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Energy & Environment

# Unconventional Oil and Gas: Community Impacts from Transportation Activities in Wales

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Report for Natural Resources Wales

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## Executive summary

### Overview

In 2016 the Scottish Government commissioned a study on '*Unconventional oil and gas development: Understanding and mitigating community impacts from transportation*', which aimed to provide an assessment of the impacts of increased traffic flows upon local communities in Scotland, and to identify means of mitigating these impacts. This report provides an updated summary of the Scottish Government study, which focusses on Wales-specific factors, and assesses whether the conclusions regarding the impacts of UOG traffic on local communities are applicable to Wales.

The objectives of this study are to consider whether the findings of the Scottish Government report are applicable to: 1. the environment and social conditions; 2. the potential availability of UOG resources; and 3. the legislative and regulatory framework, in Wales. The study also aims to identify any evidence gaps, which require further research to understand the likely community impacts associated with UOG traffic in Wales. The study includes a confidence assessment, which offers a qualitative measure (Low, Medium or High) of how well the conclusions of the Scottish Government report reflect the conditions in Wales.

### Environmental and Social Effects of UOG Traffic in Wales

The Scottish Government report provided estimations of vehicle movements for both shale gas and coalbed methane (CBM) sites. The report also identified six potential effects on local communities associated with UOG vehicle movements:

- Potential for accelerated road surface degradation
- Risk of increased accidents
- Risk of accidental release of hazardous material during transportation
- Air pollution impacts
- Noise
- Nature conservation

A review of literature published after the release of the Scottish Government report was conducted to determine whether any new information had become available to suggest that the conclusions regarding environmental and social effects, and traffic movements, were inaccurate or inapplicable to Wales. The review did not find any new estimations of vehicle movements released following the Scottish Government report, nor did it identify any publications that suggested the findings of the Scottish Government report could not be relied upon. Therefore, conclusions regarding the social and environmental impacts, and the estimations of vehicle movements were deemed to be contemporary and applicable to UOG developments in Wales.

### Availability of UOG Resources and Regional Traffic Estimations

A review of information relating to the availability of UOG resources in Wales, and an economic forecast of the potential development of individual UOG pads in Wales, indicated that it is reasonable to assume that the level of available resource in Wales is not dissimilar to that in Scotland. However, accurate forecasts on the availability of resources are limited, due to a lack of geological information in some areas. Based on the UOG developments that have been granted planning permission in Wales to date, it is likely that the focus will initially be on the development of CBM rather than shale gas, which may be more prevalent in South Wales.



Economic scenarios were used to provide estimations of the regional scale impact of UOG traffic, using the data on vehicle numbers provided in the Scottish Government report. This found the highest total weekly vehicle numbers (heavy and light) to be approximately 2,800 per week, equivalent to 0.5% or less of the vehicle flows on the M4 around Newport, assuming the development of 12 CBM pads and 8 shale pads within a period of 8 years. The results were found to reflect the conclusions in the Scottish Government report, in that additional traffic movements associated with UOG resources are unlikely to be significant or detectable at a regional or national scale, and therefore the focus should be on assessing and managing local scale impacts.

### Control Measures

A strategic review of the planning and regulatory structure in Wales was conducted. This found there to be no specific planning framework relating to UOG developments in Wales, which is consistent with the situation in Scotland. Therefore, applications for UOG developments would be considered through the existing regulatory and planning framework. The Town and Country Planning (Notification) (Unconventional Oil and Gas) (Wales) Direction, 2015, states that all proposed UOG sites, which are not refused by the Local Authority, must be referred to Welsh Ministers. This provides an additional level of protection against the potential social and environmental effects of UOG developments. The completion of an EIA is also a likely requirement for an UOG development. The IEA Guidelines provide the most relevant framework for assessing the effects of traffic on local communities.

Overall, the recommendations for additional methods of control are consistent with those set out in the Scottish Government report. A summary of each is provided in the following table:

Measure	Description
<b>Strategic Development Plans</b>	As the first SDP is not anticipated until 2021, efforts should be made to include consideration of multiple UOG developments across wider regions, particularly where clusters of UOG sites cross Local Authority boundaries. The SDPs should outline the potential for regional environmental effects, including upon air quality and designated habitat sites, due to traffic associated with multiple sites.
<b>Regional and Local Plans</b>	Regional and Local Plans should also include policies to guide the development of UOG resources, where applicable.
<b>Planning applications</b>	It is likely that UOG developments will be subject to the completion of an EIA, however it is recommended this be made compulsory for all UOG developments. Furthermore, an amendment to the DNS 2016 Regulations, to include UOG developments in the list of Developments of National Significance, should also be considered.
<b>“Framework Traffic Management Plan”</b>	A requirement for all planning applications for proposed UOG developments should be the completion of a FTMP, which demonstrates how traffic impacts would be minimised and clearly states the mitigation measures to be put in place. Once planning permission is agreed, the Operator would then be subject to a planning condition stating the requirement for a full TMP, including the provision of traffic monitoring.
<b>Roads Condition Survey</b>	During the planning application, the Operator should discuss with the Local Authority arrangements for a Roads Condition Survey and the provision of an appropriate financial bond to cover any required road repairs. Once planning permission is agreed, this may then form a planning condition.
<b>Enforcement Officer</b>	An Enforcement Officer should be appointed by the Operator once planning has been approved, to oversee the implementation and enforcement of mitigation measures throughout the life of the project. The forecast traffic movements for the development may be used to create minimum thresholds, against which the Enforcement Officer would assess the level of impact.
<b>Key transport principles for OOG</b>	It is understood that UKOOG is working with representatives from the industry, the Road Haulage Association and Fleet Operator Recognition Scheme on a set of key principles in considering transportation for UOG. Provided this is made available, these principles should be evaluated by planning authorities and, if appropriate, considered when determining planning applications for UOG development, and identifying appropriate mitigation.

## Conclusions

Overall, there was determined to be a **Medium** level of confidence in the applicability of the conclusions put forward in the Scottish Government report, regarding social and environmental impacts, and regarding the suitability of controls, to conditions in Wales. In both cases, the lack of operational evidence for UOG sites in the UK were identified as presenting a degree of uncertainty.

The assessment has identified two primary evidence gaps regarding the likely social and environmental impacts of UOG traffic in Wales, and the suitability of the measures to control them:

1. Data on traffic movements is limited, with most studies based in the USA. The majority of estimations of vehicle numbers associated with shale gas pads are based on the report published by NYCDEC. There is even less published information on traffic movements associated with CBM sites. Therefore, any assumptions made regarding traffic movements will have a degree of uncertainty for UOG sites in the UK.
2. The use of the UK planning system to control the effects of UOG traffic on communities has not yet taken place to any extent, beyond the approval of small-scale exploratory drilling. If and when full-scale well-pad development takes place in the UK, traffic impacts should be carefully monitored to confirm that the range of available controls are being implemented as anticipated.

Despite these evidence gaps, it is reasonable to conclude that the findings of the Scottish Government report are, in general, applicable to conditions in Wales, and thus, provided the planning and Environmental Impact Assessment processes are properly implemented, any significant impacts would be avoided through the application of the control measures set out above.

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# 1 Introduction

## 1.1 Study Context

In 2016 the Scottish Government published five studies on the potential environmental, health and economic impacts of unconventional oil and gas (UOG)<sup>1</sup>. The five studies followed the announcement of a moratorium on UOG development in Scotland in 2015, and were commissioned to provide a contemporary evidence base upon which the Scottish Government could make an informed decision on the future of the UOG industry in the Country. Ricardo Energy & Environment provided the report on '*Unconventional oil and gas development: Understanding and mitigating community impacts from transportation*', which aimed to provide an assessment of the impacts of increased traffic flows upon local communities, and to identify means of mitigating these impacts.

Unconventional oil and gas resources are also believed to be present in parts of Wales. Following the St David's Day process, the UK Government announced that UOG licencing should be devolved to Wales. Therefore, Welsh Ministers will also require a thorough evidence base applicable to Wales, which will enable decisions to be made regarding UOG that ensure any development does not pose unacceptable risks.

The following report provides an updated summary of the study on 'Community Impacts from Transportation', which considers Welsh specific factors, and provides an assessment of whether this provides a robust evidence base applicable to the circumstances in Wales.

## 1.2 Findings of the Scottish Government Report

The report published by the Scottish Government on 'Community Impacts from Transportation' provided estimations of the potential increases in vehicle movements associated with UOG activities in Scotland, for both shale gas and coalbed methane (CBM) sites. The report drew on forecasts of potential UOG development in Scotland<sup>2</sup>.

On the basis of these estimations it was concluded: *"The additional traffic movements associated with unconventional oil and gas resources are unlikely to be significant or detectable at a regional or national scale, in view of the much greater numbers of traffic movements resulting from other activities [and thus] the key focus for consideration of potential community impacts of UOG development is the assessment and management of potential impacts on communities local to development sites."*

The study found the primary community impacts resulting from UOG traffic movements to be *"accelerated road surface degradation; risk of increased accidents; risk of accidental release of hazardous material during transportation; air pollution impacts; noise; and nature conservation impacts."* In order to address these impacts, the study recommended the following mitigation measures:

- National, regional and local plans should set policies to guide the development of UOG resources.
- All planning applications for UOG development should be made subject to an Environmental Impact Assessment, including an assessment of traffic impacts and identification of appropriate mitigation.
- A Traffic Management Plan should be required to support planning applications for UOG sites.
- The developer and the local authority should agree on the provision of a Roads Condition Survey and provision of an appropriate financial bond.
- Where appropriate, an independent Enforcement Officer should be appointed.

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<sup>1</sup> Scottish Government – Unconventional Oil and Gas Research Published [online]. Available at <https://news.gov.scot/news/unconventional-oil-and-gas-research-published> [Accessed 24 August 2017]

<sup>2</sup> Report prepared by KPMG for Scottish Government, available from <http://www.gov.scot/Publications/2016/11/9393>

- The oil and gas industry's key principles for transportation should be evaluated, and if appropriate, taken into account in the planning process.

The study concluded that despite the likelihood that local communities would experience an increase in traffic numbers, provided the planning and Environmental Impact Assessment processes are properly implemented, any significant impacts would be avoided through the application of the mitigation measures set out above.

## 1.3 Project Objectives

The objectives of this study are to consider whether the findings of the Scottish Government report are applicable to: 1. the environment and social conditions; 2. the potential availability of UOG resources; and 3. the legislative and regulatory framework, in Wales. The study also aims to identify any evidence gaps, which require further research to understand the likely community impacts associated with UOG traffic in Wales.

## 1.4 Study Methodology

The study comprises the following elements:

- Section 2:** A summary of the risks posed to local communities by the movement of vehicles to and from UOG sites, based on the findings of the Scottish Government report. This includes a summary of estimated vehicle movements associated with UOG activities, and a desk-top review of literature published following the Scottish Government report relating to community impacts of UOG.
- Section 3:** A summary of the potential for UOG development in Wales, including the availability of UOG resources, based on published estimations provided by the British Geological Survey's 2014 report, and estimations of the potential regional traffic movements resulting from the development of UOG resources in Wales, based on Low, Medium and High economic forecasts.
- Section 4:** Analysis of the potential control methods for the mitigation of impacts resulting from UOG traffic, including a strategic review of the regulatory and planning framework in Wales applicable to the UOG industry, and consideration of additional control measures.
- Section 5:** A confidence assessment, based on the findings of items 1 - 3, of the applicability of the conclusions put forward in the Scottish Government relating to:
- Environmental and social impacts relating to UOG traffic
  - The suitability and effectiveness of control measures
- Section 6:** Conclusions on the findings of the assessment, including consideration of evidence gaps relating to impacts and control measures, which may limit our ability to forecast the potential effects of UOG traffic on local communities in Wales.

# 2 Community Impacts from Unconventional Oil and Gas Transportation

## 2.1 Environmental and Social Impacts

Road traffic impacts associated with vehicle movements to and from UOG developments, during commissioning and operation, pose a real concern for both members of the public and environmental



regulators. UOG sites require the use of heavy goods vehicles to transport equipment and materials to and from the sites, as well as smaller vehicles for staff. The frequency and vehicle types vary during the different stages of the development – exploration/appraisal, production and decommissioning – and will be dependent on the scale of the operation, with an individual well requiring fewer vehicles than a multi-well pad. Furthermore, as UOG sites are often located in rural locations, the roads serving these areas may be unsuitable for this type of traffic.

Several studies have considered the potential environment and social impacts of vehicle movements associated with UOG sites. The Scottish Government's Independent Expert Scientific Report, published in 2014<sup>3</sup>, stated the following regarding these impacts:

*"It appears that for communities near unconventional oil and gas development sites, the main health impact "stressors" (i.e. areas of perceived concern, even if unproven) are "air pollutants, ground and surface water contamination, truck traffic and noise pollution, accidents and malfunctions and psychosocial stress associated with community change."*

*"Social impacts documented from shale gas and CBM developments in the US and Australia have included ... increased truck traffic."*

The Scottish Government report on 'Community Impacts from Transportation' identified six primary potential effects on local communities associated with UOG vehicle movements. These are summarised in the following table.

**Table 1: Environment and social impacts of UOG traffic**

Impact	Summary
<b>Potential for accelerated road surface degradation</b>	<p>Additional loading due to increased heavy vehicle movements poses a risk of damaging road surfaces and the underlying road structure.</p> <p>There are opportunities to mitigate the cost of this impact through the application of taxes and fees, maintenance agreements with operators or other policies such as truck weight limits and/or improvements to infrastructure.</p>
<b>Risk of increased accidents</b>	<p>Research undertaken in the USA indicates there is an increased risk of accidents in communities located within intense areas of UOG development.</p>
<b>Risk of accidental release of hazardous material during transportation</b>	<p>Given the requirement for the movement of potentially hazardous materials to and from UOG sites, including fracturing fluid, chemical additives, flow-back fluid and produced water, there is the potential that truck accidents could lead to chemical or wastewater spills.</p> <p>Existing systems in the UK for the control of such incidences would reduce, but not fully eliminate, this risk.</p>
<b>Air pollution impacts</b>	<p>The increase in vehicle movements would result in an increase in emissions of air pollutants, including oxides of nitrogen (NOx) and particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>).</p> <p>The extent to which this would impact upon local communities would depend on the scale, location and nature of the proposed UOG development.</p> <p>Localised impacts on air quality would need to be addressed during the planning and EIA process.</p>
<b>Noise</b>	<p>The potential for noise impacts will be influenced by several factors including the type of road surface, road grade, road gradient, ground condition, distance from sensitive receptors, vehicle type, vehicle load, vehicle speed and atmospheric</p>

<sup>3</sup> "Independent Expert Scientific Panel – Report on Unconventional Oil And Gas," The Scottish Government, Edinburgh 2014

Impact	Summary
	<p>conditions.</p> <p>Localised noise impacts would need to be addressed during the planning and EIA process.</p>
<b>Nature conservation</b>	<p>The risks posed to ecological sites, associated with UOG traffic, relate to increased traffic movements in sensitive areas, the construction of new road links, the occurrence of accidental spills and sediment run-off.</p> <p>Any such effects would need to be considered during the planning and EIA process.</p>

## 2.2 Estimated Vehicle Movements

UOG sites involve the road transport of plant, equipment, materials, waste and personnel. The quantity and nature of the movements will vary due to several factors, including:

- The scale of the operation;
- The phase of the process;
- The location of the site;
- The nature of the underlying geology; and
- The availability of a local water source.

Vehicle movements are at their highest during the early stages of the development, including the construction and hydraulic fracturing phases. The Scottish Government report estimated that for a pad with 15 wells, traffic movements may be around 190 per week for the first two years. It was estimated that a shale gas well-pad may require between 13,000 and 93,000 vehicle movements, spread over a period of 20 years, whilst a CBM well-pad may require approximately 93,000 vehicle movements over a 12 year period.

The main cause of the difference in traffic movements between shale and CBM sites is that CBM requires the removal of large quantities of water from the coal seam to release the methane from the formation, estimated to be approximately 17,000 gallons (approximately 64 cubic metres) per well each day. The rate of water extracted peaks during the early stages of production and gradually reduces in each subsequent year, but remains an ongoing source of traffic movements throughout the productive lifetime of the well-pad.

The Scottish Government report provided estimations of vehicle movements (moving to and from site), for a single hydraulic fracturing site and a single CBM site, under the following scenarios:

1. Hydraulic fracturing site (single pad), including refracturing 10 years after the initial fracturing, decommissioning 20 years after construction, and the use of a dedicated pipeline delivering water to the site.
2. Hydraulic fracturing site (single pad), excluding refracturing, with decommissioning 20 years after construction, including the use of a dedicated pipeline delivering water to the site.
3. Hydraulic fracturing site (single pad), including refracturing 10 years after the initial fracturing, decommissioning 20 years after construction, with water delivered to the site by tanker.
4. Hydraulic fracturing site (single pad), excluding refracturing, with decommissioning 20 years after construction, with water delivered to the site by tanker.
5. CBM site (single pad), excluding hydraulic fracturing, with water removed by tanker and decommissioning occurring 10 years after the establishment of each well.

The estimated vehicle movements relied upon data provided by the New York State Department of Environment and Conservation (NYSDEC), which is based on a wide range of industry sources, and supplemented this with other data relevant to water quantities and CBM production. Although the traffic data used in the Scottish Government report was found to be consistent with independent datasets, it was acknowledged in the report that the use of data sourced from UOG sites in the USA, to predict impacts in Scotland, introduces “*an additional and non-quantifiable uncertainty into the traffic movements*” used in the study. This uncertainty will also apply to estimations made on traffic movements associated with UOG facilities in Wales.

The estimated traffic numbers provided in the Scottish Government report are presented in the following table.

**Table 2: Estimated total traffic movements per well pad over well-pad lifetime, provided in the Scottish Government report**

Economic scenario	Vehicle type	No re-fracturing, no water transport	With re-fracturing, no water transport	No re-fracturing, with water transport	With re-fracturing, with water transport	CBM
		<b>Total over 20 year period approximately</b>				<b>Total over 12 year period approximately</b>
<b>Central</b>	Light	11300	20400	14800	23800	48,800
	Heavy	7300	9900	16300	23700	44,300
<b>High</b>	Light	21500	39500	28400	46400	
	Heavy	13700	18900	31900	46700	
<b>Low</b>	Light	8000	14000	10300	16300	
	Heavy	5100	6900	11100	16000	

Note: “Light” vehicles include motorcycles and all two-axle, four-tyre vehicles – that is, light trucks as well as cars. The “Light” vehicle numbers include some vehicles which would be classified as HGVs in the UK.

The following graphs have been taken from the Scottish Government report, and illustrate the estimated vehicle movements for a shale well-pad (including a refracturing phase, and the removal of water by tanker) and CBM pad under the Central scenario.

Figure 1: Estimated traffic movements at a 15 well-pad, with refracturing, with water transport

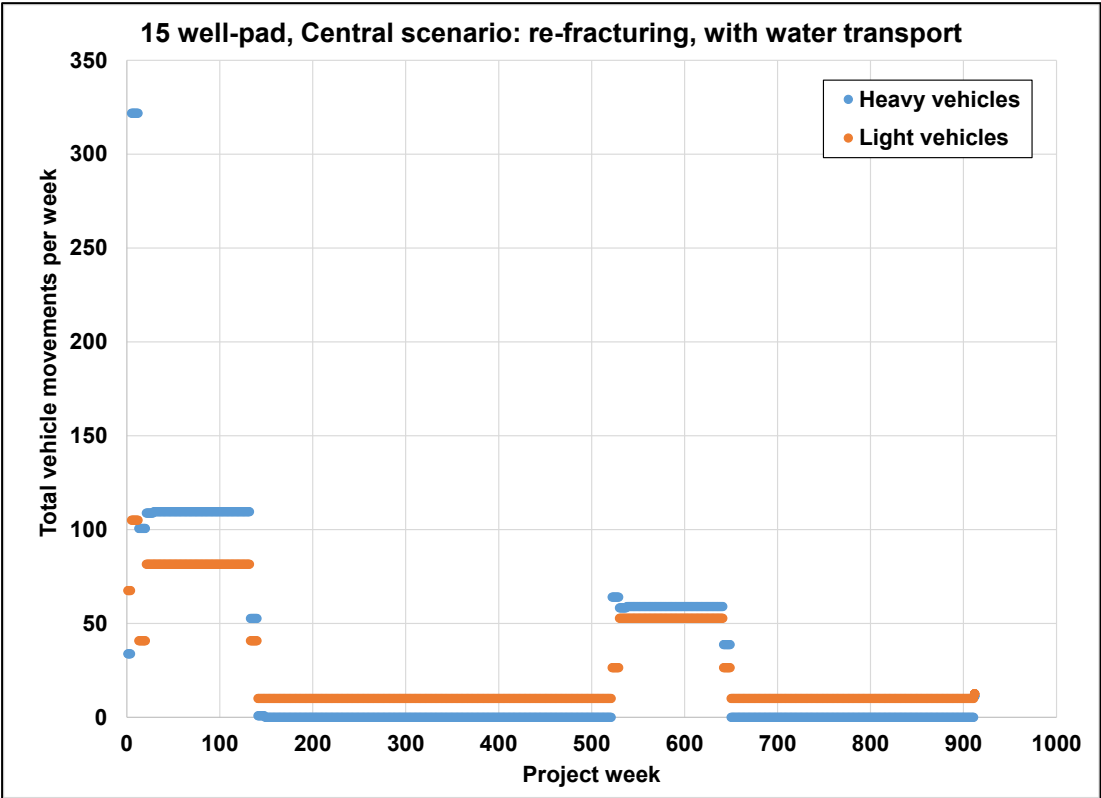
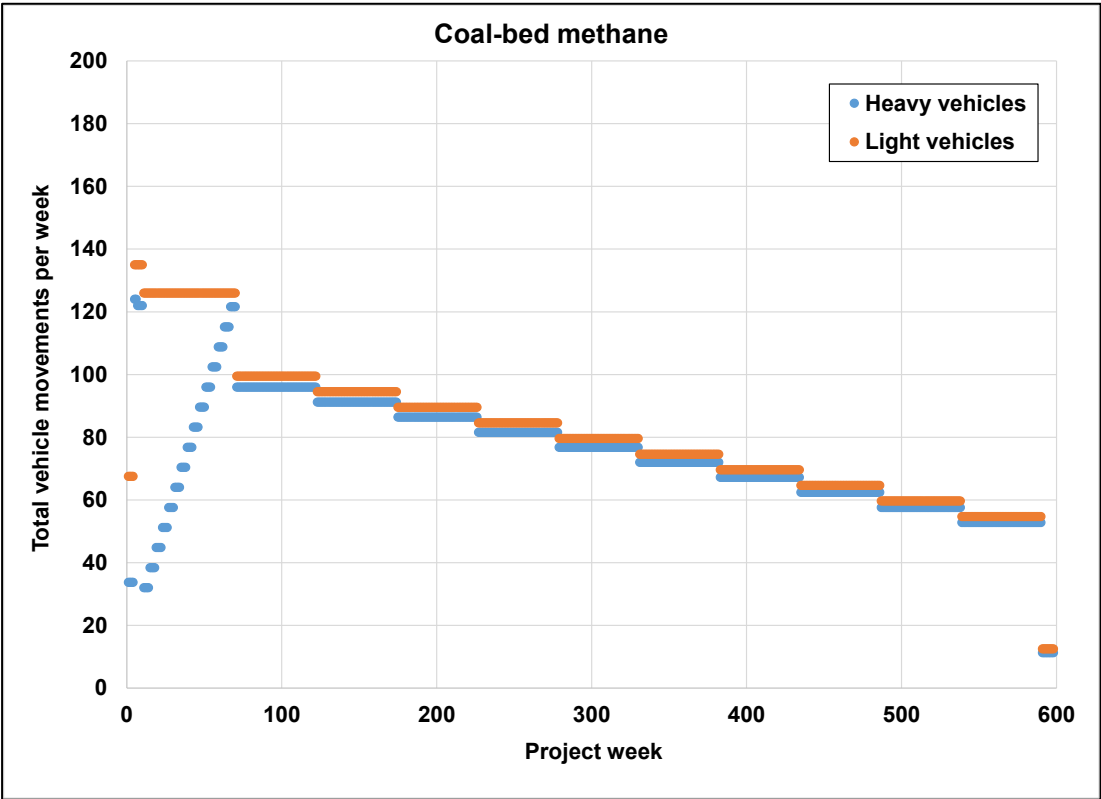


Figure 2: Estimated traffic movements at a CBM well pad



## 2.3 New Literature

A desktop review was conducted of literature published following the release of the Scottish Government report, relevant to community impacts of UOG traffic. Given the scale of public and scientific interest in the potential impacts of UOG developments, literature is regularly published on the general impacts of UOG developments. However, as was found in the Scottish Government report, published estimations of vehicle movements typically rely on the data provided in the 2011 NYSDEC report. The literature review did not find any new estimations of vehicle movements released following the Scottish Government report. Therefore, the data in the Scottish Government report remains contemporary and can be considered representative of the likely vehicle movements at UOG sites in Wales.

Regarding the environmental and social impacts of traffic movements associated with UOG developments, several scientific papers have been published, both in the UK and overseas, that support the conclusions regarding the environmental impacts of UOG traffic put forward in the Scottish Government report. Many of these studies focus on the community perception of traffic movements associated with UOG. For example, Hammond and Grady (2017)<sup>4</sup> highlighted the likelihood that traffic related impacts will be a primary concern for local communities, stating: *“Public resistance often focuses on the increased traffic and vehicle exhaust emissions and noise, particularly those emanating from heavy road transport vehicles. Indeed, the first planning application to explore shale gas in the UK was rejected by Lancashire Councillors ... on the grounds of increased noise and visual impact.”* Evensen and Stedman (2017)<sup>5</sup> support the conclusion that *“increased traffic is often perceived as a negative impact”* for local communities, however may also represent a *“clearly visible sign of (positive) increased economic activity”*. This indicates the range of potential responses that these issues may receive from members of the public in Wales.

The UK Government has also published further information relating to UOG developments following the Scottish Government report, including ‘*Guidance on application for hydraulic fracturing consent*’ published by the Department for Business, Energy & Industrial Strategy released in February 2017<sup>6</sup>. This concerns environmental monitoring and the provision of community benefits, and is not relevant to traffic impacts. The European Commission has published no further information or guidance relating to UOG developments following the Scottish Government report. In December 2016, UK Onshore Oil and Gas published guidelines for the ‘*Exploration and appraisal phase*’<sup>7</sup>, which provides recommendations for the transport of fluids and states the following regarding the effects of traffic movements on communities: *“Operators should demonstrate how they intend to minimise disruption to the community during operations, for example any vehicle management and noise reduction measures”*.

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<sup>4</sup> Hammond, G. & Grady, A. (2017) Indicative energy technology assessment of UK shale gas extraction [online]. Available at [http://opus.bath.ac.uk/49747/1/1\\_s2.0\\_S0306261916301477\\_main.pdf](http://opus.bath.ac.uk/49747/1/1_s2.0_S0306261916301477_main.pdf) [Accessed 31 August 2017]

<sup>5</sup> Evensen, D. & Stedman, R. (2017) Beliefs about impacts matter little for attitudes on shale gas development [online]. Available at <http://orca.cf.ac.uk/101760/> [Accessed 31 August 2017]

<sup>6</sup> BEIS (2017) Guidance on application for hydraulic fracturing consent [online]. Available at <https://www.gov.uk/government/publications/guidance-on-application-for-hydraulic-fracturing-consent> [Accessed 31 August 2017]

<sup>7</sup> UKOOG (2016) UK Onshore Shale gas Well Guidelines – Exploration and appraisal phase – Issue 4 [online]. Available at [http://www.ukoog.org.uk/images/ukoog/pdfs/Shale\\_Gas\\_Well\\_Guidelines\\_Issue\\_4.pdf](http://www.ukoog.org.uk/images/ukoog/pdfs/Shale_Gas_Well_Guidelines_Issue_4.pdf) [Accessed 07 September 2017]



## 3 Unconventional Oil and Gas in Wales

### 3.1 Potential Availability of Resources

In a study published by The British Geological Survey in 2014<sup>8</sup>, it was stated that the potential for onshore gas resources in Wales was most likely to be associated with coal seams or shales. The former can take a number of forms, including CBM, Abandoned Mine Methane (AMM), Coal Mine Methane (CMM), and Underground Coal Gasification (UCG). The BGS do not provide an estimate of the scale of the reserves in their 2014 report, however in an earlier study of the potential for onshore gas from coal in Wales, conducted in 2004, they estimated a potential resource of almost 290 bcm (billion cubic metres) in the South Wales coalfield. More recent estimates have been provided for CBM reserves across various Welsh regions, including:

- IGas estimate 1,095 – 3,243 bscf (billions of standard cubic feet, 30.7 – 90.8 bcm) offshore from the Point of Ayr.
- Eden Energy Ltd estimate 687 – 1,363 bcf (billion cubic feet, 19.2 – 38.2 bcm) within areas covered by their PEDL licences in South Wales.
- Dart Energy estimate 320 – 750 bcf (9.0 – 21 bcm) within the area covered by their PEDL licence near Swansea.

Interest in Carboniferous shale reserves has focussed on the coalfield strata of north and south Wales, with the following preliminary resource estimates provided by license holders:

- Dart Energy Ltd estimate 30,550 bcf (855 bcm) of gas-in-place underlying its licences across Wrexham and Cheshire.
- Eden Energy Ltd estimate 34.198 tcf GIIP (trillions of cubic feet gas-initially-in-place, 0.96 tcm GIIP) at its licence areas in South Wales.

In addition to those listed above, there are other geological units that have been identified as having potential for Shale gas in Wales, however accurate forecasts are difficult due to a lack of geological information in some areas. The BGS report that there has also been limited exploration for UOG resources in Wales outside of the coalfields, and indicate further research in this area is required to better understand Wales' shale gas potential.

To date, six UOG developments have been granted planning permission in Wales, four of which have also been issued Environmental Permits. All six sites are in South Wales. Three of the six involve CBM only, one will involve shale and CBM, whilst the other two will involve the exploration for CMM and conventional crude oil<sup>9,10,11,12,13,14</sup>.

### 3.2 Likely Regional Scale Traffic Impacts

Estimations on the potential uptake of UOG developments in Wales have been provided by Cardiff University, in the following three economic scenarios. These provide Low, Medium and High estimations of the number of CBM and shale gas pads, as well as the total number of wells.

**Table 3: Economic scenarios for UOG development in Wales**

<sup>8</sup> British Geological Survey (2014) A Study of Potential Unconventional Gas Resource in Wales [online]. Available at <http://gov.wales/docs/desh/publications/140626-energy-study-of-potential-unconventional-gas-resource-in-wales.pdf> [Accessed 15 August 2017]

<sup>9</sup> Newport City Council, Planning Portal – PAN: 11/1351 [online]. Available at: <http://planning.newport.gov.uk> [Accessed 07 September 2017]

<sup>10</sup> Neath Port Talbot County Borough Council, Planning Portal – PAN: P2015/0031 [online]. Available at: <http://planning.npt.gov.uk> [Accessed 07 September 2017]

<sup>11</sup> Bridgend County Borough Council, Planning Portal – PAN: P/13/322/FUL [online]. Available at <http://planning.bridgend.gov.uk/> [Accessed 07 September 2017]

<sup>12</sup> Vale of Glamorgan Council, Planning Portal – PAN: 2013/00334/FUL [online]. Available at [http://www.valeofglamorgan.gov.uk/en/living/planning\\_and\\_building\\_control/Planning.aspx](http://www.valeofglamorgan.gov.uk/en/living/planning_and_building_control/Planning.aspx) [Accessed 07 September 2017]

<sup>13</sup> Bridgend County Borough Council, Planning Portal – PAN: P/12/718/FUL [online]. Available at <http://planning.bridgend.gov.uk/> [Accessed 07 September 2017]

<sup>14</sup> City and County of Swansea, Planning Portal – PAN: 2015/1515 [online]. Available at <http://www.swansea.gov.uk/planningsearch> [Accessed 07 September 2017]

Scenario	CBM			Shale		
	Total no. of pads	Total no. of wells	Maximum wells per pad	Total no. of pads	Total no. of wells with laterals	Maximum wells per pad
<b>Low Scenario</b>	3	12 – 18	6	n/a	n/a	n/a
<b>Medium Scenario</b>	4	16 – 24		1	10 - 24	24
<b>High Scenario</b>	12	48 – 72		8	80 - 192	

By comparison, the economic estimations put forward in the Scottish Government report ranged from 10 pads - 10 wells per pad (Low) to 31 well pads – 30 wells per pad (High). This included shale gas pads only, as CBM pads were considered separately (2 pads – 15 wells per pad).

The Wales economic scenarios have been used to calculate the potential increases in weekly vehicle movements under each scenario. In order to do so, it has been assumed the maximum number of wells per pad would apply (6 for CBM pads and 24 for shale gas pads). For the shale pads it was also assumed there would be no dedicated water supply so that water would need to be transported to the sites by road, and that refracturing of the wells would occur after a period of approximately 10 years.

Using the estimated vehicle movements researched as part of the Scottish Government report, the following total increases in heavy and light vehicles have been calculated for the economic scenarios for UOG development in Wales.

**Table 4: Total vehicle movements based on economic scenarios for Wales**

Resource type	Vehicle type	Low scenario	Medium scenario	High scenario
<b>CBM</b>	<b>Heavy</b>	51,739	68,985	206,954
	<b>Light</b>	104,012	138,683	416,050
<b>Shale</b>	<b>Heavy</b>	0	37,114	296,910
	<b>Light</b>	0	59,068	472,543
<b>Total heavy</b>		51,739	106,099	503,864
<b>Total light</b>		104,012	197,751	888,593

These figures represent the total vehicle numbers over the entire lifespan of each CBM and shale pad, which can be expected to be approximately 20 years. The impact on any given day would reflect the activities being carried out on that day. Furthermore, each pad would be commissioned and enter operation at different times, and the pads would likely be located in different regions, which would further spread the impact, reducing the effects in any one location.

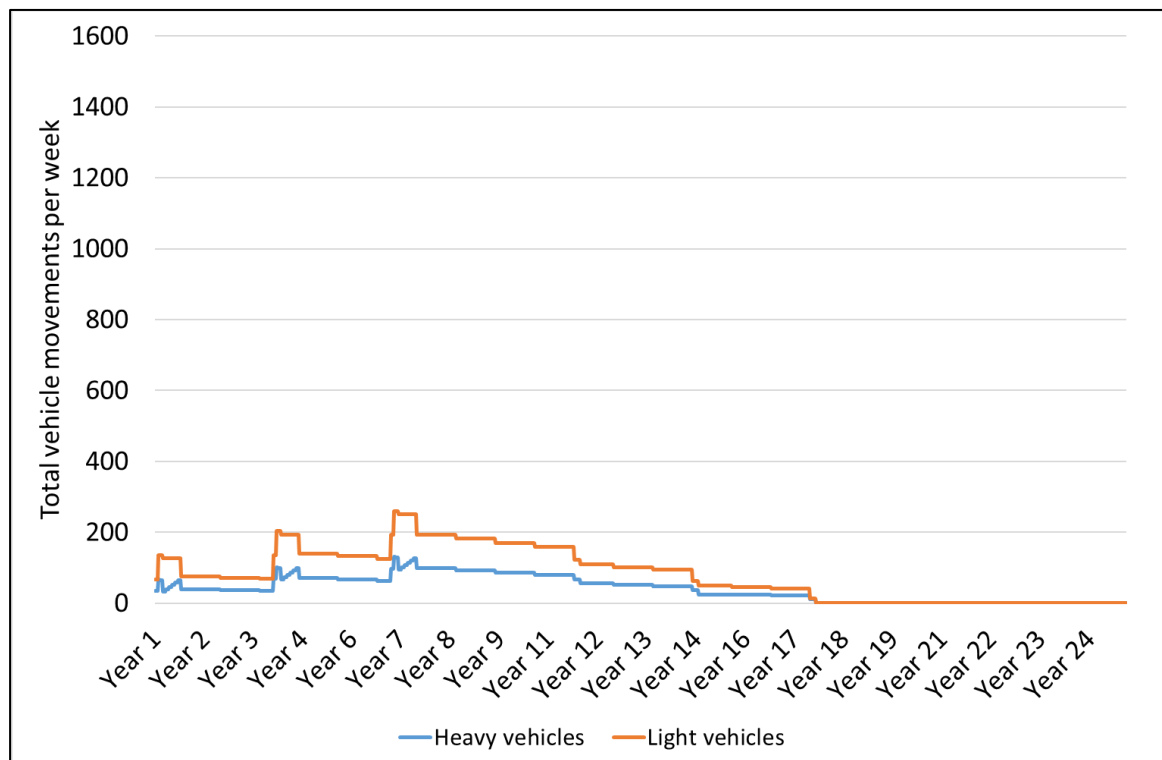
In order to provide an indication of how regional traffic levels may change over an extended period of time, the following assumptions have been made regarding the phasing of commissioning and operation of the pads under each scenario. This assumes that under each scenario, all pads would become operational within an 8-year period. Using these assumed rates of uptake time-series plots have been produced for the Low, Medium and High scenarios in Figure 3 – Figure 5.

**Table 5: Assumed rate of uptake of UOG pads in Wales under the Low, Medium and High economic scenarios**

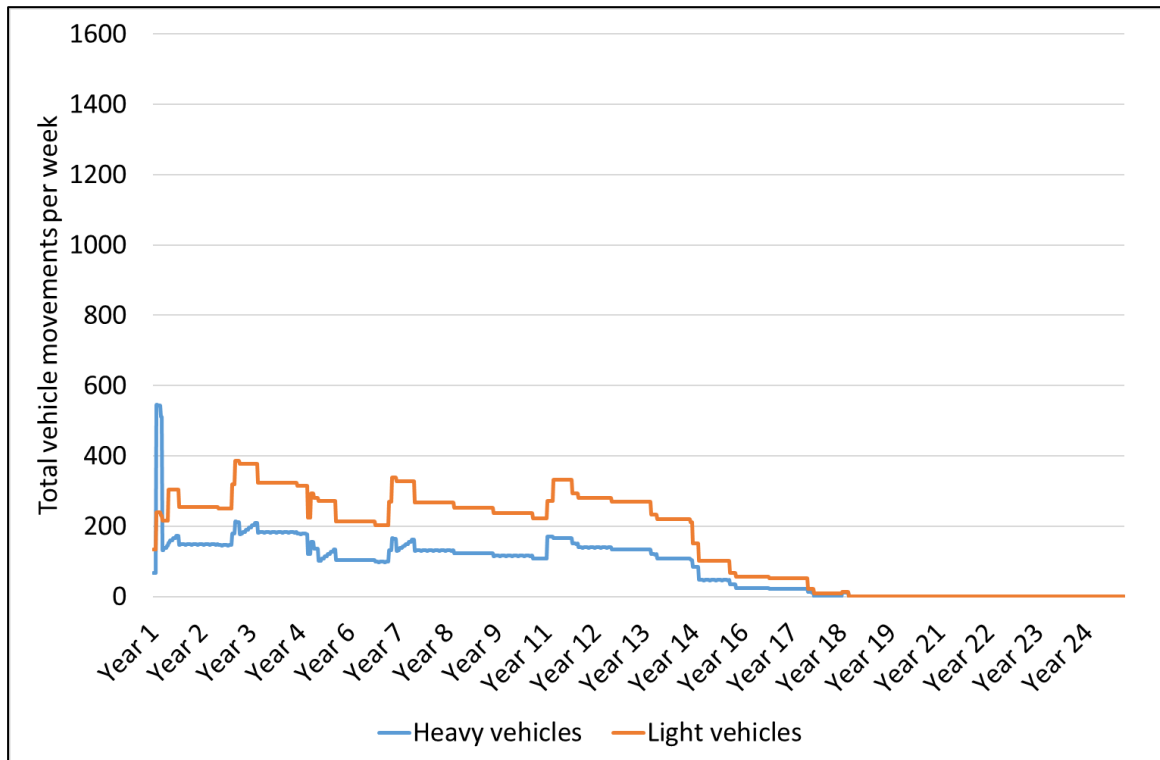
Year	Number of pads entering construction phase per year					
	Low scenario		Medium scenario		High scenario	
	CBM	Shale	CBM	Shale	CBM	Shale
<b>1</b>	1	-	1	1	2	1

Year	Number of pads entering construction phase per year					
	Low scenario		Medium scenario		High scenario	
	CBM	Shale	CBM	Shale	CBM	Shale
2	-	-	-	-	1	1
3	-	-	1	-	2	1
4	1	-	-	-	1	1
5	-	-	1	-	2	1
6	-	-	-	-	1	1
7	1	-	1	-	2	1
8	-	-	-	-	1	1

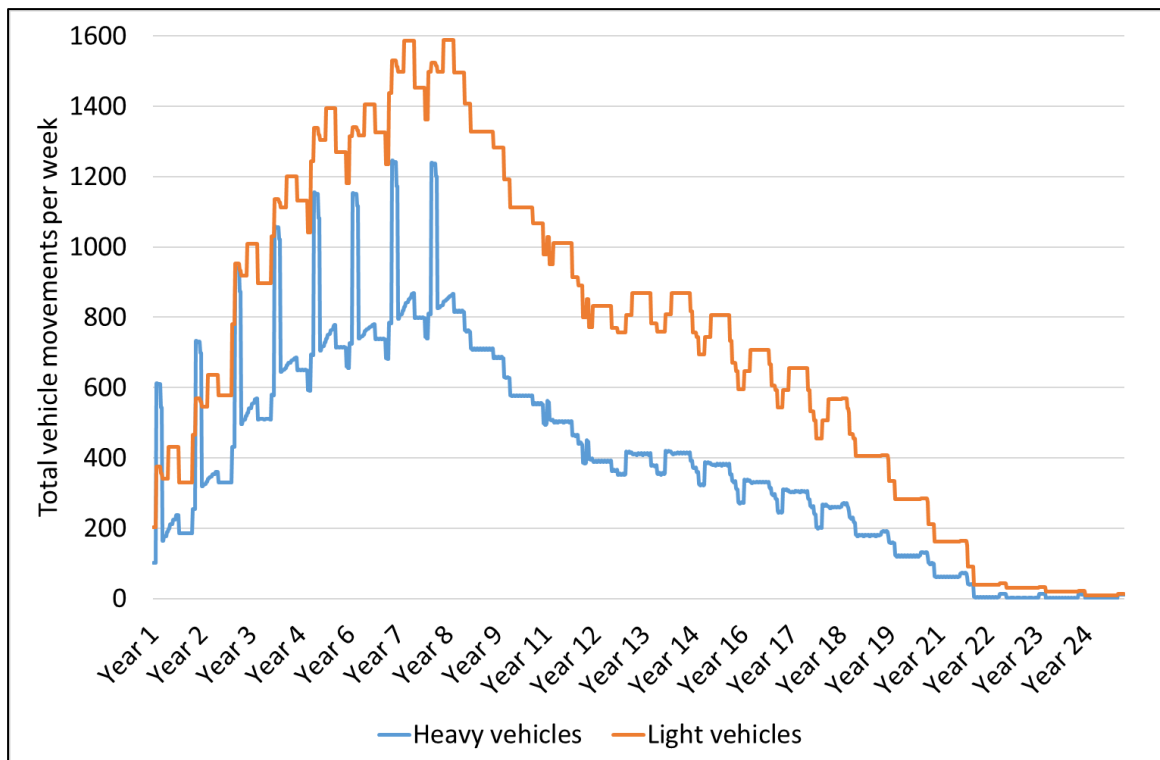
**Figure 3: Time-series of weekly vehicle numbers from UOG developments in Wales – Low scenario**



**Figure 4: Time-series of weekly vehicle numbers from UOG developments in Wales – Medium scenario**



**Figure 5: Time-series of weekly vehicle numbers from UOG developments in Wales – High scenario**



The time-series plots illustrate that under the Low scenario, numbers would remain below 300 and 200 per week for light and heavy vehicles respectively, assuming one CBM pad is commissioned every three years.

Under the Medium scenario, the shale pad would result in an initial spike in heavy vehicle numbers, to just under 500 per week, following which, combined heavy vehicle numbers from CBM and shale pads would not exceed 250 per week. Light vehicle numbers would be expected to peak after approximately 3 years, reaching just under 400 weekly movements.

Under the High scenario, the cumulative effect of heavy vehicles associated with both CBM and shale pads would reach its peak after approximately 7 – 8 years, at which point numbers would reach 1,250 per week. Following this period, heavy vehicle numbers would be expected to decrease steadily, as the initial fracturing phases are completed and the level of water removal from the CBM pads falls. Assuming refracturing is conducted at all shale pads, there would be a slight increase in heavy vehicle numbers after approximately 14 years, resulting in combined weekly heavy vehicle movements of just over 400. Light vehicles would also show a peak after approximately 7 – 8 years, of around 1,600 per week.

As discussed, these estimations are reliant on several assumptions, including those regarding vehicle numbers presented in the Scottish Government report, and regarding the rate of uptake of CBM and shale pads. However, they do provide an indication of the potential regional increases in vehicle numbers associated with UOG developments in Wales. By comparison, the following are typical traffic flows associated with other traffic-generating developments:

- Food superstore: Approximately 60,000 two-way vehicle trips per week
- Warehouse / distribution centre: Approximately 5,000 two-way HGV movements per week
- Windfarm at construction stage: Approximately 800 – 1,000 two-way movements per week

Based on the number of UOG sites that have received planning permission to date, it is reasonable to assume that much of this development will be focussed in South Wales, around the M4 corridor. As an example, the annual average daily flow on the M4 motorway around Newport in 2016 was between 73,000 and 118,000 vehicles per day. This is equivalent to 500,000 to 800,000 vehicles per week.<sup>15</sup> The highest total weekly vehicle numbers (heavy and light) under the High scenario were found to be approximately 2,800 movements per week, equivalent to 0.5% or less of the vehicle flows on the M4 around Newport. For the majority of the time, vehicle numbers would be significantly lower.

Therefore, as was concluded in the Scottish Government report, in view of the much greater numbers of traffic movements resulting from other activities, the additional traffic movements associated with UOG resources are unlikely to be significant or detectable at a regional or national scale. The focus for considering community impacts of transportation associated with UOG development in Wales should therefore be on assessing and managing local scale impacts.

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<sup>15</sup> Department for Transport – Traffic count data for Wales [online]. Available at <https://www.dft.gov.uk/traffic-counts/area.php?region=Wales> [Accessed 07 September 2017]



## 4 Controls

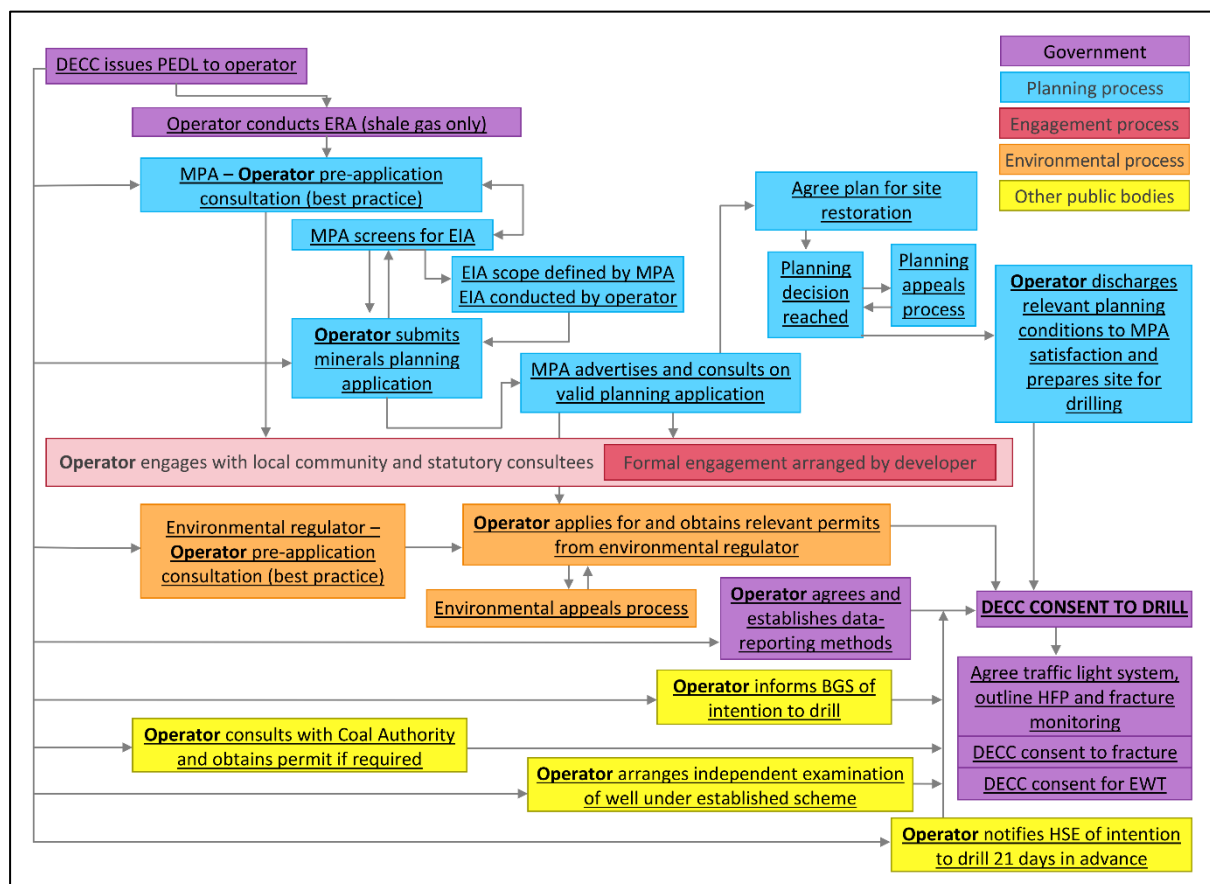
This chapter presents a strategic review of the planning and regulatory framework relating to the impact, assessment and control of transport matters as they may apply to UOG developments in Wales.

### 4.1 Regulatory and Planning Framework Applicable to UOG in Wales

#### 4.1.1 UOG Regulatory Framework in Wales

The regulatory framework for managing UOG development in Wales was set out in guidance produced by the then Department for Energy and Climate Change (DECC) in 2014 (DECC now forms part of the Department for Business, Energy and Industrial Strategy). This guidance includes the “roadmap” which is reproduced as Figure 6 below.

**Figure 6: DECC Roadmap for Regulation and permitting of UOG Development in Wales**



The section of the roadmap that concerns transport and potential community-level impacts is controlled by the planning system, represented by the blue coloured boxes, which is discussed in more detail in Section 4.1.2. However, following The Town and Country Planning (Notification) (Unconventional Oil and Gas) (Wales) Direction, which came into force on the 16 February 2015, planning applications for UOG developments must be referred to the Welsh Ministers, in all cases where the local planning authority does not propose to refuse the planning application. A similar direction was made in respect of underground coal gasification in 2016.

Upon receiving notification of a planning application for UOG development, Welsh Ministers have the following three options:

1. *“Decide to call in the planning application by exercising their powers under section 77 of the Town and Country Planning Act 1990;*
2. *Issue a direction that the application may not be approved until such time as directed by the Welsh Ministers; or*
3. *Notify the relevant local planning authority that they do not consider the proposed development to be unconventional oil and gas development.”*

The 2015 Direction defines UOG as the following:

*“development involving the onshore exploration, appraisal or production of coal bed methane or shale oil or gas using unconventional extraction techniques, including hydraulic fracturing (but does not include the making of exploratory boreholes which do not involve the carrying out of such unconventional extraction techniques).”*

Given the relative infancy of UOG developments in Wales there is no specific regulatory or planning framework currently in place aside from the 2015 Direction noted above. This strategic review therefore considers existing development planning legislation and guidance which may provide the basis for assessing traffic impacts associated with UOG developments in Wales.

#### 4.1.2 Planning and Regulatory Controls

The planning system provides the primary means of controlling the social and environmental effects associated with traffic generated by UOG developments. The legislation and regulations relevant to the national planning system in Wales include:

- The Town and Country Planning Act 1990 (TCPA 1990)
- The Planning and Compulsory Purchase Act 2004 (PCPA 2004)
- The Planning Act 2008 (PA 2008)
- The Planning (Wales) Act 2015 (PWA 2015)
- Town and Country Planning (Environmental Impact Assessment (Wales) Regulations 2016
- The Well-being of Future Generations (Wales) Act 2015 (WBFG 2015)
- The Developments of National Significance (Wales) Regulations 2016
- Welsh Government ‘Planning Policy Wales’ (PPW) 2016
- Welsh Government ‘The Wales Spatial Plan’ (WSP) 2008 and Welsh Government ‘National Development Framework’ (NDF)

There are also several additional controls at the regional and local planning level, which will influence the way in which the effects of UOG developments are managed:

#### Regional and Local Planning Framework

- Strategic Development Plans (SDPs)
- Unitary Development Plans (UDPs), Local Development Plans (LDPs), and Local Development Plans ‘Light’ (LDPs ‘Light’)

A short summary of each of these controls is provided in Table 6. Some of these set out requirements for UOG developments directly, whilst others provide general requirements for developments that have the potential to result in traffic related impacts.

**Table 6: Summary of planning / regulatory controls**

Title	Description
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Title	Description
<b>National Planning Context</b>	
<b>The Town and Country Planning Act 1990 (TCPA 1990)</b>	<p>The Town and County Planning (Act) 1990 is the basis for the 'plan-led' planning system that exists in England and Wales. The TCPA 1990 sets out the roles of Welsh Ministers and local authorities with regard to development plans, development management and enforcements. The TCPA introduced the Unitary Development Plan (UDP) for metropolitan areas as well as Structure Plans and Local Plans for non-metropolitan areas.</p> <p>Under section 77 of the Act, Welsh Ministers may call in a planning application submitted to a local planning authority, in order for the application to be determined by the Welsh Ministers rather than the local planning authority.</p>
<b>The Planning and Compulsory Purchase Act 2004 (PCPA 2004)</b>	<p>The Planning and Compulsory Purchase Act 2004 introduced various reforms to the TCPA 1990. These reforms included a statutory duty requiring the Welsh Government to prepare the Wales Spatial Plan and the introduction of the Local Development Plan (LDP) system to Wales.</p>
<b>The Planning Act 2008 (PA 2008)</b>	<p>The Planning Act 2008 introduced further reforms to the PCPA 2004. A focus of the PA 2008 was to introduce a new, streamlined consenting regime for large infrastructure projects meeting specific criteria and therefore considered to be "nationally significant infrastructure projects."</p> <p>As a result of the Government of Wales Act 2006, which confers powers on Welsh Ministers and the National Assembly for Wales, only some sections of the PA 2008 are applicable to Wales. Consequently, only a certain subset of projects otherwise meeting the criteria for nationally significant infrastructure projects would be classified as such if located in Wales. UOG developments are not explicitly covered by the PA 2008, however, the Act does cover some potentially related developments, such as certain oil and gas pipeline projects.</p>
<b>The Planning (Wales) Act 2015 (PWA 2015)</b>	<p>The Planning (Wales) Act 2015 introduces various reforms to both the TCPA 1990 and the PCPA 2004. The PWA 2015 lays the groundwork for an updated planning framework in Wales, as summarized in the Welsh Government Development Plan Prospectus dated 14 January 2015. Specifically, the PWA 2015 allows for the creation of a National Development Framework (NDF) for Wales, which will replace the current Wales Spatial Plan (WSP). It also allows for the creation of Strategic Development Plans (SDPs) and Local Development Plans 'light' (LDPs 'light') alongside the current Local Development Plan (LDP) framework.</p> <p>Section 62D of the PWA 2015 requires that applications for developments of national significance be made to the Welsh Ministers instead of to the local planning authority. A development is defined to be of national significance if it meets criteria specified in regulations made by the Welsh Ministers (see below). A development is also of national significance if it is specified as such within the National Development Framework for Wales, i.e. in the current Wales Spatial Plan (WSP) or the National Development Framework (NDF) once it is developed.</p>
<b>Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2016</b>	<p>The requirements for the completion of an Environmental Impact Assessment (EIA) are set by Directive 85/337/EEC from the European Community (EC), this Directive has been amended and is now included in Directive 2011/92/EU of 13 December 2011. This became law in Wales through the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2016.</p> <p>The types of project which are subject to the EIA process are listed in "Descriptions of development for the purposes of the definition of "Schedule 1 development"", and "Descriptions of development and applicable thresholds and criteria for the purposes of the definition of "Schedule 2 development"". The onshore oil and gas industry made a formal commitment to undertake EIAs for all exploration wells that involve hydraulic fracturing in January 2014.<sup>16</sup> This would be linked to an individual planning application, so may potentially apply to a single well, or to a group of wells located on a single site.</p> <p>All projects must be 'screened' by the approving authority to determine if it should</p>

<sup>16</sup> <http://www.ukoog.org.uk/about-ukoog/press-releases/66-how-to-engage-with-shale-gas-hydraulic-fracturing-planning-and-permitting>

Title	Description
	<p>be subject to EIA procedures. All Schedule 1 projects must be subject to EIA, whereas Schedule 2 projects may be subject to an EIA, depending on their nature, scale or location and whether they would be likely to have significant effects on the environment. UOG is not specifically included in Schedule 1. However, a development for “<i>extraction of petroleum and natural gas for commercial purposes where the amount extracted exceeds 500 tonnes per day in the case of petroleum and 500,000 cubic metres per day in the case of gas</i>” would warrant an EIA. Schedule 2 includes reference to a development area in excess of 0.5 hectares for “<i>surface industrial installations for the extraction of coal, petroleum, natural gas and ores, as well as bituminous shale</i>”.</p> <p>These requirements are equivalent to the Scottish EIA Regulations, and thus all UOG developments in Wales would either require an EIA as Schedule 1 development, or could be required to have an EIA as Schedule 2 development with potentially significant effects on the environment, or could be required to have an EIA on the basis of the industry commitment.</p> <p>Where an EIA is applicable, an ES will be prepared which contains a chapter on Access, Traffic and Transport (discussed in Section 4.2).</p>
<b>The Well-being of Future Generations (Wales) Act 2015 (WBFG 2015)</b>	<p>The Well-being of Future Generations (Wales) Act 2015 creates a statutory duty for each public body to carry out sustainable development.</p> <p>Public bodies are required to consider seven well-being goals and five components of sustainable development, as defined by the WBFG 2015, within the context of fulfilling their duties in the development process.</p> <p>The WBFG 2015 makes provisions for the assessment of well-being at national and local levels. At the national level, Welsh Ministers are required to publish a list of “national indicators”. Some of these, such as “levels of nitrogen dioxide (NO<sub>2</sub>) pollution in the air”, “areas of healthy ecosystems in Wales” and “status of biological diversity in Wales” may be impacted by transport related to UOG developments. At the local level, local authorities are required to assess the state of well-being in their area and develop local well-being plans.</p>
<b>The Developments of National Significance (Wales) Regulations 2016 (DNS 2016)</b>	<p>Certain types of large infrastructure projects, considered to be of national importance, fall under the Developments of National Significance (Wales) Regulations 2016. For each type of development, the Regulations set out criteria to determine the applicability of the DNS Regulations to the development.</p> <p>DNS applications differ from normal planning applications in the way that they are decided. While the majority of planning applications are submitted to a Local Planning Authority, a DNS application is examined by an Inspector. The Inspector makes a recommendation to the Welsh Ministers based on planning merits and national priorities, and the Welsh Ministers then make a decision on the application.</p> <p>UOG developments are not explicitly included in the list of types of developments which are of national significance under the DNS 2016 Regulations. However, the nature of UOG developments is likely to be comparable to the types of developments already considered to be of national significance. In particular, UOG projects and DNS projects are likely to be large undertakings with complex consent requirements and implications concerning more than one Local Authority. There may be an opportunity to formally designate UOG projects as developments of national significance, and thereby leverage existing guidance documentation and policy framework for the consideration of UOG development proposals.</p>
<b>Welsh Government ‘Planning Policy Wales’ (PPW) 2016</b>	<p>Planning Policy Wales (PPW) provides a thorough overview of the land use planning policies of the Welsh Government, with references to external documents containing more detailed information on various aspects of development planning and management. Section 3.7.4 of the PPW confirms that unconventional oil and gas development applications must be referred to the Welsh Ministers. The PPW also sets out the Welsh Government’s Transport Strategy, and outlines the requirements for Local Transport Plans (LTPs), transport appraisals, and transport assessments (see Section 4.2).</p>

Title	Description
<b>Regional and Local Planning Framework</b>	
<b>Strategic Development Plans (SDPs)</b>	<p>The framework to create SPDs is provided in PWA 2015, however, to date, no SDPs have been published. It is anticipated that the earliest would be adopted in 2021 ('Development Plan Prospectus').</p> <p>The SDPs will aim to address developments which cross the boundaries of two or more Local Authorities, i.e. where there are cross boundary strategic issues that need to be addressed in a development plan. UOG and transport projects are both likely to fall within this category.</p> <p>The panel responsible for preparing an SDP must give consideration to: current national policies; the NDP; the SDP for any strategic planning area that adjoins the panel's area; the LDP for each area, all or part of which is included in the panel's area; any other matters prescribed by the Welsh Ministers in regulations. The panel must also carry out an appraisal of the sustainability of the plan.</p>
<b>UDPs, LDPs, and LDPs 'Light'</b>	<p>The planning system in Wales is in a transition period. Some Local Authorities still have unitary development plans, which were introduced following the TCPA 1990. Most have now transitioned to the LDP system, or are drafting a LDP if they don't have one in effect already.</p> <p>These are not intended to repeat national planning policy or policy that should be included in SDPs; rather they are meant to address more localized issues.</p> <p>In summary:</p> <ul style="list-style-type: none"> <li>• UDPs will eventually be phased out and replaced by LDPs.</li> <li>• Where SDPs are in effect, the Local Authority can produce a shorter LDP (an LDP light) that covers only content that is not already covered in the SDP. The planning prospectus predicts that the first LDP light could be adopted by 2021.</li> <li>• LDPs will continue to be the current development plan format in areas that are not covered by SDPs.</li> </ul> <p>There is potential for LDPs to be used to set out the requirements for the management of localised traffic issues, including those associated with UOG developments.</p>

## 4.2 Guidance on the Assessment of Traffic Impacts

Where assessment of traffic related impacts is required in support of the planning application for a proposed UOG development, the following publications provide guidance on the methods for undertaking such assessments:

- **Institute of Environmental Assessment (IEA, now the Institute of Environmental Management and Assessment (IEMA)): *Guidance Notes No. 1: 'Guidelines for the Environmental Assessment of Road Traffic'*<sup>17</sup>** – Provides the basis for a systematic, consistent and comprehensive approach to the assessment of traffic impacts; noise and vibration; accidents and safety; driver delay; fear and intimidation; air pollution; dust and dirt; pedestrian / cycle amenity and delay; and severance.
- **Institution of Highways and Transportation (IHT): *Guidelines for Traffic Impact Assessment*<sup>18</sup>** – Recommends that ESs are assessed in accordance with the IEA Guidelines.
- **Planning Policy Wales: *Technical Advice Note (TAN) 18: Transport (2007)*<sup>19</sup>** – Advises on transport related issues when planning for new developments, including integration between land use planning and transport.

<sup>17</sup> <https://www.thenbs.com/PublicationIndex/documents/details?Pub=IEA&DocID=257892>

<sup>18</sup> <https://trid.trb.org/view.aspx?id=422947>

<sup>19</sup> <http://gov.wales/topics/planning/policy/tans/tan18/?lang=en>



## 4.3 Additional Control Measures

The application of appropriate controls will be essential for mitigating the potential community impacts resulting from UOG vehicle movements. These methods are in line with those published in the Scottish Government report, and are summarised below:

**Table 7: Control measures for the mitigation of UOG traffic impacts**

Measure	Description
<b>Strategic Development Plans</b>	As the first SDP is not anticipated until 2021, efforts should be made to include consideration of multiple UOG developments across wider regions, particularly where clusters of UOG sites cross Local Authority boundaries. The SDPs should outline the potential for regional environmental effects, including upon air quality and designated habitat sites, due to traffic associated with multiple sites.
<b>Regional and Local Plans</b>	Regional and Local Plans should also include policies to guide the development of UOG resources, where applicable.
<b>Planning applications</b>	As discussed in Table 6, it is likely that UOG developments will be subject to the completion of an EIA, however it is recommended this be made compulsory for all UOG developments. Furthermore, an amendment to the DNS 2016 Regulations, to include UOG developments in the list of Developments of National Significance, should also be considered.
<b>“Framework Traffic Management Plan”</b>	A requirement for all planning applications for proposed UOG developments should be the completion of a FTMP, which demonstrates how traffic impacts would be minimised and clearly states the mitigations measures to be put in place. Once planning permission is agreed, the Operator would then be subject to a planning condition stating the requirement for a full TMP, including the provision of traffic monitoring.
<b>Roads Condition Survey</b>	During the planning application, the Operator should discuss with the Local Authority arrangements for a Roads Condition Survey and the provision of an appropriate financial bond to cover any required road repairs. Once planning permission is agreed, this may then form a planning condition.
<b>Enforcement Officer</b>	An Enforcement Officer should be appointed by the Operator once planning has been approved, to oversee the implementation and enforcement of mitigation measures throughout the life of the project. The forecast traffic movements for the development may be used to create minimum thresholds, against which the Enforcement Officer would assess the level of impact.
<b>Key transport principles for OOG</b>	As stated in the Scottish Government report; it is understood that UKOOG is working with representatives from the industry, the Road Haulage Association and Fleet Operator Recognition Scheme on a set of key principles in considering transportation for UOG. Provided this is made available, these principles should be evaluated by planning authorities and, if appropriate, considered when determining planning applications for UOG development, and identifying appropriate mitigation.

## 5 Confidence Assessment

The following provides an assessment of the level of confidence with which the conclusions put forward in the Scottish Government report can be applied to conditions in Wales. This considers two aspects:

1. The assessment of potential social and environmental impacts
2. The suitability and effectiveness of controls

The confidence assessment uses the matrix shown in Figure 7, which takes into consideration the 'Level of agreement' (i.e. the extent to which the conclusions of the Scottish Government report apply to Wales) and the 'Amount of evidence', including the type, amount, quality and consistency.

**Figure 7: Confidence assessment matrix**



### 5.1 Assessment of Potential Social and Environmental Impacts

The social and environmental impacts associated with UOG traffic movements summarised in Table 1 include:

- Potential for accelerated road surface degradation
- Risk of increased accidents
- Risk of accidental release of hazardous material during transportation
- Air pollution impacts
- Noise
- Nature conservation

These impacts are based on a literature search conducted in support of the Scottish Government report. This information was based on research published in the UK and the USA. A further literature search was conducted in support of this study to identify any additional information that has been published following the Scottish Government report. This did not identify any evidence that contradicted the conclusions of the Scottish Government report. Therefore, it can be concluded that the findings of the Scottish Government report still apply.

As there are currently no UOG facilities operating in the UK, the conclusions of both studies are reliant on impacts observed in countries where the industry has been in operation for several years (i.e. the USA). Therefore, there is currently no evidence of the impacts of UOG developments on UK roadways and communities based on operational case studies, which introduces a level of uncertainty. However, it is reasonable to assume that these impacts would still apply in the UK because: 1. the nature of the vehicles and roadways can be assumed to be similar to those in the USA, and 2. these impacts are consistent with other developments that require the use of HGVs on potentially unsuitable roads in the UK.

The economic scenarios for UOG development in Wales indicated the level of uptake in Wales will potentially be lower than that forecast in Scotland, although not substantially. Furthermore, there is likely to be greater focus on CBM resources than shale gas, which will have a bearing on the profile of traffic movements, with peaks in heavy and light vehicles occurring at different stages of the development. However, the overall forecast for Wales is consistent with Scotland, as vehicle numbers associated with UOG sites on a regional scale are anticipated to be marginal when compared with existing traffic movements.

Therefore, it is concluded that the conclusions put forward in the Scottish Government report, regarding social and environmental impacts, have a **High** level of agreement, given the similarities in the scale of the resources available and the comparable environments. However due to the lack of evidence for traffic impacts related to UOG sites operating in the UK, there should be considered to be a **Medium** amount of evidence. Thus, the overall level of confidence is **Medium**.

## 5.2 Suitability of Controls

At present, there is no specific planning framework relating to UOG developments in Wales, which is consistent with the situation in Scotland. Therefore, applications for UOG developments would be considered through the existing regulatory and planning framework. The Town and Country Planning (Notification) (Unconventional Oil and Gas) (Wales) Direction, 2015, states that all proposed UOG sites, which are not refused by the Local Authority, must be referred to Welsh Ministers. This provides an additional level of protection against the potential social and environmental effects of UOG developments. The completion of an EIA is also a likely requirement for an UOG development. The IEA Guidelines provide the most relevant framework for assessing the effects of traffic on local communities.

The additional proposed methods of control are consistent with those put forward in the Scottish Government report, and include:

- Strategic Development Plans
- Regional and Local Plans
- Planning applications
- "Framework Traffic Management Plan"
- Roads Condition Survey
- Enforcement Officer
- Key transport principles for OOG

The main difference between the recommendation for additional methods of control is the inclusion of guidelines for UOG developments in the SDPs. Given the recent changes to the planning structure in Wales, and because the SDPs are not expected to come into force until 2021, this has been identified as an opportunity to highlight the requirements for UOG operators in terms of their effect on local communities and the environment, including recommendations for the mitigation of traffic related impacts.

Overall, the controls applicable to UOG traffic related impacts in Wales are consistent with, or higher than, those in Scotland, therefore the level of agreement can be considered **High**. These controls have been tried and tested, for a range of other development types, under the UK's planning and permitting system. However, because these controls have not been used to regulate the impacts of an operational UOG site in the UK, and their effectiveness tested, the amount of evidence should be considered **Medium**. Thus, the overall level of confidence is **Medium**.

## 6 Conclusions and Evidence Gaps

This report has provided an assessment of whether the conclusions put forward in the Scottish Government report on 'Community Impacts from Transportation' associated with the development of UOG resources, are applicable to the conditions in Wales. The study confirmed that the six potential social and environmental effects on local communities associated with UOG vehicle movements, identified in the Scottish Government report, would be applicable to conditions in Wales. A review of recently published information confirmed that the estimations of vehicle numbers presented in the Scottish Government report can be considered representative of the likely vehicle movements at UOG sites in Wales.

A review of information on the availability of UOG resources in Wales found that estimated resource levels are similar to those found in Scotland, however development is anticipated, at least initially, to focus more on CBM than shale gas. As was concluded in the Scottish Government report; this study found that additional traffic movements associated with UOG resources are unlikely to be significant or detectable at a regional or national scale, and therefore the focus should be on assessing and managing local scale impacts in Wales.

The application of appropriate controls will be essential for mitigating the potential community impacts resulting from UOG vehicle movements. As was found to be the case in Scotland; at present, there is no specific planning framework relating to UOG developments in Wales, and thus, UOG sites would be considered through the existing regulatory and planning framework. However, the Town and Country Planning (Notification) (Unconventional Oil and Gas) (Wales) Direction, 2015, which requires all proposed UOG sites that are not refused by the Local Authority to be referred to Welsh Ministers, does provide an additional level of protection. Despite this, additional methods of control will be required to mitigate the effect of UOG traffic on local communities. Recommendations for additional controls were largely consistent with those put forward in the Scottish Government report, with the exception of SDPs, which were identified as a unique opportunity to highlight the requirements for UOG operators in terms of their effect on local communities and the environment.

Overall, there was concluded to be a **Medium** level of confidence in the applicability of the conclusions put forward in the Scottish Government report, regarding social and environmental impacts, and regarding the suitability of controls, to conditions in Wales. In both cases, the lack of operational evidence for UOG sites in the UK was identified as presenting a degree of uncertainty.

The assessment has identified two primary evidence gaps regarding the likely social and environmental impacts of UOG traffic in Wales, and the suitability of the measures to control them:

1. Data on traffic movements is limited, with most studies based in the USA. As discussed in Section 2.2, the majority of estimations of vehicle numbers associated with shale gas pads are based on the report published by NYCDEC. There is even less published information on traffic movements associated with CBM sites. Therefore, any assumptions made regarding traffic movements will have a degree of uncertainty for UOG sites in the UK.
2. The use of the UK planning system to control the effects of UOG traffic on communities has not yet taken place to any extent, beyond the approval of small-scale exploratory drilling. If and when full-scale well-pad development takes place in the UK, traffic impacts should be carefully monitored to confirm that the range of available controls are being implemented as anticipated.

Despite these evidence gaps, it is reasonable to conclude that the findings of the Scottish Government report are, in general, applicable to conditions in Wales, and thus, provided the planning and Environmental Impact Assessment processes are properly implemented, any significant impacts would be avoided through the application of the control measures set out above.



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