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**ACCESS ISSUES AND MITIGATION
REPORT
for
EMPIRICA INVESTMENT LIMITED**

**PROPOSED WIND TURBINE INSTALLATION
at
HUNTROYDE FARM, NELSON**



carl **TONKS** consulting

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Client:		Empirica Investment Limited	
Project Name:		Proposed Wind Turbine Installation at Huntroyde Farm	
Project Number:		2012-F-001-018	
Report Title:		Access Issues and Mitigation Report	
Created by:	Carl Tonks	Date:	February 2013
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Approved by:	Carl Tonks	Date:	February 2013

1. INTRODUCTION

- 1.1 **carl TONKS consulting** is commissioned by Empirica Investments Limited to investigate practical issues of construction vehicle access associated with its proposal to install a wind turbine at Huntroyde Farm, Padiham, in the county of Lancashire.
- 1.2 This report has been compiled by visiting the site to observe the geometry and operation of the local highway network, along with a bespoke traffic survey and in light of data from the proposed turbine manufacturer and considerable experience of transporting construction components associated with wind turbines to sites often in rural locations, throughout the country.
- 1.3 This report is structured such that;
- **Chapter Two** will discuss the site location and characteristics;
 - **Chapter Three** identifies the development proposals;
 - **Chapter Four** will describe the kind and number of vehicles required to install the proposed wind turbine including relevant characteristics, particularly size;
 - Proposals for accessing the site from the adjacent highway are discussed in **Chapter Five**;
 - **Chapter Six** identifies the proposed route for construction vehicles to reach the site;
 - **Chapter Seven** draws conclusions from the observations and analyses presented in this report.

2. SITE LOCATION AND LOCAL HIGHWAY NETWORK

Site Location

- 2.1 The location of the proposed wind turbine installation is illustrated in Figure N160-PA-GR-001A SITE LOCATION, produced by one associates and included herewith as Appendix A. It is situated on under-utilised farmland at Huntroyde Farm, near to Padiham in the County of Lancashire.

Local Highway

- 2.2 This is a rural location and consequently served by a road network of typically rural construction. The road fronting the site is known as Whins Lane and exhibits generally straight horizontal alignment. Carriageway width has been measured as 6.45m in the vicinity of the proposed site access and is observed to vary little. The edge of carriageway is marked with stone walls of a height which precludes oversail by the load, despite the land on both sides being in the ownership and control of the applicant. No footways are provided in the vicinity of the proposed site access. Vertical alignment in the vicinity of the site is typically flat.
- 2.3 The route from the site to the major highway network comprises Whins Lane, Sabden Road and Slade Lane, connecting to the A6068 near to the outskirts of Padiham. Forward visibility is generally excellent throughout much of the local highway network and particularly the lane adjacent to the site frontage, enabling visibility of approaching vehicles from a considerable distance.
- 2.4 The proposed development site is accessed via a private farm track which connects to Whins Lane via an agricultural gateway, which comprises a double width five-bar gate. These gates measure 3.6m each and join via a metal post, which is removable in order to provide the full 7.2m width for turning from Whins Lane onto the farm track. The farm track climbs gently before passing close to an historic barn, thence heading across open farmland to the proposed location of the turbine.
- 2.5 A short distance to the east of the proposed site access is a private access to the Home Farm estate and to the east of this is provided a footway on the southern side of the carriageway.

- 2.6 Some 400m east of the proposed site access Whins Lane passes through a relatively tight double bend, which appears to exhibit constrained carriageway width. Carriageway measurements in this location, however, demonstrate only nominal narrowing, suggesting that this is predominantly a visual effect, no doubt due to the existence of tall stone walls immediately abutting the carriageway throughout the double bend. A bridge crossing a small stream is situated within this double bend arrangement. Carriageway widths north of the double bend are measured as 6.1m, with a further 1.8m footway provided on the southern side. To the south of the double bend the carriageway measures 5.8m and a footway of 1.5m is provided, again on the southern side. Within the double bends, spot measurements of 5.4m, 5.3m and 5.1m were taken and no footways are provided.
- 2.7 Heading further in a southerly direction, Whins Lane meets Sabden Road adjacent to Wall Green Farm. The northwest-south movement to and from Whins Lane forms the primary movement at this junction, with Sabden Road (north) forming the minor arm, however, south of here the road name is changed to Sabden Road. Heading into Padiham, Sabden Road becomes Slade Lane and exhibits a carriageway width of 8.9m, with narrow footways provided on both sides.
- 2.8 A total of some 1.4km from the proposed site access, Slade Lane connects with the A6068 via a priority T-junction. At this junction, the movement from A6068 towards Slade lane northbound is a gentle turn with a wide carriageway. A pedestrian island is provided, although the pinchpoint between the nearside kerb and the island measures a minimum of 5.8m. A6068 flares on the nearside as the junction with Slade Lane is approached in a northbound direction. Photographs of Whins Lane, Sabden Road and Slade Lane, including its junction with A6068 are included as Appendix B.
- 2.9 West of Padiham and around 1km south of its junction with Slade Lane, A6068 meets A671 Whalley Road via a traffic signal controlled cross roads junction. Geometry of this junction is generous, with carriageway width of A6068 flaring to two lanes on the northbound approach to this junction. The inside lane is a dedicated left turn, which is separately controlled, resulting in only a single northbound ahead lane, although hatching on the nearside provides significant carriageway width.

- 2.10 Continuing in a south-westerly direction, a further 750m south of its junction with A671, A6068 meets Blackburn Road (A678) at another signal controlled cross-road junction. No left turning movements at this junction are signal controlled, with priority controlled left slips provided on each arm. In addition, the northbound A6068 is provided with a straight ahead lane and a dedicated right turn lane at the stop line, although both are controlled together and share a single stop line. This provides significant width for wide loads undertaking the straight ahead manoeuvre at this junction, which are able to straddle both lanes crossing the stopline.
- 2.11 Photographs of the junctions of A6068 with A671 and A678 are included as Appendix C.
- 2.12 A little under 2km further south, A6068 meets the M65 motorway at Junction 8. This is a grade separated roundabout junction of substantial Inscribed Circle Diameter (ICD) and easily capable of catering for large loads.

3. DEVELOPMENT PROPOSALS

- 3.1 Proposals comprise installation of a single turbine on currently under-utilised land at Huntroyde Farm. Specifically, it is currently proposed to install an Enercon E-33 turbine. An illustration of load requirements for an Enercon E-33 installation is provided as Appendix D. This comprises an excerpt from Enercon publication "Access Roads and Crane Platforms E-33".
- 3.2 Of specific relevance to the delivery of turbine components is the following breakdown of component sizes;
- Blade length 20m;
 - Tower sections (x2) max length 22m
max width 3m;
 - Nacelle diameter 3.2m;
 - Generator width 2m.
- 3.3 The above components are transported individually, as Abnormal Indivisible Loads (AIL). In addition to the above AIL will be a requirement for delivery of construction materials pertaining to the turbine foundation and export of material removed during the foundation construction. These are considered in Chapter Four.
- 3.4 The above AIL components will be delivered by means of the following numbers and kinds of vehicles;
- Tower components x2;
 - Machine housing;
 - Hub;
 - Generator; and,
 - Blade vehicles x3;

4. CONSTRUCTION TRAFFIC VOLUMES AND CHARACTERISTICS

4.1 Erection of a wind turbine requires transport of various components to the construction site, some of which are available in a form which can be transported using "normal" heavy goods vehicles (HGV), whilst others are of a size and/or weight which require to be transported as AIL. Typical AIL deliveries associated with transporting construction components for an Enercon E-33 turbine are identified in Paragraph 3.2, above. In addition to these, further requirements include;

- mobile crane;
- transport of foundation material (hardcore and ready-mixed concrete) to the site; and,
- transport of excavated material from the site.

4.2 Other than the mobile crane, which is required once per site, the numbers of vehicles associated with the other functions above vary from site to site and will become clear following ground investigations further to grant of planning permission. For the purpose of informing the consideration of the planning application, however, typical indicative vehicle numbers are quoted below;

- removal of earth and delivery of concrete typically result in a combined total of some 32 movements (16 vehicles in and out) per turbine;
- earth removal is typically undertaken using rigid tipper trucks;
- concrete deliveries are by ready mixed concrete trucks;
- excavation occurs immediately prior to foundation construction;
- foundations are typically poured in a single day;
- export of excavated material and import of foundation material is typically complete within a period of up to around 5 days maximum;
- goods vehicle movements within this 5 day period typically peak at around 10 – 12 vehicle movements per day (5 – 6 in and a further 5 – 6 out).

4.3 In addition to the above are the AIL deliveries associated specifically with the turbine. These require typically 8 deliveries per turbine, comprising;

- blades x 3;

- tower sections x 2;
- nacelle;
- generator; and,
- generator casing.

- 4.4 The crane is clearly required in addition to the above and represents a single arrival at commencement of the erection process, followed by a departure following construction.
- 4.5 Of the above, the blade vehicle is generally considered the most onerous in terms of manoeuvring swept path, due to the arrangement of the load on the transport vehicle. The blades are generally transported one per vehicle, although on occasions multiple blades can be arranged on a trailer. The steerable rear wheels of the transport vehicle are generally located beneath the blade, such that the blade tip overhangs the rear of the vehicle. This overhang can be up to 5m, dependant on blade length, and therefore creates a significant rear “over-sail” on corners. It is this that generally makes the blade vehicle the most onerous in terms of manoeuvrability.
- 4.6 In addition to the blade vehicle, the two tower sections are of similar length, although greater width at the base. The arrangement on the trailer, however, tends to make the tower sections typically more manoeuvrable than the blades.
- 4.7 Assuming agreement can be reached with the relevant highway authorities, components for a single turbine are typically delivered within one to two days.

5. SITE ACCESS ARRANGEMENTS

- 5.1 It is proposed to access the site from the adjacent highway, by means of the existing agricultural gates on Whins Lane. This manoeuvre has been investigated for the blade carrying vehicle, which is typically the most onerous in terms of manoeuvring space and the resultant swept path analysis is illustrated in Figure 5.1.
- 5.2 Available visibility has been measured from this junction. The proximity of the adjacent stone walls severely restricts visibility from the farm track on approaching this junction and measured visibility splays are as identified below;
- Visibility splay to the right – 2.4m x 15m; and,
 - Visibility splay to the left – 2.4m x 16m.
- 5.3 The above notwithstanding, as identified in Chapter Two of this report, Whins Lane in the vicinity of the site access is a straight and flat alignment, resulting in excellent forward Stopping Sight Distance for traffic using this road. The above visibility splays fall significantly short of national design standards, however, visibility available from the edge of carriageway has been measured as identified below;
- Visibility to the right = 275m; and,
 - Visibility to the left = 141m.
- 5.4 A classified Automatic Traffic Counter survey has been undertaken in order to advise on traffic volumes, vehicle types and speeds for traffic currently using Whins Lane. Speeds measured in this survey are summarised in Table 5.1, below.

Table 5.1; Measured Traffic Speeds on Whins Lane and Implied Visibility Requirements

Direction	85 th Percentile speed (mph)	Design Speed (kph)	Stopping Sight Distance (m)
Westbound	43.5	70	90
Eastbound	36.8	60	120

- 5.5 It is clear from the above that, although the visibility splay available from an 'x' distance of 2.4m is substandard, that available from the carriageway edge exceeds the relevant Stopping Site Distances for the measured traffic speeds. Moreover, the above Stopping Site Distances are quoted from TD42/95 and are thereby based on significantly outdated research. More recent and relevant research has been undertaken in preparing Manual for Streets, which has redefined the appropriate 'y' distances which should be achieved for vehicle speeds of up to 40mph.
- 5.6 Vehicles leaving the construction site will comprise normal HGV's only; once off-loaded, AILs are reduced in size to a maximum of 16.5m articulated vehicles. It is proposed that the construction traffic management plan will require all vehicles leaving the construction site to halt at the edge of Whins Lane. From this location, visibility equating to the appropriate Stopping Site Distance of traffic on Whins Lane is available in both directions. It is further noted that the constraint on visibility is the two stone walls adjacent to the access junction. Construction vehicles will comprise large lorries, in which the driver will be positioned at a height enabling visibility over the walls. In combination, the above effects will ensure that the junction is safe in operation.
- 5.7 On accessing the construction site from the gateway, vehicles will use initially the existing agricultural track, which will be improved as necessary, to access the yard adjacent to the historic barn, from whence the construction site will be accessed using newly constructed tracks across farmland. All of the necessary land is within the control of the applicant. Given that this does not form part of the adopted highway and nor will it be offered for adoption, the on-site access routes are not considered in detail in this report.
- 5.8 A preliminary consideration of access routeing is provided in Chapter Six, including identification of the route from the M65 motorway.

- 6.6 Slade Lane has significant carriageway width and will enable AILs to pass oncoming vehicles safely. Sporadic on-street parking on Slade Lane may require opposing traffic to wait while the convoy passes, however, such delays will be nominal only.
- 6.7 Where Slade Lane leaves the residential area and heads into the country it is renamed Sabden Road and narrows slightly. Beyond the junction with Higham Road it is no longer appropriate to permit opposing traffic to pass the convoy and traffic will require to be held back to allow the convoy to safely pass. This should be achieved by holding opposing traffic firstly on Sabden Road whilst the convoy passes onto Whins Lane and thereafter at a point immediately west of the site access on Whins Lane.
- 6.8 The distance from the Sabden Road junction to the site entrance is approximately 700m, which at a nominal convoy speed of 20mph will take less than one and a half minutes, which is not considered a material delay.
- 6.9 Shortly after leaving Sabden Road, on Whins Lane, the convoy will be required to pass through the double bends over the bridge, described in Paragraph 2.6, above. This manoeuvre has been investigated using AutoTRACK computer software and the resultant swept path is illustrated in Figure 6.2, which demonstrates that sufficient space exists to permit safe passage by components for an E-33 turbine in the absence of conflicting traffic.
- 6.10 A short distance further along Whins Lane, the convoy will undertake a right turn into Huntroyde Farm and thence to the proposed construction site.

7. SUMMARY AND CONCLUSION

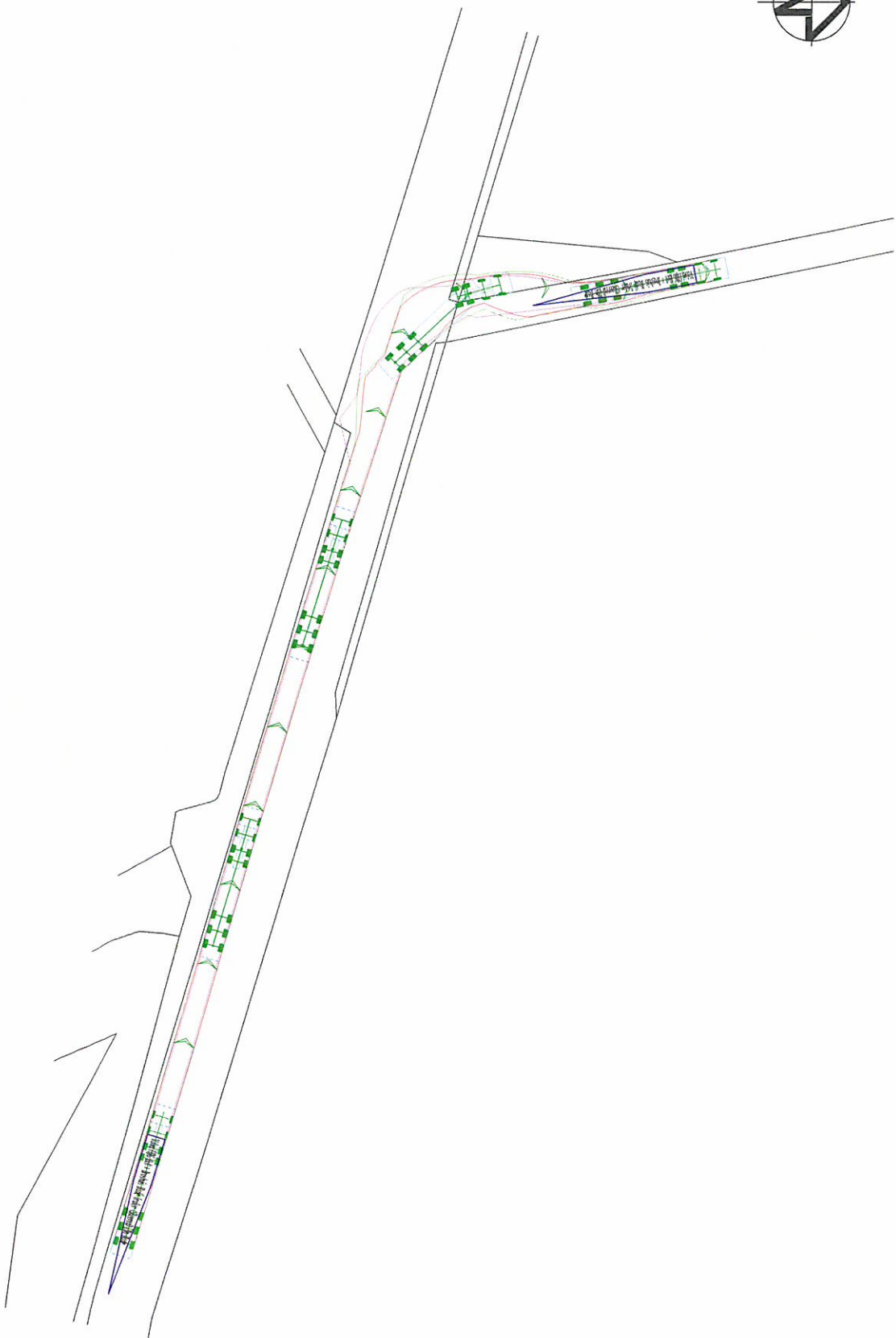
Summary

- 7.1 Empirica Investment propose to install a single wind turbine on under-utilised land at Huntroyde Farm in Lancashire. The proposed turbine will be an Enercon E-33 and will require delivery by up to eight Abnormal Indivisible Loads. In addition, the erection of the turbine will require access to the construction site by rigid HGV in order to export excavated material and import hardcore and ready-mixed concrete for construction of the required foundations.
- 7.2 The construction period is anticipated to require access by the above vehicles for a total of around 7 days (5 days by HGV and 2 days by AIL).
- 7.3 Construction traffic will be routed to and from the proposed development site from the M65 motorway (Junction 8) and via A6068 and local rural roads.
- 7.4 Junction 8 is a large diameter grade separated roundabout, which can cater successfully for passage of the necessary AILs.
- 7.5 A6068 heading north from Junction 8 is of significant width and will cater successfully for passage by the required vehicles, safety of oncoming traffic being ensured by convoy escort vehicles patrolling ahead and making southbound traffic aware of the approaching AIL convoy.
- 7.6 Both of the traffic signal controlled junctions on the A6068 (with A671 and A678) offer sufficient width at the northbound stoplines to permit AILs to pass successfully without material risk of striking signal equipment, signage or other street furniture.
- 7.7 The junction of A6068 with Slade Lane is of sufficient width and gentle angle to permit ease of passage by the AIL convoys.
- 7.8 On leaving Slade Lane, onto Sabden Road, traffic will be held at the junction of Sabden Road with Whins Lane, thence as the convoy passes onto Whins Lane, opposing traffic will be held west of the proposed site access junction. Delays associated with each of these are nominal.

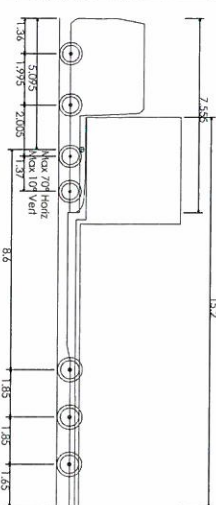
- 7.9 Once within the farmland, the convoy will travel on agricultural tracks improved as necessary to cater the loads and in accordance with standards specified by the turbine manufacturer, Enercon.

Conclusion

- 7.10 The above route presents a practical opportunity for access for an E-33 turbine without material implications in terms of either delay to existing traffic movements or road safety.



NOTES



Volvo FH16 8x4 + Broshuis Blade Trailer (Steered) 20m Blade
Overall Length 21.65m
Overall Width 7.54m
Overall Body Height 1.36m
Min Body Ground Clearance 1.37m
Track Width 2.005m
Lock to Lock Time 6.80 sec
Wall to Wall Turning Radius 9.800m

EMPIRICA INVESTMENTS Ltd

HUNTROYDE

SITE ACCESS
ARRANGEMENT

FIG 5.1 1:500@A3

2012-F-001-2003-018

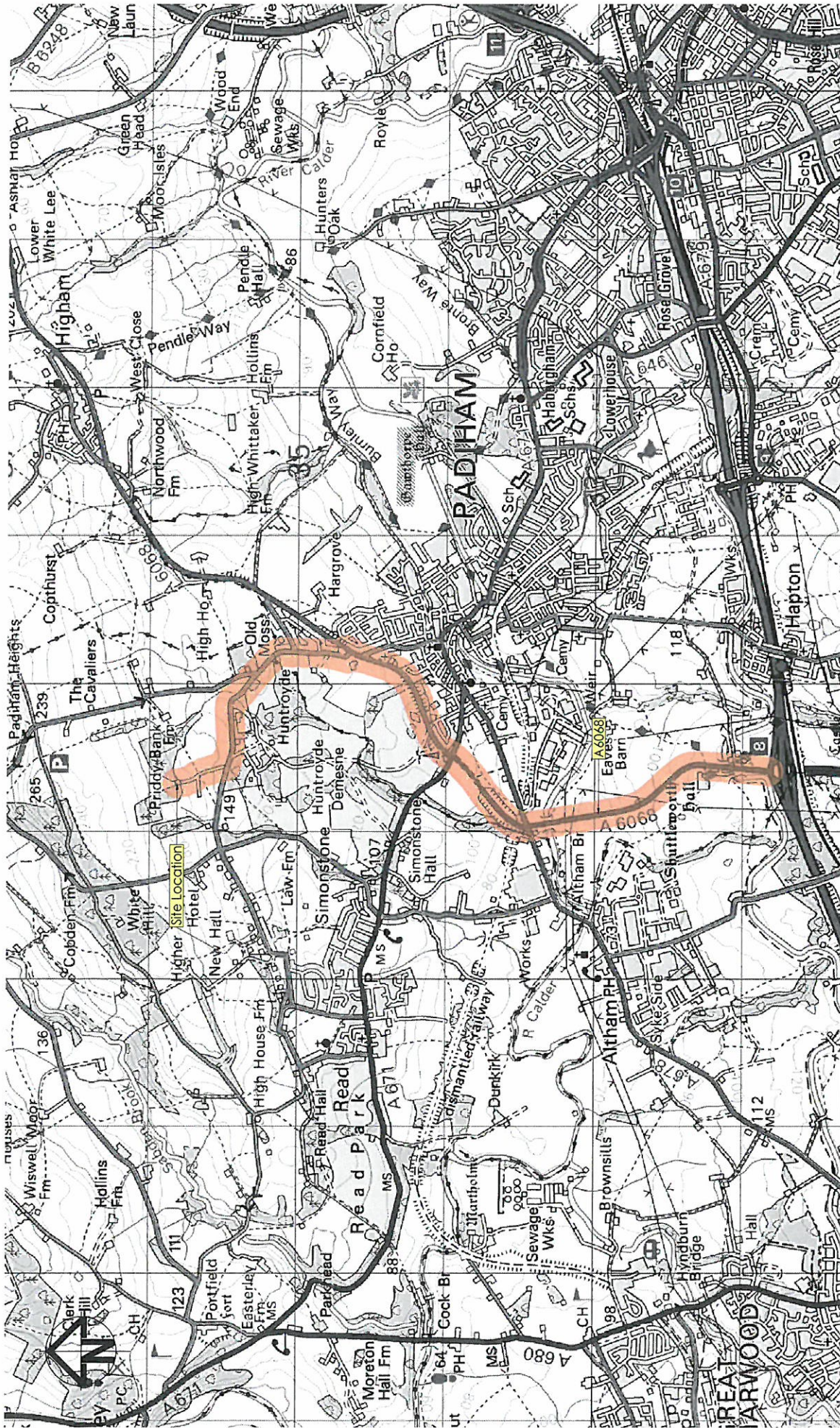
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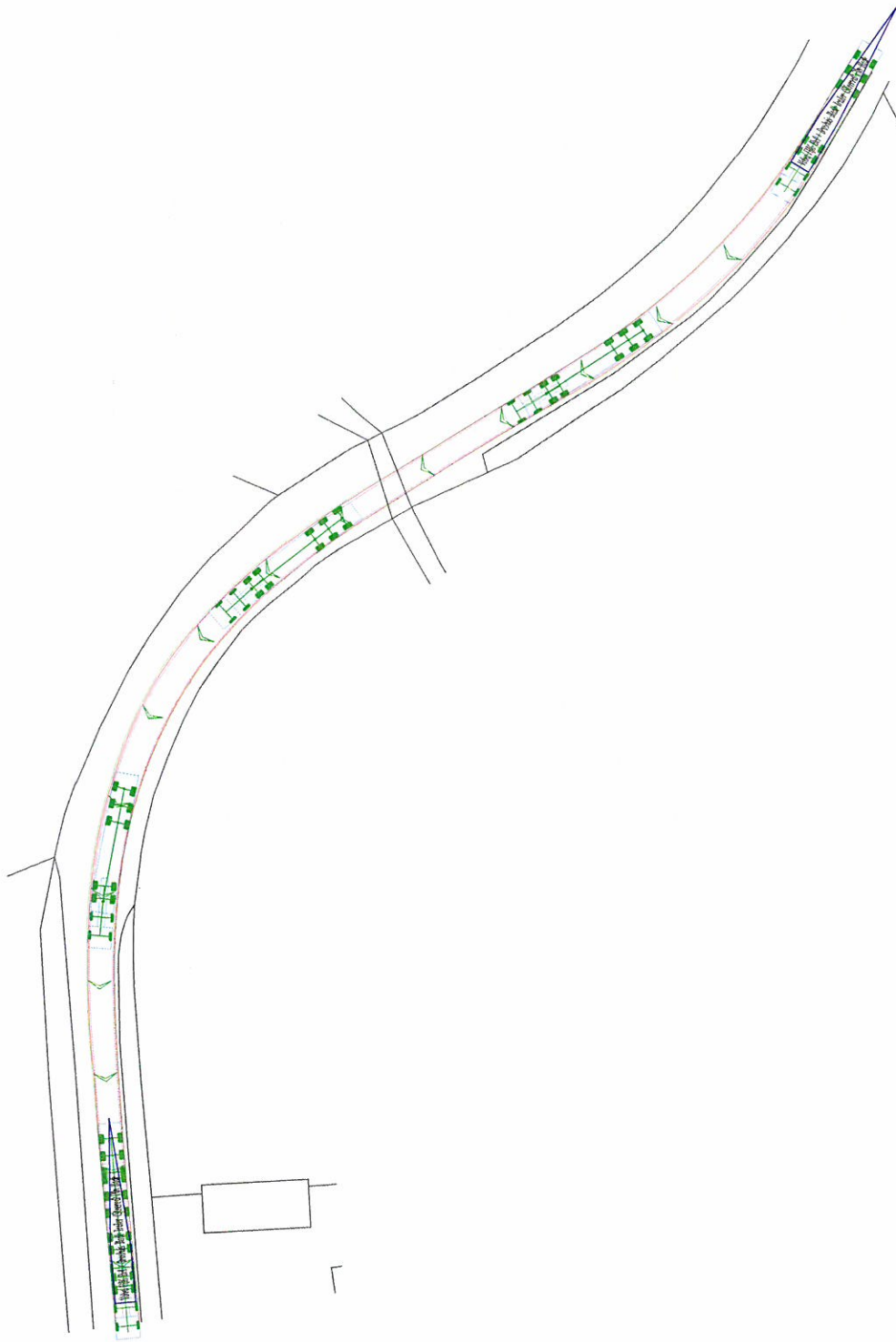
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NOTES

NOTES		EMPIRICA INVESTMENTS Ltd	INDICATIVE ACCESS ROUTE	 carl TONKS consulting 523 Horizon, Broad Wier, Bristol BS1 3DJ T - 0117 382 0507 M - 07866 543939 www.tonks-consulting.co.uk	A		
					FIG 6.1	N.T.S@A3	
					2012-F-001-2013-018		
HUNTROYDE							

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NOTES Volvo FH16 8x4 + Broshuis Blade Trailer (Steered) 20m Blade Overall Length 19.045m Overall Width 2.550m Overall Body Height 4.800m Min Body Ground Clearance 0.375m Track Width 2.500m Lock to Lock Time 6.00 sec Wall to Wall Turning Radius 9.800m	EMPIRICA INVESTMENTS Ltd	HUNTROYDE	WALL GREEN BRIDGE DETAIL	FIG 6.2	1:500@A3	A
				2012-F-001-2003-018		

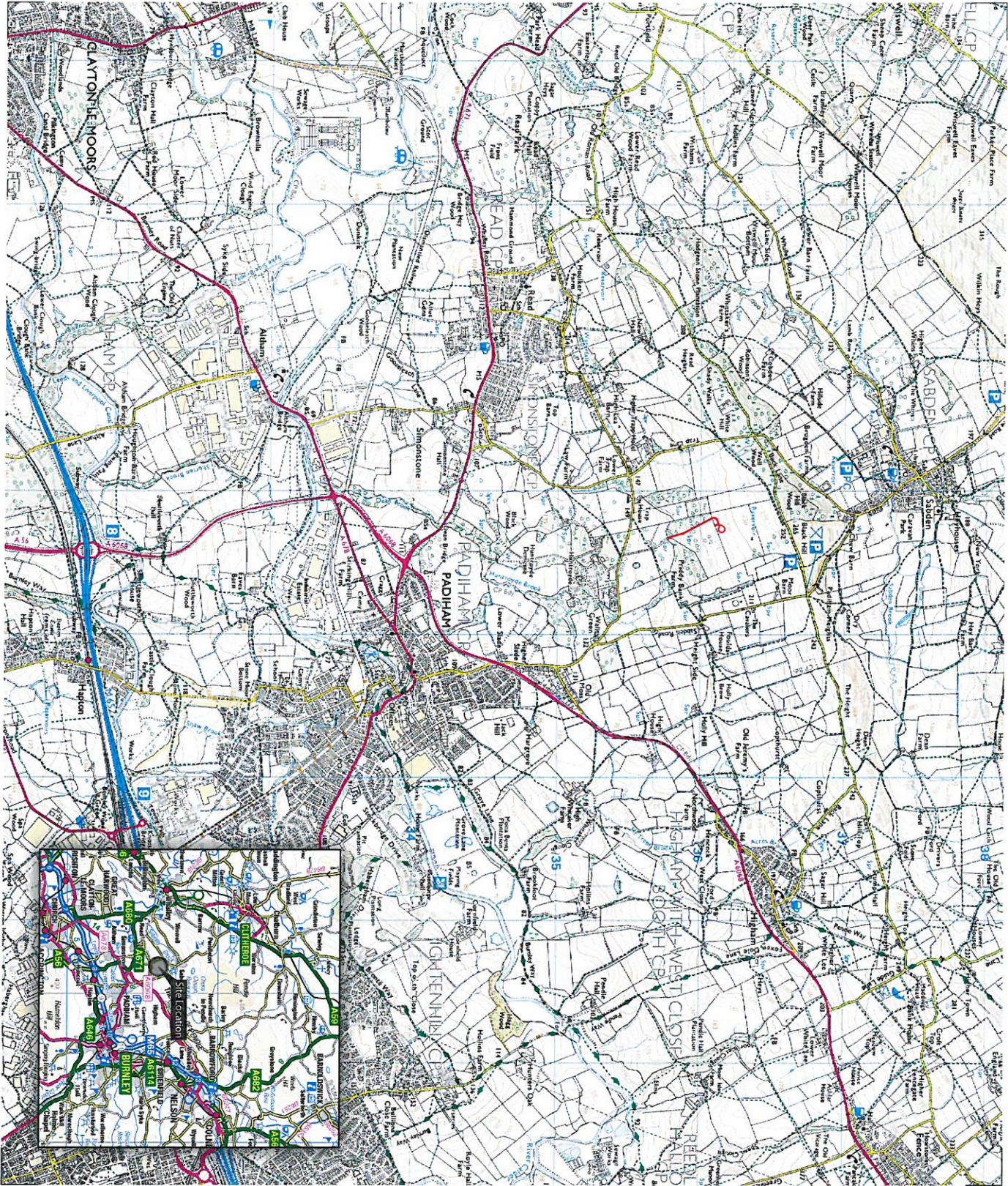
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APPENDIX A

Site Location Plan (one associates)



legend

Site boundary



0 0.25 0.5
Kilometres

project title
figure title
figure reference
scale
date

N160: Huntroyde
1: Site location
N160-GR-PA-001A
1:25,000@ A3
August 2012



APPENDIX B

Photographs of Whins Lane, Sabden Road and Slade Lane



Photo B1; Huntroyde Farm track access from Whinns Lane, showing double gates with removable centre pillar



Photo B2; Proposed site access on Whinns Lane, looking east.



Photo B3; Visibility to left from carriageway edge at proposed site access



Photo B4; Visibility to the right from the carriageway edge at the proposed site access



Photo B5; Existing bridge on Whinns Lane within the double bends



Photo B6; width constriction on Whinns Lane



Photo B7; The junction of Whins Lane with Sabden Road, looking west



Photo B8; Slade Lane, looking north



Photo B9; Slade Lane seen from A6068



APPENDIX C

Photographs of A6068, A671 and A678



Photo B1; A6068 junction with A671, looking north



Photo B2; A6068 junction with A678, looking north



Photo B3; A6068 exit from M65 junction 8



APPENDIX D

Component Details of Enercon E-33

Access Roads and Crane Platforms

E-33

43m, 48m and 49m steel tower

Document information:

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Department: Project Management
Approved/date: Gunda Hinderlich/27.07.07

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Reference:

PM-CW-SP031-E33-43,48 & 49m Zuwegung
und Kranstellfläche-Rev001ger-eng

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1. Assembling the tower and wind energy converter

The tower and wind energy converter are installed in two stages (work steps):

Step 1

Bolting the tower flanges to assemble the supplied tower sections. The 43m steel tower and 48m steel tower consist each of four tower sections. The 49m steel tower consists of two tower sections.

Step 2

Preassembly of the supplied converter components and subsequent assembly of the wind energy converter.

2. Crane technology

2.1. Details of crane technology

The following crane technology is required for the work steps described above:

	43, 48m and 49m steel tower
Crane type	300t telescopic crane
Length/basic unit	20 m
Width/basic unit	3 m
Track width	3 m
Supporting base	10 m x 10 m
Working radius	12 m

2.2. Supporting base and working radius

The **supporting base** describes the distance between the four support cylinders arranged in a square (in metres).

The **working radius** is the minimum distance between the crane hook and the crane's live ring.
Example: With a working radius of 12 m, the distance from the live ring to the centre of the foundation would be at least 12 m (see 6.2.).

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2.3. Installing the telescopic crane

The following work steps need to be performed:

- Drive crane into position
- Align the crane with the centre of the WEC (taking into account the working radius)
- Use approx. 5 trucks to transport the crane accessories to the telescopic crane with luffing jib
- Support the crane on the crane platform using load distribution plates and
- Assemble jib

2.4. Assembling the jib

The jib of the telescopic crane is extended hydraulically. Depending on the crane type, a fixed boom extension is mounted to extend the jib.

3. Access roads

Any roadways, bridges or access roads have to be able to withstand the transportation of heavy loads up to a maximum axle load of 12t and a maximum overall weight of 60t. Access has to be kept clear at all times. The responsible ENERCON Project Manager has to be informed of any failure to meet these requirements.

3.1. Minimum requirements of access roads

Useful width of carriageway	4 m
Clearance width	3.5 m
Clearance height	3.5 m
Radius of curve, external	24 m
Incline with loose surface	7%
Incline with fixed surface (paved)	12%
Ground clearance of transport vehicles	1.00 m

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und Kranstellfläche-Rev001ger-eng

5. Transport and logistics

5.1. Basic principles of transport

It is a basic principle that transport vehicles should not exceed the maximum axle load of 10t. Thus, a transport vehicle with an actual overall weight of 100t has to have at least 10 axles.

The following vehicles are used on ENERCON construction sites:

- Lowloader trailers
- Drop base vehicles
- Semi trailers and
- Adapter vehicles

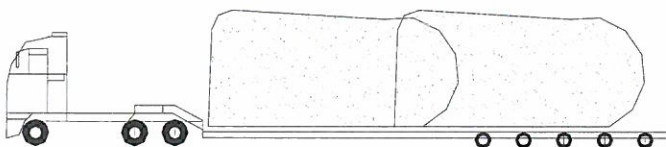
The vehicles vary to some extent in terms of length and width and can be shortened (pushed in) by several metres once they have been unloaded.

5.2. Overview of transport vehicles

Semi trailer, steel section



Telescopic semi, machine house components



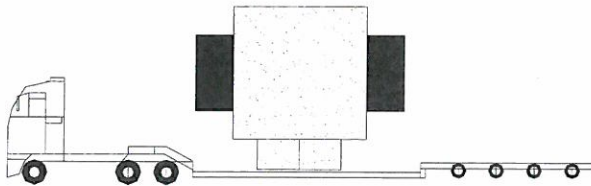
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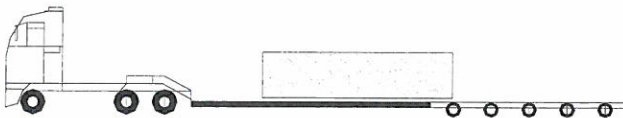
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Flatbed trailer, hub



8-axled semi, generator



Semi trailer, rotor blade



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und Kranstellfläche-Rev001ger-eng

6. Crane platforms

6.1. Minimum requirements of crane platforms

The crane platform is the key to ensuring that everything runs smoothly and safely during the construction phase.

It should take the form of a coarse, level surface with a top surface made from recycled materials or mixed minerals with a grain size of 0 – 32 mm.

The crane platform should be located above ground level to ensure that surface water is properly dispersed.

During construction, plate load bearing tests should be carried out to ensure that the necessary bearing capacity is achieved.

Any cranes used have a maximum support pressure of 200t and are supported on the crane platform by means of load distribution plates. Pressures of up to 18.5t/m² may act on the platform as a result of this and the maximum surface pressure is therefore **185 kN/m²**.

The dimensions of the crane platform should be calculated so that all the work necessary for installing the wind energy converter (including tower) can be carried out in the optimum manner. The example given in 6.2 provides a basic standard. This can be adapted to local conditions in consultation with the competent ENERCON Project Manager.

To ensure that any components inside the tower can subsequently be replaced and to protect the wind energy converter against ingress of dirt, a 5 m wide and stable access road has to be constructed between the crane platform and the tower once the foundation has been backfilled.

During foundation construction, the crane platform also serves as a storage area for material (e.g. reinforced steel) and machinery.

Any excess earth excavated during the construction phase should always be stored behind the foundation (see 6.2).

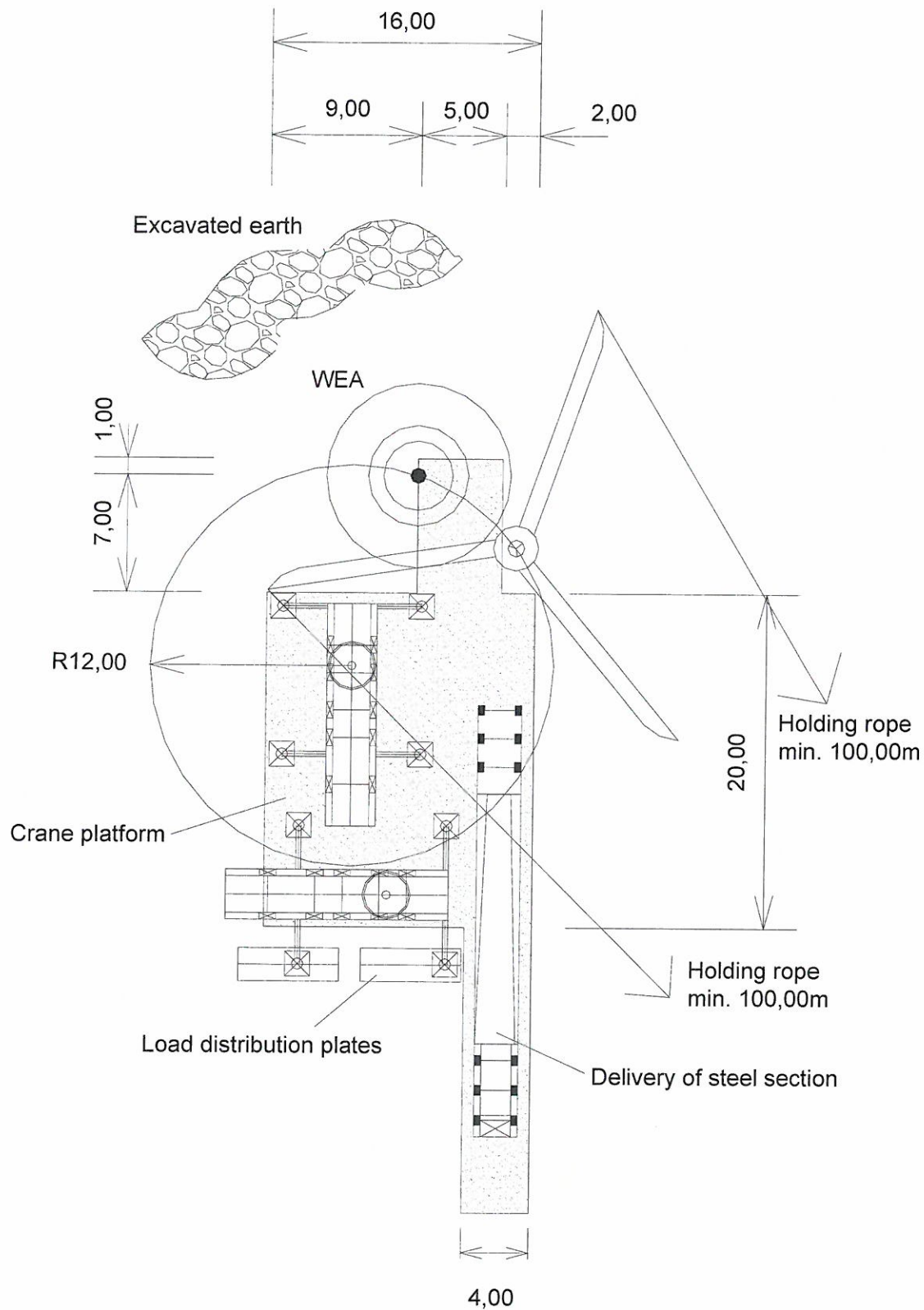
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6.2. Standard crane platform



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