The Transport Impacts of Unconventional Gas Extraction in Scotland

A Reponse from The Broad Alliance

“The Community Empowerment (2015) Act, which promotes public service reform, provides a legal basis for participation, and establishes new rights and responsibilities for community bodies and public authorities. Local communities can now identify local outcomes (including transport initiatives) related to economic development, enhancing accessibility and sustaining remote communities, which are then delivered in partnership.” (1)

National Transport Strategy 2016, The Scottish Government

31st July 2016
1. Introduction

This paper sets out the Broad Alliance’s observations concerning the negative and often disastrous transport impacts that are the outcome of the Unconventional Oil & Gas Extraction (UOGE) industry, and our view is based on evidence from countries where the unconventional gas agenda has been sanctioned and welcomed by the authorities.

Having the opportunity to submit this paper is an affirming process, because it gives weight to the position statement of the Scottish Government that it will pursue a “considered and robust approach” before reaching its decision on permitting UOGE. It is also an opportunity for the Scottish government to show that its commitment to involving communities in transport planning (see our introductory quote) is genuine.

It is our hope that the Scottish government is going to take into account actual evidence, from actual places where UOGE is happening.

What they must not do is rely solely on the speculative assessments we have seen on transport and transport movements from the industry itself. We are sharply aware that “research to fail” and “fail to research” are two available approaches, and we hope this will also be clear to the consultants carrying out this impact study.

A fit for purpose transport network spanning the whole of Scotland, and providing for all needs, including the needs of our future sustainable economy, is of vital importance. This must be a network of many component parts making a collective infrastructure that enables, allows and provides for our citizens, our public duties, our businesses and our visitors to conduct and go about their daily activities easily, quickly and sustainably.

We have a range of local and national plans aimed at supporting a modern sustainable economy. Nowhere in them is the provision of transport infrastructure to enable a new dirty fossil fuel industry. It is an unwelcome add on; if the government is going to permit it, then it must first show how these transport needs can be met without negative impacts on other parts of the economy and community.

The Scottish government has stressed the importance of reducing the potential health impacts of transport (2), and in particular the amount of airborne particulates. It is also keen to encourage “active” transport, where people walk, cycle, and travel to the countryside in order to do more walking, thereby improving health. Indeed, these objectives have been a core element of the Scottish Executive’s transport strategy since 2006 (3). It is hard to see how UOGE fits with these aspirations.

Identifying and analysing the varied and interconnected impacts which might result from UOGE in Scotland is a task that requires major investment in modelling at a scale community spokespersons such as the Broad Alliance could never achieve.

In our view it is for the government and officials to do such modelling and to do it looking at worst-case scenarios, rather than the very modest under-estimates the industry will give for traffic movements.
Without doubt, the points raised in this paper won’t be the only transport considerations taken into account by our ultimate decision makers in the Scottish Government. We will expect to see some very sophisticated risk assessment and impact modelling. What we will not find acceptable is research based only on estimates provided by the industry itself.

2. What to measure and how to measure it

2.1 Using the precautionary principle

The Broad Alliance is pleased to see that the Scottish Government is committed to an evidence-based approach to reaching a decision on UOGE. We are not opposed to the idea of establishing baselines that would enable any change to be accurately measured and cause attributed.

However, we are not happy with the idea of Baseline Indicators that are only used to provide a measurement of change once the industry gets underway. In our view this industry should not be going ahead under any and all circumstances.

However, Baseline Indicators could be used to model and measure variations BEFORE any decision to permit UOGE is taken. In other words, if Baseline Indicators only have value for saying “we told you so” – then they have no value at all to affected communities.

It is worth noting that Scotland already has a framework of established indicators, which are used to evaluate and monitor a range of public policy decisions - the Scottish National Indicators. (4) Individually, and collectively these could be a starting point for measuring all potential UOGE impacts.

Some of those most relevant to transport are:

Reduce traffic congestion
Improve Scotland’s reputation
Improve people’s perceptions about the crime rate in their area
Reduce deaths on Scotland’s roads
Improve people’s perceptions of the quality of public services
Increase the proportion of babies with a healthy birth weight
Increase physical activity
Improve self-assessed general health
Improve mental wellbeing
Reduce premature mortality
Improve people’s perceptions of their neighbourhood
Improve the state of Scotland’s historic sites
Improve access to local greenspace
Increase people’s use of Scotland’s outdoors
Improve the condition of protected nature sites
Improve the state of Scotland’s marine environment
Reduce Scotland’s carbon footprint
Increase the proportion of journeys to work made by public or active transport
Reduce waste generated
Increase renewable electricity production

Some of these have an obvious correlation to specific transport impacts arising from UOGE. UOGE could easily be evidenced as a cause of, for example, a failure to “reduce traffic congestion”, “reduce deaths on Scotland’s roads”, “reduce Scotland’s carbon footprint”.

It would be relatively easy to use as a Baseline the injury/accident/incident records on highways that will be affected by UOGE, relative to current traffic flows. By adding in the additional traffic, and in particular HGV journeys, it should be possible to extrapolate the extent to which the additional traffic will bring about a negative impact.

Other National Indicators may appear to have a less obvious relationship with UOGE transport impacts, but a pathway can be established for a number of them. For example, busier, more polluted and damaged roads would have a negative impact on “active transport”, or “physical activity”, or “perceptions of a neighbourhood” or “people’s mental health” to name but a few.

The Broad Alliance therefore suggests that the Scottish Government measures the impacts of UOGE against its own National Indicators. Will it help us to achieve them, or not?

Furthermore, as well as doing this at a national level, it should also be done at a local level where the impacts would be more concentrated and experienced by local communities and people living in them.

The Broad Alliance would also expect the following information to be gathered:

- Historic traffic counts on all proposed routes.
- Air Quality baseline values on all proposed routes.
- Historic accident rates on proposed routes.
- Properties on proposed routes are offered the right to have a structural survey paid for prior to commencement of operations.
- Usage of any nearby public rights of way and assurances that these will be guaranteed through all phases of operation from exploration through production to decommissioning.
- Noise surveys along and around all proposed routes.
- Traffic-related health impact studies (to include asthma, anxiety etc.) in areas around all routes.
• Assessment of infrastructure, i.e. bridges, drainage, water supply, electricity supply on proposed routes to confirm if they are capable of withstanding the additional stresses of much increased HGV traffic.

If the Scottish Government and their consultants believe that this level of information is not available and cannot be made available in order to model the changes that UOGF will bring, then we would suggest that, using the precautionary principle, the development of UOGF should be rejected on transport grounds.

2.2 Scoping, defining and modelling transport impacts

Given the time and resources available to the Broad Alliance, we do not offer this as a comprehensive study but just a slender reflection of the large number of concerns which have been raised within the communities we represent.

The potential scale of UOGF in Scotland is enormous. If once permitted in the existing licensed areas then there will be pressure for further areas to be licensed, as envisaged by the UK government DECC in the 14th Onshore Licensing Round, that is to say the whole Central Belt of Scotland.

In considering transport impacts, therefore, it will be essential to model exponential growth and not only current licenses. A multi-layered approach will be needed and some complex transport models.

The Broad Alliance asserts that major problems will arise as a result of UOGF and that transport issues and impacts will be experienced over Scotland’s most densely populated area, varying depending on location, e.g. proximity to well-sites, sources of water, location on transfer routes. We anticipate that the major issue will be the impact on rural and trunk roads ill-designed to cope with significant additional heavy traffic.

Our focus in this submission is on road transport, though there are other areas that could be considered. We do not feel able to comment on Air Travel and the Maritime Impacts of UOGF except to state that we do not approve of the importation by sea of gas which has been extracted through unconventional means causing damage in other countries.

In this submission we define Unconventional Oil & Gas as the collective term for different types of oil and natural gas held in reservoirs and being exploited in non-traditional ways (irrespective of depth). Unconventional Oil & Gas Extraction (UOGE) techniques include, Coalbed methane, Shale Gas (fracking) and Coal Seam Gasification. Scotland is threatened with all three of these.

With the exception of coal seam gasification, extraction is most likely to take place from a series of onshore well pads and transport impacts will arise from their preparation, construction and operation.
Three licences for coal seam gasification have been awarded in Scotland relating to both onshore and close-to-shore areas. These would operate from on-shore footprints and it is here that any transport impacts should be measured.

However, it has also been suggested that close-to-shore drilling could be used if certain conditions prevailed and this would not provide a different set of regulatory and legislative challenges and different transport impacts. However we have not explored these in detail, only note that they may need to be considered.

3. What will actually happen?
3.1 UOGE processes that will have transport impacts

Shale gas development typically takes place through the following stages:
- Stage 1 - Well-pad site identification and preparation
- Stage 2 - Well drilling, casing and cementing
- Stage 3 - Technical hydraulic fracturing
- Stage 4 - Well completion
- Stage 5 - Well production
- Stage 6 - Well/ site abandonment

The infrastructure likely to be associated with development of shale gas resources includes the following:
- Gathering and laying mains pipelines
- Constructing Compressor stations
- Gas processing and cryogenic plant for production of LNG
- Creating and utilising a water treatment infrastructure
- Building or extending road connections to gas well pads and other facilities.

Transport impacts would take place consecutively through gas well development stages 1-6. However, if permission were to be extended to licence areas beyond the current ones, then many of these stages would be taking place simultaneously in different areas, leading to a cumulative negative effect on the transport infrastructure of the Central Belt, already under considerable pressure.

This point is worth underlining. The industry will stress consecutive processes – one stage to the next in a single location – but the reality will be that if the moratorium is lifted, that would imply a commitment by the Scottish government to the development of this industry and therefore potential further licensing rounds. It will be difficult for local authorities to disallow new development on planning grounds, because they have been told that they cannot go beyond the very limited safeguards set out in the National Planning Framework.

We would therefore be experiencing the traffic impacts of all the different development and production stages happening in different locations across the Central Belt, at the same time.
3.2 The level of additional road journeys

As there is no UOGE industry yet in the UK, we need to take figures from the United States to inform the discussion:

The total number of truck movements in the US during the fracking phase alone can be anywhere from 600 to 1,000 one-way trips per well. (5) This suggests upwards of 6,000 truck movements during this phase for a ten well pad. During the heaviest period the total number of trips could be as high as 250 per day.

New York State Department of Environmental Conservation also estimated that 100 truck movements per well are estimated to be needed for waste water disposal, that would be a total of 1,000 movements for a ten well pad. This figure would be less if pipelines were available for the delivery and disposal of water.

However, Broderick et al suggest that the data for New York combined with data in relation to exploratory drilling in the UK "...suggests a total number of truck visits of 7,000-11,000 for the construction of a single 10 well pad in the UK." (6) These movements are made up as follows:

- Drill pad and road construction equipment 0.7%
- Drilling rig 0.5%
- Drilling fluid and materials 4.6%
- Drilling equipment (casing, drill pipe, etc.) 4.6%
- Completion rig 0.2%
- Completion fluid and materials 1.8%
- Completion equipment (pipe, wellhead) 0.5%
- Hydraulic fracture equipment (pump trucks, tanks) 3.0%
- Hydraulic fracture water 54.6%
- Hydraulic fracture sand 2.3%
- Flow back water removal 27.3%

These estimates are consistent with the Institute of Directors’ estimate of 870 truck movements per well, assuming that water is transported by truck rather than obtained from a mains supply.

In relation to Coal Bed Methane extraction HGV movements would be similar during well pad and access road/utility corridor construction, and drilling as the site and infrastructure development requirements are broadly the same, though well pads for CBM may be smaller and more numerous. But truck traffic would be lower overall during the final stages of drilling and completion, unless a decision is taken to frack the well, which would increase the trips to the same level as shale wells.
If produced water is stored and transported off site by truck the number of HGV trips will increase dramatically. For example, one prospective UK operator suggests water will be stored onsite and transported by tractor to a nearby treatment facility. Truck movements for the development of that facility (based on 14 drill sites) are estimated at around 3000 during construction, drilling and site reduction - but this does not include movement of produced water by tractor. There is no reason to suppose that there will always be a “nearby waste water treatment facility” available and so we would need to assume that much of the toxic water would need to be transported to treatment plants by tanker.

4. The impacts

4.1 Road infrastructure

A 2014 study published in Journal of Infrastructure Systems, “Estimating the Consumptive Use Costs of Shale Natural Gas Extraction on Pennsylvania Roadways,” noted that local roads are generally designed to support passenger vehicles, not heavy trucks. (7) This is would also the case in Scotland.

This same study looked at the design life and reconstruction costs of roadways in the Marcellus shale formation in Pennsylvania and reviews the impact of heavy vehicles on roads.

“The useful life of a roadway is directly related to the frequency and weight of truck traffic using the roadway,”(8) the review says, then goes on to describe how heavier vehicles cause exponentially greater damage. Leighton et al summarise the effects cited in the review, thus:

“Where a single axle with a 3,000-pounds load has a load equivalency factor (LEF) of 0.0011; for an 18,000-pound load, the LEF is 1.0; and for 30,000 pounds, it’s 8.28. This means that 18,000-pound and 30,000-pound single-axle ... do about 900 times and 7,500 times more damage than a 3,000-pound single axle pass, respectively.” (9)

Here in Scotland a significant part of the road network that would be used for UOGE is a network of rural and smaller roads, and the Broad Alliance would expect these roads to be subjected to a sustained period of heavy use requiring substantial repair and maintenance.

However, it is not only the rural and smaller roads that will suffer but also main arterial motorways and ‘A’ roads, which are already under considerable stress in terms of volume of traffic.

When it comes to paying for repairs, authorities can try to gain recompense from the industry, by imposing additional fees or taxes.

But the US study describes how costs were generally borne not by the industry, but by state transportation authorities, and thus taxpayers and this would also be the case in Scotland. We have seen no indication that the industry intends to contribute to funding repair and maintenance of roads. Indeed when INEOS had a recent major infrastructure project at Grangemouth it turned to the public purse for support.
Road damage would have an impact on other road users and pedestrians: additional costs for motorists having to repair damaged vehicles; risk of injury to cyclists because of uneven road surfaces or pot holes and the risk of personal injury to pedestrians.

Scotland’s road layout is more modest than long straight roads in the wide open spaces of the US. Small roads would suffer a heavy toll where there are tighter corners, narrow bridges, fences, kerbs and culverts

It is our view that any money put into communities by the UOGE companies, if it materialises, will be more than swallowed up by the cost to local authorities of repairing roads and mitigating all the other damage to other parts of the economy that UOGE will cause.

The Broad Alliance view is that any increase in road traffic and other traffic impacts that negatively affect the health, welfare and lifestyle of people in communities affected by UOGE, are totally unacceptable.

4.2 Impact on road accidents and fatalities

It is inevitable that additional journeys, especially through small towns and villages, will lead to additional road traffic fatalities.

Pedestrians and cyclists have a higher rate of fatality per distance travelled than for any other mode of transport, with the exception of motorcycles, and more than one third of pedestrian fatalities are children under 16. Children in the UK are at twice the risk of injury from road traffic compared to their peers in France and Germany.

In terms of the cost to society of road transport fatalities:

“The cost per fatality in Scotland in 2007 was estimated to be in the region of £1.65 million. This valuation of costs is based on a ‘willingness to pay human cost’ approach. It is intended to encompass all aspects of the costs of casualties including both the human and direct economic costs. The human cost covers an amount to reflect the pain, grief and suffering to the casualty, relatives and friends and, for fatal casualties, the intrinsic loss of enjoyment of life. The economic cost covers loss of output due to injury and medical costs”.

(Scottish Government, Edinburgh 2009)

The World Health Organisation recommends that the dangers of roads would be reduced through an approach that prioritises vulnerable road users and limits the speed and volume of traffic through traffic calming measures. This is different from the previous approach, which sought to reduce casualties by limiting pedestrians and cyclists and facilitating traffic (eg by the use of guardrails and barriers etc). But sustaining this more progressive approach in rural towns and villages will be made more difficult by significant additional HGV journeys linked to UOGE.
The consequences of road traffic crashes are often more severe in rural areas than in urban areas.

In the UK, the number of fatalities on all urban roads in 2010 was 572, compared to 1,046 for all rural roads, and 113 for motorways. (11) The design of rural roads and higher speed limits mean that road traffic crashes are likely to occur at higher speeds, with a higher risk of injury.

Access to rural roads is also often poor, which means the distance the emergency services must travel to reach those involved in crashes, and the equivalent delay in reaching healthcare services, poses a greater risk. Almost two-thirds of all road deaths are on rural roads.

4.3 Impacts on Health

The negative health effects of UOGE transport will be more intense in Scotland than in the United States where there are lower population densities – and as documented by numerous research studies, these are already extremely serious. The Broad Alliance has submitted a number of health studies to the Impact Assessment being conducted by Public Health Scotland.

But relating to transport, Scotland has the highest level of premature deaths from cardiovascular disease, coronary heart disease and stroke in the UK. (12) Increasing the amount of air pollution from additional traffic journeys would increase the incidence of these diseases.

The areas with the highest proportion of total deaths associated with air pollution are, with the exception of Aberdeen City, areas that would be negatively affected by UOGE traffic:

1) Edinburgh (4.9%)
2) Glasgow City (4.7%)
3) Falkirk (4.3%)
4) North Lanarkshire (4.3%)
5) = Aberdeen City and West Lothian (both 4.2%) (13)

To try to improve air quality, the Scottish government has implemented a range of measures, including identifying Air Quality Management Areas where the local authority must implement special measures, including traffic reduction. The additional UOGE traffic will negatively impact on their ability to achieve such improvements.

A 2005 European study, estimated that 3,900 myocardial infarctions per year could be attributed to traffic noise in Germany. Road traffic noise exposure has also been linked to increased rates of hypertension and psychological problems, including anxiety symptoms. There is strong and consistent evidence that the most common effect of excessive noise on children is cognitive impairment.
Transport is the leading cause of noise pollution. In addition to annoyance and sleep disturbance, there is increasing evidence that transport noise adversely affects the cardiovascular system, mental health, and school performance in children.

“Noise, smells and intrusive lighting are well recognised as health hazards and potentially serious interferences to normal day-to-day living. The stress that will be imposed upon individuals and communities is hard to predict or generalise, and will critically depend on the proximity and size of surrounding populations. It constitutes a significant form of ill health in its own right, and is a co-factor in the genesis of a range of other diseases and illnesses” (14)


Epidemiological studies show that socially disadvantaged people are more likely to live near busy roads, and are therefore at greater risk of the negative effects of noise pollution.

4.4 Impact on pedestrians and cyclists

Walking is universal and inclusive but in recent years has struggled as a means of transport against a backdrop of steadily increasing vehicle numbers and traffic volume. Actually, cars present the greatest danger to pedestrians, but people are more likely to avoid walking along roads where there are high volumes of HGV traffic.

The 2010 Marmot review, quoting National Travel Survey data, highlighted that fewer primary school children walk to school now (52%) than they did twenty years ago (62%). (15)

There are of course a range of reasons for this, but reversing the trend requires that local roads should have less, and not more, heavy goods traffic.

It is likely that because of the volume of new traffic generated close to fracking sites, it will be very difficult for local authorities to sustain their commitment to walking and cycling. They will be forced instead to facilitate UOG traffic, at the expense of local communities, exacerbating issues such as community severance, discouragement of walking and cycling, and stress and anxiety.

Cycling levels in the UK are low, and the risk of injury, or perceived risk of injury, is a major factor. Freight vehicles are the major risk to cyclists: they are 20 times more likely to be involved in cyclist road traffic injuries than cars, per kilometre travelled. Research on cyclist fatality rates in London between 1992 and 2006 has shown that freight vehicles were involved in more than four out of ten incidents. (16)

Additional HGV traffic on Scotland’s roads will lead to greater danger and greater fear of danger, discouraging cycling.
4.5 Impact on rural transport

Rural communities face a complex, and distinct, series of transport issues. People are reliant on car use as train and bus services have reduced. In 2012 the British Medical Association reported that the average journey length for those in rural communities is 10.5 miles - two miles higher than that of the UK average. Rural residents travel over 2,000 more miles per annum, in comparison to the UK average of 6,800 miles. (17)

The centralisation of healthcare, jobs, shops, education, training and services has led to the closure of many facilities, which has resulted in rural communities becoming increasingly reliant on travelling further to access services.

Most rural roads in the Central Belt are already under pressure from all of these journeys, and the addition of more HGV traffic will make life more difficult and undermine all the efforts made to encourage, for example, walking or cycling to school.

4.6 Impact on air pollution

Road-traffic emissions come from a number of sources including exhaust pipe emissions and re-suspended road dust. The main pollutants from road traffic include:

- particulate matter less than 10 or 2.5 microns (PM10 and PM2.5 respectively)
- nitrogen dioxide (NO2)
- sulphur dioxide (SO2)
- benzene and other volatile organic compounds (VOCs)
- ground-level ozone (O3) formed by interaction of VOCs with NOX in the presence of sunlight and heat.

It is estimated that in the UK, air pollution is associated with 50,000 premature deaths per year.

Research from 2010 estimated that in the UK particulate matter from transport leads to an average loss of life expectancy of six months, with 18.2 to 32.4 million life years lost. Fine and ultra-fine particulate matter in air pollution increases deaths from cardiovascular disease and respiratory illness. (18)

There is a growing body of evidence, acknowledged by authorities such as the BMA (19) and London Government, (20) showing that prenatal exposure to air pollution is associated with a number of adverse outcomes in pregnancy. These include low birth weight, intrauterine growth retardation, and an increased risk of chronic diseases in later life. Emerging evidence also suggests that long-term exposure to particulate matter, at levels such as those seen in major cities, can alter emotional responses and impair cognition.
4.7 Impact on the wider economy

Given the emphasis in the National Transport Strategy, 2016, and Scottish National Indicators (both previously referred to in this paper), on supporting the economy and connectivity through building and upgrading roads, we would be interested in a detailed analysis which takes into account factors such as:

- the negative cost to local business due to traffic from the UOGE industry.
- costs to local service providers because of congestion by way of additional HGVs.
- potential reductions in visitors and tourists.
- damage to local roads and the natural environment etc.
- the costs of additional duties to local authorities.

Local authorities in the potential UOGE areas have adopted carefully constructed infrastructure plans to support the businesses they have identified as important to their local economies. These take no account whatsoever of the impact of providing new road infrastructure, or mitigating damage to existing roads, as a result of UOGE. There will inevitably be an impact on other economic and commercial interests from the diversion of funds to support the demands of UOGE.

As well as mapping the additional costs, it will be important to measure the losses. For example, the damage to “Scotland the brand” and visitor numbers. Most of the local authorities in areas potentially affected have development plans that include increasing tourism and visitor numbers to attractions. But the reality is that nobody will want to spend their holiday or day out in a gas field, whilst competing for road space with additional HGV traffic.

5. Regulation and monitoring

It is often claimed that the UK, including Scotland, has a far superior and “gold-standard” level of regulation than the US.

Higher standards of regulation than the USA may well exist. However, in the few Scottish examples of UOGE related matters shown through the Dart Energy Public Enquiry in Falkirk, (21) or in the catalogue of “what shouldn’t have happened” at Canonbie, (22) “gold standards” have not been demonstrated.

The current economic climate means we are seeing tighter budgets for local authorities. This is already leading to reduced services, and transport planning teams under enormous pressure. The Vehicle Operator and Services Agency is under similar pressure.

It is our view that there are insufficient on-going resources to identify risks from UOGE road use, or to enforce changes if risks are identified.

The Broad Alliance will not be content with general commitments to regulation. In our view there should be specific estimates of the additional funds that will be required by local authorities and VOSA and a commitment from the government to making these funds
available. If this commitment cannot be made, then it is clear that UOGE is more than the transport infrastructure can cope with and therefore this would be another transport related reason for not going ahead.

6. Conclusion

If the Scottish government has a genuine policy commitment to reducing traffic and encouraging a modal shift to more active and sustainable forms of transport in Scotland, then reduced road capacity will have to be achieved and fewer HGV journeys. Given that transport decisions have the potential to last decades, the decision made now on UOGE will have a long-term impact on Scotland’s ability to have a transport system that supports health and wellbeing.

It is with this in mind that we echo and endorse the words from the National Transport Strategy 2016’s title in saying – we need to prepare for tomorrow and start delivering today!

Our transport priorities must not place a leading importance on fossil fuels and must place communities’ needs at the forefront of decisions if we are to arrive at a positive future!

Reference:

(1) National Transport Strategy, January 2016, Scottish Government

(2) Ibid

(3) Scotland’s National Transport Strategy, December 2006, Scottish Government

(4) Scottish National Indicators, Scottish Government
   http://www.gov.scot/About/Performance/scotPerforms/indicator


(6) Broderick, John (et al), 2011, Shale gas: an updated assessment of environmental and climate change impacts. University of Manchester
   https://www.escholar.manchester.ac.uk/uk-ac-man-scw:156730

   http://repository.cmu.edu/cgi/viewcontent.cgi?article=1065&context=cee

(8) Ibid.


(18) ibid. Pg 19

(19) ibid. Pg 19

