

UGEE Joint Research Programme – Progress Report

22nd April 2015

The Environmental Protection Agency (EPA) is coordinating a multi-agency trans-boundary programme of research on the potential Impacts on the environment and human health from Unconventional Gas Exploration & Extraction projects/ operations. This UGEE Joint Research Programme (JRP) is funded by the Environmental Protection Agency, the Department of Communications Energy and Natural Resources (DCENR) and the Northern Ireland Environment Agency (NIEA). The UGEE JRP is managed by a steering committee comprising the Environmental Protection Agency, the Department of Environment, Community & Local Government; DCENR; the Geological Survey of Ireland; Commission for Energy Regulation; An Bord Pleanála; Northern Ireland Environment Agency, the Geological Survey of Northern Ireland and the Health Services Executive.

The research is being undertaken by a consortium of independent organisations comprising CDM Smith, British Geological Survey, University College Dublin, Ulster University, Queens University Belfast, AMEC Foster Wheeler and Philip Lee Solicitors. The project began in August 2014 and is scheduled to be complete in July 2016.

The UGEE JRP has been designed to produce the scientific basis to assist assess the environmental impacts associated with high volume hydraulic fracturing (fracking) in Ireland. The programme of research will assist regulators – both North and South – in making informed decisions about fracking. Ministers in both the Republic and Northern Ireland have publically stated that the issuance of fracking licences will be dependent on the outcomes of a thorough, independent, investigation of potential impacts on the Irish environment. This precautionary approach to fracking is unique to Ireland and has been belatedly recognised as an essential process in several countries where fracking has been started. The UGEE JRP will not replace, or diminish the need for, any of the statutory processes necessary to seek permission for a fracking licence or development.

The UGEE JRP has five main elements:

1. Impacts on surface waters, groundwaters and related ecosystems;
2. Impacts on seismic activity;
3. Impacts on air quality;
4. International operational practice and impact mitigation measures; and
5. Regulatory regimes for fracking in different countries

This is a comprehensive programme of research and there are many elements to it (some baseline analysis & desk –based literature reviews). At present, there has been good progress on the UGEE JRP, as described in Table below listing progress against the individual tasks of the Terms of Reference.

The final report will be made publically available on the EPA website. Further details on the research programme are currently available on a dedicated website www.ugeeresearch.ie.

Projects	Tasks	Description of Tasks (as per Terms of Reference)	Status (22/04/2015)	Related Interim Reports
A1	1	Assessment of existing baseline monitoring (best) practices including water quality aspects, the location of existing monitoring points with specific regard to geological/hydrogeological conditions to inform best practice for an island of Ireland geological context. Any limitations and/or knowledge gaps should be expounded. This assessment should also outline/make reference to the legislative requirements to develop an environmental monitoring programme.	Nearly Complete	Awaiting finalisation of Interim Report A1.1
A1	2	Development of sub-regional geological/hydrogeological characterisation and conceptual model based on all of the available existing data for the case study areas. This model should be further refined when data are acquired through Tasks 3, 5 and 6. General principles of data requirements, acquisition and assessment should enable application in the context of the existing water management arrangements for the island of Ireland.	Nearly Complete	Awaiting finalisation of Interim Report A1.2
A1	3	Preparation of a technical specification for a sub-regional baseline monitoring programme that will be informed by the geological and hydrogeological characteristics of the case study sites, i.e. taking specific regard of the conceptual understanding of local/regional groundwater flow regimes in these areas.	Ongoing	

Projects	Tasks	Description of Tasks (as per Terms of Reference)	Status (22/04/2015)	Related Interim Reports
A1	4	Some or all aspects of this task will be part of the Supplementary Tender referred to in Section 5.2: If additional monitoring points are required, the successful Framework operator will be asked to submit a supplementary tender for Task 4 a-f inclusive and will then be responsible for the whole procurement process for a sub-contract for the installation and commissioning of the additional monitoring points, in accordance with EU and National Procurement procedures. This sub contract will include but not be limited to:	Not Started - Supplementary Tender	
A1	4a	The preparation of all tender documentation for the sub-contract including the provision of specifications for monitoring installations, which shall be in line with best practice and to an appropriately high standard. <u>The Steering Committee will review these specifications and may request amendments/clarifications (within 21 days).</u> The technical specification shall outline the parameters which should be analysed, including the reasons for selection, test methods and required limits of detection.	Not Started - Supplementary Tender	
A1	4b	Tender evaluation, tender recommendations to Steering Committee and administration including the issue of sub-contract award documentation <u>following approval (within 21 days) to award the contract from the Steering Committee.</u>	Not Started - Supplementary Tender	
A1	4c	Management, supervision and administration of sub contract for the provision of additional monitoring points, as well as attendance upon the sub-contractor. This task will include ensuring that any additional monitoring points are installed to the agreed specification and with full hydrogeological supervision.	Not Started - Supplementary Tender	

Projects	Tasks	Description of Tasks (as per Terms of Reference)	Status (22/04/2015)	Related Interim Reports
A1	4d	The successful tenderer will be required to fulfil the role of Project Supervisor Design Process (PSDP) and/or designer under the Safety, Health and Welfare at Work (Construction) Regulations 2006 and Amendment Regulations 2008 to 2013 and will be required to ensure full compliance with these regulations.	Not Started - Supplementary Tender	
A1	4e	The successful tenderer will be required to prepare the Final Account for the sub-contract and to produce the Final Report on the provision of the additional monitoring points.	Not Started - Supplementary Tender	
A1	4f	The successful framework operator will be responsible for negotiating with landowners to:	Not Started - Supplementary Tender	
A1	4f i	Obtain permissions to enter onto lands suitable for the installation of the additional monitoring points; and	Not Started - Supplementary Tender	
A1	4f ii	Use and have access to the additional monitoring points as well as making any payments arising to land owners in respect of loses/inconvenience incurred by them as a result of the operation of monitoring points on their land.	Not Started - Supplementary Tender	
A1	5	Identification of potential surface water and associated ecosystem receptors, highlighting areas that have been designated as having a particular environmental importance, which should be included in baseline monitoring.	Nearly Complete	

Projects	Tasks	Description of Tasks (as per Terms of Reference)	Status (22/04/2015)	Related Interim Reports
A1	6	This task will be part of the Supplementary Tender referred to in Section 5.2: Baseline groundwater, surface water and associated ecosystems monitoring shall be undertaken for a minimum period of 12 months with provision for the on-going operation and maintenance of the network. Where appropriate, this shall use existing monitoring networks and points, and, if required, monitoring of correctly installed additional monitoring stations upon installation. Monitoring of potential existing monitoring points and any newly installed station(s) will require discussion with the Steering Committee, which may request clarifications/amendments (within 21 days). As the monitoring results are collated, the network and procedures should be reviewed in discussion with the Steering Committee.	Not Started - Supplementary Tender	
A1	7	Geological assessment of the existing fracture networks and networks that are likely to be produced by fracking operations and the implications for water flow and pollutant transport, with specific reference to overlying groundwater bodies.	Ongoing	
A1	8	Quantitative assessment of a) water requirements for UGEE projects/operations (for an individual, typical pad and for each permit area) and b) groundwater and surface water resource availability. The assessment should identify the potential UGEE projects/operations water usage impacts on local and catchment water requirements. These requirements include, but are not limited to, direct abstractions (groundwater and surface water) and flows/inputs for surface water and ecosystems.	Ongoing (with Project B)	
A1	9	Recommendations for baseline monitoring requirements. Assessment as to which elements of baseline monitoring, could be undertaken by the state versus by the industry. The assessment should include co-ordination and quality assurance requirements, and make reference to best practice for other similar industrial activities on the island of Ireland and other EU countries.	Not started	

Projects	Tasks	Description of Tasks (as per Terms of Reference)	Status (22/04/2015)	Related Interim Reports
A1	10	Ensure effective dissemination of the research findings in accordance with the overall dissemination plan of the Research Programme, which will be agreed with the Steering Committee.	Ongoing	
A1	GTS	Groundtruthing Survey	Ongoing - 1st round has been completed - 2nd round in progress	
A2	1	Assessment of existing baseline monitoring operated worldwide for UGEE projects/operations to inform best practice for an island of Ireland geological context. This assessment should also outline/make reference to the legislative requirements to develop an environmental monitoring programme.	Nearly Complete	Awaiting finalisation of Interim Report A2.1 (Tasks 1 & 3)
A2	2	Evaluate methodologies, such as InSAR, EDM, tiltmeters and GPS, or their equivalent for the monitoring of ground deformation that may be associated with UGEE projects/operations.	Nearly Complete	Awaiting finalisation of Interim Report A2.1 (Task 2)
A2	3	Assessment of existing data on natural seismicity in the island of Ireland. This assessment should include an analysis of magnitude of natural earthquakes with regard to actual damage caused, including the potential to cause damage to the integrity of oil and gas wells, as well as the public perception of this (potential) damage.	Nearly Complete	Awaiting finalisation of Interim Report A2.1 (Tasks 1 & 3)

Projects	Tasks	Description of Tasks (as per Terms of Reference)	Status (22/04/2015)	Related Interim Reports
A2	4	Assessment of the magnitude and physical effects of induced seismicity that may be associated with UGEE projects/operations in the island of Ireland (including hydraulic fracturing and re-injection). This will include a review of induced seismicity related to existing operations elsewhere in the world but will also assess the relationship between event magnitude and physical effects applicable to the geology of the case study areas in Ireland. The actual and perceived impacts of induced seismicity from potential UGEE projects/operations in the island of Ireland should be related back to the findings of Task 3 (i.e. assessment of existing data on natural seismicity).	Nearly Complete	Awaiting finalisation of Interim Report A2.1 (Task 4)
A2	5	Preparation of a technical specification for a sub-regional baseline monitoring with appropriate conceptual model(s) that will be informed by the geological/seismological characteristics of the case study sites taking into consideration existing monitoring infrastructure and identify if, and where, additional monitoring stations are required relating back to the area-specific geological/seismological conceptual understanding.	Nearly Complete	Awaiting finalisation of Interim Report A2.2 (Task 5)
A2	6	Some or all aspects of this task will be part of the Supplementary Tender referred to in Section 5.2: If additional monitoring points are required, the successful Framework operator will be asked to submit a supplementary tender for Task 4 a-f inclusive and will then be responsible for the whole procurement process for a sub-contract for the installation and commissioning of the additional monitoring points, in accordance with EU and National Procurement procedures. This sub contract will include but not be limited to:	Not Started - Supplementary Tender	

Projects	Tasks	Description of Tasks (as per Terms of Reference)	Status (22/04/2015)	Related Interim Reports
A2	6a	The preparation of all tender documentation for the sub-contract including the provision of specifications for monitoring installations, which shall be in line with best practice and to an appropriately high standard. <u>The Steering Committee will review these specifications and may request amendments/clarifications (within 21 days)</u> . The technical specification shall outline the parameters which should be analysed, including the reasons for selection, test methods and required limits of detection.	Not Started - Supplementary Tender	
A2	6b	Tender evaluation, tender recommendations to Steering Committee and administration including the issue of sub-contract award documentation <u>following approval (within 21 days) to award the contract from the Steering Committee.</u>	Not Started - Supplementary Tender	
A2	6c	Management, supervision and administration of sub contract for the provision of additional monitoring points, as well as attendance upon the sub-contractor. This task will include ensuring that any additional monitoring points are installed to the agreed specification and with full hydrogeological supervision.	Not Started - Supplementary Tender	
A2	6d	The successful tenderer will be required to fulfil the role of Project Supervisor Design Process (PSDP) and/or designer under the Safety, Health and Welfare at Work (Construction) Regulations 2006 and Amendment Regulations 2008 to 2013 and will be required to ensure full compliance with these regulations.	Not Started - Supplementary Tender	
A2	6e	The successful tenderer will be required to prepare the Final Account for the sub-contract and to produce the Final Report on the provision of the additional monitoring points.	Not Started - Supplementary Tender	
A2	6f	The successful framework operator will also be responsible for negotiating with landowners to:	Not Started - Supplementary Tender	

Projects	Tasks	Description of Tasks (as per Terms of Reference)	Status (22/04/2015)	Related Interim Reports
A2	6f i	Obtain permissions to enter onto lands suitable for the installation of the additional monitoring points; and	Not Started - Supplementary Tender	
A2	6f ii	Use and have access to the additional monitoring points as well as making any payments arising to land owners in respect of loses/inconvenience incurred by them as a result of the operation of monitoring points on their land.	Not Started - Supplementary Tender	
A2	7	This task will be part of the Supplementary Tender referred to in Section 5.2: Seismic monitoring shall be undertaken for a minimum period of 12 months with provision for the on-going operation and maintenance of the network. Where appropriate, this shall use existing monitoring networks and points, and, if required, monitoring of correctly installed additional monitoring stations upon installation. Monitoring of potential existing monitoring points and any newly installed station(s) will require discussion with the Steering Committee, which may request clarifications/amendments (within 21 days). As the monitoring results are collated, the network and procedures should be reviewed in discussion with the Steering Committee.	Not Started - Supplementary Tender	
A2	8	Examination of global experience of seismic events stimulated by or otherwise related to fracking and other UGEE projects/operations with assessment of likely impacts and recommendations for appropriate mitigation measures within the geological context of the island of Ireland.	Ongoing	
A2	9	Linking with Project B - Assessment of the success of pre-fracturing modelling techniques to predict the propagation (number and height) of fractures in the target horizon in order to predict induced seismicity and to predict the risk of fractures creating preferential pathways for pollutants.	Ongoing	

Projects	Tasks	Description of Tasks (as per Terms of Reference)	Status (22/04/2015)	Related Interim Reports
A2	10	Assessment of what baseline monitoring could be undertaken by the state versus by the industry. This assessment should include co-ordination and quality assurance requirements, and make reference to best practice for other similar industrial activities on the island of Ireland and other EU countries.	Not started	
A2	11	Ensure effective dissemination of the research findings in accordance with the overall dissemination plan of the Research Programme, which will be agreed with the Steering Committee.	Ongoing	
A3		Review of existing air monitoring data including naturally occurring radioactive materials (NORM).	Nearly Complete	awaiting Final Reports 3 finalisation and & Summary Report 3 submission
A3		Review of requirements and experience of Air Baseline characterisation in countries where UGEE projects/operations have taken or are taking place.	Nearly Complete	awaiting Final Reports 3 finalisation and & Summary Report 3 submission
A3		Identify and make recommendations for guidelines on the extent of Air baseline monitoring (frequency, location and types of pollutants to be covered) that needs to be carried out for an Environmental Impact Statement (EIS) (i.e. on a project basis).	Nearly Complete	awaiting Final Reports 3 finalisation and & Summary Report 3 submission
A3		Ensure effective dissemination of the research findings in accordance with the overall dissemination plan of the Research Programme, which will be agreed with the Steering Committee.	Ongoing	awaiting Final Reports 3 finalisation and & Summary Report 3 submission

Projects	Tasks	Description of Tasks (as per Terms of Reference)	Status (22/04/2015)	Related Interim Reports
B	1	Water Impacts and Mitigation Measures: This task should examine the potential environmental impacts of UGEE projects/operations on groundwater and surface water bodies, including the potential migration of methane, chemicals and other contaminants, both from surface and subsurface sources. Findings should be informed by an objective assessment of the risks and hazards posed by UGEE projects/operations, supported by a literature review and experience from other jurisdictions. Mitigation measures to address water impacts (including but not limited to effluent management/treatment and well construction) should be critically reviewed and presented. This should include a review of the success of innovative developments within the industry to reduce water impacts.	Ongoing	
B	2	An assessment of the direct (e.g. abstraction) and indirect impacts (e.g. drinking water, other receptors) of the use of local water sources for UGEE projects/operations and specifically, fracking. This should include a review of innovation within the industry to source water from existing industrial processes, such as cooling water, waste water treatment works effluent and innovation related to water-free fracking.	Ongoing	
B	3	A comprehensive assessment should be conducted of experience with the level of use of recycled flowback water in UGEE projects/operations and the potential for increasing these levels. An assessment should be carried out of the scope for, and implications of, recycling the flowback water for reuse in further fracturing operations in the case study areas used for Project A1, the results of which will inform potential impacts to other locations.	Ongoing	

Projects	Tasks	Description of Tasks (as per Terms of Reference)	Status (22/04/2015)	Related Interim Reports
B	4	Other Potential Impacts and Mitigation Measures ¹ : This task should employ similar approaches to Task-1 to examine impacts from UGEE projects/operations on other areas, which shall include, but are not be limited to human beings, flora & fauna (including farm & domestic animals), air, both local and global (i.e. CO ₂ , including fugitive emissions) impacts, climatic factors, landscape, material assets, cultural heritage, as well as the interaction between these areas. Mitigation measures to address these potential impacts should be critically reviewed and presented.	Ongoing	
B	5	Life-Cycle Assessment: A comprehensive assessment of the cumulative environmental impact of UGEE projects/operations should be conducted supported by a literature review and experience from other jurisdictions and compared with similar published assessments of other energy sources.	Ongoing	
B	6	Chemicals: Typically, chemicals such as biocides and dyes, among others, are used in UGEE projects/operations. This work package should examine techniques in UGEE projects/operations, including evidence of chemical-free UGEE projects/operations and the purposes of individual additives, to ascertain current and emerging practices in the context of avoidance of the use of additives that have the potential to harm the environment.	Ongoing	
B	7	Identify and assess the success of treatment and disposal methods for flowback fluid identifying specific case studies from around the world, with specific reference to a European example. Linking with Task 6, identify the treatment technologies available to adequately treat typical chemicals, used in the process, in combination with likely constituents of produced water. Disposal options linked to the available treatment options should also be reviewed and assessed.	Ongoing	

Projects	Tasks	Description of Tasks (as per Terms of Reference)	Status (22/04/2015)	Related Interim Reports
B	8	Linking with Projects A1, A2 and A3: Research into identifying best practice for environmental monitoring of potential impacts arising from individual UGEE projects/operations sites (including emissions monitoring, monitoring of mitigation measures effectiveness, and of impacts on the receiving environment).	Ongoing	
B	9	Examination of validity and range of existing and potential monitoring and mitigation[6] techniques, to include but not be limited to geophysical techniques (down-hole and surface) for use in monitoring, control, horizon selection, and injection management.	Ongoing	
B	10	Any other issues that become apparent in the course of the project and will contribute to the required knowledge base of this topic should be considered.	Ongoing	
B	11	Ensure effective dissemination of the research findings in accordance with the overall dissemination plan of the Research Programme, which will be agreed with the Steering Committee.	Ongoing	
C	1	An overview of the EU environmental legislation applicable to UGEE projects/operations. This should include environmental legislation that relates to all aspects of UGEE projects/operations from the planning to the cessation of activities, including aftercare requirements.	Nearly Complete	
C	2	Detailed information on the regulatory approaches of other countries that have extensive experience with this activity. This should include where possible a review of case studies where UGEE projects/operations covered two jurisdictions (transboundary activities). A minimum of five countries (with at least two within the EU) should be examined including at least one country where a moratorium on unconventional gas exploration has been introduced.	Nearly Complete	

Projects	Tasks	Description of Tasks (as per Terms of Reference)	Status (22/04/2015)	Related Interim Reports
C	3	The potential role of Health Impact Assessment in regulation of UGEE projects/operations should be considered based on the experience in other countries, and recommendations should be made towards developing a protocol in the island of Ireland context.	Ongoing	
C	4	Best practice for UGEE projects/operations: This work package should examine all regulatory enforcement requirements and best operational practices for UGEE projects/operations, in relation to (but not limited to): water resources management, waste management, emissions control, risk quantification and management/minimisation, avoidance or mitigation of detrimental seismic events, use of chemicals, well construction, well and site remediation, air emissions management and residuals management, as well as financial provisions.	Ongoing	
C	5	Public engagement: This work package should examine a minimum of five case studies of public engagement in UGEE projects/operations (or other similar projects) to identify best practices and recommend the most appropriate strategy in the island of Ireland context.	Not started	
C	6	Any other issues that become apparent in the course of the project and will contribute to the required knowledge base of this topic should be considered.	Not started	
C	7	Ensure effective dissemination of the research findings in accordance with the overall dissemination plan of the Research Programme, which will be agreed with the Steering Committee.	Ongoing	