energreen wind

Black Springs Wind Farm Project

Traffic and Transport Study

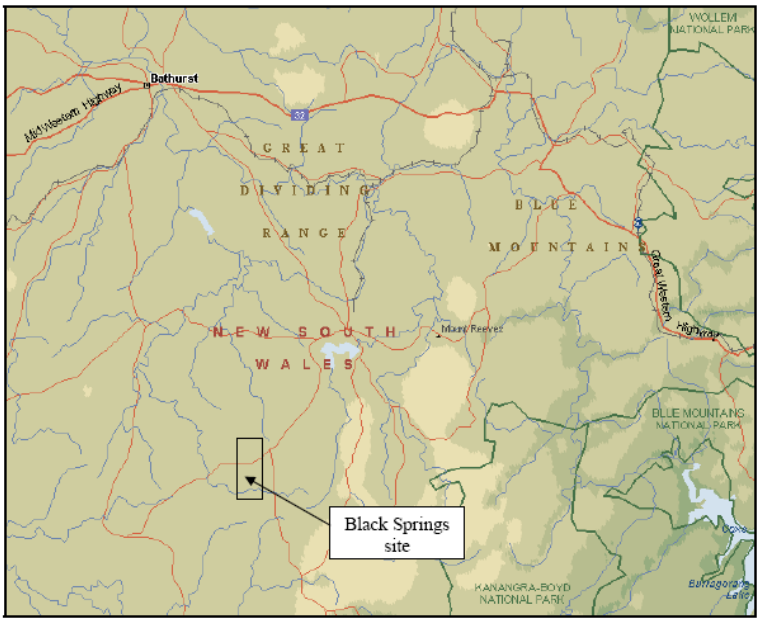
Revised November 2006

1. Introduction

The Black Springs wind farm is located approximately 25 km south of Oberon in NSW.

The project will consist of 9 wind turbine generators with a hub height of approximately 80m and rotor diameter between 82-88m. For the purpose of this study the analysis is based on an indicative turbine layout of 9, Suzlon S88 turbines (hub height 80m, rotor diameter 88m).

Figure 1: Location of Black Springs Wind Farm



The project is located on two private landholdings, *Daisybank* and *Acquatoria*.

This study is concerned with the impact of the transport and traffic related activities associated with the development. This includes the transport of people, equipment, and materials to site during the construction period as well as the development of roads on the wind farm site. Turbine components will be transported from either Port Botany or Port Kembla by road in a westerly direction across the Blue Mountains to the site at Black Springs or from Melbourne.

At different stages through the construction of the wind farm there will be oversize and over-mass loads transported on public roads. There will be an increase in traffic on public roads in the local area and immediate vicinity of the site associated with the wind farm construction. During construction there will be additional gravel access roads constructed on the wind farm site allowing all weather access for road vehicles to each of the turbine locations and the proposed substation.

The issues associated with these different activities include:

1. Suitability of existing roads and structures
2. Disturbance to community, other road users and traffic safety
3. Impact of new road construction on site.

2. Development Traffic

The proposed wind farm development will result in an increase in the level of traffic however this level will vary greatly between the construction and operational periods. The construction period is relatively short for a period of some 4 to 6 months. The operations period is then expected for a 20 to 25 year duration for the wind farm project.

2.1 Construction Period

During the relatively short construction period the traffic impacts will be associated with the following transport activities:

1. Transporting turbine components, materials, cranes and earthmoving equipment to and from the site;
2. The daily travel of up to 50 construction personnel to and from the site.

There are nine (9) Suzlon S88 or equivalent wind turbine generators proposed for the Black Springs Wind Farm. Turbine components are relatively large and heavy and will require Restricted Access Vehicles (RAVs) for transportation to the site. Each turbine consists of 9 major components which are assembled on site. These are:

- Blades (3) and Hub (1)
- Tower (4 sections)
- Nacelle (1) housing the gearbox, generator, control system, hydraulics etc.

In addition there is electrical equipment required for the wind farm substation and the electrical reticulation system within the wind farm. The substation transformer is the most significant of these items to transport.

Based on the above components it is expected there will be approximately 70 oversize RAV truck movements during the 4 to 6 month construction period which translates to an average of less than 1 RAV per working day. It is expected that the transport of main components such as blades, towers and nacelles will be done together in a short time period of one to two weeks.

Blades: The blades are up to 44m long and will be carried by a semi trailer approximately 50m long with a 12 tonne axle load. If a rear wheel steering trailer is used a 15m turning radius is required. A standard trailer has a turning radius of 30m. When assessing the transport route for the blades consideration of allowable bend radius, changes in grade and road alignment on approach to bridges and rail crossing require is critical.

Tower: Each turbine tower is comprised of three major sections plus one smaller embedded section to be used for connecting the tower to the foundation having a combined weight of approximately 165 tons. Each of the major sections will carried separately by semi-trailer while more than one embedded section (3-4) will be carried per load. With an approximate diameter of 4.5m and an overall travel height approaching 5m, attention to overhead clearance will be critical for movement of

these items. If non-steerable trailers are used turn radii and road widths at turns will need to be checked.

Nacelle: The turbine Nacelle weighs approximately 67 tons and is approx. 4m tall and 8m long. A low loader trailer is used giving a final travel height of under 5m. Overhead clearance will need to be checked and the significant mass will be a factor with regard to bridge limits and climb grades.

Substation Transformer: The transformer is estimated to be around 60 tons and therefore will require an over mass permit. The transformer will only require one singular RAV transport activity using a large multi-axle low load trailer and guided transport. The overall impact compared to the remaining construction activities is deemed to be low.

For New South Wales the over mass and over size vehicle limits available from the RTA website are listed in Table 1.

Table 1. Over Mass and Over Size Limits in NSW

State	Over Mass (Excess Mass) Limit	Over Size (Excess Dimension) Limits		
	(t)	Width (m)	Height (m)	Length (m) (Prime mover and trailer)
NSW	42.5	2.5	4.3	19

In addition to the turbine components, large cranes are required. It is anticipated that alarge 600 to 800 ton and a smaller 200 ton crane will be required on site with the larger crane required to lift the Nacelle, Blades and Hub and the smaller crane keeping the load in balance. This should occur over a 4 to 6 week period. Heavy earth moving equipment will be moved to the site in the usual manner. Although some of this plant may require permits the disturbance is expected to be minor with only several RAV truck movements compared with the transport of the wind turbine components.

The weight and length of the RAV's will mean that grades and changes in grade will require due consideration. Ideally grades en-route should be less than 10% however once on site grades of up to 14% and over can be negotiated with the support of tracked earthmoving equipment.

The construction period will be approximately 4 to 6 months long. Table 1 In Appendix A lists the estimated vehicle movements during this period.

2.2 Operational Period

In contrast to the shorter construction period, the traffic associated with the long-term operation of the wind farm will be minimal. There are two phases of operations;

1. Commissioning and Testing
2. Operations and Maintenance

During the commissioning stage, teams of technicians (10-20 staff) will be travelling to and from the site daily in commercial vehicles such as 4WD and Vans for a period of 2 to 4 months.

In the long term operations the wind farm will be staffed by 2 to 3 staff (non-permanent) and over the remaining life time of the wind farm scheduled maintenance for each turbine will occur every 6 months. Hence operational traffic level will be low and consist of light commercial vehicles such as Vans and 4WD's. Larger equipment may be required for major unscheduled maintenance events such as the replacement of a gearbox or in case of the failure of a key drive train component which cannot be repaired on-site.

2.3 Transportation Routes

There are 3 main transportation routes considered in this report;

1. Port Botany to Black Springs,
2. Port Kembla to Black Springs,
3. Melbourne to Black Springs

Energreen Wind together with the hauling and turbine contractor will develop alternate transport strategies dependent on the item being delivered and where it has been sourced. Local delivery to site will be via Oberon using the Oberon Black Springs and then the Black Springs Burraga Road.

2.3.1 Port Botany to Black Springs

The transport route from Port Botany will involve negotiation of the following roads:

- Friendship Rd, Port Botany
- Interterminal Access Rd, Port Botany
- Penrhyn Rd, Banksmeadow
- Foreshore Rd, Banksmeadow
- General Holmes Drive, Botany
- South Western Motorway, Mascot
- Westlink M7 Casula
- Western Motorway, Eastern Creek
- Great Western Highway, Glenbrook
- Jenolan Caves Rd, Hartley
- Hampton Rd, Hampton
- Duckmaloi Rd, Oberon
- Oberon St, Oberon
- Goulburn Rd, Oberon
- Dog Rocks Rd, Black Springs
- Campbells River Rd, Black Springs

- Swatchfield Rd, Black Springs

Figure 2: Port Botany to Black Springs

2.3.2 Port Kembla to Black Springs Route

Some of the Nacelle, Blades, Hubs and ancillary components arriving from overseas are likely to be delivered into Port Kembla. Depending on the weight of the components they will be delivered to site in one of two ways:

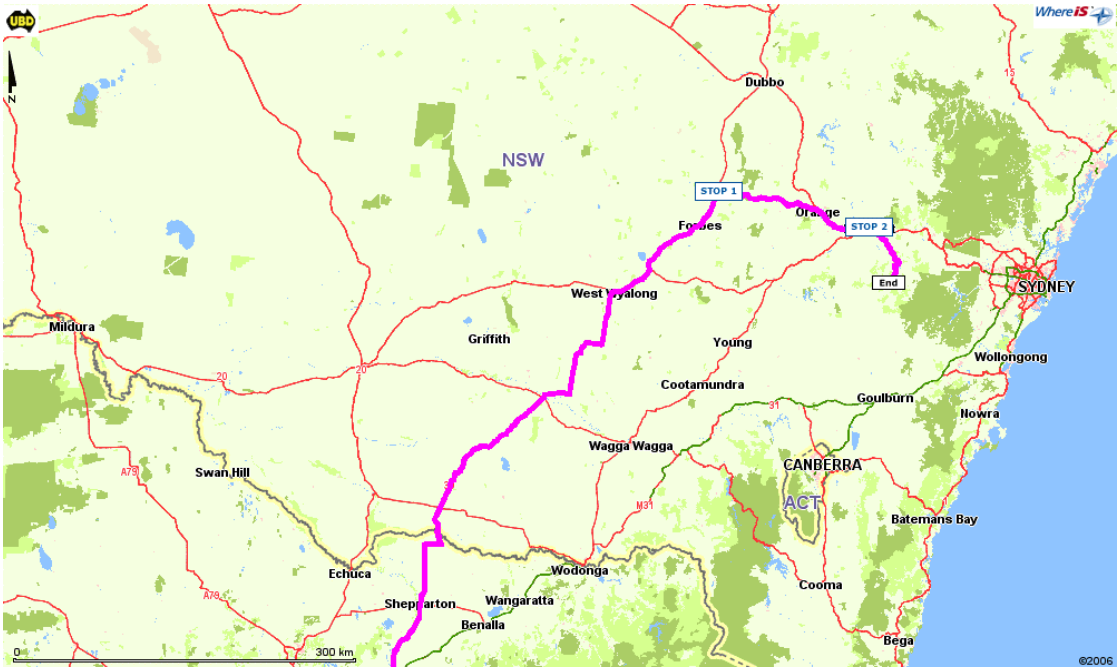
- For over-dimensioned items less than 24 tonne, ie blades, hubs etc these will be delivered to site via the Hume Highway, passing through Goulburn, and Yass, then up the Lachlan Valley Highway to Cowra, across the Mid Western Highway into Bathurst and then south to Black Springs
- For items in excess of 24 tonne, there is a restriction on the bridge at Cowra and as a consequence these items will need to be delivered to site under night-time and escorted control through Camden to Penrith and along the Great Western Highway through Katoomba and Lithgow to Bathurst and then south to site. It is likely that ancillary items such as turbine controllers that are in sea containers will also be delivered via this route.

Figure 3: Port Kembla to Black Springs

2.3.3 Melbourne to Black Springs Route

Tower sections that are fabricated on the mainland are likely to be delivered via the Newell Highway to the South-East, up to Parkes and then across to the site via Orange and Bathurst.

Figure 4: Melbourne to Black Springs



Tower sections that are fabricated in Tasmania or overseas will most likely be delivered into Sydney and will be delivered under night-time and escorted control through Camden to Penrith and along the Great Western Highway through Katoomba and Lithgow to Bathurst and then south to site.

3.0 Transportation Co-ordination

Manufacture of WTG components will be coordinated with the Balance of Plant[1] (BoP) contractor to accommodate for their construction schedule with adequate contingency allowance in the construction programme for orderly delivery of components to the wind farm site. Haulage of wind turbine components and materials, once they have cleared customs at either Port Kembla or Sydney will be coordinated directly with the Turbine Manufacturer and the BoP Contractor Project Management Team as well as the general hauling contractor.

A delivery compound area will be levelled and surfaced with an all weather gravel cap to provide safe and secure storage at site for the purpose of delivery management and co-ordination. WTG components and tower sections can be delivered to site in advance of the construction requirements. These items will be located in the delivery compound (remaining on haulage trailers as necessary) until needed at the nominated turbine locations.

The haulage contractor will have one or two prime movers readily available to the site for delivery of items to the various turbine locations to meet construction requirements. This strategy will enable a supply of a sufficient number components on site ahead of scheduled construction requirements in order to minimise the construction timeframe and optimise usage of heavy machinery and cranes.

It is anticipated the haulage contractor will provide a tracked machine on site to assist the prime movers in delivering components around the site, particularly where ridges are steep and it is not viable to provide roads suitable for heavy haulage road vehicles.

4 Wind Farm Access

For access and delivery to and from the vicinity of the proposed wind turbines it is proposed that road access will be via Campbells River Rd from the Goulburn Rd. It is anticipates that all turbine components arrive within a 1-3 week period thus creating disturbance only for a very short time.

The daily axil movements for the project are contained in Appendix D.

4.1 Goulburn Road

The Goulburn Road leaves Oberon in a Southerly direction and arrives at Black Springs approximately 25 km south of Oberon. This road is sealed with few bends and there are no significant grades that are likely to cause difficulties for the haulage equipment and transport vehicles.

[1] The BoP Construction includes construction of roads, the electrical reticulation system, the substation and ancillary buildings

4.2 Black Springs

Black Springs is a small community with a single general store and community hall. It is located at the intersection of the Oberon and Taralga Roads. The main road going through Black Springs is sealed with very few and slight bends and will not cause any difficulties for the haulage equipment and transport vehicles.

Figure 5: Black Springs township, looking South from the Goulburn Rd.

4.3 Campbell's River Road

Campbell's River Road provides direct access to the Daisybank and Acqualoria properties, the access of which is located approximately 1 km from the intersection of Swatchfield Rd. Campbell's River Rd is sealed with few curves or climbs at excessive grade. The grades between Black Springs and the Daisybank/Acqualoria Properties is reasonably flat with grades less than 10% which can be easily negotiated by long trailers. Access to the most southern located turbines will be via a gravel Forestry track located immediately to the west of the Daisybank property, as illustrated on the Internal Road Network Plan contained in Appendix C.

Figure 6. Campbells River Rd, looking East, with Daisybank property on rhs.

5. Wind Farm Internal Access

Internal gravel access roads between turbines and to the substation will be required to allow transport of material and equipment to each turbine location. Post construction these roads will be used for maintenance activities and can be grassed over if required by the landholder.

Appendix C shows the proposed layout of these roads. Generally the roads will follow the contour lines and the existing farm tracks. Careful consideration has been given to routing the access tracks away from vegetation and any cultural heritage features to ensure minimal impact[2]. Where possible, existing farm and Forestry tracks will be used and upgraded, if necessary and all internal roadworks will be carried out in close consultation with the affected landowners.

Access to the wind farm will be inside the boundary of "Daisybank" via Campbells River Rd and also a Forestry track located immediately to the west of the site. Access to the Aqualoria property is also via Campbells River Rd.

[2] The impact of internal access roads on the flora and fauna has been assessed in a separate independent ecological assessment conducted by Harper Summers O'Sullivan.

6. Current Road Use

The motorways used to transport the turbines are all heavy vehicle transport routes. These roads experience a high and constant flow of freight transport underpinned by weekly movement of goods between Sydney and Melbourne. The traffic level varies with time of day and week, however generally the heavy traffic vehicle levels would be described as high on parts of the proposed route.

In addition to freight transport, the level of light vehicles traffic is also high on the motorways around Sydney and Melbourne. The main motorways carry a significant level of commuting traffic during the week with delays regularly experienced during the peak times of 8:00-9:30 am and 4:30 – 6:00 pm.

In contrast to the motorways and highways, traffic levels on the public access routes to the wind farm site are very low, except for the traffic associated with logging vehicles and timber delivery. Swatchfield Road has only very limited local traffic and is mainly used for individual farm access.

7. Development Transport and Traffic Impact

The following impacts of transport and traffic associated with the development require consideration:

- Route suitability in terms of load layout, structures and road surface
- Impact on other road users along the proposed routes and associated safety issues
- Impact on local communities
- Onsite traffic and new road construction impact

7.1 Suitability of Existing Road Layout and Structural Capacity

The suitability of the road layout is based on the roads allowing passage of the RAV. The critical vehicles will be those transporting blade and tower parts. The length of the blade trucks means that consideration of bend radii and roads width at bends as well as the approach to bridges is required. The loaded height of the tower sections will require that overpass clearances are checked along the route.

The road surface capacity and condition also requires consideration. Smaller roads may not be designed for the passage of over-mass vehicles, consequently any deterioration or road wear such as potholes or edge spalling may be accelerated by the passage of such loads.

The structural capacity of features such as bridges, drainage culverts and cattle grid need to be addressed. During the RAV permitting process route assessments are undertaken by the Road Traffic Authority in NSW. In NSW the permit assessment will include a review of the structural capacity of bridges along the main roads.

7.2 Impact to Other Road Users and Local Community

Traffic associated with the development has the potential to disrupt and restrict normal traffic flow, increase noise levels experienced by residents and pose a safety threat. Other road users and the communities nearby to the transport routes may be subject to such issues.

RAV vehicles required for the movement of tower components have the potential to restrict traffic flow due their size and slow speed. This may result in significant disruption to traffic when passing through metropolitan areas or lead to delays on single lane roads where there are not opportunities for other traffic to pass.

Where residences are located near transport routes the noise impact of a significant number of slow moving heavy vehicles needs to be considered. In the immediate vicinity of the site the movement of vehicles associated with the civil works trucks bringing material to site (concrete, road base, steel, water etc) will create additional noise and pose a hazard for local road users.

7.3 Traffic Safety

The capacity of RAV vehicles to delay traffic may lead to other road users becoming frustrated and attempting unsafe overtaking manoeuvers. The significant increase in the number of this type of vehicles along a single route compounds the risk.

Wide loads on single lane (each way) roads introduce a hazard for oncoming vehicles. On the highway speed and driver fatigue are a concern while on narrow country roads the unexpected nature of such vehicles and the often windy nature of the route increase the risk to driver safety.

In the rural towns pedestrian traffic is a consideration, particularly in Oberon where the highway passes directly through the commercial centre. The transport of turbine components through these centres will attract attention and may pose an additional risk to the safety of pedestrians as well as other road users.

Where RAV vehicles are required to negotiate significant turns, sufficient warnings to other road users are required and it is likely that traffic control measures will also be needed.

7.4 On-Site Traffic Management

Construction of the wind farm requires that access roads be constructed to each turbine position. These roads and the crane hardstands need to be of sufficient pavement design to facilitate the traffic of heavy and civil works vehicles. Post construction they may be grassed over for the occasional use by maintenance staff.

The nature of the impact on site due to additional access tracks may include disturbance to habitat, potential erosion and the introduction and movement of weeds onto farmland.

Wind farms are normally located away from dense vegetation so that the disturbance of vegetation is minimal. During the hours of construction wildlife are likely to move away from the immediate vicinity; however assuming habitats are not removed this is only a temporary impact. As mentioned earlier, the impact of the construction and use of internal roads on flora and fauna is addressed separately in an independent study.

Disturbance to areas of cultural heritage importance is to be avoided. A separate archaeological site study has been carried out for the site and is contained as an Appendix in the Black Springs Wind Farm Environmental Assessment.

Appropriate drainage design and avoidance of steep slopes and water courses serves to minimize erosion. Further to this, detailed management plans will be

required to ensure the appropriate sediment control measures are put in place on site.

Vehicles will be required to cross land owner boundaries and some will be entering the site with loads which may carry unwanted plants or seeds or spores. The degree of concern regarding the spreading of weeds varies with each landowner. The propagation of weed species may be a negative impact of transport on site and, depending upon the concerns of the landowner, may require control or mitigation through the use of wash down areas for vehicles.

Post construction and commissioning tracks can be re-grassed. During the operational lifetime of the wind farm traffic levels on internal access tracks will be very light. Scheduled maintenance activities occur every 6-12 months using light commercial vehicles or four wheel drives which will have a negligible impact. Rarely there may be the requirement for medium to large cranes to access the site in the unlikely case of the failure of a large component which cannot be repaired on-site. Unless original access roads or hardstand have suffered significant deterioration there is unlikely to be a requirement for further civil works.

8 Impact Assessment

From the respective Ports of Sydney, Port Kembla and Melbourne, heavy vehicles movements are commonplace and frequent. Given the number of heavy vehicles which use the route from the port, along the major highways the additional impact of the development traffic is not expected to be a concern.

Ramps joining the main Motorways are single lanes but of adequate width and bend radius to accommodate the blade trucks. Any single lane ramp connections between the Motorways with concrete barriers and turns through 90° will require a more detailed assessment during the specific transport permitting stage.

There are a number of overhead structures between the Port of Sydney and along the Great Western Highway. These include bridges, conveyors, toll booths and signs however all are at least 5m high and provide sufficient clearance for all RAV's travelling from the Port.

Figure 7: Overpass on the Great Western Highway heading west

The tower sections may also be transported from the Port if they cannot be manufactured locally. The first two sections of tower have a maximum diameter of

4.2m, and will have a loaded height which may exceed 5m. Consideration of overhead clearance will be critical for the transport of these components and assessed in detail during the transport permitting stage.

If possible, the transport of turbine components should be scheduled to avoid known peak traffic times at the Port as well the commuter peak hour.

The Great Western and Hume Highways both carry a significant level of heavy vehicle traffic. The pavement design is expected to be of sufficient standard to accommodate the development traffic without issue.

The use of the Great Western Highway through the Blue Mountains will require negotiation of some steep grades and curves. The larger loads will seek to avoid this route, preferring access via the Hume Highway.

8.1 Wind Farm Access

The proposed route from the Goulburn Road is a relatively wide local road and experiences some heavy vehicle movements in the form of logging trucks and timber deliveries to Oberon.

The turbine component RAV's will not be restricted by the layout of the Goulburn Road access as it provides sufficient width for the turning of the blade and tower trucks. The pavement condition is also good along the Goulburn Road and Campbell's River Road to the Daisybank and Acqualoria Farm gate.

Wind farm traffic is required to turn left and right from the Campbell's River Road into the wind farm site. The road is sufficiently wide and any turns should be easily negotiated by blade and tower trucks. When the trucks enter the site compound, signalling and traffic management will be required for this short time period.

Figure 8: Access onto the Daisybank property from Campbell's River Road

There will be some impact of construction traffic to the residents of the Black Springs Township and to those residents on and using Campbell's River Road. The impact will be in the form of increased traffic and some daytime noise disturbance as well as possible traffic delays on the roads in the immediate vicinity of the site. All road vehicles must comply with RTA noise guidelines.

Given the number of concrete trucks required to access the site during the concrete foundation construction, this period of work is likely to be the period of greatest impact to residents.

Although the number of vehicles will increase above the average daily movements for the construction period, their movement on the roads will be quicker and less obstructive than that the transport of turbine components. A concrete batching plant will be operating on site and is proposed to be located on Daisybank adjacent to the substation. This will significantly reduce the distance that concrete agitators need to travel on public roads and therefore minimize the extent of disturbance.

Periodically during the pouring of the foundation, bulk carriers will use the Campbell's River Road to bring raw materials (cement, water, sand and gravel) to the batching plant site. This adds to the traffic level on this route, but as the batch plant has bulk storage capability, the deliveries will not be constant but rather spread intermittently at no more than one or two additional movements per day during the foundation period.

Any drainage culverts or small creek crossings between the Goulburn Rd and site will need to be assessed for strength prior to permitting.

8.2 Wind Farm Internal Access and Road and Traffic Impact

The construction of roads and hardstands on the wind farm site has an impact on the local environment as does the traffic activities which occur on them. The impact on both Flora and Fauna and cultural heritage has been assessed and minimized through consideration in design.

Across the majority of the site, existing public roads and the existing farm roads are used to access the turbine locations. As a result the new internal access roads linking turbines are generally located away from water courses. In some cases descent and accent of ridge slopes is required. In order to maintain a feasible grade (less than 15%) for turbine component transport the proposed roads may traverse slopes. In these locations road construction will require cut and fill techniques and the implementation of appropriate erosion and sediment control measures will be critical.

The main access to the wind farm uses the existing access road to Daisybank and Acqualoria Farms which are well maintained and suitable for heavy traffic. The small individual access tracks to the turbines will be built to avoid damage to the sealed Campbell's River Road according to council requirements. The turn-offs will have to be wide enough to allow the turning of the long trailers used for blade transport. As these roads will only be for 1 turbine each, only very limited traffic can be expected during construction which should be taken into account when defining the turnoff-design. Due to the existing roadside vegetation, appropriate locations with no requirement for tree-clearing shall be defined by the developer together with council.

Over the wind farm area internal access roads may cross cadastral boundaries. In some cases these crossings will be critical (land owner boundaries) while at other

times they may be landowner internal boundaries without any fencing. There is a risk that boundary requirements such as the holding of stock and restriction of weed transfer between properties will be compromised. This risk will be managed in consultation by affected landowners to ensure proper stock management and weed control during construction.

Road construction involves the removal of ground cover and topsoil followed by the laying of road base. The amount of road base material that is required to be brought into the site will depend upon the existing ground conditions. Movement of road material and topsoil can contribute to the problem of weed transfer.

These potential impacts can be minimized through implementation of control and mitigation measures.

9 Impact Mitigation

The most significant impact from the proposed development is likely to be experienced at a local level and be due to the increase movement of traffic along the wind farm access routes. To reduce the disturbance of development traffic upon local residents and other road user's, notice of the impending traffic conditions should be provided. This can be in the form of radio and newspaper notices as well as posting on community noticeboards. In addition to media notification, roadside notice and warning signs will be utilized.

Through the permitting process consultation with Shire Councils along the transport route may be required. Consultation with the local council in which the wind farm is proposed (Oberon Shire Council) will take place. Local councils are likely to have conditions regarding the maintenance of access roads as well as requirements on community notification. Given their knowledge and understanding of local road conditions consultation with the public works department of each council will be valuable.

The volume of RAV traffic may impact other road users particularly on single lane sections of road. Where transports pass through towns and settlements, the timing of the traffic should be, if possible such to minimize the impact on the local community. It would be assumed that turbine components are transported through the major metropolitan areas outside peak hours. As the roads may only be single lane from the Ports to the main Motorways, appropriate timing should be given to avoid any peak transport loading times at the port.

All RAV's will have warning signage indicating an oversize or over mass vehicles, escort (where required) and night travel restrictions[3]. Night travel restrictions may also be applied to construction traffic other than those carrying turbine components. This could include construction traffic travelling locally such as concrete agitators or dump trucks.

Traffic control will be utilized where vehicles are required to carryout potentially hazardous manoeuvres on public roads. These include turning at intersections, turning across the path of oncoming traffic and when operating on winding sections of road where visibility is limited. While on single lane highways slow moving vehicles will be required to move off the road at times to allow traffic to pass.

[3] As per NSW Department of Main Road requirements

On the wind farm site it is critical that a detailed site management plan be drafted and referred in order to mitigate the impact of transport related activities. The development of this plan should include close consultation with landowners to ensure their interests are protected. Within the site management plans the following are to be addressed;

- Erosion and sediment control
- Control of Stock
- Minimization of seed and weed transport
- Site Security

On-site access roads and hard stands are to be located such that disturbance to vegetation and existing hydrological patterns is minimized. An example of a preliminary management plan is included in Appendix B.

To minimize vegetation and habitat impact as well as weed transport, construction traffic and materials will be restricted to allocated tracks, set down areas and hardstands, using only wide sections or specific passing areas to manoeuvre around materials and other traffic. Where weed transfer is of critical concern vehicle wash-down stations can be set up.

Local access roads and internal wind farm access roads will endure a relatively high level of heavy vehicle traffic during the construction period. The condition of local roads should be assessed prior to the start of work and then regular maintenance carried out to ensure they are kept in a safe condition. The monitoring of local road conditions will involve the local council department. Although not monitored by an external authority, internal access roads must also be maintained to ensure safety and effectiveness of sediment and erosion controls.

10 Conclusion

The purpose of this report has been to consider the overall impact of traffic and traffic related activities from the construction and operation of the Black Springs Wind Farm which is proposed 25km south of the township of Oberon in New South Wales.

The impacts of wind farm construction traffic are going to be highest in the immediate vicinity of the site. Notification of the local community, appropriate warning signs and traffic control will minimize any safety risk. Any daytime noise disturbance or delays in traffic are considered to be a relatively small impact considering the local population and the temporary nature of the traffic. Close consultation with local councils and the implementation of mitigation measures will ensure a minimal impact to both the local community and those travelling through the area.

Transport of turbine components to site will require over size and over mass haulage and it is predicted this will occur at an average of one additional road movement per day The alternate routes have been identified and are considered feasible however consideration of timing to avoid peak traffic times as well as an awareness of safety issues will be important. It is recommended a Traffic Management Plan be prepared by experienced contractors, liaison with the permitting sections of both state road departments and notification of local shire councils on route will ensure that the overall impact and disturbance to infrastructure and other road users is minimal.

The impact of traffic on the wind farm site is largely associated with the construction of gravel roads and hardstands. Independent flora, fauna and archaeological studies have been completed and have concluded that the impacts are minimal. Through the implementation of an on site management plan and consultation with landowners other potential impacts such as erosion, disturbance of waterways, weed propagation and stock control can be minimized.

In conclusion, taking into account the current road usage near the Black Springs site and the expected increase in traffic, particularly during the construction phase, we are of the opinion that the impacts from traffic and traffic related activities due to the Black Springs Wind Farm are not significant and where there are impacts identified these can be mitigated with good management and the implementation of a Traffic Management Plan by an experienced contractor during construction.

Appendix A Estimated Transport Movements

Transport load	Total Quantity (max)	Vehicle	Vehicle movements (incl. return)
Turbine Components			
Blades (3 per WTG)	27	RAV	54
Hubs	9	RAV	18
Nacelles	9	RAV	18
Tower Sections (4 per WTG)	36	RAV	Approx 80
Wind farm Substation			
Substation Transformer	1	RAV	2
Switchgear and other substation equipment	1	Semi Trailers	8-16
Construction Materials			
Concrete	~5,000m^3	Concrete Agitators	1300
Reinforcing Steel	~400t	Semi-trailers	18
Roadbase	5000 m^3	Dump Truck	150
Fill	3,000 m^3	Dump Truck	80
Cables	7km	Semi Trailers	10
General Equipment/Materials	Nominal	Semi-trailers	110
Non Materials Traffic			
Cranes	2	Semi-trailers and mobile wheel based cranes	2
Staff (6 month construction)	10-15	Light vehicles	2500-3200
Earthmoving vehicles and equip.	6	Various	16
Establishment and Disestablishment	Nominal	Semi-trailers	8

Appendix B Preliminary Erosion and Sediment Plan

Preliminary Erosion & Sediment Management Plan

A detailed Erosion & Sediment Management Plan will be developed by Energreen within the first 12 months of project development.

Principles

- Effective erosion and sediment control is essential given that site adjoins some seasonal waterway and land has significant slope constraints.
- No disturbance within 40 metres of a creek line.
- Temporary access via existing access to include a ‘shaker ramp’ to minimise tracking of sediment onto Maybole Road and other access or transport roads.
- Site compound and temporary material storage site identified.
- Existing grassed areas identified as sediment filter to remain generally undisturbed during construction.

Notes

(i) Diversion of all clean runoff to the stable disposal areas prior to entry to disturbed areas

(ii) All hardstand and stockpile sites to have runoff diverted around stockpile areas

(iii) Sediment fence to be located below all disturbed areas and stockpiles

(iv) All structures to be de-silted after storm events to maintain capacity and function

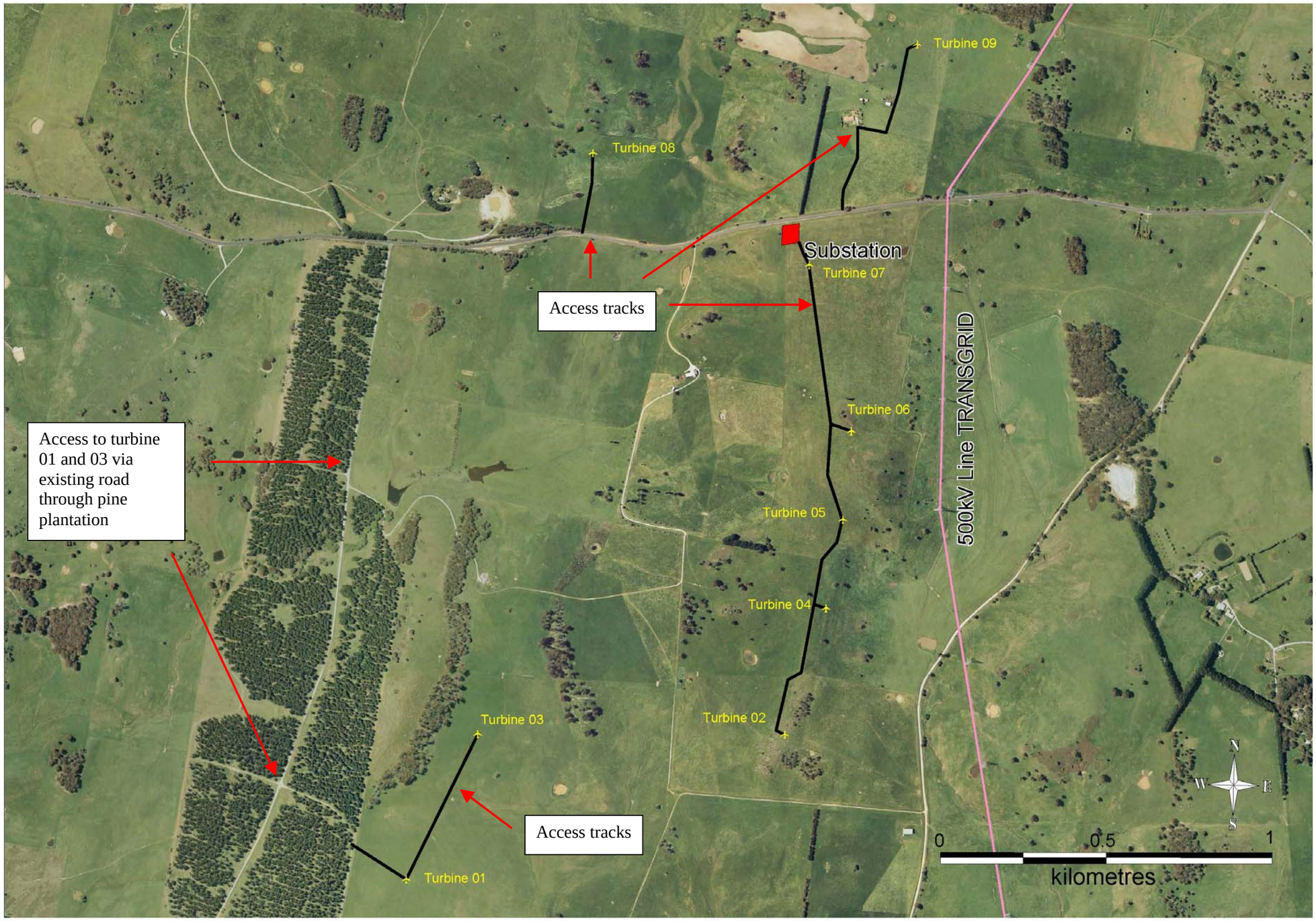
(v) Course aggregate and ‘shaker ramp’ at entry to site to prevent sediment being tracked onto adjoining roads

(vi) At end of work each day ‘silt sausages’ are to be placed across disturbed carriageway to minimise erosion in the event of an overnight storm

(vii) Topsoil stockpile should not be more than 2m deep and seeded with appropriate grasses

(viii) The site supervisor shall exercise discretion as to the appropriate location of erosion and sediment control measures given the stage of operations and the nature of soil disturbance.

Appendix C Internal Road Layout



Appendix D Daily Axle Movements

Transport Load	Quantity	Vehicle	Axles	Vehicle Movements (including Returns)	Total Axle Movement	Time Taken to Construct (days)	Daily Axle Movement
Turbine Components							
Blade Delivery	27	RAV	10	54	540	21	26
Hubs	9	RAV	6	18	108	21	5
Nacelles	9	RAV	6	18	108	21	5
Tower Sections	36	RAV	9	80	720	50	14
Total			**31**	**170**	**1476**	**113**	**50**
Wind Farm Substation							
Substation Transformer	1	RAV	10	2	20	5	4
Switchgear & Other Equipment	1	Semi Trailer	6	16	96	21	5
Total			**16**	**18**	**116**	**26**	**9**
Construction Materials							
Concrete	5,000m³	Concrete Agitator	6	1,300	7800	50	156
Reinforcing Steel	400t	Semi Trailer	6	18	108	50	2
Roadbase	5,000m³	Dump Truck	3	150	450	30	15
Fill	3,000m³	Dump Truck	3	80	240	60	4
Cables	7km	Semi Trailer	6	80	480	60	8
Equipment/Materials	Nominal	Semi Trailer	6	110	660	80	8
Total			**30**	**1,738**	**9738**	**330**	**193**
Non-Materials Traffic							
Cranes	2	Semi Trailer & Mobile Wheel Based Crane	52	2	208	10	21
Staff	10 to 15	Light	2	3,000	6000	250	24
Earthmoving Equipment	6	Various	9	16	144	60	2
Establsihment/Disestablishment	Nominal	Semi Trailer	6	8	48	60	1
Total			**69**	**3026**	**6400**	**380**	**48**

References

Voll, B (2005). *Highfields Wind Farm Project, Traffic and Transport Study*. Energreen Wind 23/10/2005.

Voll B (2006) *Black Springs Wind Farm. Noise Study.* Energreen Wind 22/3/06.