Technical Feasibility Review — Overhead Line

1. Feasibility Summary

The route is feasible with mitigation but cannot proceed to construction authorisation without formal resolution of three blocking conditions. The no-go layer violations — the route crosses Water Bodies for 101 m and Surface Water for 79 m — require either repositioning of all affected tower footings outside the no-go polygons, or a formal derogation supported by an appropriate assessment, before any consent or construction can be granted. The two 400 kV overhead line crossings at chainages 20,392 m and 24,251 m each require confirmed outage windows with NESO / National Grid — a process with typically long lead times — and the multi-track rail crossing at chainage 30,638 m requires a signed Network Rail protection agreement before erection work may proceed. All remaining risks across the 44.9 km alignment are manageable through standard engineering measures applied in advance. The route carries an overall penalty score of 14,863,105 and a total cost of 40,490,798, with the dominant penalty contributors being existing high-voltage transmission infrastructure, protected environmental designations, and buffered facility zones.

2. Route and Structure Overview

The route forms a single Steel Tower section across its full length.

Metric	Value
Total route length	44.9 km
Number of structures	111
Number of sections (spans)	110
Average span length	408 m
Longest span	500 m
Shortest span	51 m
Suspension towers	68 (standard)
Tension / angle towers	41
Terminal towers	2

3. Topography and Elevation Profile

The route traverses 44.9 km of varied terrain in north-east Wales. The 3D route distance of 45.2 km against the 2D alignment indicates terrain relief of 388 m across the corridor. Minimum elevation along the route is 14.5 m OD, reached at approximately chainage 42,400 m (point index 1439) in the low-lying eastern terminal section. Maximum elevation is 421 m OD, reached at approximately chainage 3,400 m near the western origin terminal. Mean elevation is 189 m OD. The maximum recorded slope is 25.5 degrees with a mean of 5.0 degrees; no section exceeds the critical slope limit of 40.0 degrees, and no section breaches the Steel Tower elevation limit of 600 m. The steepest and highest ground is concentrated in the western 5 km of the route. The origin terminal sits at approximately 409 m OD and the alignment rises briefly to its absolute maximum of approximately 420.7 m OD at around chainage 3,400 m (point index 115) before descending progressively eastward through a broad mid-route plateau of 200–300 m OD. In this western band, slopes approaching 25.5 degrees affect crane-pad stability and access-track design for structures in the chainage 3,000–4,000 m zone; this is the only location where gradient is severe enough to drive plant selection rather than simply precautionary matting.

The route's second principal terrain-driven engineering zone is the final 8.3 km (chainage 36,600–44,858 m), where ground falls from approximately 92 m OD to a route minimum of 14.5 m OD. The 21 towers in this section

sit on low-lying, potentially flood-prone and soft-ground terrain (ground levels 14.5–25 m OD) that influences foundation design and seasonal access rather than gradient. No significant ridge, escarpment, or valley crossing beyond these two zones is indicated by the available source data.
The minimum span of 51 m — against a mean of 408 m and a maximum of 500 m — is likely in the central forestry corridor (chainage 12,000–17,000 m) where the alignment negotiates forest edges; this short span introduces sag-tension and ground-clearance design checks that are flagged as a manageable risk (Risk 7, Section 9).

4. Angle Points and Alignment

The route contains 41 angled towers: 30 in the negligible deviation band (0.0 degrees–30.0 degrees) and 11 in the low deviation band (30.0 degrees–60.0 degrees). The mean realised angle across all angled towers is 22.5 degrees and the maximum realised angle is 49.8 degrees. No tower exceeds the 60.0 degree upper bound of the low angle band.
Per-feature angle-point data was summarised at layer level for this run due to data volume; individual tower-by-tower deviation figures and precise chainages for the majority of angled towers are not available from the supplied source data beyond those cited in the constructability and access files. The table below records the information that is available from those files; the per-structure schedule for the remaining 39 angle towers should be obtained from the full tower schedule during detailed design.

Angle point / tower no.	Deviation (degrees)	Tower type required	Notes
~Ch. 41,800 m (eastern approach, structures ~T91–T111 band)	49.8 (maximum realised angle on the route)	Heavy angle steel tower	Most critical single structure; crane-pad geometry and stringing-drum positioning require individual assessment due to tight working corridor in the 38–42 km band of frequent direction changes
11 towers — low range (30.0°–60.0°, including the above)	30.0–60.0	Medium to heavy angle steel tower	Summarised at layer level due to data volume; elevated conductor tensions and heavy angle fittings required across this band; see Risk 6, Section 9
30 towers — negligible range (0.0°–30.0°)	0.0–30.0	Light to medium angle steel tower	Summarised at layer level due to data volume; distributed along the full route

5. Span and Section Breakdown

Per-feature span data was summarised at layer level for this run due to data volume; a span-by-span schedule with individual elevation changes and terrain classifications is not available from the supplied source data. The route-level statistics — mean span 408 m, minimum 51 m, maximum 500 m across 110 spans — and the section-by-section descriptions in Section 7 constitute the available level of detail. The table below uses the seven access sections defined in Section 7 as the working breakdown.

Section	Length	Elevation change	Terrain type	Structures (from–to)	Notes
1: Western origin to ~Ch. 5 km	~5 km	~409 m OD descending from max ~421 m OD	Upland farmland; elevated restricted local access roads; Forest Recreation Route crossings	T1–~T13 (origin terminal + ~12 structures)	Highest elevation and steepest gradients on the route (max 25.5 degrees); 5 Forest Recreation Route crossings at ch 743 m, 921 m, 2,048 m, 3,530 m and 4,419 m; watercourse crossing at ch ~832 m coincides with no-go Water Bodies layer
2: ~Ch. 5 km to ~Ch. 12 km	~7 km	~250 m to ~200 m OD (moderate descent)	Agricultural lowlands	~T14–T25	Multiple named watercourse crossings; Grassland, heaths and bogs crossed at ch 23,781–23,869 m; Mine Plan Extents active throughout
3: ~Ch. 12 km to ~Ch. 17 km	~5 km	Broadly level, ~100–200 m OD	Coniferous and broadleaved forest; NRW Open Access land	~T26–T36	National Trail crossing at ch 15,772 m; minimum span of 51 m likely in this section; Surface Water no-go layer crossed (~79 m); felling licences required
4: ~Ch. 17 km to ~Ch. 24 km	~7 km	~200–300 m OD	Central agricultural zone	~T37–T55	Two 400 kV OHL crossings at ch 20,392 m and ch 24,251 m; SAC (500 m buffer) traversed for 2,124 m; named watercourse crossings at ~ch 22,100 m and ~ch 23,800 m
5: ~Ch. 24 km to ~Ch. 31 km	~7 km	~200–350 m OD	Upland transition; agricultural	~T56–T73	Multi-track rail crossing at ch 30,638 m; SPM 132 kV OHL crossings at ch ~29,300 m and ~29,400 m; Scheduled Monuments buffer (515 m total across route); Flood Zone High (NRW) at ch ~27,037–27,413 m
6: ~Ch. 31 km to ~Ch. 37 km	~6 km	~200 m to ~20 m OD (descending)	Agricultural; AONB / LOSI fringe; SPZ	~T74–T90	Source Protection Zone (NRW) covers 7,593 m; Historic Landfill clusters at ch 34,089–34,818 m and ch 35,975–36,124 m; Mineral Extraction Site at ch 36,005–36,333 m; Parks and Gardens (NRW) for 966 m
7: ~Ch. 37 km to ~Ch.	~8 km	~22 m to 14.5 m OD (low-	Low-lying floodplain; eastern terminal section	~T91–T111 + eastern	Flood Zone High (NRW) crossings; maximum angle tower at ~ch 41,800 m (49.8 degrees); terminal tower at ch 44,858 m (GL 22.3 m OD); soft

Section	Length	Elevation change	Terrain type	Structures (from–to)	Notes
44,858 m		lying)		terminal	and potentially waterlogged ground throughout; single-track rail crossing at ch ~37,200 m

6. Crossings

Road, watercourse, and minor-utility crossing features were summarised at layer level for this run due to data volume; the per-feature crossing data in the supplied source files does not contain individually named road or watercourse records. Individual chainages and feature identities below are drawn from the technical feasibility and access logistics source files where available; layer-level totals are sourced from the constraint configuration data.

No-Go Layer Crossings

Both crossings below are classified as no-go in the constraint configuration and constitute construction blockers (see Risk 2, Section 9).

Crossing type	Feature name / layer	Chainage	Clearance required	Achieved by current design?	Special structure needed?
Watercourse / water body	Water Bodies (no-go layer)	Multiple points across ~101 m route extent	No tower footing within no-go polygon	No — constraint violation confirmed	Tower repositioning or formal derogation with appropriate assessment required before construction authorisation
Watercourse / surface water	Surface Water (no-go layer)	Multiple points across ~79 m route extent	No tower footing within no-go polygon	No — constraint violation confirmed	Tower repositioning or formal derogation with appropriate assessment required before construction authorisation

High-Penalty Crossings (Maximum Penalty, 1,000)

Crossing type	Feature name	Chainage	Clearance required	Achieved by current design?	Special structure needed?
Overhead line	400 kV Overhead Line	~20,392 m	BS EN 50341 / NSNA statutory clearance	To be confirmed — outage and clearance design required	Yes — crossing tower and conductor attachment points designed for statutory clearances; confirmed outage with NESO / National Grid required before erection
Overhead line	400 kV Overhead Line	~24,251 m	BS EN 50341 / NSNA statutory clearance	To be confirmed — outage and clearance design required	Yes — as above
Rail	Rail – Multi Track	~30,638 m	Network Rail clearance envelope	To be confirmed — possession window and protection agreement required	Yes — dedicated crossing span; erection under Network Rail possession only; signed protection agreement required before works commence

Other Named / Identified Crossings

Crossing type	Feature name	Chainage	Clearance required	Achieved by current design?	Special structure needed?
Overhead line	SPM 132 kV Overhead Line	~29,300 m	BS EN 50341 statutory clearance	To be confirmed	Outage / clearance management required
Overhead line	SPM 132 kV Overhead Line	~29,400 m	BS EN 50341 statutory clearance	To be confirmed	Outage / clearance management required
Rail	Rail – Single Track	~37,200 m	Network Rail clearance envelope	To be confirmed	Operator consent and possession window required
Public right of way	National Trail	~15,772 m	Statutory clearance; reinstatement to pre-construction standard	To be confirmed	Temporary closure; Traffic Regulation Order or equivalent; surface reinstatement obligation
Public right of way	Forest Recreation Route	~743 m	Clearance during stringing; reinstatement	To be confirmed	Temporary exclusion fencing and signage; permit conditions may include seasonal or weekend-only restrictions
Public right of way	Forest Recreation Route	~921 m	As above	To be confirmed	As above
Public right of way	Forest Recreation Route	~2,048 m	As above	To be confirmed	As above
Public right of way	Forest Recreation Route	~3,530 m	As above	To be confirmed	As above
Public right of way	Forest Recreation Route	~4,419 m	As above	To be confirmed	As above

Road Crossings (Layer-Level Summary)

Road crossing features were summarised at layer level due to data volume. The route carries 35 minor road crossings, 17 restricted local access road crossings, and 8 A-road crossings distributed along the full 44.9 km alignment, along with B-road crossings identified at multiple points in the access section analysis. Named road crossing details, specific clearances, and any road-strengthening requirements for abnormal indivisible loads are to be established during detailed design from the full per-feature schedule.

Watercourse Crossings (Layer-Level Summary)

Twelve named watercourse crossings and 13 river crossings are distributed along the full route. Individual watercourse names and exact chainages were summarised at layer level due to data volume; the specific locations noted in Section 7 provide the most granular available data. The route also crosses 873 m of Flood Zone High (NRW) across 12 discrete flood-zone features, 288 m of Flood Zone Medium (NRW) across 27 features, and 475 m of Flood Zone Low (NRW) across 31 features; the most consequential flood-zone crossings from a foundation-engineering perspective are located in the valley sections between chainage 832 m and chainage 13,124 m, and in the low-ground terminal section between chainage 36,721 m and chainage 39,920 m (see Section 8.2 for detail).

Constraint Area and Environmental Crossings

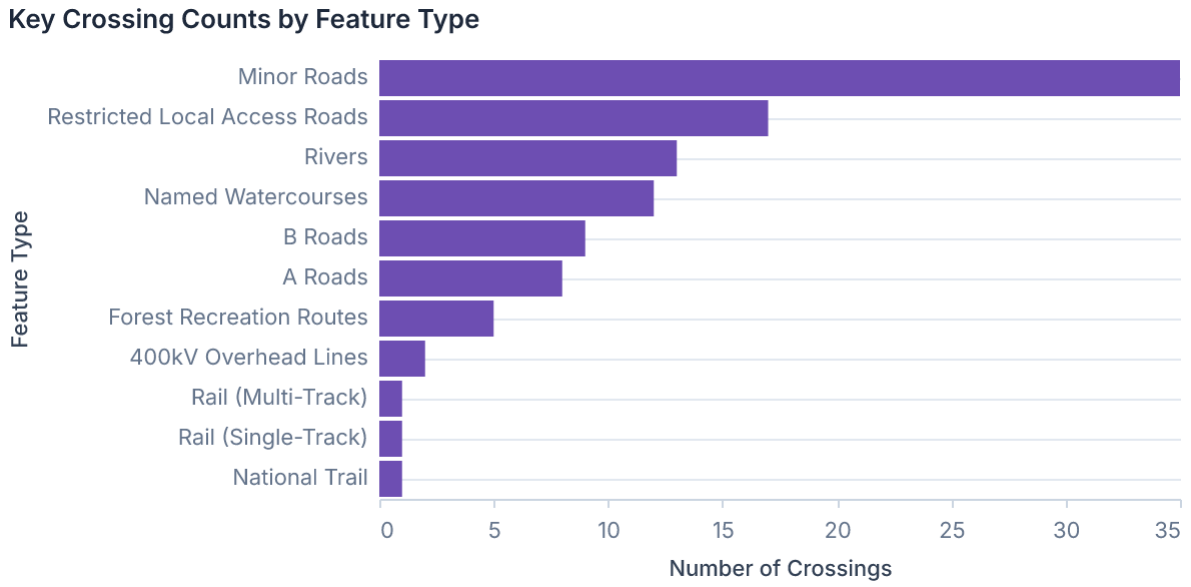
Crossing type	Feature name	Extent	Notes
Environmental designation	Special Areas of Conservation – NRW (500 m Buffer)	2,124 m along route	Construction Environmental Management Plan and NRW licence condition required; penalty 100 per steel tower
Scheduled monument buffer	Scheduled Monuments – NRW (100 m Buffer)	515 m along route; 6 features within 35 m of centreline	Watching brief required for all foundation excavation within buffer; Cadw / CPAT agreement on excavation methodology
Mine workings	Mine Plan Extents	44,858 m (full route length)	Penalty 300 per steel tower; Coal Authority / BGS records to be reviewed at each of 111 tower foundations before detailed design
Woodland	Broad-leaved Forest	503 m along route	Penalty 300 per steel tower; felling licence from NRW required
Upland habitat	Grassland, heaths and bogs	~97 m at ch 23,781–23,869 m	Penalty 300 per steel tower; peaty / organic soil risk — trial investigation required at nearest towers
Flood zone	Flood Zones High – NRW	873 m across 12 features	Penalty 100 per steel tower; construction scheduling and foundation design implications (see Section 8.2)

7. Access and Construction Logistics

Overview

The route extends 44.9 km (2D) as a single Steel Tower section comprising 111 towers (68 standard, 41 angled, 2 terminal), with a mean span of 408 m. The 3D route length of 45.2 km indicates moderate terrain relief of 388 m across the alignment. Maximum recorded slope is 25.5 degrees, with a mean of 5.0 degrees, confirming that most of the route is traversable by conventional access vehicles, though localised steeper passages require individual attention. Elevations range from 14.5 m to 421 m, with the highest ground concentrated in the western portion of the route. The route passes through Mine Plan Extents for its full 44.9 km length, which is the single most consequential access-planning constraint across all sections.

Route-wide crossing counts provide an important backdrop to the logistics assessment: 35 minor road crossings, 17 restricted local access road crossings, 12 named watercourse crossings, 13 river crossings, 8 A-road crossings, 5 Forest Recreation Route crossings, 2 overhead 400 kV line crossings, and 1 multi-track rail crossing all present specific constraints on crane, stringing, and convoy routing that are described section by section below.



Section 1: Western Origin to ~Ch. 5 km — Terminal Tower to Forest Margin (Structures T1–T8, ~13 towers)

Access track availability: The terminal tower at the route origin (chainage 0 m) is situated at approximately 409 m elevation. Restricted Local Access Roads run alongside and cross the route repeatedly at chainages 0.9 km, 1.2 km, 1.5 km, 2.8 km, 3.1 km, 3.7 km, and 4.4 km, providing a partial network that can service many tower bases directly or with short spur tracks. Minor roads cross at chainages 2.1 km and 2.3 km, offering additional access options. New permanent or temporary access tracks will nonetheless be required for structures positioned off the road network on elevated farmland ground.

Terrain difficulty: Standard vehicle access is feasible at most locations in this section. The route passes through its maximum-elevation area (420.7 m reached around point index 115, chainage approximately 3.4 km), and slopes in this area approach the route maximum of 25.5 degrees. For tower positions coinciding with the steepest ground near the 3–4 km extent, track reinforcement or matting is likely to be required for heavy plant.

Named constraints: Five Forest Recreation Route crossings are concentrated in this section (chainages 0.7 km, 0.9 km, 2.0 km, 3.5 km, and 4.4 km), restricting access convoy routing and requiring temporary traffic management at each crossing point. A named watercourse is crossed at chainage 0.8 km, coinciding with an area where the River/Rivers layer is also recorded; this crossing falls within a no-go Water bodies layer breach (surface water crossed for 101 m route-wide) and constrains the placement of temporary stream crossings or bridging for construction plant. The route enters Broad-leaved Forest (503 m total route-wide), with forest habitat in close proximity from approximately 5 km onward, further tightening working-corridor widths.

Seasonal restrictions: The watercourse crossing at chainage 0.8 km and the associated river proximity zone introduce reduced ground-bearing capacity during wet conditions, particularly in winter and early spring. Forest Recreation Route crossings may impose permit conditions with seasonal or weekend-only restrictions.

Crane pad and stringing feasibility: Tower positions in the 3–4 km band at higher elevation have reduced available working area due to the combination of gradient (approaching 25.5 degrees) and the proximity of Forest Recreation Routes. Crane pad preparation on sloping ground in this zone is flagged as requiring ground levelling or engineered pad construction. The terminal tower at the origin (T1) requires a dedicated laydown and stringing area; feasibility is dependent on the configuration of the connection point and whether an existing substation yard or compound area is available.

Section 2: ~Ch. 5 km to ~Ch. 12 km — Mid-Western Agricultural Lowlands (Structures ~T9–T25)

Access track availability: This section passes predominantly through agricultural land (Agriculture layer covers approximately 39,979 m of the 44,858 m route). Restricted Local Access Roads cross at chainages 9.1 km and 11.5 km; minor roads cross at multiple points including 6.5 km, 6.8 km, 7.8 km, 9.0 km, 9.6 km, 11.3 km. A B-road crossing occurs at 7.8 km. This represents a relatively well-served zone and existing agricultural tracks are likely to connect most tower positions, with short new spur tracks required for structures positioned in field interiors.
Terrain difficulty: Standard vehicle access throughout. Mean slope is 5.0 degrees and no steep-terrain flags apply in this lower-elevation section (ground levels declining from ~420 m at the start of the route to approximately 200–250 m by this point).
Named constraints: The route crosses 12 named watercourses in total route-wide; several are in this section (discrete item chainage records at 5.6 km, 5.7 km, 6.8 km, 10.0 km, and 11.8 km). Named watercourse crossings are not classified as no-go in the configuration but require consent and bridging or span solutions. The Grassland, heaths, bogs layer is crossed for 97 m within the route, with at least one polygon in this zone; ground-bearing capacity on bog substrate will be reduced in wet seasons. The route also begins traversing Mine Plan Extents continuously across this section; works within mine plan extents may require pre-construction mine workings investigations and could necessitate longer piled or reinforced foundations, with implications for the size and weight of plant that must access each tower base.
Seasonal restrictions: Any crossing of Grassland, heaths, bogs within this section is subject to restricted ground-bearing capacity and potential ecological access restrictions in the growing season. Watercourse crossings are subject to in-river works restrictions typically enforced between October and March for salmonid species, though the specific watercourses' classifications are not available from this data.
Crane pad and stringing feasibility: The relatively open agricultural character of this section is broadly favourable for crane pad formation and stringing, subject to Mine Plan Extent workings investigations at each structure. No immediate terrain or proximity constraint flags are raised for individual structures in this band.

Section 3: ~Ch. 12 km to ~Ch. 17 km — Central Coniferous Forest Corridor (Structures ~T26–T36)

Access track availability: This section passes through the largest continuous woodland and coniferous forest area along the route (Coniferous Forest: 3,875 m total, Woodland: 4,378 m total, Woodland – NRW: 4,132 m total; much of this is concentrated in the 12–17 km band). Open Access Land (Public Forest – NRW) totals 3,710 m route-wide and is likely concentrated here. Existing forest tracks (accessed via Restricted Local Access Roads at chainages 12.2 km, 12.6 km, and 13.1 km, and minor roads at 13.1 km, 13.8 km, 14.3 km, and 14.3 km) provide a partial framework, but new temporary access tracks through the forestry block will be required for structures set back from these routes.
Terrain difficulty: Requires matting or reinforcement in areas of recently harvested or soft-ground forestry compartments, and where surface water from the layer crossing (79 m of Surface Water no-go zone crossed within the route) indicates wet ground. Slope data for this section does not indicate steep terrain, but forestry soil types can significantly reduce trafficability under wet conditions.
Named constraints: The route crosses the National Trail at chainage 15.8 km (discrete item confirmed), carrying a configuration penalty and requiring formal crossing permission, temporary barriers, and reinstatement obligations. The Open Access Land: Public Forest – NRW designation (totalling 3,710 m route-wide) implies formal consent from Natural Resources Wales (NRW) and may carry access restrictions on public recreational routes. Coniferous Forest is a high-penalty (300) crossing layer for 3,875 m. The route is also within the National Landscape (AONB) – NRW for 7,142 m total; a portion of this likely falls in this forest section, which will impose NRW consultation requirements and potentially heightened visual and ecological constraints on track construction.
Seasonal restrictions: Construction access through forestry is typically restricted during periods of high fire risk (dry summer months) and is further constrained during nesting seasons under ornithological survey requirements.

Ground-bearing capacity is markedly reduced over winter, and matting is likely required for crane operations and delivery vehicle movements on forest tracks.
Crane pad and stringing feasibility: Working-corridor widths in the forestry block are constrained by standing timber; felling licences and clearance approvals from NRW will be required before crane pads can be formed. Where the route passes through the NRW-designated forest recreation zone, stringing areas may need to be staged to avoid simultaneous obstruction of public access routes. The minimum span of 51 m (recorded route-wide) is likely to occur in this woodland section where the alignment negotiates forest edges.

Section 4: ~Ch. 17 km to ~Ch. 24 km — Central Agricultural Zone with 400 kV Crossing (Structures ~T37–T55)

Access track availability: Two 400 kV Overhead Line crossings occur at chainages 20.4 km and 24.3 km (discrete items confirmed). Multiple minor and restricted local access roads cross in this band (chainages 19.8 km, 20.2 km, 20.5 km, 21.7 km, 22.4 km, and 23.2 km), and A-road crossings are recorded at 22.4 km. The existing road network offers reasonably good access to most structures, with new spur tracks likely needed for a minority of positions between road crossings.
Terrain difficulty: Standard vehicle access. Elevations in this zone are intermediate (approximately 200–300 m), and no steep-slope concentration is indicated by the per-point data.
Named constraints: The two 400 kV overhead line crossings carry the maximum penalty (1,000 each) in the configuration and represent high-complexity crossings requiring outage coordination with the network operator, temporary conductor protection, and works outside normal construction hours. Tower positions immediately adjacent to the 400 kV crossing points (indices 693 and 824) must have crane working envelopes assessed against live-line clearance distances; this directly constrains crane pad positioning. Named watercourses cross at chainages 22.1 km and 23.8 km, each requiring bridging or temporary culverting for plant crossings. The route enters the SAC 500 m buffer for 2,124 m within this general zone; access track construction and materials storage near these towers will require NRW consultation.
Seasonal restrictions: Watercourse crossings at chainages 22.1 km and 23.8 km impose in-channel works restrictions in line with fisheries season protections. The proximity to the SAC buffer may introduce additional seasonal restrictions on works (e.g., bat commuting corridor mitigation windows).
Crane pad and stringing feasibility: At the two 400 kV overhead line crossing points, stringing operations must be sequenced with live-line clearance protocols and may require temporary conductor barriers. The crane working envelope at structures on either side of each crossing is restricted and will require individual assessment. Named watercourse crossings immediately adjacent to tower positions (chainages 22.1 km and 23.8 km) constrain the downstream stringing drum placement.

Section 5: ~Ch. 24 km to ~Ch. 31 km — Upland Transition and Rail Crossing (Structures ~T56–T73)

Access track availability: The single multi-track rail crossing occurs at chainage 30.6 km (maximum-penalty crossing in the configuration). A-road crossings are recorded at chainages 29.8 km and 31.4 km; minor roads cross at chainages 25.9 km, 26.5 km, 27.6 km, 28.3 km, 28.7 km, 30.8 km, and 31.2 km. The SPM 132 kV overhead line is crossed twice (chainages 29.3 km and 29.4 km). Existing road density is relatively high in this section, affording access to most structures by existing infrastructure. Short new access spurs will be required for structures positioned away from the road network on agricultural land.
Terrain difficulty: Standard vehicle access for most structures. Elevations rise toward the mid-section maximum (ground level around point index 115 is the route peak, reached earlier in the route; this section shows ground levels in the 200–350 m range). No slope concentrations exceeding standard vehicle access thresholds are indicated for this band.
Named constraints: The multi-track rail crossing at chainage 30.6 km (Rail – Multi Track, maximum penalty 1,000) requires the network operator's consent, possession windows for stringing, and specific tower-foundation design to address rail proximity. The SPM 132 kV crossings at chainages 29.3–29.4 km also require outage and clearance management. The route passes through the Scheduled Monuments – NRW (100 m Buffer) layer for 515 m total across the route; some of this concentration appears in this section (six Scheduled Monument (100 m Buffer) polygons are within 15 m of centreline route-wide), and tower positions within these buffers require Historic Environment Records assessment and, potentially, archaeological watching briefs that extend the access and construction programme.
Seasonal restrictions: Rail possessions for the multi-track crossing are subject to operator scheduling and are typically available only during engineering hours (weekends or overnight possessions), which constrains the construction programme and limits the size of plant that can be mobilised within a possession window.

Archaeological constraints from Scheduled Monument buffers may impose seasonal restrictions on ground-breaking works pending survey outcomes.
Crane pad and stringing feasibility: At the rail crossing structure (chainage 30.6 km), the crane working radius must be assessed against the rail clearance envelope, and there is likely to be a constrained working area between the track and the nearest road. Stringing drum placement on the rail approach span is further restricted if the crossing angle is shallow (crossing angle data is available in the span metrics but specific values were not retrieved). The Historic Landfills – NRW layer is crossed for 528 m route-wide; some landfill polygons in this section may restrict the depth of crane mat installation or require contaminated ground assessment before pads are formed.

Section 6: ~Ch. 31 km to ~Ch. 37 km — Mid-Eastern Agricultural Land and AONB Fringe (Structures ~T74–T90)

Access track availability: The Landscapes of Outstanding Special Interest – NRW layer covers 4,798 m of the route; the National Landscape (AONB) – NRW covers 7,142 m. Taken together with the Source Protection Zone (SPZ) – NRW covering 7,593 m, much of this section is within sensitive designations. Minor roads cross at chainages 33.1 km, 33.4 km, 35.0 km, and 36.0 km; restricted local access roads at chainages 34.1 km and 38.9 km. A B-road crossing is recorded at 35.7 km. The existing road network provides moderate coverage; new access tracks will be required for structures positioned between roads, particularly within the AONB and LOSI designations where track width and design will need to reflect NRW requirements.
Terrain difficulty: Standard vehicle access. Ground levels in this band are declining from approximately 200–250 m toward the east. No steep-terrain flags apply.
Named constraints: The Source Protection Zone (SPZ) – NRW for 7,593 m constrains surface drainage, fuel storage, and machinery maintenance within the zone — measures that directly affect site compound layout and access track drainage design. Any construction pollution incident in this zone carries heightened regulatory consequence. Named watercourses cross at chainages 36.9 km and approximately 35.5 km. The Scheduled Monuments – NRW (100 m Buffer) remains an active constraint in this section (6 polygons within 15 m of centreline route-wide). Parks and Gardens – NRW is crossed for 966 m, with two polygons within 15 m and 35 m of the centreline; access track routing adjacent to these designations will require NRW pre-approval.
Seasonal restrictions: The SPZ designation restricts timing of any vegetation clearance or earthworks within the zone, and in wet conditions, the risk of surface run-off contaminating source catchments triggers additional mitigation requirements. Ground-bearing capacity in lower-lying areas near SPZ-designated land may be reduced in winter and spring.
Crane pad and stringing feasibility: The AONB and LOSI designations may require NRW agreement on crane pad surface reinstatement, particularly where pads are formed in areas of semi-natural or improved grassland within the designation. No specific individual tower constraints beyond these design-standard requirements are identified from available data in this band.

Section 7: ~Ch. 37 km to ~Ch. 45 km — Eastern Approach and Terminal Tower (Structures ~T91–T111, terminal T112)

Access track availability: The single-track rail crossing is recorded at chainage 37.2 km. The terminal tower at the route end (chainage 44,858 m, latitude 53.049°N / longitude -2.901°E) is at low elevation (22.3 m ground level), in a lower-lying area likely near an existing substation or grid connection point. A-road crossings are recorded at 37.1 km and 42.4 km; minor roads cross at multiple points including 38.5 km, 39.6 km, 41.4 km, 41.5 km, 43.2 km, and 44.2 km; B-road crossings at 37.5 km, 44.3 km, and 44.6 km. The route is well served by the road network in this section, and the cluster of standard and angled towers near the terminal end (notably the high density of angled towers in the 38–42 km band, with an angled tower at chainage 41.8 km achieving near the maximum angle of 49.8 degrees) provides relatively accessible positions despite frequent direction changes.
Terrain difficulty: Standard vehicle access. Ground levels are low (declining to the route minimum of 14.5 m at approximately chainage 42.4 km, point index 1439); the very low-lying ground near the terminal introduces the possibility of soft ground or waterlogged conditions, and the Flood Zones High – NRW layer is crossed for 873 m total route-wide. At least some of these high-flood-zone crossings are likely to fall in this lower-elevation section.
Named constraints: The Flood Zones High – NRW crossings (873 m) carry a high configuration penalty (100) and are significant constraints on construction logistics: tower positions within the high flood zone may be inaccessible during flood events or have inadequate ground-bearing capacity for crane operations. Named watercourse crossings at chainage 36.9 km (in the preceding section) and approximately at the eastern approach add to the watercourse management burden. The single-track rail crossing at chainage 37.2 km requires operator consent and possession window management. Historic Landfills – NRW crossings (528 m route-wide) have been

noted; where these occur in this lower-lying zone, they may constrain excavation depth for foundations and require contaminated-land assessments before crane mat installation.

Seasonal restrictions: The Flood Zones High – NRW designation identifies zones that may be completely inaccessible by wheeled plant during winter flood episodes. Construction programmes should include contingency for delayed access across this section between October and March. In wet conditions, ground-bearing capacity in the low-lying areas near the terminal will be reduced; temporary bridging or crane mat systems are likely to be required for crane operations at affected tower positions.

Crane pad and stringing feasibility: The terminal tower at chainage 44,858 m requires a permanent stringing and assembly area; at low elevation in potentially flood-prone ground, the working platform will need to be elevated or adequately drained. The concentration of angled towers (including the maximum 49.8 degrees angle tower at chainage 41.8 km) in the 38–42 km band introduces tighter working-corridor geometry: stringing drums and conductor running lines must accommodate the change of direction at each angled tower, and crane pad positioning must be assessed individually for each structure given the route's frequent turns. Where the route runs parallel to or crosses A-road and B-road alignments in this section (chainages 37.1 km, 42.4 km, 44.3 km, 44.6 km), overhead line conductor installation over carriageways will require road closure or convoy escort.

Route-Wide Logistics Notes

The Mine Plan Extents layer covers the entire 44.9 km route, imposing a route-wide requirement for mine-workings risk assessments prior to any ground investigation, foundation design, or excavation. This constraint applies to all 111 tower positions and to any new access track construction. Foundation designs across the route should be considered provisional until mine-workings data has been reviewed at each structure.

The predominance of restricted local access roads (17 crossings, 503 m total distance through the layer) throughout the route indicates that many access routes to tower bases will themselves be subject to access consent and may have axle-weight restrictions that preclude abnormal indivisible loads without prior road strengthening or temporary bridge solutions.

The 41 angled towers — of which 11 are in the 30 degrees–60 degrees angle range with a maximum of 49.8 degrees — present working-corridor geometry constraints throughout the route. Tension stringing plans must account for the lateral pull component at each deviation, which requires the stringing block position and dead-end anchor layouts to be assessed against available working area on a structure-by-structure basis.

Peaty Soils – NRW returned zero metres of crossing at the 15 m and 35 m centreline buffer scales, indicating that no peat constraint is active at tower-footprint level from this dataset. However, peaty soils are recorded within the 500 m corridor (13 polygons), and access track alignments connecting tower bases to the road network may traverse peat that is absent from the centreline corridor. Track-by-track geotechnical assessment will be required to confirm ground conditions on approach routes.

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8. Geotechnical and Ground Conditions

This section assesses the ground conditions along the 44.9 km route, structured by the four engineering domains of greatest relevance to foundation design, plant access, and construction programming. Ground-condition evidence derives from Natural Resources Wales (NRW) constraint layers intersecting the route corridor, supplemented by per-point ground-level data and span-level crossing metrics from the route model.

8.1 Peat

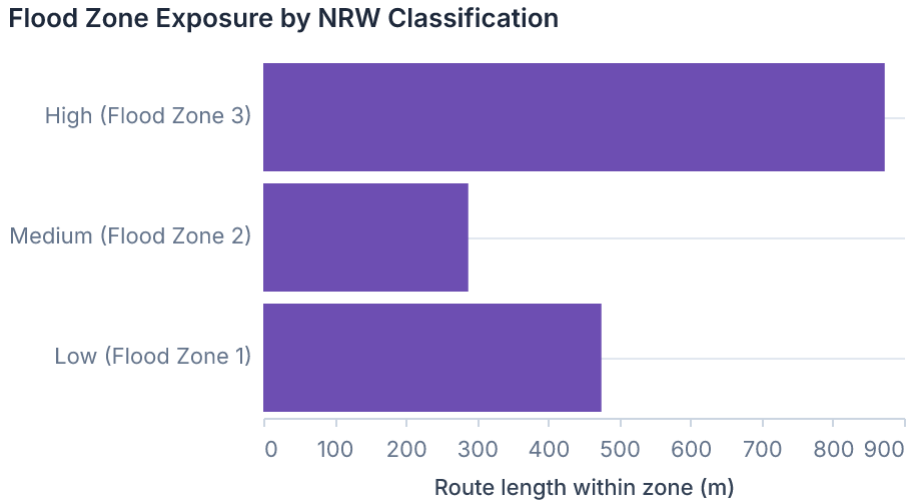
The two NRW Peaty Soils layers registered in the constraint dataset — *Peaty Soils* and *Peaty Soils - NRW* — do not intersect the centreline of this option. Both layers record 13 features within the inner study buffer, confirming that peat-bearing ground approaches the corridor but does not, on current data, lie beneath the proposed line of travel.

The one area of potential concern is the *Grassland, heaths and bogs* layer, which is crossed over approximately 97 m at chainage 23,781–23,869 m, at a ground elevation of approximately 275–276 m OD. This is upland terrain and is consistent with blanket bog or peaty heath rather than lowland fen peat. The four route points through this feature all sit between structures, indicating the crossing is a mid-span condition rather than a tower location. Nonetheless, organic soils at this elevation may be of sufficient thickness in locally wet hollows to limit ground-bearing capacity, and trial pitting or probing during detailed survey would be needed before foundation type can be confirmed for the nearest towers at approximately ch 23,781 m (angled tower, index 781) and ch 24,251 m (standard tower, index 824).

Peat depth data was not available in the supplied dataset. If trial investigation confirms peat depth greater than approximately 0.5–1.0 m at any tower location, pad or raft foundations on the peat may be inadequate and driven or bored piling to a competent stratum would be required. Access plant on upland bog must remain on purpose-built timber matting or steel road panels; tracked vehicles without ground protection will cause rutting and may trigger slope instability on the steeper approach gradients in this section (mean slope 5.0 degrees, maximum 25.5 degrees).

8.2 Flood Zone

The route passes through all three NRW flood-risk zone categories, with a combined exposure of 1,636 m.



High flood risk (NRW Flood Zone 3) — 873 m of route crosses this zone across 12 discrete intersecting features, with 53 further features recorded within the inner study buffer. The crossings are distributed at multiple sections along the route. Ground-level data identifies the most consequential High flood-risk encounters at:

- **ch ~832 m** (GL ~289 m OD) — upland watercourse crossing near the start terminal; flood risk here likely relates to a narrow high-gradient stream;
- **ch ~9,764–10,058 m** (GL ~96–99 m OD) — a broader lowland valley section where three to four spans traverse a floodplain; the angled tower at index 359 (ch 10,616 m, GL 89 m OD) is the nearest structure;
- **ch ~11,805–13,124 m** (GL ~86–106 m OD) — river-valley crossings with towers at index 402 (ch 11,863 m) and index 453 (ch 13,357 m) on valley margins;
- **ch ~27,037–27,413 m** (GL ~137–143 m OD) — mid-route elevated section, likely relating to upland drainage;

- **ch ~36,721–37,078 m** (GL ~21–22 m OD) — the most significant flood-risk zone for foundation engineering. This section forms part of a continuous low-ground corridor from ch 36,601 m to the end of the route at ch 44,858 m, where ground levels fall between approximately 14.5 m and 25 m OD. The towers at index 1251 (ch 36,721 m, GL 21.8 m OD) and index 1261 (ch 37,019 m, GL 20.9 m OD) both sit within or immediately adjacent to the High flood-risk zone at this low elevation;
- **ch ~39,890–39,920 m** (GL ~19 m OD) — a further High flood-risk pocket in the same low-ground section, coinciding with the standard tower at index 1358 (ch 39,891 m).

Medium flood risk (NRW Flood Zone 2) — 288 m across 27 intersecting features, distributed across several of the same valley sections, with additional overlap in the low-ground section around ch 36,691–37,108 m and ch 39,861–39,920 m.

Low flood risk (NRW Flood Zone 1) — 475 m across 31 intersecting features, with occurrences around the same valley crossings and within the low-ground terminal section.

For the valley crossings in the ch 9,764–13,124 m band, the principal engineering implication is the design flood level for foundation top-of-concrete: construction works within the High and Medium zones should be scheduled outside the high-flow season (typically November–April) unless flood-resilient cofferdams or temporary works exclusion zones are provided. Concrete foundations should be specified with a minimum top-of-concrete elevation above the modelled 1 % AEP flood outline, to be confirmed during detailed hydraulic assessment.

For the low-ground section from ch 36,601 m to the terminus (21 towers, ground levels 14.5–25 m OD), the combination of low elevation, shallow water table, and flood-risk classification implies that excavation for pad or footing foundations will encounter groundwater at or close to surface level. Dewatering during construction is expected; foundation designs should be assessed against buoyancy uplift for the operational life of the structure. Driven or augered piled foundations may reduce excavation depth and groundwater inflow risk compared with open-cut reinforced concrete pad solutions.

8.3 Other Adverse Ground

Mine Plan Extents

The route is within Mine Plan Extent polygons along virtually its entire length of 44.9 km. The span-metric data confirms active or registered mine plan coverage from the start terminal (ch 0 m) through to beyond ch 44,000 m, encompassing all 111 structures. The Mine Plan Extents layer carries a penalty of 300 per steel tower in the constraint configuration, reflecting the substantial engineering risk from underground workings.

Mine plan coverage does not by itself indicate abandoned workings beneath every tower location, but it does indicate that the Coal Authority or equivalent records should be consulted for each foundation footprint before detailed design. Where recorded workings are identified at shallow depth (typically less than 10–15 m below proposed founding level), treatment options include grouting, bridging foundations, or deeper piling to a competent horizon below the affected strata. The sheer extent of mine plan coverage (the full route) means this is a standing precondition for all geotechnical investigation works, not a localised risk.

Historic Landfills

The Historic Landfills (NRW) layer is intersected across two main clusters:

- **ch ~34,089–34,818 m** (GL 77–92 m OD) — covering the angled tower at index 1171 (ch 34,354 m) and the angled tower at index 1187 (ch 34,818 m);
- **ch ~35,975–36,124 m** (GL 52–66 m OD) — immediately upslope of the transition into the low-ground section, coinciding with the angled tower at index 1219 (ch 35,766 m) and the standard tower at index 1204 (ch 35,318 m).

Historic landfill ground typically contains heterogeneous fill of variable compressibility, potentially including organic waste subject to long-term settlement and landfill gas generation. Differential settlement beneath tower foundations in these sections is the primary structural concern. Phase 1 geo-environmental desk study and Phase 2 ground investigation (including gas monitoring) would be required at each structure within the landfill boundary before foundation design can proceed. Where waste depth is significant, piled foundations bypassing the fill are likely to be required.

Mineral Extraction Sites

A mineral extraction site is crossed in a short section around ch 36,005–36,333 m (GL 34–67 m OD), overlapping with the standard tower at index 1235 (ch 36,243 m, GL 33.4 m OD). This is adjacent to and partially overlapping with the historic landfill clusters above. Quarrying or open-cast extraction creates voids, backfilled areas of variable density, and potentially perched groundwater. Probing and trial pitting at the tower footprint will be required.

Grassland, Heaths and Bogs (Upland Adverse Ground)

As noted in Section 8.1, the 97 m crossing of the Grassland, heaths and bogs layer at ch 23,781–23,869 m (GL ~275–276 m OD) represents upland bog or peaty heath. At this altitude the terrain is likely underlain by thin mineral soils or weathered rock rather than deep peat, but organic horizon thicknesses and bearing capacity must be confirmed by investigation.

8.4 Soil Profile

Specific borehole or trial-pit records for this alignment were not available in the supplied dataset. The following interpretation of likely soil profile is drawn from ground-level data, topographic context, and the NRW constraint layer data.

Upland section (ch 0–approximately 33,000 m, GL broadly 75–421 m OD): The route crosses upland hill country in north-east Wales. At elevations above approximately 200 m OD, the expected profile to foundation depth is thin organic/peaty topsoil overlying weathered rock (mudstone, siltstone, or sandstone of the Carboniferous or Ordovician/Silurian sequences prevalent in this region), with bedrock encountered within 1–3 m depth on ridge lines and hilltops. In valley bottoms crossing named watercourses (12 crossings recorded between ch 832 m and ch 36,899 m), alluvial clay or gravels may extend to several metres depth, with the water table close to surface. Tower foundations on ridge or hillside ground at higher elevations are likely to be rock-socketed or closely founded on weathered rock; valley crossings may require deeper reinforced concrete spread footings or short piles to span alluvial deposits.

Mine plan corridor (ch 0–44,858 m): Because mine plan extents cover the full route, the subsurface profile throughout the upland section may include shallow mine workings, drainage adits, or voids in Coal Measures or other workable strata. This is most likely in the Carboniferous coal-bearing zones encountered broadly in the eastern portions of the route. Foundation design in any area where shallow workings are confirmed must account for void bridging.

Transitional section (approximately ch 33,000–36,600 m, GL 33–92 m OD): Ground levels descend from the upland plateau towards the low-lying final section. Historic landfill and mineral extraction sites in this band (ch 34,089–36,333 m) create a heterogeneous made-ground layer of uncertain depth and composition overlying

natural soils. The natural stratum in this area is likely alluvial or glacial in origin (clays, silts, sands, and gravels), given the topographic position on a hillside above a major river valley. Foundation designs through made ground must be piled to the underlying natural stratum.

Low-ground terminal section (ch 36,601–44,858 m, GL 14.5–25 m OD): This 8.3 km continuous section descends to near sea level. The ground is low-lying and was likely deposited under estuarine or alluvial conditions, suggesting soft to firm alluvial clay or silty clay from surface to several metres depth, possibly underlain by fluvio-glacial sands and gravels, with bedrock at significant depth. Bearing capacity for conventional pad foundations will be limited by the soft upper clay horizon, and settlements under working loads would need to be assessed. Driven steel tube or precast concrete piles to the underlying granular stratum are the most probable foundation solution for the 21 towers in this section. The terminal structure at index 1524 (ch 44,858 m, GL 22.3 m OD) will be subject to the same conditions and carries the added requirement for a defined minimum edge clearance from any existing embankment or drainage infrastructure at the terminus substation. Plant access throughout this section will be constrained by soft ground; tracked plant is expected to require ground-reinforcement matting or temporary haul roads across the most saturated zones.

8.5 Ground-Condition Layer Summary

The table below summarises the constraint-layer coverage for the two ground-condition themes assessed in this section, as recorded in the option layer-level data.

Layer Theme	Aggregate Result	Key Risks and Challenges
Hydrology and Hydrogeology	3 layers (of which 3 crossed, 0 significant), 1,636 m through area layers	0 significant layers; highest configured penalty: 100
Sensitive Environmental Areas	2 layers (of which 0 crossed, 0 significant)	0 significant layers; highest configured penalty: 30

The significance threshold applied in the constraint configuration is 90% of the maximum configured penalty (1,000), equating to 900. Neither the flood zone layers (highest penalty 100) nor the peaty soils layers (highest penalty 30) reach this threshold. This does not diminish their engineering significance — the flood zone crossings in particular carry material implications for foundation design and construction scheduling, as described in Section 8.2 above.

9. Constructability Risks and Mitigations

The risks below are drawn directly from evidence established in Sections 3–8. Each row carries a **Construction Impact** flag:

- 🔴 **BLOCKING** — condition that would prevent construction proceeding without a formal resolution
- 🟡 **MANAGEABLE** — addressable with standard engineering measures applied in advance

#	Risk	Location	Source Section	Construction Impact	Proposed Mitigation	Residual Risk
1	Route traverses 873 m of Flood Zone High (NRW), constraining foundation excavation and materials delivery during elevated river flows	Multiple spans in Flood Zone High areas across the 873 m extent; 12 named watercourse crossings and 13 river crossings distributed along the full 44.9 km route	§6 — Hydrology & Ground Conditions	🟡 MANAGEABLE	Schedule foundation works and concrete pours outside the October–March high-flow period; design foundations to accommodate temporary inundation; install cofferdam or sheet-piling at watercourse crossing tower bases where ground saturation is confirmed	Medium
2	Route crosses Water Bodies (no-go layer, 101 m) and Surface Water (no-go layer, 79 m); both are classified as constraint violations that would ordinarily prohibit tower placement	Water Bodies crossing (~101 m total run); Surface Water crossing (~79 m total run) — specific chainage data for these crossings were not available in the per-feature crossing table	§5 — Crossings	🔴 **BLOCKING**	Tower positions over no-go water-body and surface-water layers must be resolved before construction can be authorised: either re-peg the crossing spans so that no tower footing falls within the no-go polygon, or obtain a formal derogation supported by an appropriate assessment; until resolved this is a construction blocker	High

#	Risk	Location	Source Section	Construction Impact	Proposed Mitigation	Residual Risk
3	Multi-track rail crossing at chainage ~30,638 m (route index 1044) carries the maximum penalty (1,000) and requires Network Rail possession windows; any misalignment of span geometry risks operational disruption	Rail – Multi Track crossing, chainage 30,638 m, between standard steel towers at indices 1029 and 1041	§5 — Crossings	🔴 **BLOCKING**	Agree possession and protection requirements with Network Rail prior to detailed design; design crossing span to clear all live-rail infrastructure with adequate electrical clearance; erect crossing conductors under weekend or overnight possessions using pre-strung bundles; no construction activity may commence at this location without a signed Network Rail protection agreement	High
4	Two 400 kV overhead line crossings (at chainages ~20,392 m and ~24,251 m) require live-line working or planned outages on the existing National Grid infrastructure; penalty is at the maximum configured value (1,000 per crossing)	400 kV OHL crossings at chainage 20,392 m (index 693) and 24,251 m (index 824)	§5 — Crossings	🔴 **BLOCKING**	Coordinate outage windows with NESO/National Grid at pre-application stage; design crossing towers and conductor attachment points to provide required statutory clearances (BS EN 50341 / NSNA); erection of crossing conductors subject to a live-line safety plan; no erection on crossing spans permitted without confirmed outage dates	High
5	Full route length (44,858 m) lies within Mine Plan Extents	Entire route, all 111 tower foundations; historic landfill layer	§8 — Geotechnic	🟡 MANAGEABLE	Commission a desk-based mine-workings assessment	Medium

#	Risk	Location	Source Section	Construction Impact	Proposed Mitigation	Residual Risk
	with a penalty of 300; historic mine workings present a risk of differential settlement, voids, or contaminated ground at 111 tower foundations	intersects 528 m of the route corridor	al & Ground Conditions		(Coal Authority / BGS records) followed by targeted ground investigation boreholes at each tower location; design foundations with enhanced bearing area or piled solutions where voids or weak strata are confirmed; programme intrusive investigation 12–18 months ahead of construction	
6	11 angled steel towers in the 30°–60° deviation band (maximum realised angle 49.8°) impose elevated conductor tensions and require heavier angle structure fittings; these towers also concentrate installation risk at tight alignment changes	11 angle towers distributed along the route; the tower realising 49.8° is the most critical single structure (specific chainage not listed in the per-feature data, but the tower is within the angled_steel_tower series)	§4 — Angle Points & Alignment	🟡 MANAGEABLE	Confirm conductor tension calculations for each high-angle tower under worst-case broken-wire and wind/ice loading combinations; procure heavy-angle cross-arms and anchor fittings appropriate for the 30°–60° range; sequence stringing to limit unbalanced longitudinal loads on adjacent standard towers; consider temporary back-guys during stringing	Medium
7	Minimum span of 51 m (against a mean of 408 m and maximum of 500 m) is notably short and indicates a constrained location; short	Specific tower pair producing the 51 m span (exact structure numbers not available in the per-feature data)	§3 — Span Breakdown	🟡 MANAGEABLE	Verify conductor sag–tension calculations for the 51 m span under all loading conditions (ice, wind, maximum temperature);	Low

#	Risk	Location	Source Section	Construction Impact	Proposed Mitigation	Residual Risk
	spans can cause conductor clashing, reduced ground clearance under ice load, and complicate stringing operations				confirm that statutory minimum ground clearance and inter-phase clearance are maintained; if not achievable, review tower heights or insert an intermediate tower	
8	Maximum slope of 25.5° along the route creates challenging access for heavy plant (crane outrigger stability and haul-road gradients typically limited to ~15°); affects tower erection and foundation concrete delivery at steeper locations	Sections approaching maximum elevation of 421 m; mean slope 5.0°, with the steepest exceedances concentrated in the higher-terrain portions of the route	§3 — Terrain & Elevation	🟡 MANAGEABLE	Develop a site-specific access and logistics plan; construct temporary haul roads with compacted stone or geogrid reinforcement on slopes above ~15°; deploy telescopic or crawler cranes rated for the ground bearing and gradient; erect towers in pre-assembled sections where crane reach is limited by topography	Medium
9	Route passes through 515 m within the 100 m buffer of Scheduled Monuments (NRW) (6 features recorded within 35 m of centreline); ground-disturbing works risk inadvertent damage to below-ground archaeology	Scheduled Monuments – NRW (100m Buffer), spanning 515 m of the route; 6 features within 35 m of centreline	§8 — Geotechnical & Ground Conditions	🟡 MANAGEABLE	Undertake a watching brief by a qualified archaeologist during all foundation excavation within the 515 m buffer extent; obtain Cadw / CPAT agreement on excavation methodology; avoid setting tower stub positions where trial trenching identifies below-ground remains; adjust individual tower peg	Medium

#	Risk	Location	Source Section	Construction Impact	Proposed Mitigation	Residual Risk
					positions within permitted tolerances where necessary	
10	Route traverses 2,124 m within the 500 m buffer of Special Areas of Conservation (NRW); construction noise, dust, run-off and lighting could impact qualifying features of the SAC during works	SAC (500m Buffer) extent of 2,124 m along the corridor	§5 — Crossings / §8 — Ground Conditions	🟡 MANAGEABLE	Prepare a Construction Environmental Management Plan (CEMP) for the SAC buffer section including run-off bunds and silt fencing at watercourse crossings; restrict working hours to daylight periods during key bird/bat seasons; agree a licence condition with Natural Resources Wales before construction commences in this section	Medium
11	Route crosses a National Trail at chainage 15,772 m and 5 Forest Recreation Routes; public rights of way and recreational users must be managed throughout the construction programme	National Trail crossing at chainage 15,772 m (index 535); Forest Recreation Route crossings at chainages 743 m, 921 m, 2,048 m, 3,530 m, and 4,419 m	§5 — Crossings	🟡 MANAGEABLE	Apply for a temporary Traffic Regulation Order (or equivalent Countryside Act closure) for each crossing; erect temporary exclusion fencing and signage; limit road/trail closures to the minimum duration required for conductor stringing; restore trail surfaces to pre-construction standard on completion	Low
12	Broad-leaved Forest (503 m) and Woodland — NRW (4,132 m) are crossed by the	Broad-leaved Forest, 503 m; Woodland (NRW), 4,132 m — concentrated in the western third	§6 — Access & Constructio	🟡 MANAGEABLE	Obtain felling licences from Natural Resources Wales before procurement;	Low

#	Risk	Location	Source Section	Construction Impact	Proposed Mitigation	Residual Risk
	route; tree-felling and brashing operations create additional programme activities, require forestry consents, and produce residual combustible material	of the route near the terminal at chainage 0 m (dense forest coverage in early spans)	n Logistics		carry out brashing and felling with an approved forestry contractor during the pre-construction programme; clear and chip material promptly to reduce fire risk; restore any felled swathe to the agreed minimum wayleave width	

Summary of blocking risks: Risks 2, 3, and 4 are identified as construction blockers. The no-go layer violations (Water Bodies and Surface Water, Risk 2) require either geometric resolution of tower positions or formal derogation before any consenting or construction authorisation can proceed. The multi-track rail crossing (Risk 3) and the two 400 kV OHL crossings (Risk 4) each require formal third-party agreements — with Network Rail and NESO/National Grid respectively — that typically have long lead times and cannot be assumed at the programme outset. All remaining risks (1, 5–12) are manageable through standard engineering measures, appropriate pre-construction surveys, and phased programme planning.

10. Conclusion and Recommendation

The route is constructible as currently aligned, subject to resolution of the three blocking conditions identified in Section 9. The no-go layer violations at the Water Bodies and Surface Water crossings (Risk 2) are the most immediate constraint: tower pegging across those ~101 m and ~79 m extents must be adjusted to avoid placement within the no-go polygons, or a formal derogation obtained, before the design can be taken forward to any consenting or construction stage. The two 400 kV OHL crossings (Risk 4) and the multi-track rail crossing at chainage 30,638 m (Risk 3) are programme-critical rather than geometrically unresolvable — both are achievable in engineering terms — but the lead time for securing confirmed outage windows from NESO / National Grid and a signed protection agreement from Network Rail means these negotiations must be initiated at the earliest opportunity, well ahead of detailed design completion.

Of the nine manageable risks, the mine plan coverage of the entire 44.9 km route (Risk 5) and the ground conditions in the low-lying terminal section (ch 36,601–44,858 m, Risks 1 and 8 in part) are the ones most likely to affect programme if not addressed early. A desk-based mine-workings assessment and targeted ground investigation programme across all 111 tower positions should be commissioned 12–18 months before construction to allow foundation designs to be finalised without programme delay. The remaining manageable risks — access logistics on steeper western terrain, the short 51 m span, archaeological watching briefs, forestry consents, and the SAC buffer CEMP — are all resolvable through standard pre-construction planning and do not represent conditions that would block construction if the three primary blockers are cleared.