostly small migratory songbirds)
- Raptors: < 0.1 fatalities per turbine per year
- Mortality is highest in spring/fall migration, lowest in winter

2. Mitigation and Response Strategies

Projects must implement mitigation if:

- >10 birds are found at a turbine in one search
- >33 birds are found across all monitored turbines in a season

Mitigation includes raising cut-in speeds or temporarily curtailing turbines.

Bower Hill Wind Farm will meet or exceed all regulatory requirements and incorporate siting strategies to avoid sensitive areas like wetlands.

Key finding: Wind is among the least impactful forms of human infrastructure on bird populations.

Conclusion

While bird mortality at wind farms does occur, it is both monitored and minimized through science-based regulation and mitigation. In context, turbines represent a very small portion of human-caused avian deaths. Wind remains one of the most environmentally compatible electricity sources, and Bower Hill Wind Farm is committed to meeting the highest standards of ecological stewardship.

Report B4: Do Wind Turbines or Their Vibrations Damage Water Wells?

Overview

Concerns have been raised about whether wind turbine construction or operation might affect domestic water wells. The only Ontario case with substantial investigation involved the North Kent Wind project, where 16 well owners reported sediment or flow-rate changes after foundation pile driving. The project developer commissioned third-party reviews by AECOM and Golder Associates under oversight by the Ontario Ministry of the Environment. These investigations found no evidence of vibration-related well damage.

Peak particle velocities (PPV) at well casings were measured at a maximum of 0.04 mm/s—well below the 0.5 mm/s threshold associated with cosmetic damage to structures. Groundwater in local bedrock moves only a few metres per year, making sediment migration from turbine sites to wells implausible. In many cases, vibration levels from household water pumps or passing vehicles were higher than from turbine construction or operation.

1. Vibration Monitoring and Thresholds

• Monitored using accelerometers placed on residential well casings.
• Pile driving PPV: ~0.04 mm/s
• Common activities (traffic, well pumps): >0.1 mm/s
• Structural cosmetic damage threshold: ~0.5 mm/s (ISO standard)
• Human perception threshold: ~0.5–1.0 mm/s

Vibrations attenuate with distance—by over 50% at 100 m and more than 75% at 300 m. These low levels pose no risk to infrastructure or subsurface systems.

2. Why Sediment Doesn't Travel from Turbines to Wells

• Groundwater in bedrock aquifers moves only metres per year.
• Sediment movement at millimetres per day cannot travel tens or hundreds of metres within any timeframe that would explain sudden well impacts.
• Monitoring showed no increase in turbidity or sediment load after construction.

3. North Kent Investigations – Findings and Oversight

• 16 complaints logged out of more than 400 wells.
• No correlation found between vibration levels and complaint locations.
• All testing and post-construction water quality checks matched pre-construction baselines.
• Ministry of the Environment accepted the findings and closed the investigation.
• Full report: https://patternenergy.com/wp-content/uploads/2022/04/NKW_Well_Findings_Brochure_WEB_FINAL.pdf

4. Best Practices and Commitments at Bower Hill

• Bower Hill will use cast-in-place foundations (not pile driving), further reducing vibration levels.
• Pre-construction baseline testing of nearby wells (flow rate, turbidity, casing condition).
• Accelerometers at high-risk sites to track vibration.
• Follow-up water testing post-construction.

Conclusion

Extensive field data and engineering analyses in Ontario confirm that neither the vibrations from pile driving nor the ongoing operation of wind turbines damage water wells or mobilize aquifer sediment. Vibration at residential wells is far below levels known to harm structures or subsurface infrastructure. Well water concerns in wind-farm areas should first be assessed against natural aquifer conditions and aging well construction—rather than attributed to turbine vibration.

Key References (with Links)

1. **North Kent Wind & Your Well Water**
   AECOM/Golder investigation summary showing pile-driving PPV ≤ 0.04 mm/s and no change in water quality.
   https://patternenergy.com/wp-content/uploads/2022/04/NKW_Well_Findings_Brochure_WEB_FINAL.pdf

Bower Hill Wind Project – Community Information Series

Report B5: Understanding and Addressing Shadow Flicker

Overview

Shadow flicker occurs when the rotating blades of a wind turbine pass in front of the sun, casting a moving shadow that can be seen through windows or on buildings. While some find this effect noticeable, especially during early morning or late afternoon on sunny days, it is predictable, limited, and manageable. In Ontario, the required setback of 550 meters significantly reduces the frequency and duration of flicker.

1. What Causes Shadow Flicker

Shadow flicker can only occur when:

- The sun is low in the sky and unobstructed.
- A turbine lies between the sun and a window.
- The sun is shining directly and the turbine is operating.
- The observer is inside a structure where sunlight enters.

2. Duration and Frequency at 550 Metres

Homes located 550 meters from a turbine generally experience:

- 5–20 hours per year of flicker in worst-case modeling
- 2–8 hours per year in realistic scenarios, accounting for weather and turbine downtime
- Flicker primarily in spring and fall for a few minutes per day

3. Health and Regulatory Perspective

According to Health Canada (2014), shadow flicker is not linked to adverse health effects. The National Collaborating Centre for Environmental Health and the German Federal Environment Agency confirm this finding. However, some individuals may find flicker annoying, particularly when it occurs in frequently used rooms.

4. Bower Hill's Mitigation Process

Bower Hill Wind Project is implementing a voluntary mitigation protocol:

- Site-specific modeling to assess potential flicker exposure
- Monitoring using light loggers at affected homes (on request)
- Mitigation offered if annual flicker exceeds 2 hours:
  - Blinds or vegetation screens
  - Goodwill payments (e.g., $200/year)
  - Operational curtailment in rare cases

5. Ontario Regulations and Precedent

Ontario's Renewable Energy Approvals (REA) regulation requires a 550-meter setback to reduce flicker and noise impacts. The Environmental Review Tribunal has repeatedly found no evidence that shadow flicker causes serious harm to human health. Best practices from international standards suggest keeping flicker below 30 hours/year, with 8 hours/year as a preferred limit—well within typical Ontario values.

Conclusion

Shadow flicker is a known and manageable aspect of wind turbine operation. For residences over 500 meters away, actual flicker is low and infrequent. At Bower Hill, we are committed to proactive assessment, transparent monitoring, and reasonable mitigation when needed. We believe this approach supports community confidence and regulatory compliance alike.

Bower Hill Wind Project – Community Information Series

Report B6: Wind Turbines and GPS Equipment – Understanding Interference Risk

Overview

One concerns have been raised about whether wind turbines can interfere with GPS-based systems, particularly those used in precision agriculture. While turbine structures can theoretically reflect or block signals under certain conditions, peer-reviewed studies and field data show that actual interference is rare. This report summarizes how GPS systems work, the potential sources of interference, and what farmers can expect in practice.

1. How GPS Works and Potential Interference Mechanisms

GPS systems receive very weak signals from satellites in the L-band (1.2–1.5 GHz). For standard GPS users, interference is extremely rare. For high-precision users (e.g., RTK GPS in agriculture), the most likely sources of error near turbines include:

- Signal reflection (multipath)
- Obstruction of line-of-sight to satellites or base stations
- Scattering by rotating blades
- Very low likelihood of electromagnetic interference (EMI)

2. Likelihood of Interference by GPS Type

- Standard GPS (±1–3 m): No interference expected. GPS signals are unaffected by turbines at these usage levels.
- DGPS (±20–50 cm): No practical interference reported.
- RTK GPS (±2–5 cm): Low risk under specific conditions:
  - Operating directly between turbines
  - Obstructed view to RTK base station
  - Using radio (UHF/VHF) correction links instead of cellular (NTRIP)

3. Evidence from Studies and Field Experience

- The Kingsbridge Wind Farm EMF study in Ontario found electromagnetic fields near turbines were lower than those from home appliances and had no effect on GPS systems.
- No peer-reviewed Canadian study has identified significant GPS disruption from wind turbines.
- Anecdotal issues are typically resolved by relocating RTK base stations or using NTRIP-based correction systems that bypass line-of-sight constraints.

4. Mitigation Practices for RTK Users

- Use correction services like NTRIP over cellular networks.
- Place base stations in elevated, unobstructed areas.
- Use multipath-resistant antennas and algorithms provided by GPS manufacturers.
- Avoid working directly between turbine towers where reflections may occur.

5. Summary of Interference Risk by System Type

• Standard GPS: No risk
• DGPS (WAAS/EGNOS): No risk
• RTK with radio correction: Low, situational
• RTK with NTRIP/cellular: Very low risk

Conclusion

Modern wind turbines do not emit signals at GPS frequencies and are not active sources of interference. While signal reflections or line-of-sight issues can impact high-precision RTK GPS systems, these are rare and manageable with proper mitigation techniques. Most farming operations and standard GPS-based activities will not be affected. We are committed to work with landowner that have location specific questions or concerns.

Bower Hill Wind Project – Community Information Series

Report B7: Wind Turbines and Cellular Signal – Technical Overview

Overview

Some residents have expressed concern that wind turbines might interfere with mobile phone signals. This report reviews the technical mechanisms involved, findings from field studies, and why turbines rarely cause meaningful disruption to cellular networks. Most signal issues near wind farms are due to line-of-sight obstruction, not electromagnetic interference.

1. Electromagnetic Emissions from Wind Turbines

Wind turbines contain electronics and transformers that emit electromagnetic fields (EMFs). These emissions are minimal, regulated, and comparable to those of common household appliances. There is no credible evidence that turbine EMFs disrupt cellular communication, which operates at regulated, protected frequencies well above EMF influence.

2. Obstruction and Multipath Effects

• Wind turbines can physically block or reflect signals.
• Effects include minor attenuation and multipath interference, particularly with high-frequency signals.
• These effects are typically localized—only noticeable when the user is directly behind the turbine relative to the cell tower.
• Silos and other tall structures can have similar or greater effects.

3. Frequency and Coverage Design

Cell networks operate over multiple frequencies:
• Lower bands (e.g., 700 MHz) penetrate buildings and obstructions better.
• Higher bands (e.g., 2.5 GHz) are more susceptible to reflection or shadowing.
Modern networks use overlapping coverage zones and signal processing to maintain performance even in the presence of physical obstructions like turbines.

4. How to Assess Potential Interference

If cell signal concerns arise, the following steps can be used to assess whether turbines are a factor:
• Signal strength and quality measurements near turbines
• Spectrum analysis to check for emissions near cell frequencies
• Network performance logging: call drops, data rates, handover success
• Collaboration with mobile providers to assess local tower behavior

5. Practical Comparison: Turbines vs. Silos

Farm silos and turbines both present vertical obstructions. Silos cause predictable, minimal disruption and are often used to mount antennas. Wind turbines, with moving blades, can reflect signals dynamically—but this is rare and usually insignificant unless in a weak coverage zone. In strong coverage areas, signal paths re-route through nearby towers.

Conclusion

Wind turbines can affect cell signal only in rare, location-specific situations involving obstruction or reflection. These effects are minimal and usually manageable within today's overlapping, multi-band cellular networks. Like silos, barns, or terrain, turbines may contribute to localized signal weakening—but are not a general source of interference.

Bower Hill Wind Project – Community Information Series

Report B8: Wind Turbines and Property Values in Ontario

Overview

Concerns about wind turbines affecting nearby property values are common, but academic research in Ontario provides strong evidence to the contrary. A peer-reviewed study from the University of Guelph—focused on Melancthon Township, home to one of Ontario's largest wind farms—found no statistically significant effect on residential or agricultural property values due to turbine proximity, visibility, or density.

1. Key Study Findings

- Study reviewed over 7,000 property transactions from 2002 to 2010.
- 133 turbines were constructed in Melancthon between 2005 and 2008.
- Used a hedonic pricing model to isolate the effect of turbines on sale prices.
- Controlled for building features, lot size, land use, sale date, and market conditions.
- No significant price effects found at distances of 5 km, 2 km, or even 1 km.
- No differences in sale price trends based on turbine visibility from the home.
- Applicable to both rural residential and agricultural properties.

2. Research Methods and Validity

- Institution: University of Guelph
- Published in: Canadian Journal of Agricultural Economics
- Method: Hedonic pricing model – a well-established real estate valuation tool
- Controlled variables: Home characteristics, land use, sale timing, turbine view, and turbine proximity
- Analysis was robust across different subgroups and model variations

3. Relevance to Southwestern Ontario

Melancthon is a large rural municipality comparable to many areas in Oxford and surrounding counties. Because it hosted a project larger than most current developments, and the study used rigorous academic methods and a large dataset, its findings are reliable for understanding potential impacts in Bower Hill and similar regions.

Conclusion

The University of Guelph's research offers strong, Ontario-based proof that wind turbines do not negatively affect property values. This should provide confidence to municipal councils, landowners, and communities evaluating wind energy development. As projects like Bower Hill move forward, the conversation can be guided by verified data—not speculation.

Full study: https://puc.sd.gov/commission/dockets/electric/2018/EL18-003/testimony/dakotarange/mexhibit5.pdf