



University College Dublin

Quality Improvement Plan

UCD School of Geological Sciences

January 2012

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1. Introduction

The quality review of the School of Geological Sciences took place in April 2011 when the School was part of the College of Engineering, Mathematical and Physical Sciences. In September 2011, the School was transferred into the newly formed College of Science, which better reflects the School's current activities and strategic goals. Since then the School has received strong support and encouragement from the College Principal, who has been proactive in addressing many of the difficulties faced by the School as a result of deteriorating physical infrastructure and lack of investment in staff and teaching facilities. The School has also benefited from the proactive support of the recently appointed Associate Dean of Science in promoting and marketing the School's undergraduate programme. The School has continued to engage proactively with UCD's Earth Institute, recognising its potential to provide infrastructural and administrative support for the School to enhance its inter-disciplinary research profile and income.

This document sets out each of the recommendations of the Review Group and the School's response under the categories and following the options set out by the Quality Improvement Template Document. Recommendations in section 10 of the Review Group Report, viz., "Summary of Commendations and Recommendations" are not dealt with separately since they are already included elsewhere.

The members of the Quality Improvement Committee were:

- Professor Stephen Daly, Associate Professor of Petrology, Head of School (Chair)
- Professor Frank McDermott Associate Professor of Geochemistry (Head of School at the time of the Review and Chair of the Self Assessment Report Coordinating Committee)
- Professor Christopher Bean, Associate Professor of Geophysics
- Dr Conrad Childs, Lecturer (Tullow Lecturer)
- Dr Peter Haughton, Senior Lecturer
- Mr Tony Keogh, Chief Technical Officer
- Dr Julian Menuge, Senior Lecturer
- Dr Patrick Orr, Senior Lecturer
- Miss Sarah Procter, School Administrator
- Professor Patrick Shannon, Professor of Geology
- Professor Ian Somerville, Associate Professor of Palaeontology
- Professor John Walsh, Professor of Structural Geology

2. Recommendations for Improvements – Follow-Up Action Taken and/or Planned

CATEGORY 1: Recommendations concerning academic, organisational and other matters which are entirely under the control of the unit

- **Category 1(a) Recommendations already implemented**

Recommendation 2.12: *Leveraging additional expertise*

The School needs to ensure that it has a good financial planning capacity. This will require establishing close working relationships between the College Finance Officer, the Head of School, and the School administrator

Action taken: Following the re-organisation of the university in September 2011, UCD School of Geological Sciences is now part of the College of Science. The Head of School in co-operation with the School Administrator has developed a close working relationship with the College Accountant, Bernadette Gallagher and College Director of Financial Planning & Strategy, David Kelly.

Recommendation 8.8: Among the Officers of College and University with whom the School needs to develop stronger ongoing relationships are the following:

- The College Finance Officer, who needs to be more actively engaged in supporting the Head of School, the School Executive, and the School administrator in understanding and managing the School budget.
- The Principal of the College, who needs to be fully apprised of developments in the School's strategic deliberations, strategic priorities, resource supports required, and problems arising from engagement with the University administrative offices.
- UCD Buildings Office, intensive engagement with which will be vital to drive through the extensive refurbishment of the School infrastructure which the School so manifestly needs as a matter of urgency.
- IT Services, to ensure that they are fully aware of the specific complex requirements of the School, so they too can plan in advance to meet the School's needs.

and Recommendation 8.7: The School should aim to improve its strategic capacity to engage in effective liaison with College and University offices, to mobilise assistance and leverage resources from elsewhere in the College and the University, and to assist the School in advancing its strategic priorities in the medium to longer term.

Action taken: Joining the College of Science in September 2012 has resulted in a better alignment of the School and College strategic goals. In parallel with this change there are now much improved channels of communication with all of these offices and individuals. This also reflects the strongly supportive proactive leadership of the new College Principal, who has been very supportive in assisting the School in developing our Quality Improvement Plan and in helping us to implement many of the changes recommended by the Review Group.

Recommendation: 2.11 *Sub-committees to ensure specialisation and follow-through*
Ensuring that key School objectives are met will require consistent attention and sustained follow-through. This will require the formation of smaller working groups

within the Executive, with specific tasks and timelines for which named individuals will assume responsibility.

Action taken: Smaller working groups are regularly formed to carry out specific tasks. For example, currently active working groups include a Science Hub Planning Group to ensure that adequate provision is made for School rock storage facilities comprises Professor Stephen Daly, Professor Frank McDermott and Dr Peter Haughton; a Technical Group to oversee planning of new analytical facilities for trace element analysis in the Earth Institute comprises Professor Stephen Daly, Dr Julian Menuge, Dr Shane Tyrrell and Mr Michael Murphy.

Recommendation: 3.14 *Equipment support through cost recovery from grants*

Cost recovery from grants where possible should be used as a means to ensure equipment is kept up-to-date and replaced periodically. If the School adopts an enhanced role for u/g research projects, as is recommended elsewhere in this Report, then some general School facilities will need to be significantly upgraded, especially the general geochemistry laboratory and rock preparation areas.

Action taken: In cases where the main use of equipment is for research, e.g. Desktop SEM, Neptune ICPMS there is a system in place for full cost recovery on a fee per hour or fee per day basis. Maintenance of equipment mainly used for teaching (e.g. thin section cutting and microscopes) is a recurrent problem and is supported by the School's meagre Supplies and Travel budget. When, occasionally, equipment funds become available (e.g. from College funds), these often have to be used to replace damaged teaching equipment. The School is acutely aware of this problem and is constantly on the lookout for opportunities to recover these kinds of costs.

Recommendation: 3.15 *National Centre for Isotope Geochemistry*

The School should continue to engage with other Irish Earth Sciences interests to develop the national facility to the maximum benefit of the University and Irish geoscience generally.

Action taken: Funding for the equipment in the National Centre for Isotope Geochemistry was raised jointly by PIs in UCD (80%), TCD (13%) and UCC (7%), mainly from Science Foundation Ireland. Representatives of all three institutions are involved in its management. The centre is open to all users on a shared cost collaborative basis. Discussions have recently taken place with NUIG in the hope that they will become more fully involved.

Recommendation: 3.16 *Issues affecting Equality*

Chairs of appointing committees (at least) should receive training in identifying factors that affect equality at all stages in the appointment process including job description, advertisement, and interview.

Action taken: The Head of School has attended a course on Equality Awareness.

Recommendation: 4.8 *Leaving Certificate Geography as a degree-specific entry subject*

In collaboration with the UCD School of Geography, Planning & Environmental Policy, campaign for recognition of Leaving Certificate Geography as a degree-specific entry subject for Geology and Geography degrees at UCD.

Action taken: Discussions are continuing with UCD School of Geography, Planning & Environmental Policy on this and related issues. Meanwhile, the Head of School (with the support of other staff) has raised the question of the recognition of Leaving Certificate Geography as an entry qualification for Science at the College of Science Programme Board and the College of Science Executive, where further discussion will take place on the issue at a future meeting.

Recommendation: 6.7 In attempting to meet requirements for increased student numbers it is important that the School preserves the excellent research-centred ethos. Thus any reforms to the undergraduate curriculum and introduction of new courses should always be mindful of the potential benefit to the research effort of the School, for example through the development of undergraduate research projects as a means to increase the visibility of research at bachelor-degree level, to provide training in research techniques, and to ensure efficient use of academic and research staff time.

Action taken: All staff within the School are aware of the critical interdependence of excellent teaching and research. To the extent that time and resources allow we strive to include as much research experience as possible in the undergraduate curriculum. This includes modules designed to introduce research methods and experience (e.g. SCI10010; GEOL 30220, 5 credits each), a major commitment to independent field study as part of the final year of the B.Sc. (GEOL 40170, 15 credits) and the continuing practice of all teaching staff as far as possible to make use of their own research output in the curriculum. Increasingly we strive to make the most efficient use of staff time by teaching appropriate undergraduate modules in concentrated blocks of time rather than occupying timetable slots that last for an entire semester.

Recommendation: 6.9 The School should continue to view research groups as somewhat fluid entities, constructed around shared facilities and interests, but open to future developments and collaborations.

Action taken: This has always been the view of the School staff and in practice there is a significant degree of collaboration and inter-dependence between the groups.

Recommendation: 6.9 The School should continue to support the individual research aspirations of the academic staff. To some extent this might be achieved by encouragement of sabbatical leave, and development of more flexible ways of delivery of teaching, by post-doctoral researchers for example, in order that academic staff time may be more effectively concentrated on different tasks at specific times in the University calendar.

Action taken: The School has always facilitated short sabbaticals through a general willingness of all staff to swap timetable slots and to take over teaching and administrative responsibilities to facilitate their colleagues absences. In addition there is a general willingness for staff to co-operate so as to allow selected modules to be taught in shorter intensive

periods, whether these arrangements are experimental or permanent. However, the introduction of new modules in recent years has increased the challenges in trying to facilitate such short sabbaticals. Post-doctoral researchers already contribute to a range of teaching activities in the field and classroom, and this has increased in the current academic year.

- **Category 1(b) Recommendations to be implemented within one year**

Recommendation 4.8: Develop an integrated strategy to improve recruitment of undergraduates into geoscience degree pathways. In particular, increase modestly (to at least 20) the number of students in the flagship Geology BSc as there is a clear market for these graduates,

e.g., Consider the merits and implications of recruiting additional cohorts of students from Northern Ireland and from Britain.

Action planned: In collaboration with the College of Science Education and Outreach Manager, the School will increase its efforts to increase student recruitment from non-traditional markets. Already students from Northern Ireland have attended a Geology workshop for second level pupils in November 2011. Many of these students were unaware of the opportunity to study Science (including Geology) in UCD and it is hoped to increase our contacts with Northern Ireland schools in the coming year. In addition, following discussions with the Associate Dean of Science, the title of the Mathematical and Physical Sciences subject stream (our main catchment) will be amended to Mathematical, Physical and Geological Sciences, thereby increasing the profile of our discipline within the College.

e.g., ask undergraduate students to return to their schools to promote geology as a degree (using a standard presentation and documentation prepared by staff). The absence of geology as a Leaving Certificate science subject is a major disadvantage as many undergraduates only 'discover' the subject by chance in Stage 1 Science. This method is used extensively in France.

Action planned: Potentially this is a useful suggestion, though there are practical difficulties since to make such visits, graduates will need to take time out of work etc. We will implement this on a trial basis in the 2012-2013 academic year. Recent graduates have already been featured in promotional literature for the School (and College) and the School's Facebook page is used to gather accounts from graduates of their exploits in employment and further study. Possibly from the secondary schools' perspective, targeted marketing using social media and pdf brochures that focus on the early career achievements of recent secondary school alumni, may well be as effective in promoting graduates' degree subjects and career prospects as visits to the schools by the graduates in person.

Recommendation 4.10: Investigate the viability of a joint Geology-Geography 4 year BSc programme in collaboration with the UCD School of Geography, Planning & Environmental Policy. This degree has clear potential. Stronger ties with geography in both teaching and research could be beneficial to the School of Geological Sciences.

Action planned: Discussions with UCD School of Geography, Planning & Environmental Policy were initiated by the previous Head of School, Professor Frank McDermott and are continuing under the current HOS.

Recommendation: 5.7. Reducing the number of student contact hours in favour of more project/personal work time.

Action planned: All staff are aware of the importance of project work and personal learning. Additional project work is currently being planned for several modules including GEOL 30110, GEOL 40180, GEOL 40280, which will replace more structured lecture and practical sessions. A new module, GEOL20120 Mineralogy, Geochemistry, Petrology, to be introduced in 2012-2013 will include ~5 week group research projects. It is also planned to reintroduce project work in the revised Stage 2 version of GEOL 30130).

Recommendation: 5.7. Integrating more quantitative work into the degree programme such as geostatistics, geomechanics, petrophysics, for example. This would increase the quantitative skills of students, thus making them more adaptable in their careers.

Action planned: The School is aware of the desirability to include as much quantitative coursework as possible. At present new modules are being planned as a result of the re-organisation of the Science curriculum in 2011. New Stage 2 modules (from 2012-2013) and Stage 3 modules (from 2013-2014) will consolidate and improve upon existing quantitative exercises, e.g. in igneous and metamorphic petrology. In general this will be done in other subject areas to the extent that the current staff profile allows. We will keep this recommendation in mind when considering future appointments to the School.

Recommendation: 5.10 Integrate GIS and remote sensing applications into the final stages of field mapping projects. Get necessary teaching from experts outside the School.

Action planned: Since 2011, the School has provided GPS receivers to all students undertaking mapping projects and in future will integrate their use into the two main field-mapping training courses. These location and field data will form the basis of GIS-based laboratory exercises. Further use of Google Earth and other remote imagery will be made on both field courses and in laboratory exercises and students will continue to be encouraged to incorporate imagery into their field mapping projects. Subject to availability of funding it is hoped to expand the present involvement of experts from outside the School (e.g. from Geological Survey of Ireland) in teaching a GIS short course to Stage 4 students. In the current academic year we are hoping to arrange additional contributions by staff from Queen's University, Belfast.

Recommendation: 6.8 The School should pursue vigorously the opportunities for developing research initiatives afforded by the ESI, including outward-looking collaborations (e.g. with the Geological Survey of Ireland and policy-making bodies).

Action planned: The School is enthusiastic about the opportunities afforded by UCD Earth Institute, not least since one of our staff has been appointed Interim Director and all members of staff are members of the

Institute. Another staff member will lead one of the Institute's three research clusters on Climate Adaptation, Mitigation and Geohazards. Several staff already have collaborative links with bodies such as the Geological Survey of Ireland, the Marine Institute and the Environmental Protection Agency and these will likely strengthen, in part through the Earth and Natural Sciences Structured PhD Programme.

- **Category 1(c) Recommendations to be implemented within five years**

Recommendation 3.10: Whilst the Review Group recognises the extremely challenging financial climate that the School finds itself in, it is imperative that the School develops, reviews and articulates its plans for academic staff replacements over the short to medium term, justifying these plans in the context of an overall academic strategic plan which should include a realistic financial case. The School should also consider how, in the long term, it will deal with the expanding scope of the geological sciences, including those aspects embodied by a small number of academic staff in cognate schools. Does the School wish to remain a relatively narrowly defined 'Geology' School, or does it wish to be seen more broadly as a School of Earth Sciences. Could the latter be achieved by developing strategic initiatives with other UCD schools?

Action planned: The School is acutely aware of the age profile of the academic staff and the need for the recruitment of younger staff to maintain the quality and intensity of field teaching, which makes heavy demands on staff time and is critically dependent on physical fitness and continuing good health. We are also aware of the need to generate income from new sources. To this end in 2007, the School made a carefully argued and costed proposal to senior management to make two additional staff appointments to enable the introduction of a professional Masters course. Unfortunately in the economic circumstances of the time, this proposal was not accepted. At present the School is awaiting the result of a major funding proposal made by UCD Foundation to an industrial benefactor, which if successful will involve the appointment of three new academic staff positions, thereby enabling the setting up of a Petroleum Geoscience Masters programme. These new staff positions will also have the effect of broadening and consolidating the existing range of expertise on the School. The School's identity with regard to "Geology" versus "Earth Sciences" will continue to be discussed in the light of academic developments, employment prospects of graduates and trends in student recruitment. See also response to Recommendation 4.9 below.

Recommendation 3.12: The School will need to consider urgently how best to provide the necessary technical support in the short to medium term. Proposals for future technical support should be strongly linked to the overall academic strategic plan and include a business case. Effective recovery of costs from grants should be used to provide at least partial financial support for technical services in all areas of School activity. The Review Group recommends that the School undertake a thorough review of the deployment of technical staff with a view to making the best possible use of existing staff resources, maximising activities that are cost effective, and identifying areas of activity that will require technical support in the future.

Action planned: The School is acutely aware of its dependence on key technical experts who are close to retirement. This will likely have a

negative impact on the proposed Masters Programme. Discussions are ongoing between the Head of School and the College Principal who has expressed his support for a phased recruitment of technical staff in advance of anticipated retirements. In the meantime, the School hopes to advertise at least one technical position under the proposed JobsBridge initiative, which is expected to be announced early in 2012.

Recommendation 4.9: The School may wish to explore taking responsibility for the BSc programme in Climate and Earth Systems. This degree is currently run by the UCD School of Mathematical Science and appears to have become vulnerable due to staff retirement and departure. In view of the new Earth Science Institute (ESI), and the growth of national and international concern for climate and natural resources issues, this degree is of strategic importance. Its development should be closely linked in School strategy to ESI policy in collaboration with other member Schools of the ESI.

Action planned: The School recognises the value of B.Sc. programmes which have a broader scope or different focus to the core programme in Geology. However, due to tight constraints in terms of the skills profile of current staff in the school, any such additional degree programmes can only be run in conjunction with other schools in the university. Hence, the School by itself cannot sustain the B.Sc. in Climate and Earth System Science if there are retirements in or departures from the School of Mathematical Sciences. The School will, however, reassess the possibility of a broader Earth Sciences programme (including a strong climate component) through a consultation process with Schools / staff members associated with UCD Earth Institute. Although the Earth Institute cannot run undergraduate programmes, it may be in a position to help promote any new programme and to give it added cohesion.

- **Category 1(d) Recommendations which will not be implemented**

Recommendation 2.10 *School Executive*

A new core group should be established which would have focused responsibilities and whose members would be charged with ensuring that specific longer-term planning objectives are met. This group should probably comprise: Head of School, Head of Teaching and Learning, a research group representative, a technical officer representative, and a postgraduate representative. The research representative should rotate among the six School research clusters, but not more frequently than annually. Effective consultative mechanisms between the relevant School representatives and the research and technical groups respectively should be set up.

Reason for not implementing:

The School Committee takes the view that the involvement of all members of the Committee is essential in long-term planning of School activities. In a small school such as ours, meetings of the School Committee operate efficiently and there is hence no need to implement “effective consultation measures”, which would be required if a core group was established.

Recommendation: 5.8 *School meetings: Academic Staff, School Council*

Meetings of the School academic staff should continue, comprising academic staff, a representative from the technical staff, and representatives from among the postdocs/ research fellows, and postgraduate students. School Council plenaries should be convened not more than once a semester. This should work well as a

forum for pooling information if relevant stakeholders know they also have channels for representation and consultation.

Reason for not implementing: All categories of staff are represented on the existing School Committee. This committee does not have a graduate student representative. However the interests and views of graduate students are very well catered for through the School Staff-Student Committee, Doctoral Studies Panels (DSP) and regular contacts with supervisors. Issues of a confidential nature can be brought to the attention of the DSP during the Stage 1 to Stage 2 Transfer interview, at which supervisors are not present. Graduate students are free to call a meeting of this committee at any time. Hence we believe that the interests of graduate students are very well catered for in our School.

Recommendation: 2.13. Moving the main mapping project to the summer between stages 2 and 3, thus freeing up Stage 4 for an in-depth research project (e.g. 30 credits). While the quality of the mapping projects would decrease, this would provide a more structured and transparent progression in learning and competence through the four year degree programme. The degree would also become more easily comparable to British M.Sci. degrees and therefore more marketable on a European stage. This could also enhance research activity in the School and reduce teaching loads of staff.

Reason for not implementing: This suggestion is impractical because our Stage 2 students have insufficient experience at the end of Stage 2 to undertake a significant mapping project. In contrast to the typical British curriculum, ours is based on a broad Science education leading to specialisation in the degree subject only in Stages 3 and 4. British Geology students typically take 60-80% of their credits in the degree subject in their first and second years combined. By contrast, in a UCD Geology degree with its omnibus science entry, only 25% of credits might be accumulated in Geology in the first two years of study.

Recommendation: 5.6. Splitting large modules into smaller, more visible modules of say, 24 hours (approximately 1 week of teaching; 2 ECTS credits).

Reason for not implementing: The standard minimum module size in UCD is 5 ECTS credits. The proposed change would entail serious practical problems with little obvious benefit

Recommendation: 7.5. The School should implement the detailed management restructuring recommendations in Section 2 above.

Reason for not implementing: See above

CATEGORY 2: Recommendations concerning shortcomings in services, procedures and facilities which are outside the control of the unit

- **Category 2(a) Recommendations already implemented**

Recommendation 3.9: In view of the continued delay in redeveloping Science West, the Review Group strongly recommends that an immediate plan of priorities

be developed by the School, with committed financial support from the UCD Buildings Office, and planning support from the College. This should identify year-on-year improvements that can be made to increase the functionality and versatility of existing spaces (especially rooms, offices and corridors) that are used in the education of undergraduate students. The Review Group commend the UCD Buildings Office for their proactive willingness to work closely with the School in order to achieve a satisfactory working environment that will permit the School to increase its cohort of degree students. Over a four year period, with a phased budget of say €1m from the UCD Buildings Office (for example, €250-300k per annum), this plan should indicate the sequence of changes that would allow the School to reach a target number of graduating BSc Geology students in the order of 20 per annum. These expenditures should include items that would continue to be valuable in the new Science West building (e.g., movable teaching benches, overhead video projectors, etc.) as well as improvements to the workplace environment that are similar to what has been achieved in the UCD School of Biology & Environmental Science.

Action taken: Modest improvements to the functionality and versatility of the teaching facilities are being undertaken immediately with the support of the College Office. As a modest first step new projection facilities are being installed in the three School teaching rooms. Additional support is required for practical teaching involving optical microscopy (dedicated microscopes with live camera feed to data projectors). The proposal to the industrial sponsor includes some provision for computing facilities for a Masters programme and in future the School also hopes to have access to modern teaching space in Science East.

- **Category 2(b) Recommendations to be implemented within one year**

Recommendation 3.11: Compelling evidence has been seen by the Review Group to recommend that University-wide discussions be opened immediately on the career grade for Research Fellows (not for Stage I or Stage II Postdoctoral Researchers). It is the considered opinion of the Review Group that such people should be allowed to be Principal Supervisors of PhD students in their own right.

Action planned: It is hoped that positively-received discussions between the Head of School and College Principal, between the Head of School and the Registrar and between the Graduate Studies Coordinator and the Graduate School Board will lead to a change in regulations to allow Research Fellows to act as Principal Supervisors of PhD students.

Recommendation 3.13: As part of its strategic planning the School should consider how administrative resources should be best deployed to continue to provide outstanding support for its core research and teaching activities.

Action planned:
The School regularly reviews the workloads of administrative staff and in anticipation of a major increase in workload arising from the planned introduction of a MSc course in Petroleum Geoscience, the School has flagged the need for additional administrative support as part of a major funding proposal that has been made to an industrial benefactor by UCD Foundation. In the meantime, the School hopes to advertise at least one

administrative position under the proposed JobsBridge initiative, which is expected to be announced early in 2012.

Recommendation 8.5 Deficits in UCD's centralised support services need to be addressed as a matter of urgency. These problems are not exclusive to the UCD School of Geological Sciences. The characteristics of those wider University functions that work well appear to be "customer-focused" or "school-centric" (Library; HR Partner). Units that are the cause of specific problems include Fees & Grants; Pre-Award; Post-Award; UCD Bursar's Office; UCD Research. The University and the new College of Science should prioritise the quality of their service provision by being more customer focused. Among the issues that require attention are the following:

- There are persistent delays in the supports required at School level from UCD Fees and Grants Office, especially for incoming non-EU PhD students who have a number of distinctive start-up requirements. This is a recurring issue with a highly foreseeable group, and yet it seems to occasion constant problems.
- The centralised aspects of UCD Human Resources is perceived as being unduly slow to respond to recurrent needs to set up or amend contracts for research staff.
- The support for project management available from research overheads is inadequate. In a School with a large research staff complement, this creates an additional heavy administrative burden for the School.
- UCD Finance Office's approach to the School's budget results in an ongoing lack of clarity, and there are persistent difficulties over invoice management, where incorrect billing requires constant School vigilance and over which transparency is often lacking.

This Report recommends that the University should take heed of these concerns in its own quality review practices.

Action planned: For its part, all members of the School will continue to co-operate positively with these various UCD support staff and agencies and, whenever the opportunity arises, to point out ways in which procedures can be tailored to better meet the needs of the School, its staff and students. Many of these issues affect other Schools right across the University, underlining the need for University action.

• **Category 2(c) Recommendations to be implemented within five years**

None

• **Category 2(d) Recommendations which will not be implemented**

Recommendation 8.6: Some of the issues associated with the design of School systems may be amenable to management at School level. The surges of administrative requirements, which can at times overwhelm the School administrator and the research administrator could be relieved through more anticipatory planning and a more consistent approach to designing School systems that do not require extraordinary personal sacrifices from School support staff.

Reason for not implementing: In the recent past, it seems that the entire university suffered from a lack of anticipatory planning and poor integration of information storage and retrieval. We have been frequently required at short notice to supply information to one university office that only a short period beforehand was requested by (and supplied to)

another office but in a substantially different format. This adds enormously to the workload of the School Administrator and to all staff required to supply the necessary data. It is hoped that with new structures in place and new personnel leading our College that this state of affairs will ameliorate to the benefit of all.

CATEGORY 3: Recommendations concerning inadequate staffing, and/or facilities which require recurrent or capital funding

- **Category 3(a) Recommendations already implemented**

Recommendation 4.7: Reduce teaching loads of staff and doctoral students. Some suggestions are offered in the Curriculum section for reduction in the overall number of contact hours in existing teaching programmes. Other suggestions are:

1. Involve Postdocs and research fellows more in teaching.
2. Invite industrialists and specialists from semi-state bodies and various Adjunct/Visiting Staff to provide teaching in specialised domains.
3. Involve colleagues from other areas of the University in more teaching, for example, on field courses or short courses.
4. Increase class sizes in Stages III and IV to numbers that are sustainable and manageable without compromising on the quality of education.

Action taken: Suggestions 1 and 2 relate to actions that are already in place but which cannot be easily increased. Suggestion 3 is impractical and is discussed in category 3d. Suggestion 4 is an obvious ambition of the School and action to achieve it is discussed under category 1b in response to recommendations 4.8 and 4.10.

Postdocs and research fellows are already heavily involved in supporting the School in various ways including supervision, mentoring and technical training of research students, giving research seminars (to the whole School including Stage 3 and Stage 4 undergraduates), occasional lecturing and more regular practical demonstrating to undergraduates, participating in reviews of course content, field supervision of graduate students, and teaching on undergraduate field classes. In addition, some postdocs have contracts that severely limit the teaching hours that they can undertake.

Experts from industry and state bodies such as the Geological Survey of Ireland already contribute to graduate and undergraduate modules. In our experience, most of our external experts have unpredictable schedules and cannot commit to more than a one-off class, the timing of which is unpredictable far in advance. This plays havoc with students' timetables and, in practice, limits the use of external teachers to 4th year classes.

- **Category 3(b) Recommendations to be implemented within one year**

Recommendation 4.6: Improve the teaching facilities urgently (see elsewhere in the Report). This must include a properly equipped IT laboratory with sufficiently powerful computers to support GIS, geophysical and numerical modelling software.

Action planned: Depending on the success of funding proposals currently under consideration by an external donor, it is planned to start a taught Postgraduate MSc course in Petroleum Geoscience. This course will require new staff as well as new teaching facilities, including specialised computing equipment, which will also benefit undergraduate teaching.

- **Category 3(c) Recommendations to be implemented within five years**

None

- **Category 3(d) Recommendations which will not be implemented**

Recommendation 4.7: Reduce teaching loads of staff and doctoral students.

See above (category 3a for suggestions 1 and 2; category 1b for suggestion 4)

Suggestion 3: Involve colleagues from other areas of the University in more teaching, for example, on field courses.

Reason for not implementing: This is impractical because staff in other areas of the university do not have expertise in field geology or field geophysics

3. Prioritised Resource Requirements

1. Academic staff and administrative support to run a new taught Postgraduate MSc course in Petroleum Geoscience, subject to securing substantial additional resources from an industrial benefactor.

A sustainable, internationally competitive MSc course will require additional specialist academic staff and a dedicated administrator. Such a course must be able to compete at the highest level with comparable professional courses run elsewhere (e.g. Imperial College London, University of Manchester, University of Aberdeen) in order to attract high quality, fee-paying students, as well as attracting industry funding to provide scholarships and internships. The breadth of disciplines in Petroleum Geosciences will demand three additional academic staff to cover the key areas. (Recommendations 3.10; 3.12; 3.13)

2. Space to run the planned taught Postgraduate MSc course in Petroleum Geoscience. An MSc course will require a large dedicated laboratory space where lectures, seminars and practical work can take place. The area required for 20 students would be equivalent to room G01 in the School. (Recommendations 3.10; 3.12; 4.6)
3. Equipment for the taught Postgraduate MSc course in Petroleum Geoscience, which will also support undergraduate teaching. Each MSc student will require access to a twin-screen workstation supporting industry-standard seismic and wireline log processing, interpretation modelling and GIS software. Licensing rental and support costs will need to be paid. (Recommendations 3.10; 3.12; 4.6)
4. Training of specialised technical staff in anticipation of retirements. (Recommendation 3.12)
5. Improvements to teaching infrastructure including teaching microscopes with camera attachments and mobile laboratory furniture with data and power services via underfloor ducting (instead of fixed benches) to facilitate group projects/ group learning (Recommendation 3.9)

Note: The Quality Improvement Plan should be used to inform School/Support Unit and College level academic, support service and resource planning activities.