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Revised 2018-2033 Local Development Plan

Transport Background Paper Cross Hands East Employment Site

September 2022

Technical Note

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1. Introduction

The settlement of Cross Hands occupies a nodal location on the A48 which represents the main transport route through South West Wales.

The A48 intersects the A476 at the Cross Hands Roundabout and runs along an east-west alignment, linking Cross Hands with Carmarthen and Swansea. The A476 runs along a north-south alignment linking Cross Hands with Llandeilo and Llanelli. The Cross Hands Business Park and services (including Aldi) are also accessed from the A48 Cross Hands Roundabout.

Historically, the Cross Hands Roundabout and the A476 Gorslas 'Six-Ways' junction (located c.1km to the north of the Cross Hands Roundabout) experience capacity problems, particularly at peak times.

Located to the south of the Cross Hands Roundabout is the A48 'Diamond' junction. The Cross Hands Economic Link Road (ELR) extends from the A48 'Diamond' junction to the A476 at a point approximately 1.2km to the north-east of Gorslas. The link road is being delivered in three phases:

- Phase 1a links the A48 'Diamond' junction to Cross Hands Business Park (Heol Parc Mawr);

- Phase 1b links Cross Hands Business Park (Heol Parc Mawr) to Black Lion Road; and
- Phase 2 will link Black Lion Road to the A476 north of Gorslas (before the junction with the B4297 Gate Road). It crosses the B4556 Norton Road in proximity to the Penygroes Concrete Products Works and residential properties in the vicinity.

The ELR concept was originally conceived in the 1990's as part of the then Gwendraeth Valley Link Road which was intended to run from Cross Hands down the Gwendraeth Valley to Kidwelly. Both the alignment and extent of the route have changed in the intervening period as the scheme objectives evolved. The ELR was listed as part of the priority Economic Regeneration Infrastructure within the Regional Transport Plan (RTP) for South West Wales, approved by the Welsh Government and Phases 1a and 1b of the ELR have already been constructed and are currently operational. Phase 2 of the ELR has obtained planning approval and is currently under construction.

The Cross Hands ELR was developed in line with the Welsh Government's Transport Appraisal Guidance (WelTAG). The ELR was granted approval and funding on the basis that it would address existing transport constraints (congestion and safety) and would facilitate economic growth within the Cross Hands area. Once completed, the ELR is forecast to provide the following transport related benefits:

- Improved access to the proposed East Strategic Employment Site (ESES) and other proposed economic developments within Cross Hands and the surrounding area (including the Carmarthen Road residential development and the mixed-use developments at Cross Hands West and Parc Emlyn);
- Relieve congestion and improve safety on the A48 Cross Hands Roundabout (which is on a Trans-European Route) and at the A476 Gorslas 'Six-Ways' junction;
- Improve journey time reliability through the A48 Cross Hands Roundabout and the A476 Gorslas 'Six-Ways' junction;
- Improve safety on the A476 Llandeilo Road as part of the 'Safer Routes in Communities' programme;
- Improve noise and air quality on the A476 Llandeilo Road; and
- Support the delivery of the overarching objectives of the RTP.

Notwithstanding the above benefits, the Welsh Government have previously stipulated that further development of large sites (beyond those already appraised) within the Cross Hands area can only come forward in conjunction with a substantial transport infrastructure improvement scheme, as such there is an expectation that developments will contribute towards such improvements. Potential improvement schemes (to which contributions may be required) include:

- Further phases of the ELR; connecting to the Gwendraeth Valley in the west;
- A476 link and junction improvements;
- A48 Cross Hands Roundabout capacity and safety improvements;
- Walking and cycling linkages;
- Electric Vehicle (EV) charging infrastructure; and
- Passenger transport enhancements.

This Technical Note provides an overview of the transport related appraisals undertaken for Cross Hands and the surrounding area; providing details of committed infrastructure improvements and the associated benefits forecast to be accrued, as a means of demonstrating the level of development that can be accommodated without further improvement to the surrounding transport network.

2. Cross Hands Economic Link Road (ELR)

2.1 ELR Phase 1a and 1b

Phase 1 of the ELR was delivered as part of the Cross Hands ESES development (application S/23781); with Phase 1a and 1b constructed during the 2011/12 and 2015/16 financial years respectively. Phase 1 of the ELR was funded by the European Regional Development Fund (ERDF).

2.1.1 Background Context

The proposals for a 'Sustainable Industrial Park' at the ESES expanded the availability and mix of good quality industrial units at Cross Hands to create a prime location for businesses seeking to access markets in Carmarthenshire, Swansea Bay and throughout West Wales. They built upon the existing business activities at Cross Hands East by capitalising on the highly accessible location and the increasing importance of the 'green economy' to improve the stock of units in line with the strategic priorities of Carmarthenshire County Council (CCC) and the Welsh Government.

A Transport Assessment (TA), produced by Arup, accompanied the outline planning application for the 'Sustainable Industrial Park' and the detailed planning application for the supporting road infrastructure (forming Phases 1a and 1b of the ELR). The supporting traffic modelling work provided an understanding of operational conditions in the event that a number of developments within the Cross Hands area were implemented; including the Strategic Employment Site proposals and a mixed-use development at the nearby Cross Hands West site (formerly referred to as Cross Hands West Tip), which was the subject of a separate TA (prepared by Atkins). To accurately account for the cumulative impact of both developments and for consistency purposes, the TA was predicated on wider forecasting and modelling work undertaken by Atkins.

The methodology applied by Atkins was agreed with CCC and the South Wales Trunk Road Agent (SWTRA). It is described in detail within the 'Cross Hands Mixed Development: Scoping Report' (June 2010) which informed the content of the TA for the West Tip site and is provided as Appendix A to the Cross Hands ESES TA. Atkins utilised a SATURN (Simulation and Assignment of Traffic in Urban Road Networks) model (originally built by Waterman Burrow Crocker) for the purposes of estimating traffic flows associated with the Strategic Employment Site access routes. This enabled traffic to be reassigned to simulate network conditions once the road and associated development had been implemented.

2.1.2 Development Proposals

The TA produced in support of the outline application considered the impact of development proposals that comprised 19.1ha of gross site area with 10.25ha of this considered net developable. The proposals were to provide a total of 40,023m² of floorspace, broken down as follows:

- Offices: 4,900m²;
- Hotel: 2,555m² (50 bedrooms);
- Industrial Units: 31,208m²; and
- Incubator Units / Central Hub: 1,360m².

Access

The proposed industrial park had two vehicular access points as shown in **Figure 1**.

Graph to insert

Figure 1 – Cross Hands SESE Access Proposals

Congestion at the A48 Cross Hands Roundabout, together with the need to relieve local residential areas from commercial traffic, formed key supporting arguments underpinning the provision of the new site access road. The creation of a new site access road provided the principal vehicular access into the site and also provided a strong connection to the A48 Trunk Road (T). From the new site access road, the primary access point into the Strategic Employment Site was constructed along the south-eastern boundary (representing Phase 1a and 1b of the ELR).

A secondary point of access was constructed along the southern boundary of the site, providing a direct connection to the existing Cross Hands Business Park via Heol Parc Mawr. This access ensured an alternative route of entry and exit in the event of an emergency and achieved a degree of traffic dispersal by integrating with the existing business park. The secondary access was also proposed to facilitate the potential provision of alternative public transport routes running through the site.

2.1.3 Impact Appraisal

The SATURN model utilised by Atkins was predicated on an Opening Year of 2015 for the Cross Hands West mixed-use development. Due to the longer phasing of implementation expected for the Strategic Employment Site proposals, for modelling purposes it was assumed that the industrial park development would not be fully built out until 2025. This meant that 2025 formed the Base Year for testing the Strategic Employment Site proposals. At the request of SWTRA, all Trunk Road junctions were also assessed for a 2030 Design Year as this represented 15 years post completion of the Cross Hands West development.

Atkins projected base flows accounted for two committed developments that were expected to come forward in advance of the Strategic Employment Site. They consisted of the following:

- Cross Hands West (Tip) Mixed Use Development:
 - Food Store and Petrol Filling Station (PFS) (6,967m²);
 - Residential Development (200 units);
 - Residential Care Home (60 residents); and
 - Doctors Surgery (1,500m²).
- Residential Development, Carmarthen Road, Cross Hands:
 - Residential Development (183 units).

The following junctions were modelled as part of the TA with the assessments considering likely impacts for future Design Years of 2025 and 2030 (the assessments were undertaken utilising traffic flow forecasts derived from the Atkins SATURN model and the industry recognised TRL Junctions software package ARCADY and PICADY):

- Black Lion Road junction;
- Strategic Employment Site access;
- Heol Parc Mawr;
- Meadows Road;
- Secondary Strategic Employment Site access junction;
- A476 Llandeilo Road / Cefneithin Road / Black Lion Road (Gorslas West);
- A476 Llandeilo Road / Pen-y-Groes Road / Church Road (Gorslas East);
- Cross Hands A48 Roundabout;
- A48 East / Heol Parc Mawr Roundabout; and

- A48 West / Heol Parc Mawr Roundabout.

The TA concluded that the junction layouts forming part of the Strategic Employment Site access road would operate satisfactorily and that there were no discernible changes forecast in conditions along the A48 corridor and improved junction operations along the A476 corridor at Gorslas. An overview of the modelling analysis is presented in **Table 1**.

Junction AM PM 2025 Base 2025 Post Dev. 2030 Post Dev. 2025 Base 2025 Post Dev.
2030 Post Dev.

Black Lion Rd Junction

Strategic Employment Site Access

Heol Parc Mawr

Meadows Road

Secondary Strategic Employment Site Access Junction

A476 Llandeilo Road/Cefneithin Road/ Black Lion Road (Gorslas West)

A476 Llandeilo Road/Pen-y-Groes Road/Church Road (Gorslas East)

Cross Hands Roundabout

A48 East/Heol Parc Mawr Roundabout

A48 West/Heol Parc Mawr Roundabout

Key Not a model scenario within Capacity, Approaching Capacity, Over Capacity

Table 1 – Modelling Analysis Summary

In conclusion, the modelling work undertaken in support of the Cross Hands ESES TA demonstrated that with Phase 1 of the ELR in place, the following developments (with their associated infrastructure improvements) would be acceptable from a transport perspective:

- Cross Hands ESES Development;
- Cross Hands West (Tip) Mixed Use Development; and
- Residential Development, Carmarthen Road, Cross Hands.

1.1. ELR Phase 2

Phase 2 of the ELR will run between Black Lion Road and the existing A476 Llandeilo Road. The northern most section between Norton Road and the A476 has been substantially completed. The remaining section south of Norton Road will see the formation of a staggered priority junction at the intersection with Norton Road. The western spur will link to Norton Road directly with limited horizontal and vertical re-alignment. However, the eastern spur would link to Norton Road by traversing the Parc Emlyn ‘Mixed Use’ development site, linking to a proposed roundabout junction adjacent to Jerusalem Chapel, approximately 360m east of the main link road. Norton Road would essentially be truncated by the ELR, terminated on its eastern side by means of a turning head, and would remain open to traffic to provide access to those properties to the eastern side of the ELR.

1.1.1. Cross Hands Economic Link Road Phase 2 WelTAG

Background Context

Arup and Jacobs were commissioned by CCC in 2013 to undertake a scheme assessment study in accordance with the principles of the 2008 WelTAG, to determine the 'Preferred Route' for Phase 2 of the Cross Hands ELR, and develop that 'Preferred Route' into a 'Preliminary Design' to take through the statutory procedures for environment, planning and land acquisition.

In March 2013, CCC published the recommendations of the WelTAG Planning and Stage 1 assessment. The report was titled 'WelTAG Planning Stage and Stage 1 Appraisal' and recommended that three of the broad corridor options be taken forward and assessed in more detail at Stage 2. As part of the Stage 2 WelTAG, an appraisal of the routes within the three recommended corridors was undertaken and a recommendation made on a 'Preferred Route'.

Problems, Opportunities, Objectives and Stakeholder Engagement

The baseline studies and stakeholder consultation undertaken as part of the Planning and WelTAG Stage 1 assessment provided a detailed understanding of the problems and opportunities for the scheme within the study area as well as identifying the Transport Planning Objectives (TPOs) for the scheme. The further baseline studies and stakeholder consultation and participation undertaken for the Stage 2 study further informed and confirmed the problems and opportunities within the study area and confirmed the key TPOs for the scheme.

During the Stage 2 study, the stakeholder consultation undertaken included a public exhibition and stakeholder workshops.

Route Development

The Stage 1 appraisal recommended three broad corridor options be taken forward and assessed in more detail at Stage 2 to develop the options and ultimately recommend a 'Preferred Route'.

The Stage 2 study developed route and junction options for the new link road for each of the Stage 1 corridors, seeking to minimise impact on the known engineering and environmental constraints.

The three routes that were developed to be taken through the WelTAG Stage 2 appraisal to determine the 'Preferred Route' were as follows:

- **Orange Route** – This route would have continued in a north-easterly direction from the end of the ELR Phase 1 across Black Lion Road with a near straight alignment. It would then move into a left hand bend and cross Norton Road seeking to minimise impact on the associated residential properties. From here the route would have run north, again with a near straight alignment, to the east of the Caeau Blaen-yr-Orfa Site of Special Scientific Interest (SSSI) whilst avoiding direct impact on a field actively used for horses, before moving into a right hand bend to join the A476 Llandeilo Road just south of the existing B4297 Gate Road junction. This route would have approached the A476 at an angle that facilitated a continuous alignment with the existing A476, to assist in re-routing strategic traffic onto the new route. The approximate length of the Orange Route was 2.0km;
- **Green Route** – This route would have closely followed the Orange Route until just north of the Norton Road crossing where it would have moved north-east through a right hand bend then a left hand bend before joining the existing B4297 Gate Road in the gap between the residential properties. It would then have used and upgraded the existing Gate Road through to its junction with the A476 Llandeilo Road. The approximate length of the Green Route including the existing section of Gate Road was 2.0km; and
- **Pink Route** – This route would have closely followed the Orange and Green Routes until just north of Norton Road crossing where it would have run between the two routes as they separate through a large right hand bend. It would then have crossed the B4297 Gate Road and the Afon Lash, seeking to minimise impact on the rear of the properties on Gate Road, before running north and

then east to join the A476 Llandeilo Road with a continuous alignment close to the end of the residential built-up area. It was considered that routing this option to join the A476 further east at an angle that would facilitate a continuous alignment with the existing A476 was viable as it would benefit the associated residential properties on the A476 and it would not significantly increase the impact on the associated farm holding. The approximate length of the Pink Route was 2.3km.

Route Appraisal

An assessment of the three routes was undertaken with the outcomes incorporated into and reported in the WelTAG Stage 2 appraisal against the Welsh Impact Areas (Economy, Environment and Society), the scheme TPOs and the other criteria. This assessment included the following:

- **Highway Geometry and Junction Strategy** – It was considered that any of the likely junction forms (at-grade ghost island right turn junctions, at-grade roundabouts or signals) could be accommodated at any of the proposed junction locations without significant additional impact on adjacent properties. Analysis was undertaken on the possible use of at-grade ghost island right turn junctions (using the PICADY software), and this confirmed adequate capacity for all junctions except the Norton Road East arm of the Norton Road junction where a two-lane entry would be required;
- **Road Safety** – It was considered that all three routes would improve road safety with the new improved road infrastructure and particularly at the Gorslas ‘Six-Ways’ junction and at the A48 Cross Hands Roundabout with a significant proportion of strategic traffic being diverted away from these junctions onto the new link to join the A48 at the Cross Hands Business Park junction;
- **Traffic** – A comparison of the estimated traffic flows suggested that all three Stage 2 routes would attract traffic from the existing A476 Llandeilo Road. It suggested that the potential traffic on the new link road would be less with the Green Route where the new link road ties into the existing Gate Road before joining the A476, whilst the other options tie onto the A476 Llandeilo Road;
- **Earthworks** – With the undulating topography across the study area, all three routes would have required significant cut and fill earthworks. In addition to the site won material from the cuttings, there were also areas of soft ground and Peat which could have been either dried out and treated for use as engineering fill, excavated and used as landscape fill or excavated and taken off site to landfill. There were also areas of contaminated land for which it was assumed that the material would need to be excavated and taken off site to the nearest suitable landfill facility in Bridgend. A number of coal seams outcrop were present at shallow depth within the study area and the Coal Authority reported a number of coal mine entries. The Orange Route did not appear to be affected by any mine entries on line or within 20m of the route, whilst the Green and Pink Routes could potentially have been affected by three and two mine entries respectively;
- **Construction Issues** – Traffic management was not considered to be a significant issue where all routes intersected the existing road network at the proposed junctions however with the Green Route, the traffic management on the improved section of Gate Road may have been more difficult. Although there were areas of poor quality soft ground with all routes and areas of shallow mine workings and mine shafts as detailed above, these were not considered to create any particularly complex issues for a competent contractor;
- **Land and Compensation** – The number of residential properties affected was identified as follows:
 - Orange Route: 2 no. residential properties and 1 no. agricultural outbuilding;
 - Green Route: 2 no. residential properties; and
 - Pink Route: 2 no. residential properties.
- **Scheme Costs** – Estimated scheme costs (Q3 2013 prices) were as follows:
 - Orange Route: £14,754,000;
 - Green Route: £13,825,000; and
 - Pink Route: £17,199,000.

The full WelTAG Stage 2 appraisal of the three developed routes against the Welsh Impact Areas (Economy, Environment and Society), the scheme TPOs and consideration of the public and stakeholder acceptability, feasibility, affordability and risk, is recorded in Appraisal Summary Tables

(ASTs) in Appendix G of the WelTAG Stage 2 Appraisal Report (November 2013). A summary is provided in subsequent sections of this Technical Note.

The economic assessment of the three routes used the Transport Users Benefit Appraisal (TUBA) software and utilised data from the traffic model forecasts in relation to the number of trips, average journey times and average distances. The economic benefits were calculated based on the cost savings with the new road scheme in place (Do-Something) compared with the costs savings without the new road scheme in place (Do-Minimum). The results of the TUBA economic assessment are outlined below:

- **Orange Route**
 - Present Value of Benefits (PVB): 60,289;
 - Present Value of Costs (PVC): 13,158;
 - Net Present Value (NPV): 47,131; and
 - Benefit to Cost Ratio (BCR): 4.58.
- **Green Route**
 - PVB: 44,021;
 - PVC: 12,286;
 - NPV: 31,735; and
 - BCR: 3.58.
- **Pink Route**
 - PVB: 60,701;
 - PVC: 15,354;
 - NPV: 45,347; and
 - BCR: 3.95.

The results indicated that all three routes had a positive NPV and BCR and that the scheme is positive in economic terms as the scheme costs will be more than offset by the improvements in transport economic efficiency, safety and carbon emissions. The high BCR's indicated that the scheme would represent 'good' Value for Money (VfM). Furthermore, the wider economic impact assessment for the scheme (presented in Appendix F of the WelTAG Stage 2 Appraisal Report, November 2013) concluded that the impact would be unambiguously positive for all three routes, primarily with the contribution the scheme would make to the development of strategically important sites in Cross Hands.

From the overall WelTAG Stage 2 appraisal of the three routes, it was recommended that the Orange Route be selected as the 'Preferred Route' for Phase 2 of the Cross Hands ELR for the following main reasons:

- All three routes demonstrated very good economic return with the Orange Route providing the best VfM;
- Based on the estimated scheme costs, the Orange Route was within approximately 6% of the lowest scheme cost with the Green Route;
- The Orange Route was considered to have the least environmental impact with the biodiversity and landscape / townscape topics providing the key differentiating factors. This view was supported by Natural Resources Wales (NRW) at an ELR environmental consultation meeting;
- As with the other routes, the overall impact of the route on society would be beneficial, in terms of improved transport safety, permeability and social inclusion;
- The Orange Route would have a beneficial impact on the TPOs for the scheme with a greater beneficial impact than the other two routes;
- The Orange Route was the preferred route in terms of public and stakeholder acceptability;

- As with all routes, the scheme would improve road safety although with fewer junctions proposed with the Orange Route, it was considered to have the greatest benefit in road safety; and
- The Orange Route had the potential for an approximate 700m length of a 50mph speed limit with the associated economic benefits and the attractiveness of the route.

It was therefore recommended that the Orange Route be taken forward as the 'Preferred Route' and developed into a 'Preliminary Design' to take through the statutory procedures for environment, planning and land acquisition. The Orange Route was formally approved by CCC's Executive Board on 2nd June 2014.

2.2.2 Cross Hands ELR Phase 2 Transport Assessment (2014)

Following formal approval of the Orange Route, Atkins were commissioned by CCC in 2014 to prepare a TA in support of an application for full planning permission for Phase 2 of the Cross Hands ELR.

Phase 2 Route – Development Proposals

As shown in **Figure 2**, which is a plan of the route proposed at planning in 2014, Phase 2 of the ELR continued from the northern end of Phase 1b; crossing Black Lion Road in a north-easterly direction. Before crossing the B4556 Norton Road, the proposed left hand bend changed the alignment of the ELR to a northerly direction. The ELR then passed to the east of the Caeau Blaen-yr-Orfa SSSI before moving into a right hand bend to join the A476 Llandeilo Road, just south of the existing B4297 Gate Road junction. The ELR approached the A476 at an angle that facilitates a continuous alignment with the existing A476, which assists in re-routing strategic traffic onto the new route.

Phase 2 of the Cross Hands ELR also facilitates access to the existing road network at the following locations:

- Black Lion Road – via a staggered priority junction;
- B4556 Norton Road – via a staggered priority junction; with a roundabout along the eastern arm of the junction providing access to Norton Road (east); and
- A476 Llandeilo Road – via a staggered priority junction.

Graph

Figure 2 – Cross Hands ELR Phase 2 Route Plan

Provision for pedestrians and cyclists, forming part of the scheme, is outlined below:

- Economic Link Road
 - A 3m wide (off-carriageway) footway / cycleway provided along the verge adjacent to the northbound carriageway of the ELR; and
 - An uncontrolled crossing of the ELR provided between its junctions with Norton Road and the A476 Llandeilo Road. This crossing is provided as mitigation to severance (of Public Footpath FP50/1/1) caused by construction of the ELR.
- Black Lion Road
 - An uncontrolled pedestrian crossing of the ELR provided at its junction with Black Lion Road; with a pedestrian refuge located in the middle of the junction. The crossing is provided as mitigation to severance (of Black Lion Road) caused by construction of the ELR; and
 - The Black Lion Road / ELR junction was designed not to unduly impact on Sustrans proposals for the on-road Amman Valley Cycle Route. The Amman Valley Cycle Route enters Black Lion Road to the north of the ELR before connecting to Heol Gorsddu.
- B4556 Norton Road

- An uncontrolled pedestrian crossing of the ELR provided at its junction with Norton Road; with a pedestrian refuge located in the middle of the junction. The crossing is provided as mitigation to severance (of Norton Road) caused by construction of the ELR; and
- A further uncontrolled crossing with pedestrian / cycle refuge, forming part of the ELR's 3m wide (off-carriageway) footway / cycleway, is provided across the western arm (Norton Road) of the ELR / Norton Road junction.
- A476 Llandeilo Road
 - An uncontrolled crossing with pedestrian / cycle refuge, forming part of the ELR's 3m wide (off-carriageway) footway / cycleway, provided across the western arm (Llandeilo Road) of the ELR / Llandeilo Road junction.
- B4297 Gate Road
 - An uncontrolled pedestrian crossing of the ELR, with pedestrian refuge, provided immediately north of Gate Road.

It is envisaged that the completed ELR will form the primary link for traffic using the A476 (east) to connect to the A48. It will also provide a new east-west route for A476 traffic that avoids the A48 Cross Hands Roundabout which can experience congestion at peak times. The A48 Cross Hands Roundabout was forecast to experience increased future traffic demand and congestion associated with committed development within its vicinity, were the ELR not to be completed.

Section 4 of the Cross Hands ELR Phase 2 TA (2014) provides a detailed appraisal of existing transport provision, condition and operation in the area surrounding the Cross Hands ELR, including the highway, public transport (bus and rail), pedestrian and cycle networks.

Assessment Methodology

Section 5 of the ELR Phase 2 TA, outlines the methodology used in identifying and assessing the transport impacts of Phase 2 of the Cross Hands ELR. It provides details of the scenarios assessed and the modelling work undertaken to derive transport forecasts for each scenario. A summary is provided in the following section.

A48 SATURN Model

Traffic forecasts were derived from the A48 SATURN Traffic Model which had been updated by Arup for the purpose of the Stage 2 WeTAG appraisal. Details of the model and the updates performed are included in the Cross Hands Economic Link Road Phase 2 Local Model Validation Report (LMVR) (Arup, March 2014).

The model was used to derive traffic forecasts for a 2017 Opening Year and a 2032 Design Year, covering weekday peak and inter-peak periods. The following two scenarios were modelled as a means of assessing the vehicular impact of the ELR Phase 2 scheme on the surrounding road network:

- Do-Minimum scenario (i.e. without the proposed ELR Phase 2 in place); and
- Do-Something scenario (i.e. with the proposed ELR Phase 2 in place).

The assessment process considered the effects of the proposed scheme (Do-Something) against the Do-Minimum; that is, what could be reasonably expected to occur if Phase 2 of the ELR was not constructed. The Do-Minimum scenario therefore includes the base network plus the demand and supply elements of any committed or proposed development and transport schemes within the study area.

The schemes included in the Do-Minimum scenario comprised of the following:

- Cross Hands ELR Phase 1a;
- Cross Hands ELR Phase 1b;

- Cross Hands West (Tip) Development and associated road improvements:
 - 200 Residential Units;
 - 60 bed Residential Care Home;
 - 8,375m² Food Store; and
 - 1,500m² Health Centre.
- Cross Hands East Strategic Site Development:
 - 32,568m² Industrial Estate;
 - 4,900m² Offices; and
 - 50 bed Hotel.
- Parc Emlyn Development:
 - 400 Residential Units; and
 - 200 Pupil Primary School; and
- Carmarthen Road Development (only included in 2032 Design Year):
 - 173 Residential Units.

The Do-Something scenario also included the development of Phase 2 of the Cross Hands ELR. Therefore the Do-Something scenario was the base network plus any committed or proposed highway schemes within the study area and Phase 2 of the ELR.

Impact Assessment

Utilising the traffic forecasts derived from the A48 SATURN Traffic Model, junction capacity assessments were undertaken at the following junctions (including full descriptions):

- **Cross Hands A48 Roundabout** – At grade six arm, non-signalised roundabout formed by the A48(T), A476, Heol Stanlyd and services access;
- **A48(T) / Heol Parc Mawr Grade Separated Interchange (A48 ‘Diamond’)** – This grade separated junction is formed by an overbridge over Heol Parc Mawr, with an eastern and western roundabout providing links to the A48 on-slips and off-slips;
- **Meadows Road / Heol Parc Mawr Junction** – Priority ‘T’ junction formed by Heol Parc Mawr (main arm) and Meadows Road (minor arm);
- **Cross Hands ELR / Black Lion Road Junction** – Proposed staggered junction formed between Cross Hands ELR (main arm) and staggered minor arms from a realigned Black Lion Road;
- **Cross Hands ELR / B4556 Norton Road Junction** – Proposed staggered junction formed between Cross Hands ELR (main arm) and staggered minor arms comprising Penygroes Road (existing alignment) and Norton Road (realigned to create stagger); and
- **Gorslas B4556 / A476 ‘Six-Ways’ Junction** – This is an existing crossroads junction formed by the A476 (Llandeilo Road) as the main arm and the B4556 (Penygroes Road) connecting from the east and Church Road connecting from the west. In close proximity to the south, two further arms (Black Lion Road and Cefneithin Road) also connect to the A476.

The location of these junctions is shown in **Figure 3**.

Small graph

Figure 3 – Study Junctions

The junction capacity analysis undertaken provided a basis for determining whether additional traffic generated by the developments around Cross Hands could be satisfactorily accommodated whilst also ensuring that the design of ELR Phase 2 would be operationally effective.

The junction capacity assessments were undertaken utilising the industry recognised TRL Junctions software package (ARCADY for roundabouts and PICADY for priority junctions). Each assessment

scenario was tested within the peak weekday AM and PM periods (identified as 0800-0900 and 1700-1800).

Junction capacity is measured (within ARCADY and PICADY) as the Ratio of Flow to Capacity (RFC), which is a measure of the volume of traffic divided by the capacity for that particular movement. It is generally agreed that the theoretical capacity of a roundabout or a priority junction is taken as the RFC value of 100% or 1.00 and the design capacity as 85% or 0.85. The design capacity allows for +/- 10-15% of the standard error and provides a level of confidence that for 5 out of every 6 cases queuing can be avoided. Junctions can still operate within capacity with an RFC of up to 100% or 1.00, however there is a lower level of confidence.

The junction capacity assessments undertaken confirmed the following:

- Junctions proposed along Phase 2 of the ELR have been suitably designed and had sufficient capacity to accommodate forecast future year traffic flows; and that
- Phase 2 of the ELR would not trigger capacity problems at nearby junctions but would indeed improve operational conditions at some of the most congested junctions on the surrounding road network; most notably at the A476 priority junctions in Gorslas (Junction 6a) and the A48 Cross Hands Roundabout (Junction 1).

Table 2 provides a summary of the junction capacity analysis undertaken as part of the ELR Phase 2 TA.

Junction	AM Peak				PM Peak			
	2017 Opening Year		2032 Design Year		2017 Opening Year		2032 Design Year	
	DoM	DoS	DoM	DoS	DoM	DoS	DoM	DoS
Key Phase 1 ELR Junctions								
Junction 3: Meadows Road / Heol Parc Mawr	✓	✓	✓	✓	✓	✓	✓	✓
Key Phase 2 ELR Junctions								
Junction 4: Cross Hands ELR / Black Lion Road	-	✓	-	✓	-	✓	-	✓
Junction 5: Cross Hands ELR / B4556 Norton Road	-	✓	-	✓	-	✓	-	✓
Junction 7: Cross Hands ELR / A476 Llandeilo Road	-	✓	-	✓	-	✓	-	✓
Key Local Junctions								
Junction 2a: A48(T) / Heol Parc Mawr Roundabout (East)	✓	✓	✓	✓	✓	✓	✓	✓
Junction 2b: A48(T) / Heol Parc Mawr Roundabout (West)	✓	✓	✓	✓	✓	✓	✓	✓
Junction 6a: A476 Llandeilo Road / Cefneithin Road / Black Lion Road (Gorslas West)	✓x	✓	x	x	✓	✓	x	✓x
Junction 6b: A476 Llandeilo Road / Pen-y-Groes Road / Church Road (Gorslas East)	✓	✓	✓	✓	✓	✓	✓x	✓
Junction 1: Cross Hands A48 Roundabout	✓	✓	✓	✓	✓	✓	✓	✓

DoM - 'Do-Minimum' Scenario: Without Phase 2 of the Cross Hands ELR

DoS - 'Do-Something' Scenario: With Phase 2 of the Cross Hands ELR

Not Applicable - -

Within Design Capacity - ✓

Within Theoretical Capacity - ✓x

Over Capacity - x

Table 2 – ELR Phase 2 TA: Junction Capacity Analysis Summary

In conclusion, the modelling work undertaken in support of Phase 2 of the ELR demonstrated that with both Phase 1 and 2 of the ELR in place, the following developments (with their associated infrastructure improvements) would be acceptable from a transport perspective:

- Cross Hands West (Tip) Development and associated road improvements;
- Cross Hands East Strategic Site Development;
- Parc Emllyn Development; and
- Carmarthen Road Development.

Furthermore, the cumulative transport infrastructure improvements being delivered as part of the developments around Cross Hands are forecast to improve operational conditions at the congested A48 Cross Hands Roundabout and the Gorslas 'Six Ways' junction. The full benefits of the committed transport infrastructure improvements are captured in the ELR Phase 2 TPO appraisal which is outlined in the next section.

ELR Phase 2 TPO Assessment

Objective 1 – Improve access to the proposed East Strategic Employment Site (ESES) and other proposed economic developments within Cross Hands and the surrounding area

Phase 1a of the ELR provided an improved road link connecting the A48 and Meadows Road to the Cross Hands Business Park; whilst Phase 1b connects through to Black Lion Road with a ghost island priority junction providing access to the ESES.

Phase 2 of the ELR will connect Black Lion Road to Norton Road and the A476 Llandeilo Road (approximately 1.2km to the north east of Gorslas). It will complement the accessibility benefits accrued from phases 1a and 1b of the ELR, by improving connectivity with settlements in the north and east, including Ffairfach, Llandeilo and Ammanford. In doing so, the completed ELR will improve access to the proposed ESES and other proposed economic developments within Cross Hands (including Cross Hands West) and the surrounding area (including Parc Emlyn).

Furthermore, the completed Cross Hands ELR (combined Phases 1a, 1b and 2) will provide a new east-west route that will allow traffic to bypass congested parts of the A476 (in close proximity to Gorslas) and in some cases the A48 Cross Hands Roundabout (depending on journey origins and destinations). Operational problems along these congested parts of the surrounding road network will be compounded if the ELR is not completed, potentially to a level that could limit the amount of economic development intended for the surrounding area.

Objective 2 – Relieve congestion and improve safety on the A48 Cross Hands Roundabout which is on a Trans-European Route

As explained above, the completed Cross Hands ELR will provide a new east-west road link that will allow traffic to avoid congested parts of the surrounding road network, including both the A476 and the A48 Cross Hands Roundabout.

It is envisaged that the new road link will, in due course, form the primary route for traffic using the A476 (north-east of Gorslas) to connect to the A48. This is facilitated by the proposed design at the north eastern end of Phase 2, where the ELR connects to the existing road network at an angle that provides a continuous alignment with the existing A476 (to / from Carmel / Ffairfach). The proposed alignment will assist in re-routing strategic traffic (currently using the A476 Llandeilo Road) onto the ELR. Consequently, the following flow reductions were forecast at the A48 Cross Hands Roundabout (compared to the Do-Minimum scenario):

- AM Peak 2017 – 192 Passenger Car Units (PCUs) (4.82% reduction);
- PM Peak 2017 – 139 PCUs (3.34% reduction);
- AM Peak 2032 – 259 PCUs (5.87% reduction); and
- PM Peak 2032 – 279 PCUs (5.86% reduction).

The flow reductions outlined above reflect significant decreases in traffic flows along the A476 (north-east) arm of the roundabout; leading to desirable reductions in the level of vehicular conflict at the A48 Cross Hands Roundabout. The combined flow and vehicular conflict reductions are expected to accrue desirable safety benefits and congestion relief.

Should the ELR fail to divert the desired volume of traffic away from the A476 Llandeilo Road and the A48 Cross Hands Roundabout, it may be appropriate for a complementary signage strategy to be developed and implemented.

Objective 3 – Relieve congestion and improve safety on the A476 Gorslas ‘Six-Ways’ junction

The A476 Llandeilo Road intersects Cefneithin Road, Black Lion Road, the B4556 Penygroes Road and Church Road at Gorslas. Whilst it’s known locally as the ‘Six-Ways’ junction, it tends to operate as two separate priority controlled crossroads as follows:

- Gorslas West – A476 / Cefneithin Road / Black Lion Road; and
- Gorslas East – A476 / B4335 Penygroes Road / Church Road.

Whilst the assessment results for these junctions show significant congestion at the western crossroads in the Design Year, operational conditions are shown to improve with Phase 2 of the ELR in place (compared to the Do-Minimum scenario). The operational improvements are a direct consequence of the forecast reassignment of traffic from the A476 at Gorslas onto Phase 2 of the ELR.

The forecast flow reductions at both junctions with Phase 2 of the ELR in place are shown below:

- Gorslas West:
 - AM Peak 2017 – 350 PCUs (22.46%);
 - PM Peak 2017 – 519 PCUs (30.69%);
 - AM Peak 2032 – 286 PCUs (16.04%); and
 - PM Peak 2032 – 478 PCUs (24.60%).
- Gorslas East:
 - AM Peak 2017 – 457 PCUs (31.65%);
 - PM Peak 2017 – 520 PCUs (31.53%);
 - AM Peak 2032 – 432 PCUs (25.59%); and
 - PM Peak 2032 – 468 PCUs (24.31%).

The forecast flow reductions outlined above are expected to deliver safety and operational benefits at both junctions.

Objective 4 – Improve journey time reliability through the A48 Cross Hands Roundabout and the A476 Gorslas ‘Six-Ways’ junction

As described above (in relation to Objectives 2 and 3) traffic flow reductions are forecast at both Gorslas and the A48 Cross Hands Roundabout with Phase 2 of the ELR in place. Associated improved operational conditions are also expected at both these locations. With journey time reliability being a recognised facet of congestion; the proposed scheme will deliver improved journey time reliability through the A48 Cross Hands Roundabout and the A476 Gorslas ‘Six-Ways’ junction.

Objective 5 – Improve safety on the A476 Llandeilo Road as part of the ‘Safer Routes in Communities’ programme

The objectives of the ‘Safer Routes in Communities’ programme are to “improve road safety, minimise accidents, improve children & adult’s health and development, reduce traffic pollution and help stronger communities”.

As discussed previously, Gorslas suffers from a combination of high traffic volumes and insufficient capacity at the 'Six-Ways' priority junctions during peak periods. These problems are compounded by local parking pressures and high pedestrian demand associated with local amenities, particularly Gorslas Primary School and Cae'r Ffair Nursery.

Gorslas Primary School is bounded by the A476 to the west and Black Lion Road to the east. The main gate and vehicular entrance is situated off Black Lion Road whilst there is a dedicated pedestrian access off the A476. Cae'r Ffair Nursery is also located on the northern corner of the A476 Llandeilo Road / Church Road junction. Both of these educational establishments also trigger a spike in pedestrian demand during peak periods and an undesirable conflict with vehicular traffic. The proposed scheme will not affect existing levels of pedestrian demand or parking pressures within Gorslas; however, it will directly contribute towards achieving the 'Safer Routes in Communities' objective by significantly reducing traffic volumes through Gorslas and reducing the level of conflict between different transport modes. In turn this is expected to provide the desired community, environmental and safety benefits.

Objective 6 – Improve noise and air quality on the A476 Llandeilo Road

Noise and air quality was considered as part of the Environmental Statement (ES) for Phase 2 of the ELR. The ES for the scheme was submitted as one of the core documents for the ELR Phase 2 planning application.

Objective 7 – Improve existing ecological habitats within the study area as part of the scheme

Ecology was also considered as part of the ES for Phase 2 of the ELR. The ES for the scheme was submitted as one of the core documents for the ELR Phase 2 planning application.

Objective 8 – Support the delivery of the overarching objectives of the Regional Transport Plan (RTP)

The published RTP was initially produced by the South West Wales Integrated Transport Consortium (SWWITCH), however SWWITCH ceased to exist since the end of the 2013 / 14 financial year. Nevertheless the RTP covered the planning period up until 2015 and had not been updated or superseded by the replacement strategic transport body; the Swansea Bay City Region Board when the ELR Phase 2 WeITAG and TA were undertaken.

The South West Wales RTP, prepared by SWWITCH, was framed around a series of objectives, which included the following;

- To improve access for all to a wide range of public and private services and facilities including employment and business, education and training, health care, tourism and leisure activities;
- To improve the sustainability of transport by improving the range and quality of, and awareness about, transport options, including those which improve health and wellbeing;
- To improve the efficiency and reliability of the movement of people and freight within and beyond South Wales to support the regional economy;
- To implement measures which make a positive contribution to improving air quality and reducing the adverse impact of transport on health and climate change, including reducing carbon emissions; and
- To improve road safety and personal security in South West Wales.

Phase 2 of the Cross Hands ELR supports the delivery of overarching national, regional and local policy objectives. Furthermore, the Cross Hands ELR was included in all three five year RTP programmes as part of the priority Economic Regeneration Infrastructure as well as being identified in various complementary policies and strategies including the former Unitary Development Plan (UDP), Local Development Plan (LDP) and county council Local Transport Plan (LTP).

Following the cessation of SWWITCH, a new regional Strategy and Action Plan has been developed in line with the emerging Swansea Bay City Region and Regional Economic Regeneration Strategy. The emerging strategy required a well-connected, reliable and functional transport system which the Cross Hands ELR contributes towards.

Objective 9 – Facilitate the scheme being delivered in phases

Phase 1a of the ELR provided an improved road link connecting the A48 and Meadows Road to the Cross Hands Business Park; whilst Phase 1b connects through to Black Lion Road with a ghost island priority junction providing access to the ESES. In line with the programmed phased delivery of the ELR improvements, Phase 2 was programmed for construction following completion of Phase 1b.

3. Summary and Conclusions

The settlement of Cross Hands occupies a nodal location on the A48 which represents the main transport route through South West Wales. The A48 intersects the A476 at the Cross Hands Roundabout and runs along an east-west alignment, linking Cross Hands with Carmarthen and Swansea. Historically, the Cross Hands Roundabout and the A476 Gorslas 'Six-Ways' junction (located c.1km to the north of the Cross Hands Roundabout) experience capacity problems, particularly at peak times.

Located to the south of the Cross Hands Roundabout is the A48 'Diamond' junction. The Cross Hands Economic Link Road (ELR) extends from the A48 'Diamond' junction to the A476 at a point approximately 1.2km to the north-east of Gorslas. The ELR was listed as part of the priority Economic Regeneration Infrastructure within the Regional Transport Plan (RTP) for South West Wales, approved by the Welsh Government and Phases 1a and 1b of the ELR have already been constructed and are currently operational. Phase 2 of the ELR has obtained planning approval and is currently under construction. The Cross Hands ELR was developed in line with the Welsh Government's Transport Appraisal Guidance (WelTAG). The ELR was granted approval and funding on the basis that it would address existing transport constraints (congestion and safety) and would facilitate economic growth within the Cross Hands area.

Notwithstanding the above benefits, the Welsh Government have previously stipulated that further development of large sites (beyond those already appraised) within the Cross Hands area can only come forward in conjunction with a substantial transport infrastructure improvement scheme, as such there is an expectation that future developments will contribute towards such improvements.

This Technical Note provides an overview of the transport related appraisals undertaken for Cross Hands and the surrounding area; providing details of committed infrastructure improvements and the associated benefits forecast to be accrued. This provides an indication of the extent of development that can be accommodated without further improvement to the surrounding transport network. The headlines from the appraisals undertaken are presented below.

The modelling work undertaken in support of the Cross Hands ESES TA demonstrated that with Phase 1 of the ELR in place, the following developments (with their associated infrastructure improvements) would be acceptable from a transport perspective:

- Cross Hands ESES Development;
- Cross Hands West (Tip) Mixed Use Development; and
- Residential Development, Carmarthen Road, Cross Hands.

The modelling work undertaken in support of Phase 2 of the ELR demonstrated that with both Phase 1 and 2 of the ELR in place, the following developments (with their associated infrastructure improvements) would be acceptable from a transport perspective:

- **Cross Hands ESES Development.** The development will provide a total of 40,023m² of floorspace, broken down as follows:
 - Offices: 4,900m²;
 - Hotel: 2,555m² (50 bedrooms);
 - Industrial Units: 31,208m²; and
 - Incubator Units / Central Hub: 1,360m².

The proposed industrial park has two vehicular access points. The primary access point into the Strategic Employment Site was constructed along the south-eastern boundary (representing Phase 1a and 1b of the ELR). A secondary point of access was constructed along the southern boundary of the site, providing a direct connection to the existing Cross Hands Business Park via Heol Parc Mawr.

- **Cross Hands West (Tip) Development.** The development will provide:
 - Food Store and Petrol Filling Station (PFS) (6,967m²);

- Residential Development (200 units);
- Residential Care Home (60 residents); and
- Doctors Surgery (1,500m²).

The development at Cross Hands West included three site access points at Llandeilo Road, Heol y Parc and Carmarthen Road. A planning condition for the development required the main site access from Llandeilo Road to be signalised prior to the commencement of development.

- **Parc Emlyn Development.** The proposals were to provide:

- 400 Residential Units; and
- 200 Pupil Primary School; and

Due to the infancy of the above development proposals when modelling work was undertaken, infrastructure improvements immediately surrounding the site were not assessed or modelled. However, for modelling purposes, access to the proposed development site was permitted via Phase 2 of ELR.

- **Carmarthen Road Development.** The proposal was to provide:

- 173 residential dwellings

As outlined previously, the committed transport infrastructure improvements being delivered in support of the developments around Cross Hands are forecast to improve operational conditions at the congested A48 Cross Hands Roundabout and the Gorslas 'Six Ways' junction. Nevertheless, the Welsh Government have previously stipulated that further development of large sites (beyond those already considered) within the Cross Hands area can only come forward in conjunction with a substantial transport infrastructure improvement scheme, as such there is an expectation that future developments will contribute towards such improvements. Potential improvement schemes (to which contributions may be required) include:

- Further phases of the ELR; connecting to the Gwendraeth Valley in the west;
- A476 link and junction improvements;
- A48 Cross Hands Roundabout capacity and safety improvements;
- Walking and cycling linkages;
- Electric Vehicle (EV) charging infrastructure; and
- Passenger transport enhancements.