Volume 2 Attachments

Landscape and Visual Impact Analysis

St Patricks Plains Wind Farm

inspiring place

EPURON

PREPARED FOR
EPURON PTY LTD
SEPTEMBER 2021

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Date	Version	Authorised Signature
22.12.20	Preliminary Draft for Review	JERRY de GRYSE
01.04.21	Revised Draft	JERRY de GRYSE
14.09.21	Draft for Final Review	JERRY de GRYSE
27.09.21	Final	JERRY de GRYSE

Inspiring Place Project No. 20-37 (20-RR)

Cover photo: St Patricks Plains Wind Farm Preliminary Photomontage - Photomontage view from Highland Lakes Rd (Source: Epuron)

Volume 2 Attachments

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ATTACHMENT A
GIS SPECIFICATIONS USED IN THE STUDY

Source: Entura

A.1 Zone of Visual Influence Map (ZVIs)

A.1.1 Mapping ZVI

The purpose of the ZVI is to show the potential visual influence for the wind turbine field and how many of either the Hubs or the Tips of the Wind Turbines you can see from any one area or zone. It highlights the potential theoretical scale of impact in different locations around the proposed wind farm. The ZVI can be run out to different distance to capture the potential for visual impact from up to 5km, 10km, 20km, 50kms away.

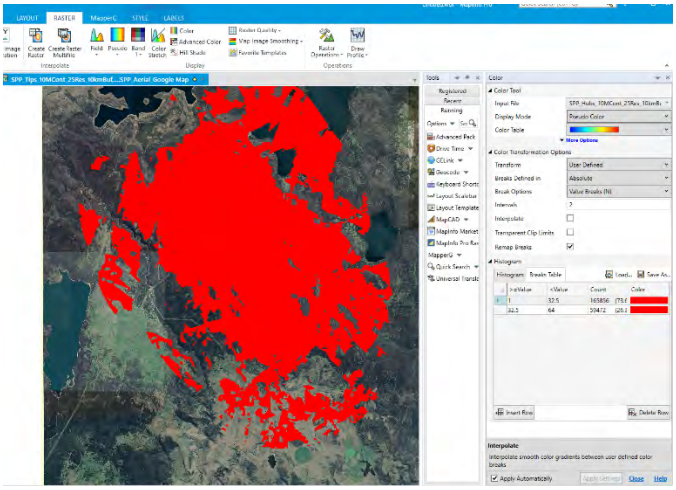
Wind PRO, ZVI (Zones of Visual Influence for WTG or radar) module is used along with the preferred mapping tool to produce ZVI.

The turbine visibility calculation is selected to calculate the number of visible turbines from a project across a specified area. All ZVI calculations can consider either hub or tip of the turbines. In a standard approach, ZVI is calculated using a "bare earth" model which only accounts for variations in visibility caused by terrain and does not consider vegetation, buildings or infrastructure. Once the ZVI mapping is generated, it can be exported into variable file formats and GIS software is used to process the mapping for further applications.

A.1.2 Colour the Rasta ZVI:

You cannot clip a raster image so when you have tips and hubs shown and overlapping the opacity settings will change the colour and blend in all overlapping areas (there will be no reference for this colour in the legend) The areas need to be clipped instead of overlapping.

Fig.1 Shows Tips ZVI



Raster ZVI contain all the visual data/visible turbines and can be broken down into coloured sections (eg. 5 sections and numbered in order of turbines visible from that location 0-10, 11-20, 21 -40 and so on. Each section is attributed a colour to show the varying degree of visual impact zone).

Fig.2 Shows hubs visual impact in one ZVI file and overlayed onto a map of St Patricks Plains with 50 turbine locations. This also demonstrates the degree of impact denoted by the different zones.

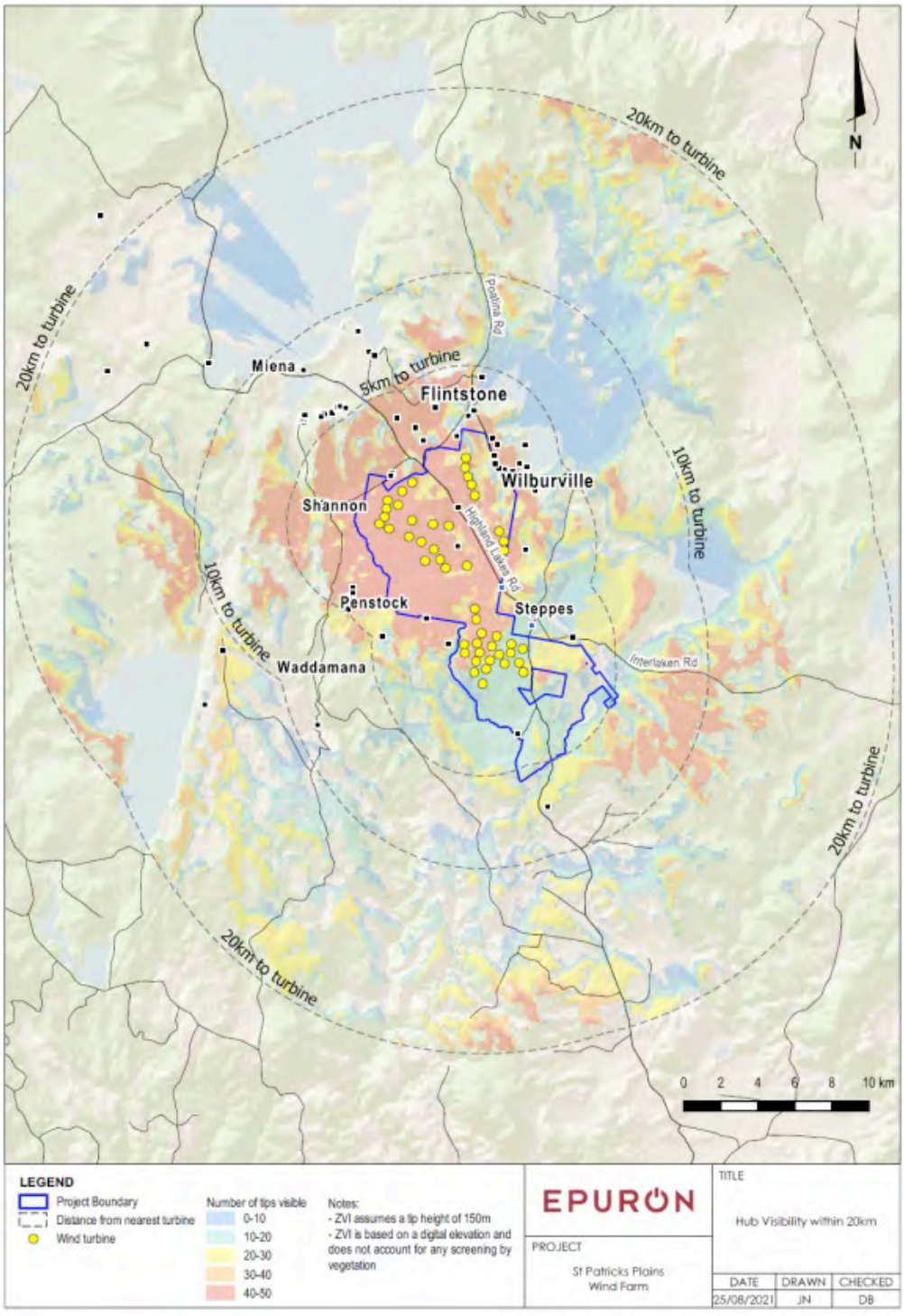


Fig.2 Hubs Visual impact

A.2 PHOTOMONTAGES

A.2.1 Use of wireframes and photomontage

Wireframes show the proposed wind farm on a computer representation of the Digital Terrain Model (DTM) from a chosen viewpoint location. This provides an aid to the assessment of impacts, by allowing the assessor to compare the wireframe with the view seen on site and understand the location and scale of the proposed development from that viewpoint. Photomontages are intended to provide an indication of how a photograph from a chosen viewpoint would look if the development were already constructed. Therefore, they must be constructed accurately in order to give a fair representation of the proposed development.

A.2.2 Photography

Photographs were taken using a 50mm equivalent focal length lens using a Nikon D610 digital SLR camera. Photographs were taken in portrait format to reduce any possible lens distortion and to ensure that the final panorama stitched accurately. The camera was mounted on a stable, levelled tripod with a professional panoramic head attached. This positions the focal centre of the camera lens above the pivot of the tripod and allows the photographs to be stitched together accurately. The position of the viewpoint location was recorded using a GPS receiver that was tethered to the DSLR, allowing coordinates to be exported for each photo. Individual photographs were spliced together in Photoshop to create a panorama. The final panoramas were then saved as high-resolution full-colour digital images.

A.2.3 Wireframe Production

Computer-generated wireframes of the panorama of the view were constructed. The wireframes show a DTM for a defined viewpoint, direction and field of view. A correctly dimensioned 3D wireframe model of the wind turbines used in the development was generated by the computer software. This was placed onto the ground model to scale, and in the correct position. Photograph images (if available) can be matched to the wireframe by adjusting view direction and other parameters until all major topographic features are consistent between photograph and wireframe. The wireframes displayed in this document do not include photographed images.

A 2.2.4 Photomontage

A detailed correctly dimensioned 3D computer model of the turbines was generated. This was placed onto the ground model to scale, and in the correct position. For each

photomontage viewpoint, turbine lighting settings were adjusted in accordance with the time of day the photos were taken. The photomontages were produced by overlaying the rendered image on the photograph and aligning using topographical features. Final adjustments were then made to brightness and contrast of the rendered image to match it to the photograph. Any rendered items that should be obscured by foreground detail within the photograph were then digitally removed using Adobe Photoshop. The resulting photomontage was then saved as a high-resolution full-colour digital image.

ATTACHMENT B
FRAME OF REFERENCE CENTRAL PLATEAU LANDSCAPE CHARACTER TYPE

Source: Forestry Commission 1990. **A Manual for Forest Landscape Management.**

9 Central Plateau Landscape Character Type

	HIGH SCENIC QUALITY	MODERATE	LOW
LANDFORM	• Isolated small peaks and high points with distinctive form rising abruptly from the surrounding landscape (greater than 50% slope). • Large to small valleys and clearly defined and incised drainages with strong spatial definition. • Very large boulder fields or scree slopes, massive rock outcrops, cliffs and distinctive escarpments, all with strong colour contrast.	• Rolling terrain with low hills and ridges, and gently sloping sugarloaves (10% to 40%). • Shallow drainages with moderate spatial definition. • Medium-sized rock outcrops and rock slabs with regular shape and pattern and moderate colour contrast.	• Extensive areas of flat land (0% to 10% slope).
VEGETATION	• Strongly defined patterns and textures created by combinations of sedge, alpine heath, wet sclerophyll and dry sclerophyll plant communities. • Moderate-sized stands of native conifers. • Dramatic displays of seasonal colour.	• Discernible patterns and textures due to interspersal of different plant communities and to changes in forest age and height classes.	• Extensive areas of similar vegetation with few discernible patterns.
WATERFORM	• Major rivers and streams. • Lakes and areas with high concentrations of small tarns.	• Small streams less than 2 m wide.	• Intermittent streams and shallow ponds.

ATTACHMENT C
SCENIC INTEREST FRAME OF REFERENCE

Source: Inspiring Place

Frame of reference Scenic Interest

High Scenic Interest	Moderate Scenic Interest	Low Scenic Interest
Industrial estates which appear highly ordered, with strong unity of purpose and which are well maintained particularly in contrast to a powerful landscape setting (e.g **Woolnorth wind farm, Middelgrunden offshore windfarm, Denmark**) High technology industries where the activity is expressed in its architecture or surrounds (**solar furnace, Laguardia Airport TWA terminal**) Strong contrasting industrial forms of an immense scale expressed through colour or linking elements (conveyors, piping, night lighting, etc.) (e.g. Pasminco EZ zinc works, **River Rouge Ford Plant, large scale oil refinery**) Large scale industrial elements with a strong 'industrial' design expressing function (**Telstra tower, Canberra**) Large scale utilitarian features exhibiting a modernist design aesthetic of simple geometry, clean lines and raw material finishes, with the form expressive of its function (e.g. Gordon River Dam, **power station cooling towers**) (particularly where the utilitarian, human created element is in stark contrast to a natural setting (e.g. **Hoover Dam**, Gordon River Dam).	Large scale industrial elements with a strong utilitarian design (e.g. **groupings of penstocks, wind turbine(s), container port or other** large scale lifting cranes, **spillways**) Moderate scale industrial buildings with strong unified forms and a readily apparent design ethos (e.g. **Tarraleah Generator Building, Pump Station at Pump House Point, heritage sub-stations, some power stations**) Complex clusters of industrial elements of multiple forms but lacking in legibility (i.e. the uninformed viewer does not have the capacity to understand the workings of the activity but responds to the complexity) (e.g. **large electrical substation, Tarraleah Power Station**)	Scattered buildings of limited architectural character and/or scale (e.g. light industrial buildings, aluminum **and tilt up concrete sheds**) Disturbed open storage areas lacking apparent organization or scale (e.g. temporary construction materials set down areas) Large monolithic stockpiles of industrial materials or wastes (e.g. wood chip piles, **fuel or water storage tanks**, excavation spoils) Common industrial elements (e.g. **common electricity transmission towers, small switchyards, steel or plastic electrical turrets/ transformers**) Linear features without topographic or alignment relief and/or with multiple repetitive, low scenic interest elements (e.g. **electrical transmission corridors, some canals**)

Examples of High Scenic Interest Infrastructure

1 Telstra Tower, Canberra – strong industrial design form that expresses its function

2 Middelgrunden Windfarm, Denmark – highly ordered, with a strong unity of purpose in contrast to its powerful landscape setting

3 Laguardia TWA Terminal, New York – air flight, a high technology industry as expressed in the architecture of the TWA terminal

4 Gordon River Dam - a modernist design aesthetic of simple geometry, clean lines and raw material finishes, with the form expressive of its function

5 Oil refinery, Alberta, Canada - strong contrasting industrial forms of an immense scale expressed through inking elements such as pipework and lighting


1


2

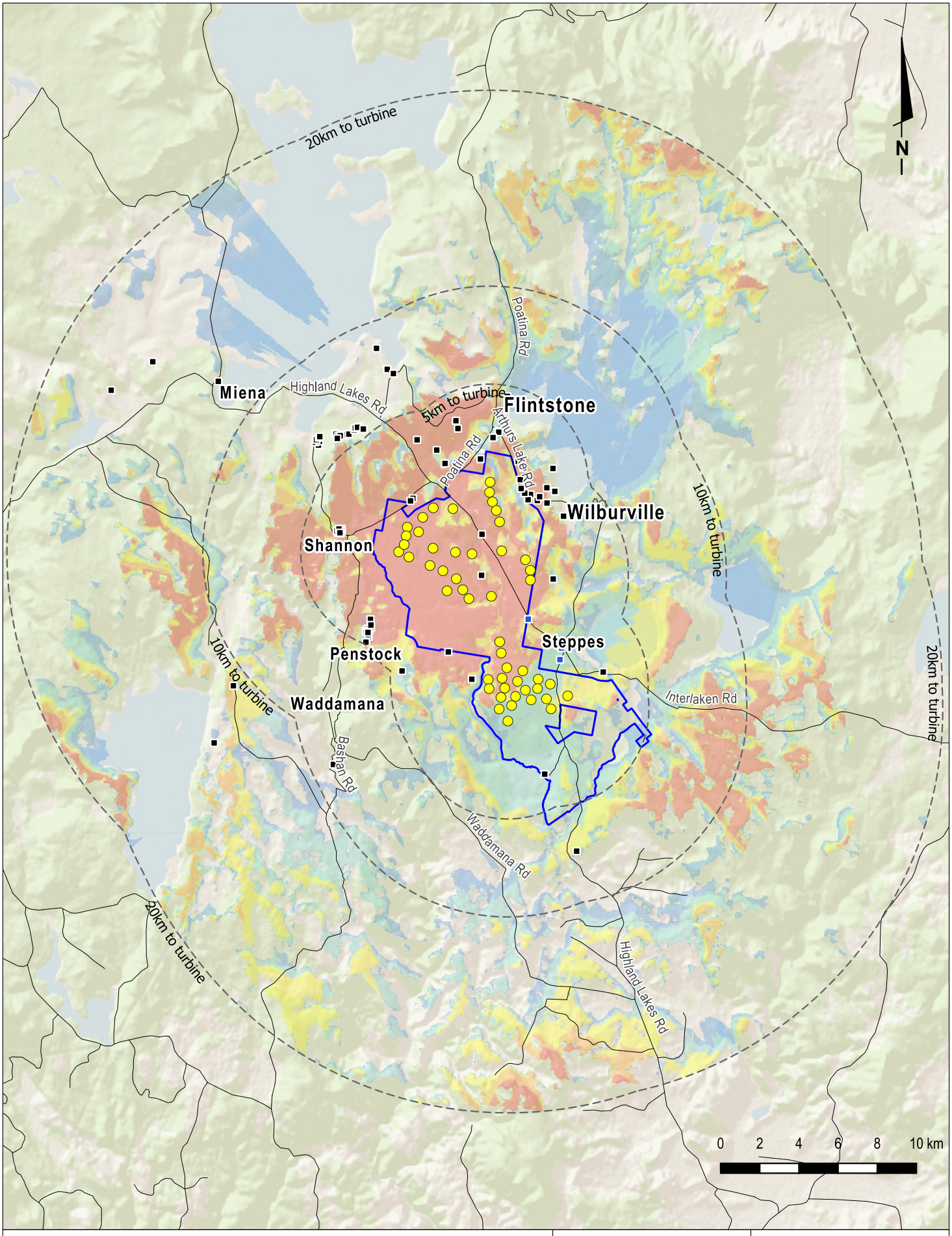

3


4


5

ATTACHMENT D
SEEN VIEW ANALYSES

Source: Entura



LEGEND

- Project Boundary
- Wind turbine
- Distance from nearest turbine
- House

Number of hubs visible

- 0-10
- 10-20
- 20-30
- 30-40
- 40-50

Notes:
- ZVI assumes a hub height of 150m
- ZVI is based on a digital elevation and does not account for any screening by vegetation

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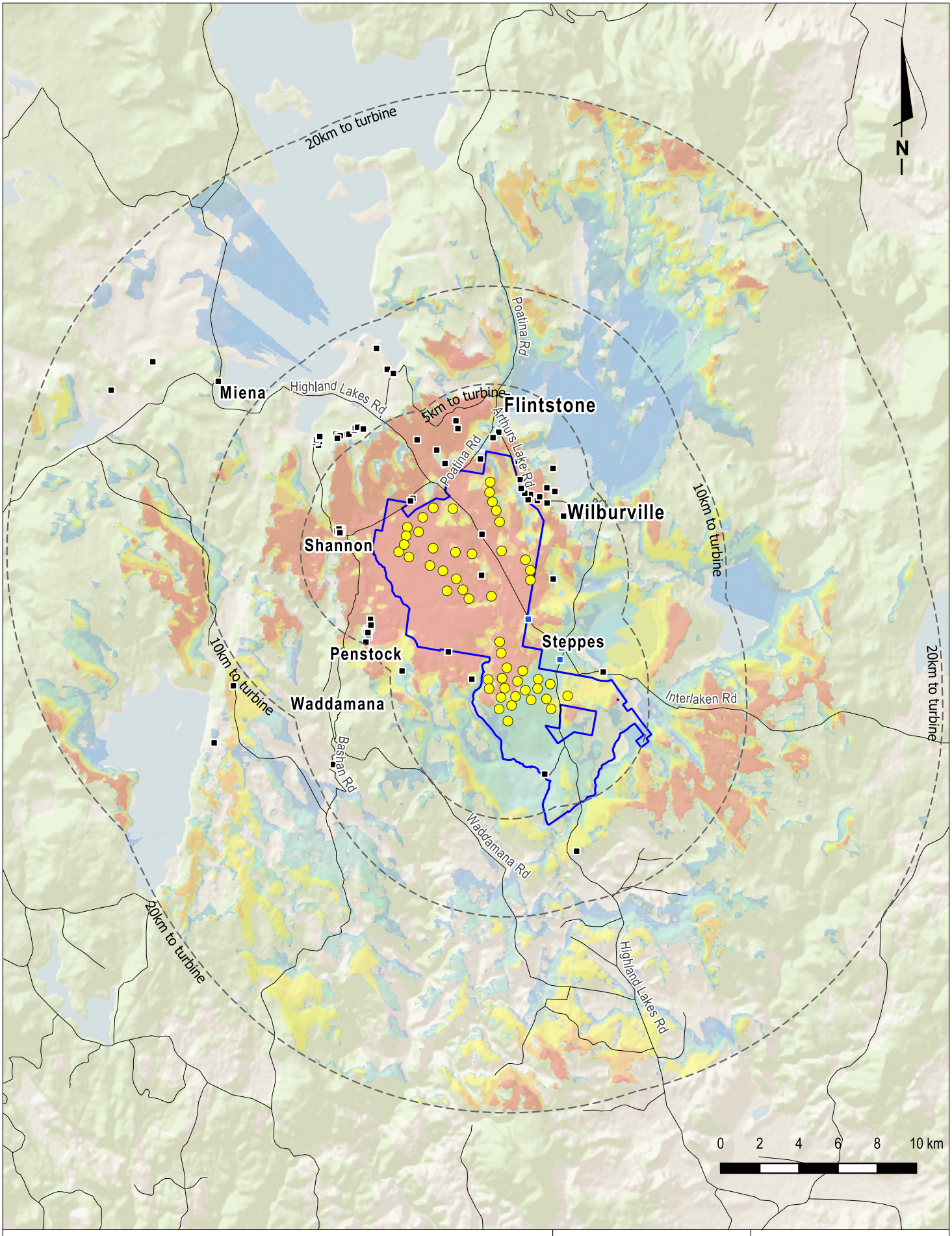
PROJECT

St Patricks Plains Wind Farm

TITLE

Hub Visibility within 20km

DATE	DRAWN	CHECKED
27/08/2021	JN	DB



LEGEND

- Project Boundary
- Wind turbine
- Distance from nearest turbine
- House

Number of tips visible

- 0-10
- 10-20
- 20-30
- 30-40
- 40-50

Notes:
- ZVI assumes a tip height of 231m
- ZVI is based on a digital elevation and does not account for any screening by vegetation

EPURON

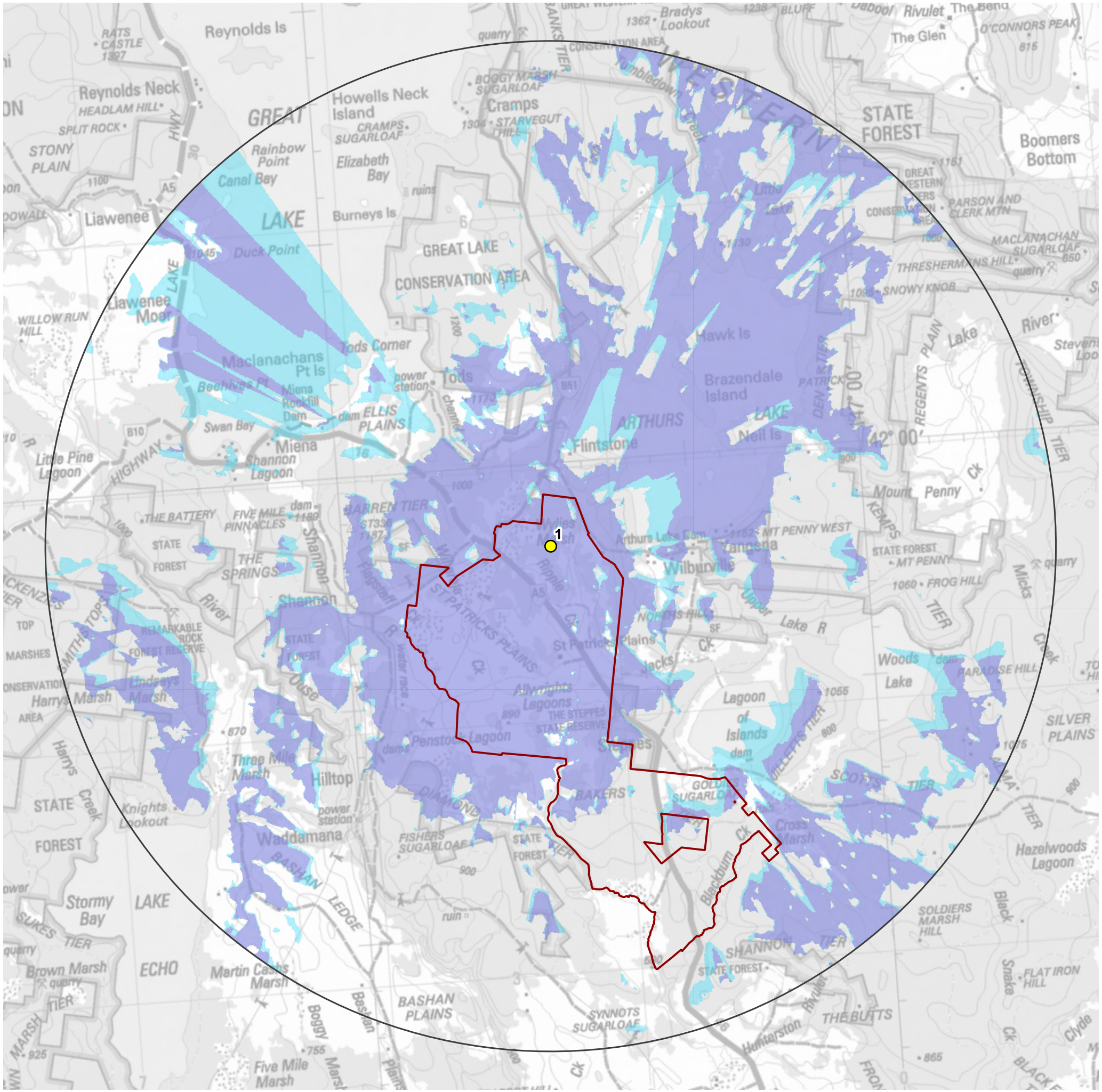
PROJECT

St Patricks Plains Wind Farm

TITLE

Tip Visibility within 20km

DATE	DRAWN	CHECKED
27/08/2021	JN	DB



Legend

- Project Boundary
- 20km ZVI extent
- Wind turbine
- Area where at least 1 turbine tip and 1 turbine hub will be visible
- Area where at least 1 turbine tip will be visible

Notes:
- ZVI assumes a tip height of 231m and a hub height of 150m.
- ZVI is based on a digital elevation model and does not account for any screening by vegetation.

Turbine 1 visibility within 20km

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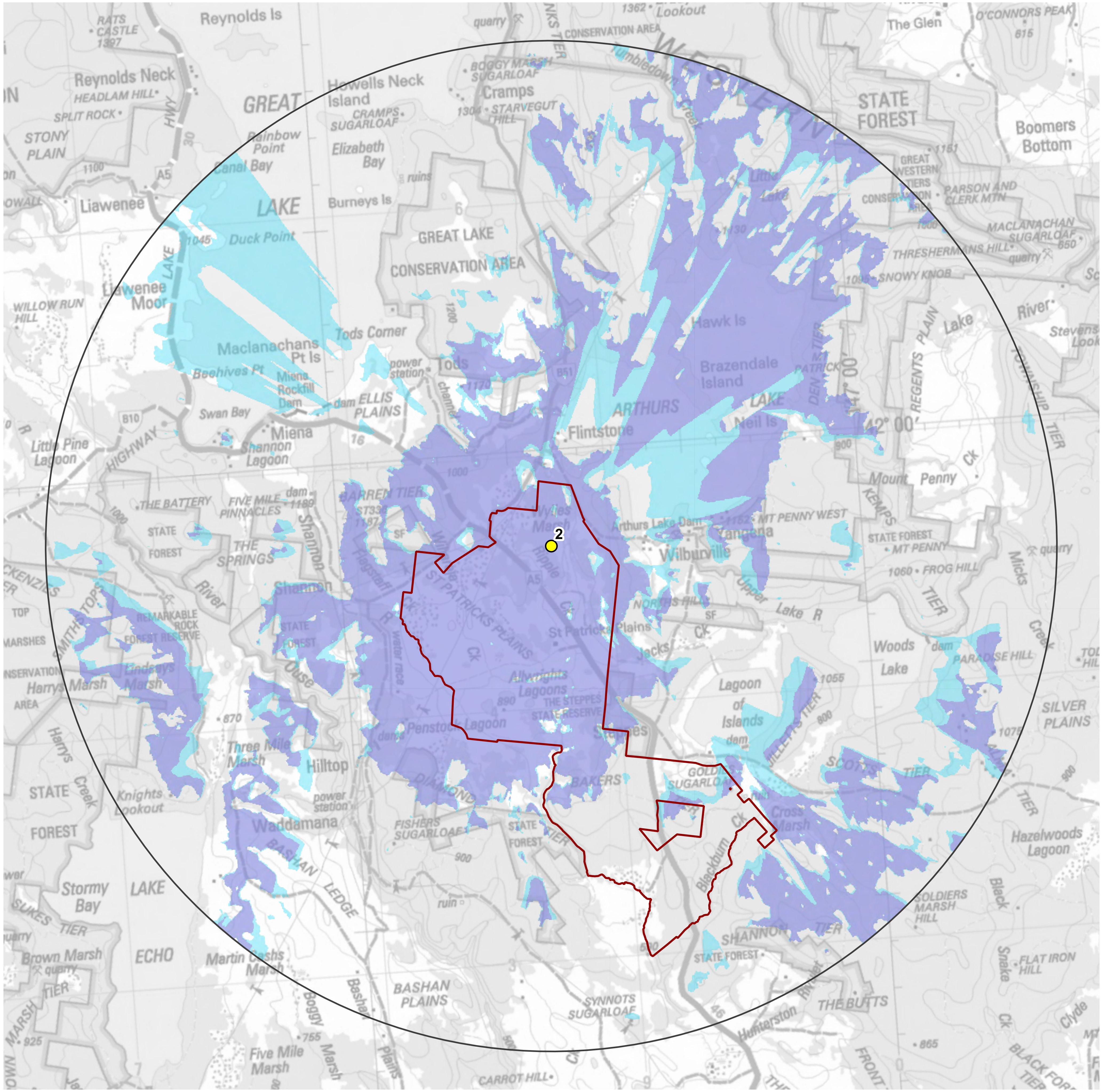
Date: 26/10/20

0 2 4 6 8 10 km

N

St Patricks Plains Wind Farm



Legend

- Project Boundary
- 20km ZVI extent
- Wind turbine
- Area where at least 1 turbine tip and 1 turbine hub will be visible
- Area where at least 1 turbine tip will be visible

Notes:
- ZVI assumes a tip height of 231m and a hub height of 150m.
- ZVI is based on a digital elevation model and does not account for any screening by vegetation.

Turbine 2 visibility within 20km

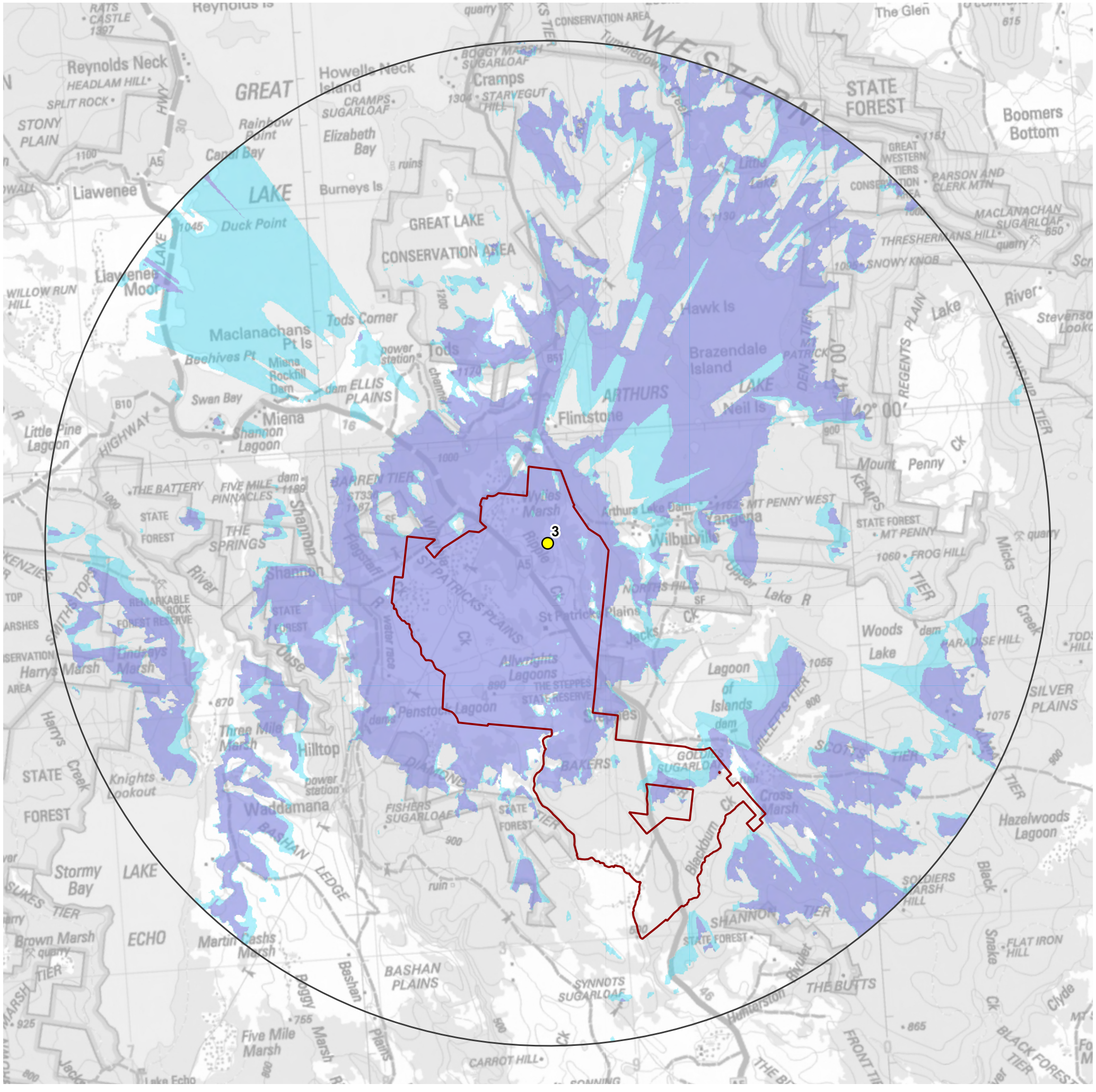
EPURON

Date: 26/10/20

0 2 4 6 8 10 km

N

St Patricks Plains Wind Farm



Legend

- Project Boundary
- 20km ZVI extent
- Wind turbine
- Area where at least 1 turbine tip and 1 turbine hub will be visible
- Area where at least 1 turbine tip will be visible

Notes:
- ZVI assumes a tip height of 231m and a hub height of 150m.
- ZVI is based on a digital elevation model and does not account for any screening by vegetation.

Turbine 3 visibility within 20km

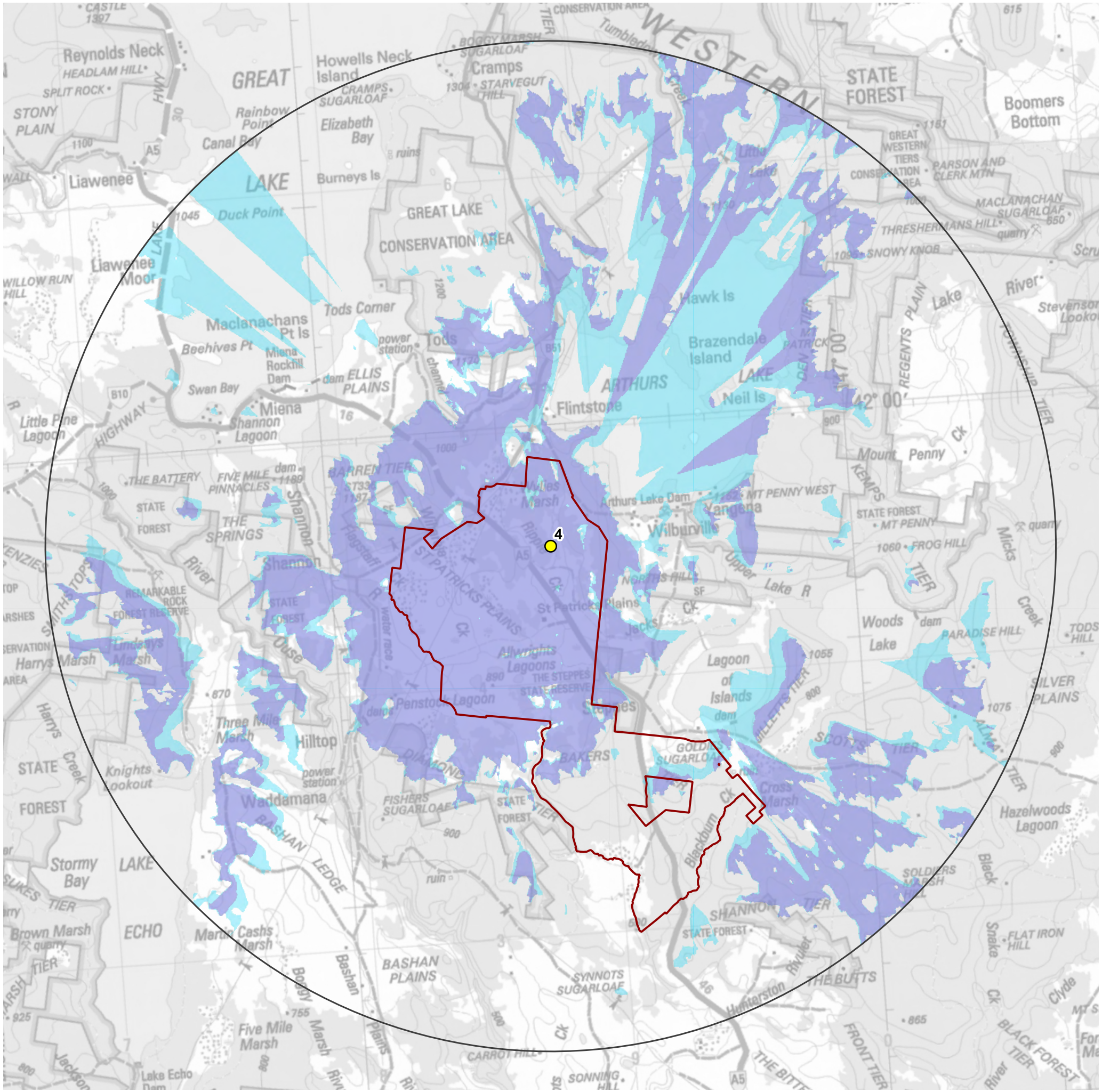
EPURON

Date: 26/10/20

0 2 4 6 8 10 km

N

St Patricks Plains Wind Farm



Legend

- Project Boundary
- 20km ZVI extent
- Wind turbine
- Area where at least 1 turbine tip and 1 turbine hub will be visible
- Area where at least 1 turbine tip will be visible

Notes:
- ZVI assumes a tip height of 231m and a hub height of 150m.
- ZVI is based on a digital elevation model and does not account for any screening by vegetation.

Turbine 4 visibility within 20km

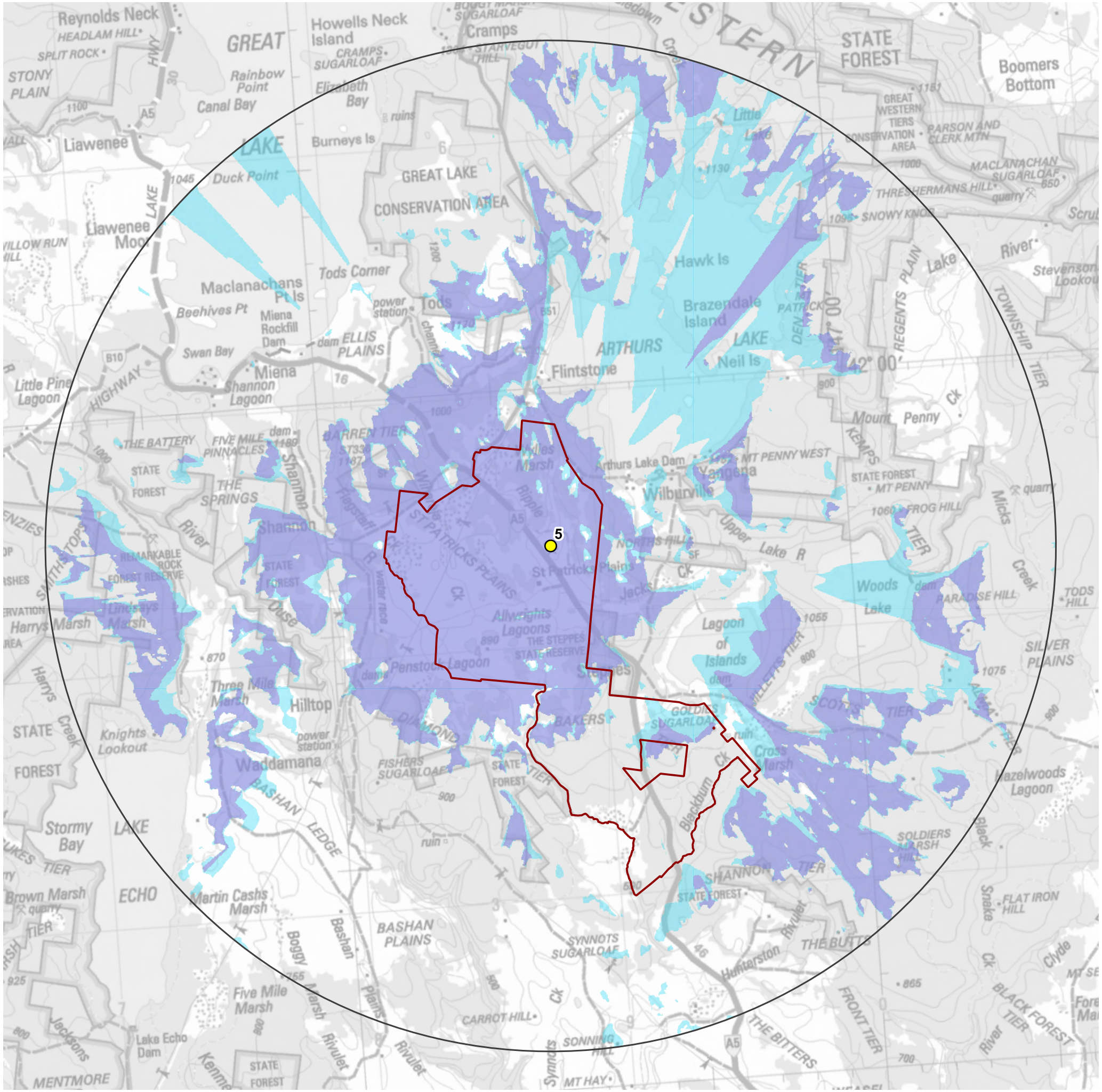
EPURON

Date: 26/10/20

0 2 4 6 8 10 km

N

St Patricks Plains Wind Farm



Legend

- Project Boundary
- 20km ZVI extent
- Wind turbine
- Area where at least 1 turbine tip and 1 turbine hub will be visible
- Area where at least 1 turbine tip will be visible

Notes:
- ZVI assumes a tip height of 231m and a hub height of 150m.
- ZVI is based on a digital elevation model and does not account for any screening by vegetation.

Turbine 5 visibility within 20km

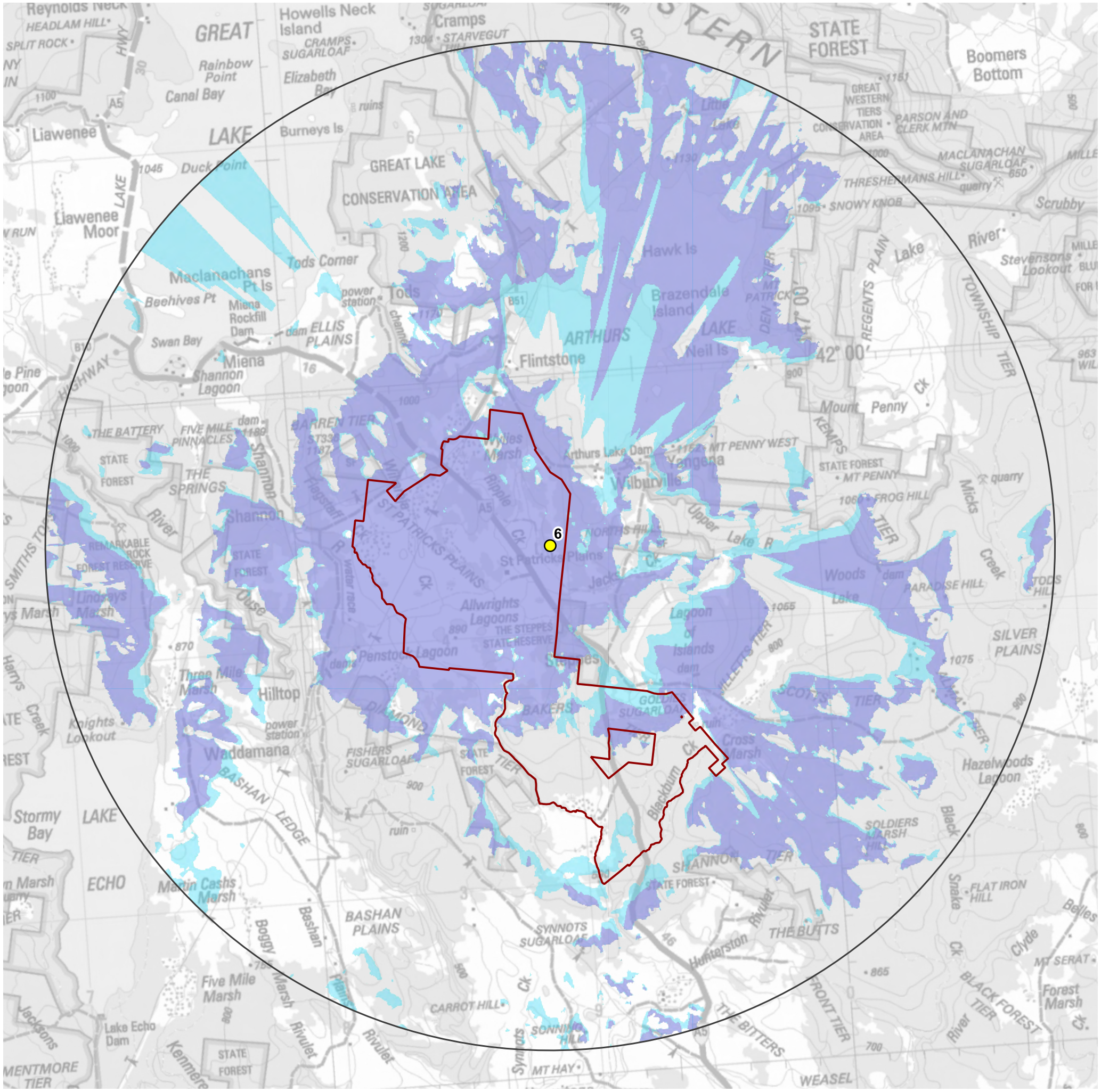
EPURON

Date: 26/10/20

0 2 4 6 8 10 km

N

St Patricks Plains Wind Farm



Legend

- Project Boundary
- 20km ZVI extent
- Wind turbine
- Area where at least 1 turbine tip and 1 turbine hub will be visible
- Area where at least 1 turbine tip will be visible

Notes:
- ZVI assumes a tip height of 231m and a hub height of 150m.
- ZVI is based on a digital elevation model and does not account for any screening by vegetation.

Turbine 6 visibility within 20km

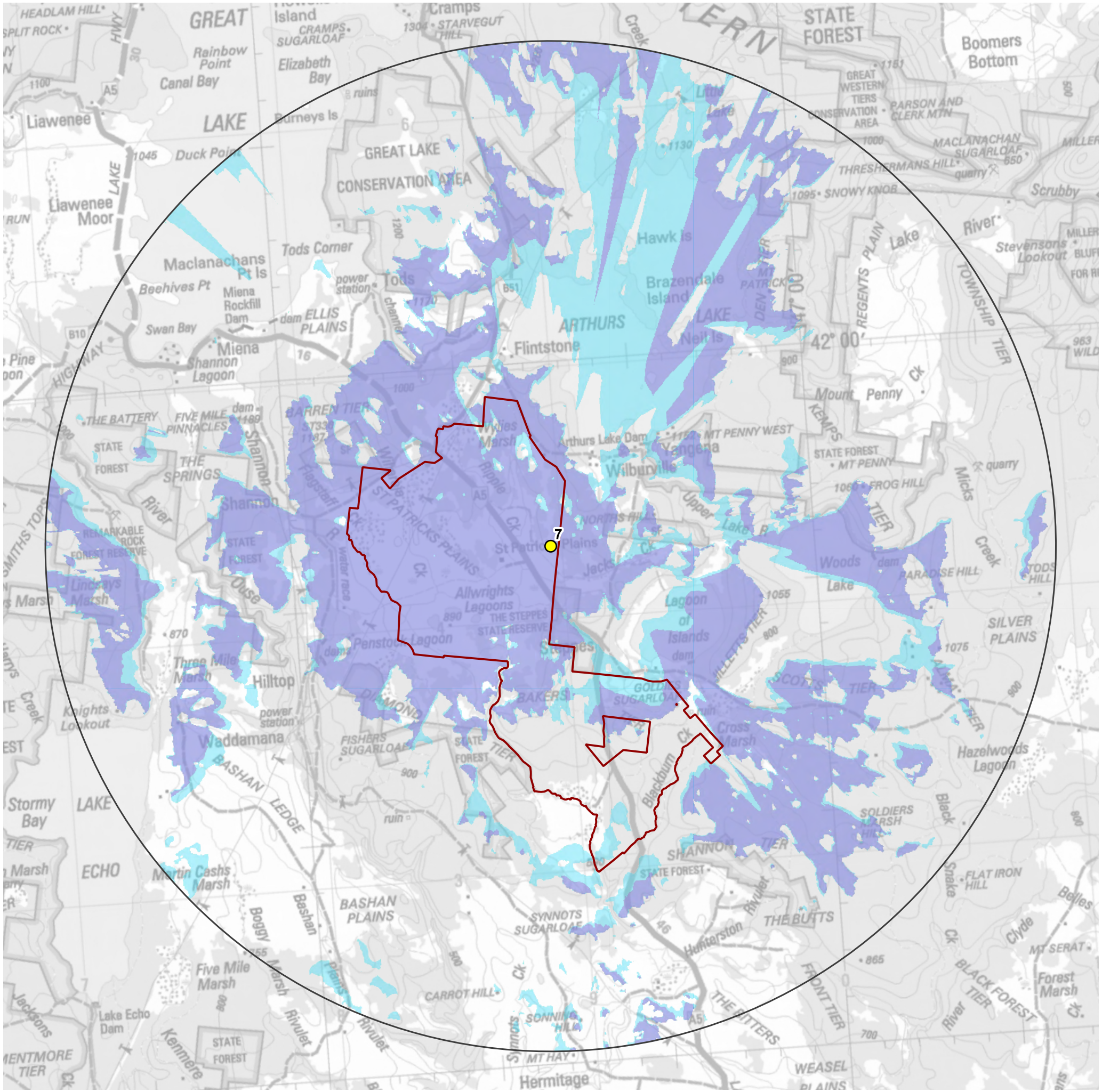
EPURON

Date: 26/10/20

0 2 4 6 8 10 km

N

St Patricks Plains Wind Farm



Legend

- Project Boundary
- 20km ZVI extent
- Wind turbine
- Area where at least 1 turbine tip and 1 turbine hub will be visible
- Area where at least 1 turbine tip will be visible

Notes:
- ZVI assumes a tip height of 231m and a hub height of 150m.
- ZVI is based on a digital elevation model and does not account for any screening by vegetation.

Turbine 7 visibility within 20km

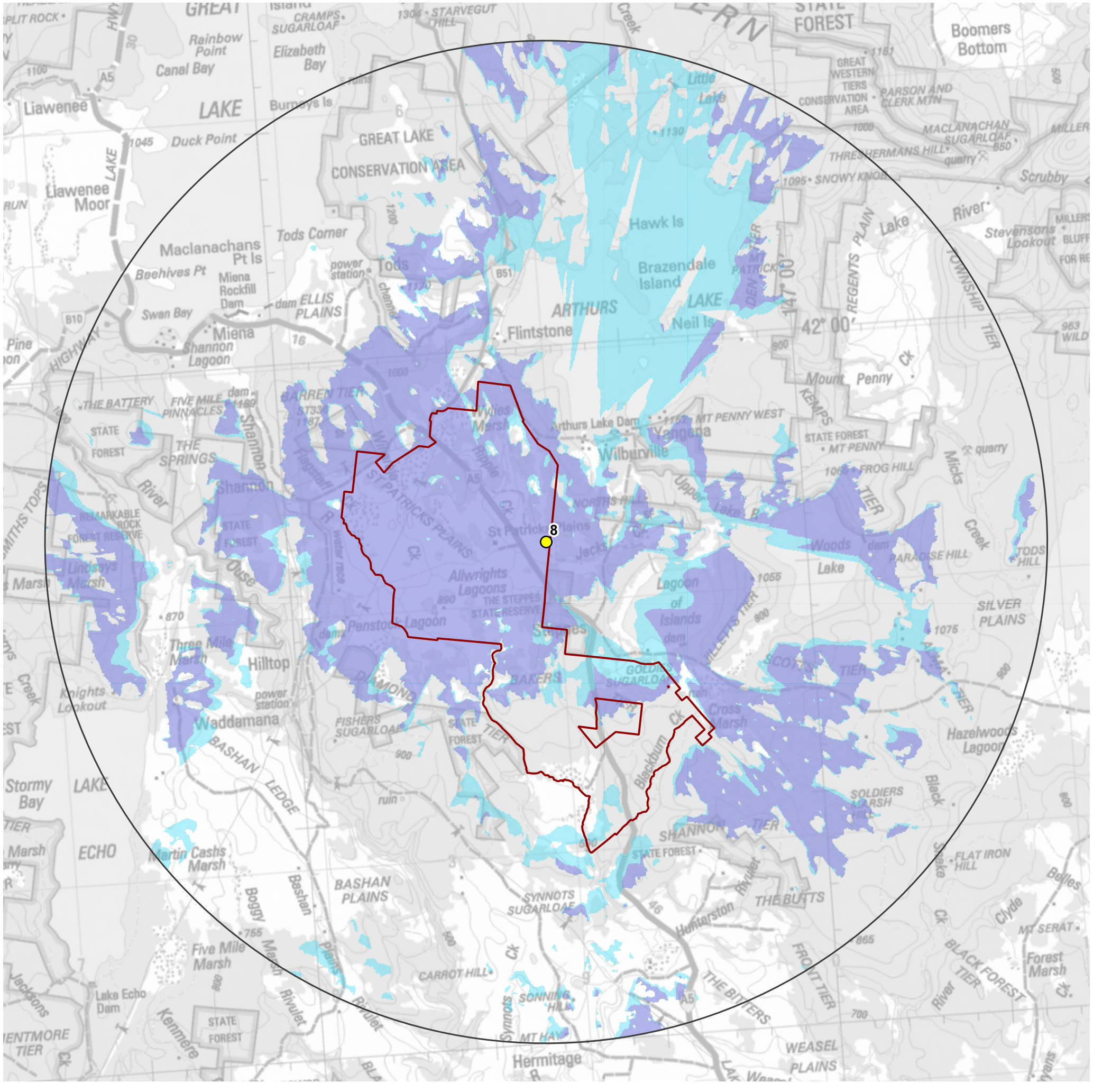
EPURON

Date: 26/10/20

0 2 4 6 8 10 km

N

St Patricks Plains Wind Farm



Legend

- Project Boundary
- 20km ZVI extent
- Wind turbine
- Area where at least 1 turbine tip and 1 turbine hub will be visible
- Area where at least 1 turbine tip will be visible

Notes:
- ZVI assumes a tip height of 231m and a hub height of 150m.
- ZVI is based on a digital elevation model and does not account for any screening by vegetation.

Turbine 8 visibility within 20km

EPURON

Date: 26/10/20

0 2 4 6 8 10 km

N

St Patricks Plains Wind Farm