



Review of availability of candidates for groundwater-related jobs in the UK

prepared by

UK Groundwater Forum Secretariat

Publication title	Review of availability of candidates for groundwater-related jobs in the UK
Report no.	GWF/07/01
Version	Final Report
Date	October 2007

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Acknowledgement

The UK Groundwater Forum would like to thank all those organisations that responded to the questionnaire that was the basis of this review. The Forum would also like to thank Dr Andrew Skinner of the International Association of Hydrogeologists for allowing the use of data from a paper that was still in preparation at the time of publishing this report.

UK Groundwater Forum

The Forum is a grouping of organisations and individuals which aims to raise the awareness of the importance of groundwater to the UK, to help ensure that it plays its full part in meeting the needs of society and the environment. The Forum is run by a Steering Committee which includes representatives of the UK environment regulatory agencies and the water industry.

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Executive Summary

The environmental goods and services market is a fast-growing part of the UK economy. The water and wastewater treatment and waste management sectors together account for more than 70% of the market. Many of the organisations in these sectors require the services of groundwater specialists. Currently the demand for people with these skills outweighs the supply. The UK Groundwater Forum has undertaken this review of the availability of candidates for groundwater-related jobs to examine in more detail the root causes of the problem.

The Forum's review involved: the circulation in August and September 2006 of a questionnaire to potential employers of groundwater specialists (to approximately 240 organisations in the water industry, the public sector and the environmental consultancy field); plus, insights into the underlying reasons for recruitment difficulties from published articles and from informal discussions through the Forum's network of contacts.

Responses to the questionnaire were received from 13 organisations (~5% return). Although a small number, the results are consistent in many aspects. The review has found that a significant number of the recruitment exercises reported on (59%) did not result in the positions being filled or, where they were filled, recruits had lower levels of skills or experience than initially wanted by the employers. This was the case with posts across all levels of experience although it was a particular problem at more senior levels.

The recruitment problem stems from the increased demand for groundwater specialists due to greater awareness of groundwater issues, pressure to develop new water resources and the requirements of legislation, such as the Water Framework Directive and Habitats Directive. The majority of those who completed the questionnaire believe this demand will only increase further in the future. The main reasons given as to why this demand is not currently being met were the shortage of graduates from relevant university courses and the lack of people entering the profession, primarily because of pay levels. The number of postgraduate groundwater-related courses has increased in recent years although this still does not appear to be producing enough graduates to meet the demand. In the case of at least one university, the limitation on places on the Hydrogeology MSc course is the inadequate numeracy skills of the applicants. In relation to the issue of pay levels, employers report that salaries have increased significantly in response to the competition for recruits and that progression within organisations for groundwater specialists is fast. Employers are also addressing the lack of suitable candidates by undertaking more training of existing staff and recruiting from overseas, particularly the rest of Europe.

Sponsorship of staff and students to undertake relevant postgraduate courses has also been identified as a means to address the lack of suitable job candidates. Many respondents expressed the view that the number of students graduating from groundwater-related postgraduate degree courses needs to increase. This would address to some degree the difficulties in finding junior level candidates, but would take some time to filter through to more senior level posts. The survey has indicated that employers may be receptive to increasing their sponsorship of students if they could ensure direct benefits to themselves.

The implications of this review are serious, indicating the great difficulty that will be experienced in the future in managing the groundwater resources of the UK, given the reported shortfall in adequately trained personnel. Through the review the UK Groundwater Forum has identified a number of initiatives that it is considering to help address the problems being experienced by employers:

- Examine what support the Forum can give to universities and careers officers to help promote applications to groundwater-related postgraduate courses from undergraduates with adequate numeracy skills;
- Lobby influential organisations to try to increase the number of studentships on groundwater-related post-graduate courses, e.g NERC;
- Explore opportunities to broker financial support for studentships by employers of groundwater specialists;
- Continue to provide careers information through the UK Groundwater Forum web site.

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1 Background and aims

The environmental goods and services market is a fast-growing part of the UK economy. According to the Environmental Industries Unit (EIU (2005), EIU (2006)), it has an annual turnover of over £25 billion, putting it on par with the pharmaceuticals and aerospace industries. It employs around 400,000 people in more than 17,000 companies. Figure 1 shows the composition of the market in the UK.

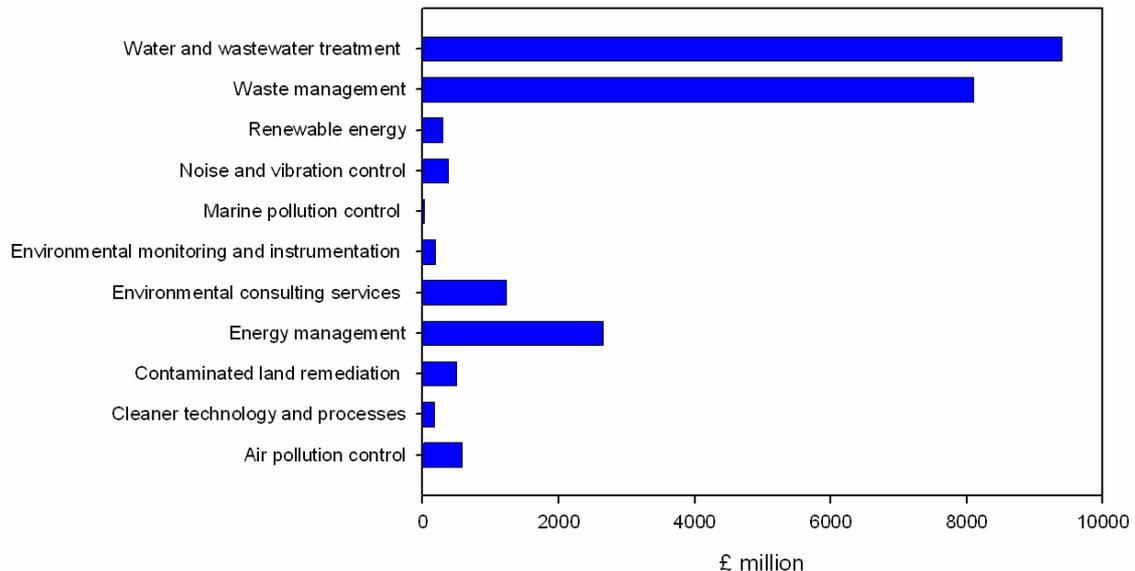


Figure 1 UK environmental goods and services market by sector in 2005

A number of the sectors shown in Figure 1 will require the services of groundwater specialists. These include water and wastewater treatment and waste management, which together account for more than 70% of the market. Other sectors that employ groundwater specialists include environmental consulting services and contaminated land remediation. While their overall market shares are smaller, they are among the fastest growing areas. The environmental consulting industry has had a double digit rate of growth since 2000. The market for contaminated land remediation is also strong and growing in the UK due to the steady rise in the use of brownfield sites. Skinner (*in preparation*) estimates the number of groundwater professionals working in the UK at around 1100, this number having increased almost ten-fold in the past 30 years (n.b. this does not include the significant number of UK-trained groundwater professionals working on long-term appointments outside of the UK).

The rapid expansion of the environmental goods and services market in the UK has been accompanied by a shortage of skills. An ENDS survey¹ conducted in 2006 reported that:

“For the third year in a row, the general feedback from recruitment consultants is that they are thriving in a sector where demand for experienced environmental professionals outweighs the number of suitable candidates. It remains very much an employees’ market.”

¹ ENDS reports are available on-line at <http://www.endsdirectory.com/index.cfm?action=articles.home>

The survey also concluded that hydrogeology was one of the specialist areas in which the skills shortage was particularly acute. This was also identified in a review by a House of Commons Science and Technology Select Committee in 2002-03².

“For example in Hydrogeology, there is a national skills shortage. The Environment Agency alone has over 120 vacancies; they have now downgraded the skills level required in an attempt to fill them.” (Written evidence submitted by the Geological Society of London to the House of Commons Science and Technology Committee in 2003)

Other sources have also identified the shortfall in candidates for jobs in the water industry and groundwater in particular:

“Finding, extracting and treating water is now a multi-million pound business, and it’s an industry that is crying out for trained staff in the UK.” (The Guardian, 16 Oct 2004)

“I’ve given up expectations of recruiting trained hydrogeologists, either with experience or with recent post-graduate qualifications...we provide a wide range of groundwater management experience and are a family-friendly employer, yet we rarely attract suitable applicants for these jobs.” (Employer in Hampshire, 2006)

The demand-supply imbalance has meant that salaries for hydrogeologists are reported to have risen very rapidly. A series of annual ENDS surveys conducted since 2002 have found that hydrogeologists cornered some of the biggest pay rises in the environmental sector, in spite of the fact that hydrogeology has traditionally tended to be a relatively low paid discipline.

The UK Groundwater Forum has undertaken this review of the availability of candidates for groundwater-related jobs in the UK to examine in more detail the root causes of the problem. Through the review it aims to identify measures that the Forum could take, or promote others to take, to address the problem.

2 Approach

The approach taken by the UK Groundwater Forum in its review of the groundwater job market was two-fold. The Forum’s Secretariat circulated a questionnaire to potential employers of groundwater specialists in August and September 2006 (Appendix). The questionnaire sought to obtain information on:

- whether problems in recruiting exist;
- what are the aspects of recruitment that are particularly problematic;
- whether difficulties in recruitment are likely to increase;
- employers’ strategies currently in place to address recruitment problems;
- views on other means to address recruitment problems outside of the control of those consulted.

² <http://www.publications.parliament.uk/pa/cm200203/cmsselect/cmsctech/674/67402.htm>

Questionnaires were sent out to approximately 240 organisations, in the water industry, the public sector and the environmental consultancy field, the majority being from the latter category. Responses were received from 13 organisations (~5%), one of which was anonymous.

In addition to the questionnaires, insights into the underlying reasons for difficulties in recruiting groundwater specialists were obtained from published articles and from informal discussions through the network of contacts held by the UK Groundwater Forum steering committee.

3 Results from questionnaire

The organisations that returned the UK Groundwater Forum questionnaire vary greatly in size. The smallest organisation has six employees, all but one of whom are groundwater specialists. The largest is a water utility with a high reliance on groundwater for water supply. Eleven of the organisations are environmental consultancies, with a range of work areas including water resources, geothermal energy, mining hydrogeology, pollution investigation and remediation and contaminated land. Of the other two, one is a public sector organisation working in geoscientific research including hydrogeology and one is a water utility.

3.1 Recruitment methods

All organisations that completed the questionnaire advertise their vacancies through their own web site or through the printed or electronic media; Geoscientist, ENDS and Earthworks being mentioned most often. Nine of the 13 report using recruitment agencies. The same number reported attending university career fairs or making presentations to students while at university. Other methods highlighted included recruitment through the personal contacts of their staff and headhunting, in particular for more senior staff.

3.2 Recent recruitment exercises

Employers were asked to provide information on the last three recruitment exercises they had undertaken for groundwater-related posts in the past five years, including qualifications required of candidates and whether the post was filled satisfactorily. Details of 29 completed recruitment exercises were obtained. The employers were asked to categorise the posts into the qualifications and experience required of candidates. These details are presented in Table 1.

The majority the posts were for general hydrogeologists. A few posts for specific aspects of hydrogeology such as contaminated land assessments, groundwater modelling and mining hydrogeology were included. Posts for which a groundwater background was only part of the requirement were included, for example 'Geoenvironmental Engineer' and 'Environmental modeller'. A number of posts had generalised titles such as 'Graduate scientist' and 'Junior Consultant'. Table 1 shows, as would be expected, that more senior posts required project management, staff management and business development experience not required for the more junior posts. For the majority of posts an MSc in Hydrogeology was expected. Although perhaps not significant given the size of the sample, the data may indicate that employers have lowered their expectations in terms of the postgraduate qualifications required of entry-level recruits.

Table 1 Questionnaire results: qualifications and experience required of candidates applying for past three recruitment exercises undertaken by responding employers

Experience	Qualifications					Business skills		
	Undergraduate degree	MSc in Hydrogeology	MSc in other subject	PhD in Hydrogeology	PhD in other subject	Project Management	Staff Management	Business Development
no work experience	4	4			1			
up to 2 years experience	3	2	3	1	1			
2-5 years experience	1	4	3			2		
5-10 years experience	1	5		1		3	2	2
over 10 years experience		2				1	1	1

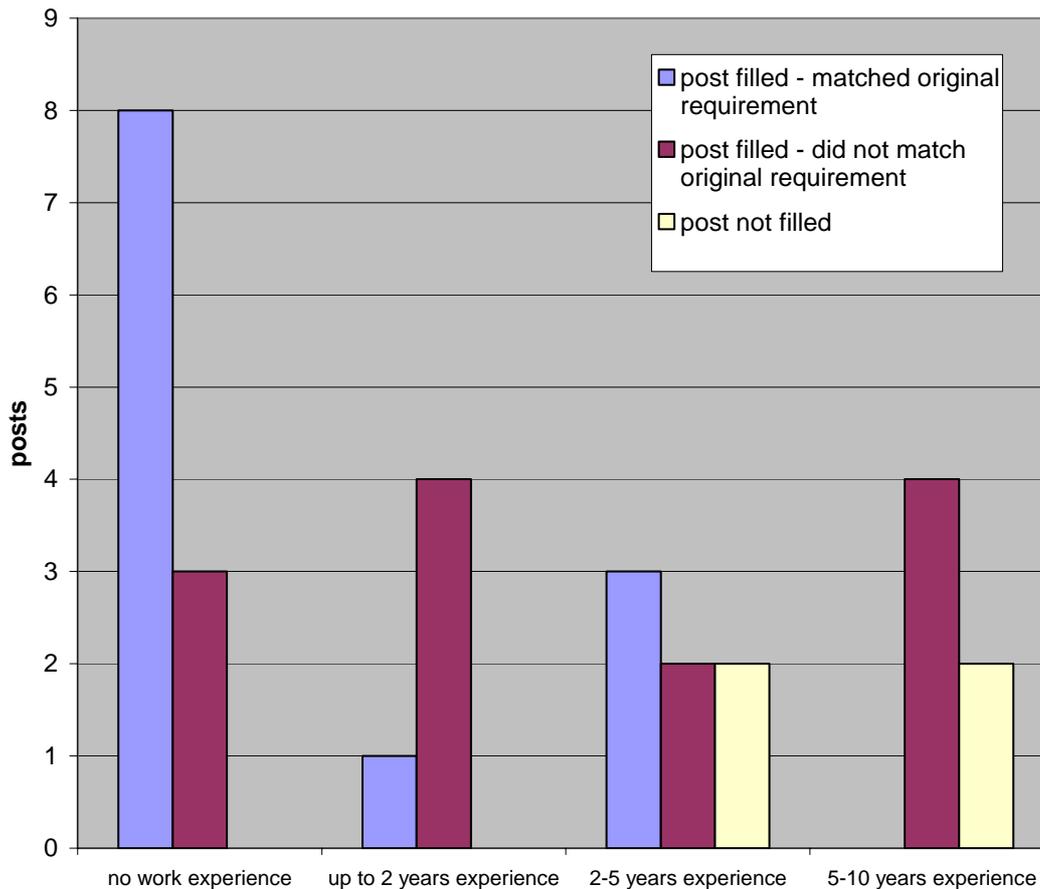


Figure 2 Questionnaire results: outcome of recruitment exercises undertaken by employers for groundwater-related posts (n.b. information on posts requiring greater than 10 years experience was not provided)

Employers reported that over the last five years all but one have had problems filling groundwater-related posts. Only 12 of the 29 posts referred to in the questionnaires were filled with candidates who matched the original requirements (Figure 2). Nearly half the posts were filled as a result of employers accepting candidates who did not fulfil all the requirements of the post, and four posts could not be filled at all due to a lack of suitable candidates. A higher proportion of the more junior posts were filled with candidates who matched the original requirement. The four unfilled posts were in the two more senior categories.

3.3 Staff recruited in the last 5 years

3.3.1 Entry-level recruits: undergraduates

Nine of the 13 responding employers had recruited undergraduates without work experience in the last five years. Of the other four, one organisation explicitly stated that it did not recruit undergraduates, but added that this would probably change as a result of the prevailing job market conditions.

The work profile of these staff typically involved fieldwork and monitoring and data collation and processing. The typical starting salary was in the £15,000–20,000 bracket (see Figure 3).

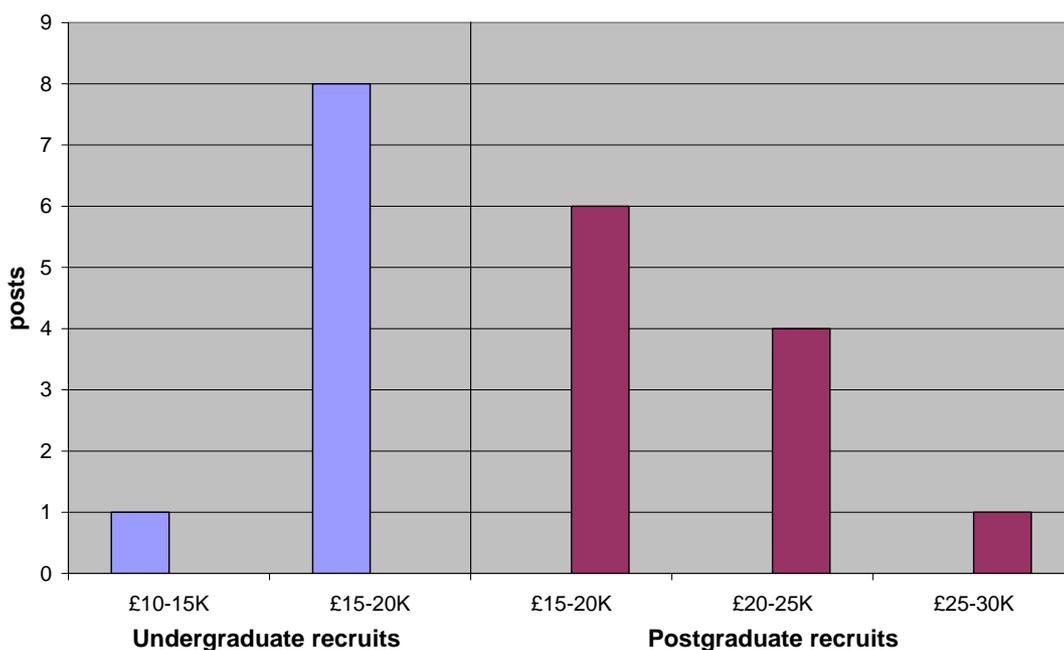


Figure 3 Questionnaire results: starting salaries for recruits employed at entry level with undergraduate or postgraduate degrees

In general, employers indicated that there were good opportunities for progression of these staff:

- “We are currently expanding rapidly, so good candidates can move up rapidly”.
- “Candidates often progress swiftly (6-12 months) to a level of junior consultant and within 2-3 years to consultant and within 5-10 years to senior consultant level”.
- “There are prospects for promotion to consultant grade (entry level for MSc hydrogeologist) after 2-3 years”.

The majority of undergraduates came with degrees in geology and environmental sciences (Figure 4). Employers were asked to identify which skills and areas of knowledge were lacking in their entry-level recruits (Figure 5). The area of most concern with undergraduate recruits is poor report writing skills. Numeracy and modelling were also identified by two employers as skills lacking in recruits. Further questions were posed in the questionnaire specifically about numeracy. Eight out of 10 employers that responded see a requirement for a high level of numeracy from staff working in groundwater-related jobs. Seven of the 11 employers to respond on this issue felt that the level of numeracy in their undergraduate recruits was adequate and only two said it was below the level necessary.

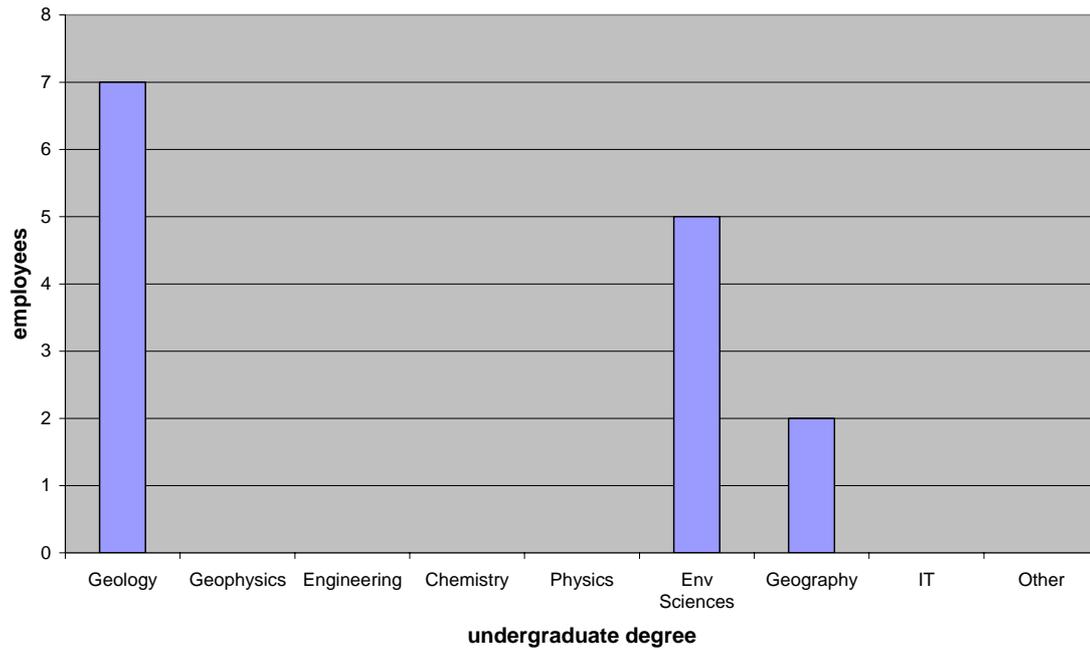


Figure 4 Questionnaire results: degrees held by undergraduates employed at entry level

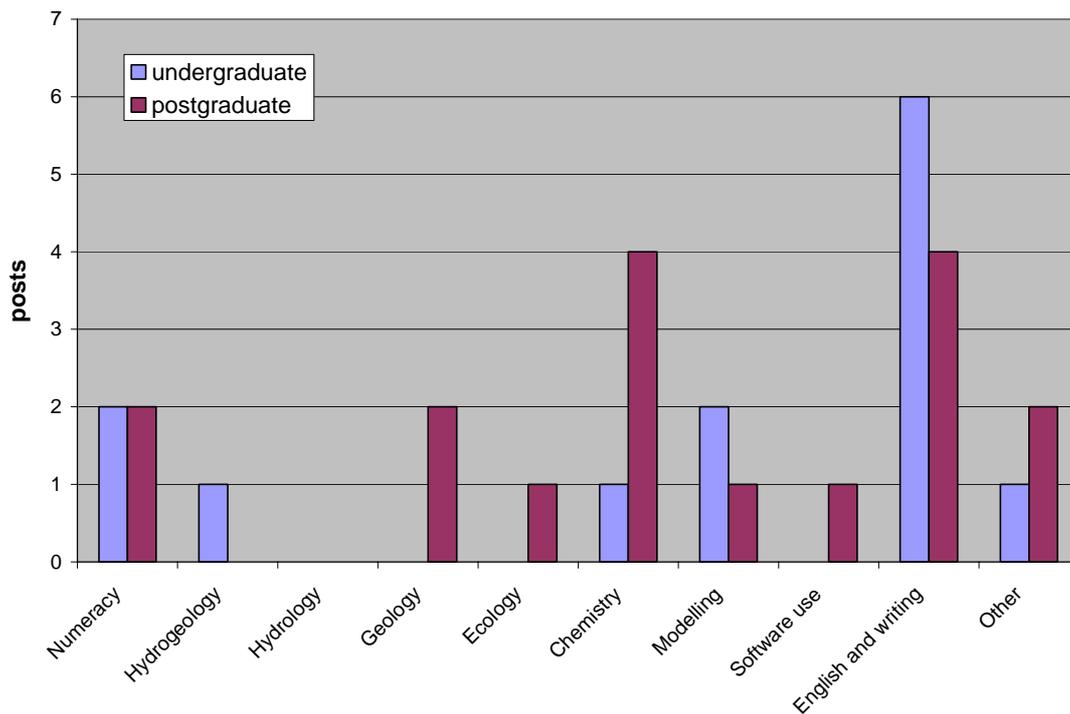


Figure 5 Questionnaire results: skills or knowledge lacking in recruits employed at entry level with undergraduate or postgraduate degrees

3.3.2 Entry-level recruits: postgraduates

In the past five years all but two of the 13 employers that responded had recruited postgraduates without any work experience. The majority of recruits started on a

salary in the range of £15,000 - £20,000 (Figure 3) although just below half started in a higher bracket. Most MSc postgraduates recruited came with hydrogeology or environmental science degrees (Figure 6). Three recruits came with PhD degrees in non-hydrogeology topics including geochemistry and microbiology.

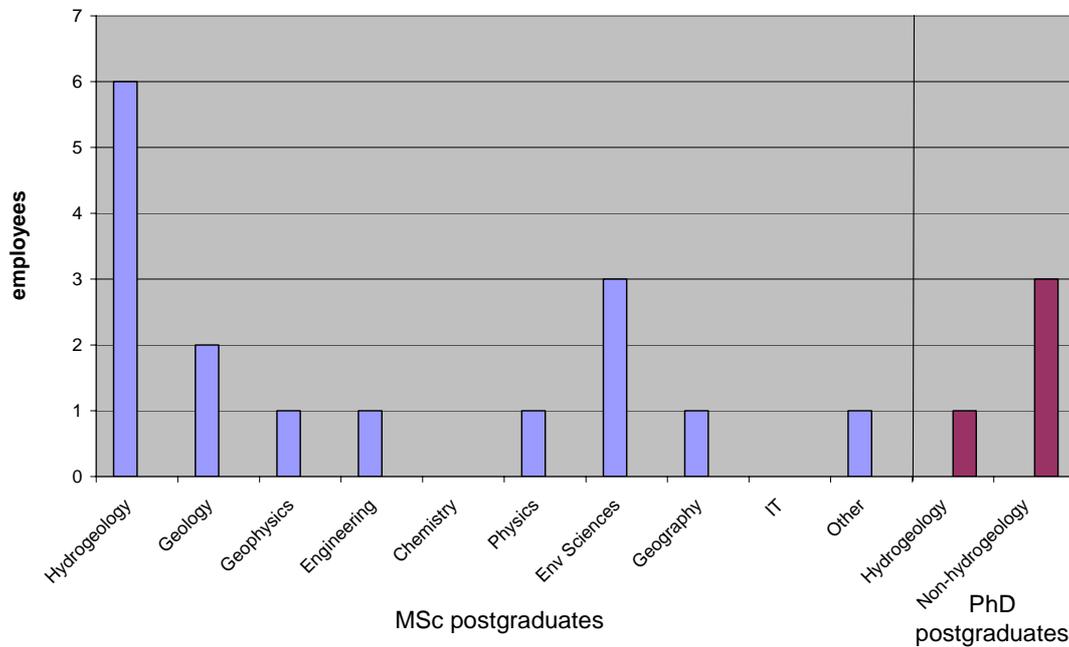


Figure 6 Questionnaire results: subjects of postgraduate degrees held by recruits employed at entry level

As with undergraduate recruits, poor written English and report-writing skills were identified as areas of concern for employers (Figure 5). Knowledge of chemistry was also identified as a weakness.

3.3.3 Junior-level recruits

Six of the responding organisations had recruited junior-level candidates within the last five years, defined here as those with 2-5 years work experience. Of the seven posts reported on in the questionnaire (Figure 2), three were filled with candidates that matched the original requirement but two posts filled did not reach the original requirement and two were not filled at all. The lack of business skills such as project management, staff management and business development was found to be the main issue with recruitment in this group, although several respondents also stated that poor numeracy was a problem (Figure 7). Other issues raised included difficulties caused by the lack of senior hydrogeologists to supervise junior level recruits, a difficulty in retaining staff and a bias in technical background towards contaminated land assessment. One organisation reported they employ staff in this category mostly from Europe.

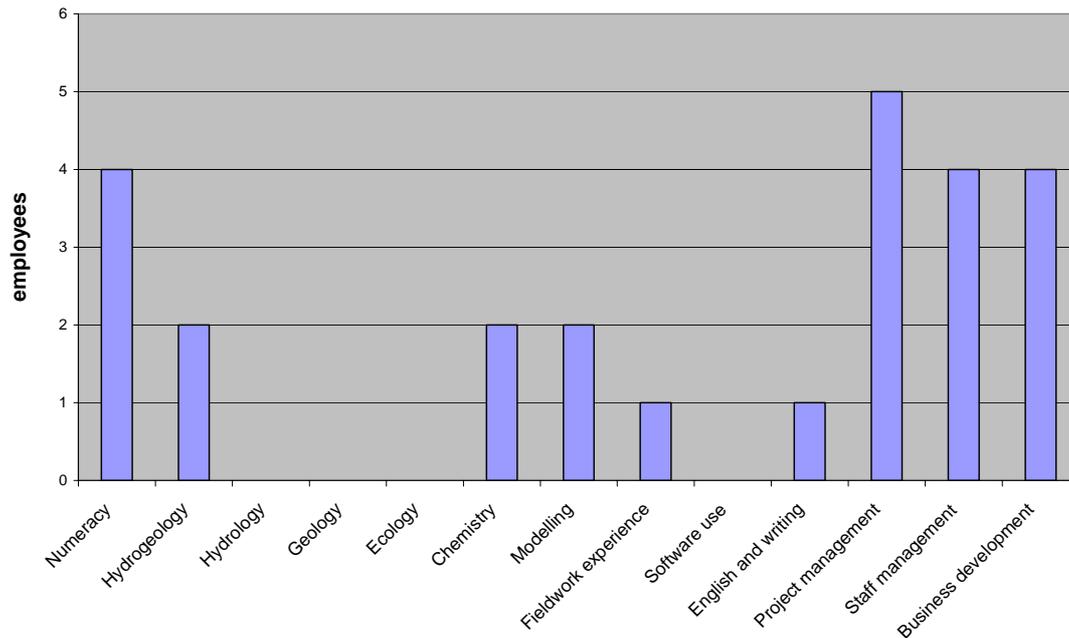


Figure 7 Questionnaire results: skills or knowledge lacking in recruits employed at junior level

3.3.4 Middle-level recruits

Seven of the responding organisations had recruited middle-level candidates within the last five years, defined here as those with 5-10 years work experience. Of the six posts reported on in the questionnaire (Figure 2), none were filled with candidates that matched the original requirement. Four posts filled did not reach the original requirement and two were not filled at all. Nine out of the 12 organisations said that they have experienced a shortage of candidates with 5-10 years experience to fill groundwater-related posts.

Employers identified a number of reasons for difficulties in recruiting at this level of recruitment. There has been a lack of candidates with the necessary commercial skills and experience of management and environmental regulation. In addition people with the relevant experience are generally paid well by their current employers to retain them, as well as being less willing to relocate due to family circumstances. One respondent explained in relation to middle and senior level staff:

“People at this level (that are good) tend to be well looked after where they are, so are difficult to attract unless there is a specific geographic reason. Once candidates have their own family, children in school etc., they are very difficult to move.”

3.4 Coping strategies

Although the geographical location was highlighted by a number of employers that responded to the questionnaire, the primary reason given by the majority of organisations for recruitment difficulties is the shortage of suitable applicants for groundwater-related jobs. Of the 13 organisations that replied, seven said they have experienced a shortage of candidates for entry-level positions, eight for junior-level

positions and nine for middle-level positions. Through the questionnaire, organisations were asked how they have responded to the recruitment difficulties in recent years. Seven options were given for how their organisation had attempted to deal with the shortage of candidates (none of the respondents suggested alternative approaches). The options were:

- Offered higher salary to attract suitable candidates;
- Offered other benefits to attract suitable candidates;
- Accepted candidates with less than required qualifications and provided training to fill gaps;
- Provided sponsorship for individuals to obtain required qualifications;
- Trained existing staff to take over additional roles;
- Recruited candidates from abroad;
- Other (please specify)

The question was asked for each level of experience defined in section 3.3. The results of the survey are presented in Figure 8.

Raising starting salaries was the most common approach to attract candidates, particularly in relation to middle-level jobs. In addition, benefits such as bonus schemes and flexible working options are offered to potential recruits at this level. At all three levels employers acceptance of candidates with less than the required qualifications and providing to address shortfalls is also common. A significant number of employers say they are also training up their existing staff to address the organisations' needs. Four of the seven organisations that responded on coping strategies at entry level are providing sponsorship for individuals to obtain the required qualifications (although this option was written such that it is not clear if this was prior to employment).

Six of the 13 respondents indicated that they have recruited candidates from abroad to address the shortage of candidates. In one of the organisations, non-UK European recruits currently comprise 10% of the technical team. One respondent reported that recruits from the rest of Europe are keen to work in the UK as it is recognised as a leading country in water resources and groundwater modelling. Knowledge of foreign languages and different training and experience to UK candidates make it desirable to employ candidates from abroad. On the negative side, language is an issue; one respondent noted that

“written English usually takes one year to reach a reasonable standard”.

Obtaining work permits/visas for non-EU candidates can also be a time consuming and expensive process for employers.

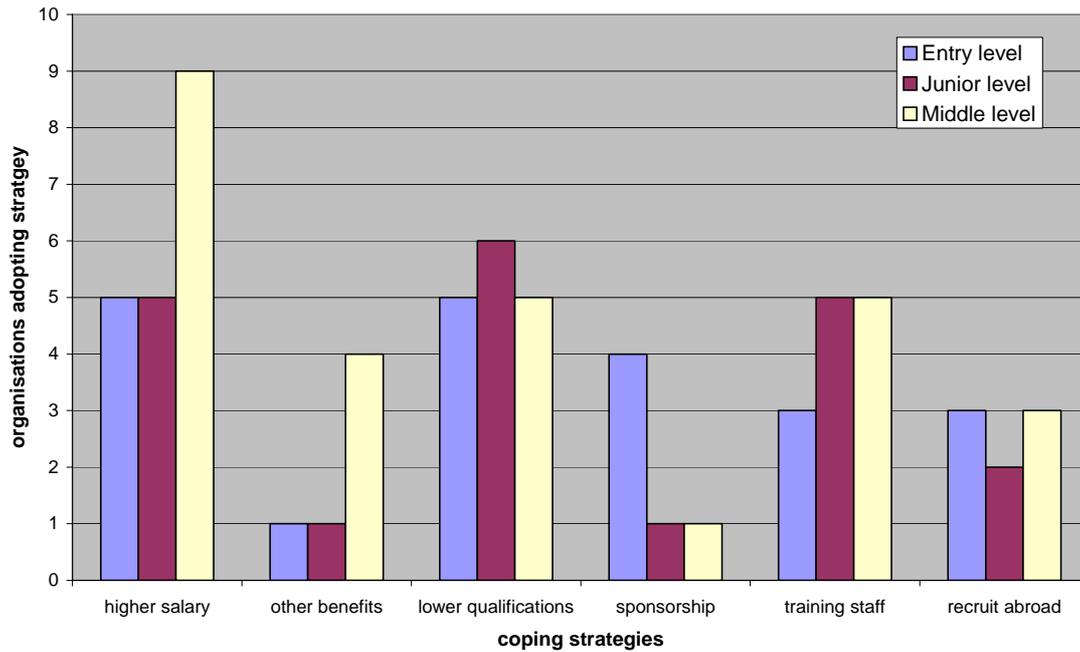


Figure 8 Questionnaire results: coping strategies for dealing with the shortage of candidates with the required qualifications, skills and experience

3.5 Current and future trends

All the respondents agreed that the demand for candidates to fill groundwater-related posts has been increasing over the last five years. The majority of respondents believe this demand will continue to increase although a couple think it will remain the same, citing a decline in economic growth and a peak in the work required to address legislative requirements as the reason. This concurs with estimates of the growth in numbers of groundwater professionals in the UK made by Skinner (*in preparation*) and illustrated in his graph (Figure 9).

The UK Groundwater Forum questionnaire addressed primarily the experience of the individual organisation, however, in response to the question as to whether there is a shortage of candidates to fill groundwater-related posts in the industry as a whole, all respondents answered yes. Six options were offered as to the reasons for this and the respondents were asked to rank these:

- Rapid expansion of the environmental sector has created more demand for candidates than can be filled;
- Competition from higher-paying professions attracts candidates away from the industry;
- Not enough people are entering the profession because of a lack of interest in or awareness of groundwater;
- A shortage of places on relevant MSc courses means that not enough people are getting qualified;
- Lack of maths qualifications at A-levels means that many candidates are not numerate enough;
- Other.

All respondents answered this question; none offered other reasons than those provided. The responses are presented in Figure 10.

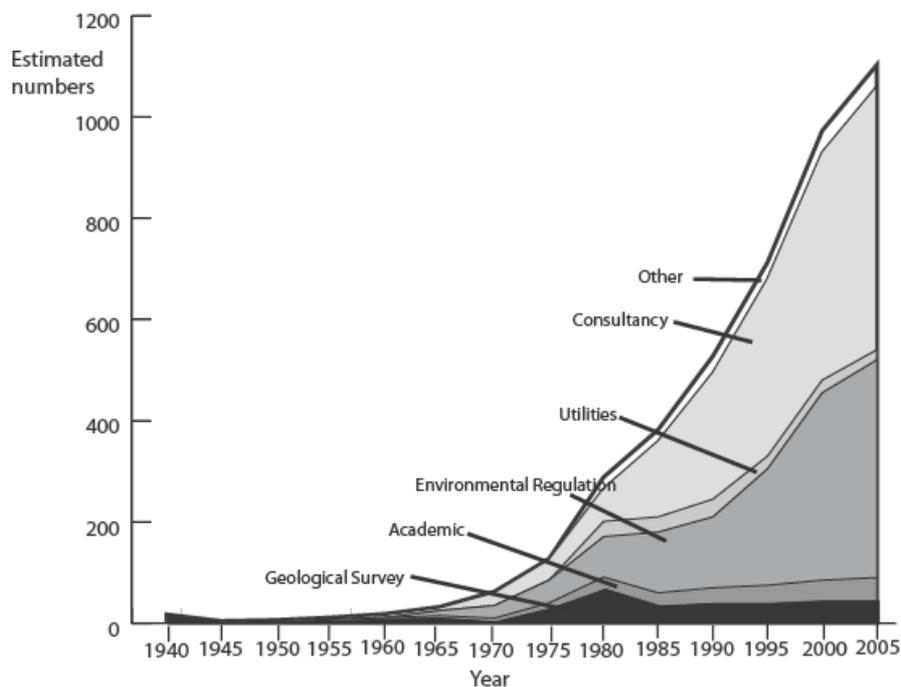


Figure 9 Estimates of growth in numbers of groundwater specialists in the UK, 1940 -2005 (Skinner, *in preparation*)

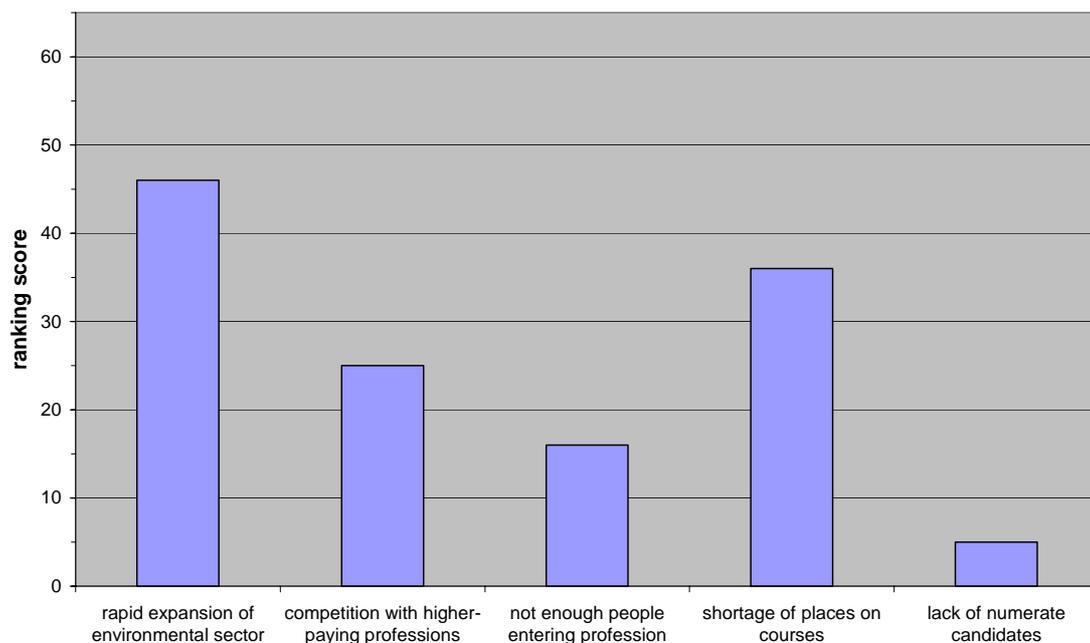


Figure 10 Questionnaire results: reasons for shortage of candidates to fill groundwater-related posts (Highest ranking reason was given 5 points, down to the lowest which was given 1 point. The highest score that could have been achieved was 65.)

The highest ranked reason for the imbalance between the demand for groundwater specialists and availability of candidates was the rapid expansion of the environmental sector. More specifically, respondents cited: the greater awareness of water resource issues in general and groundwater in particular; the pressure to develop water resources due to increasing supply problems; and the requirements of legislation, such as the Water Framework Directive and Habitats Directive, which aims for increased protection of the environment.

The shortage of places on relevant MSc courses also ranks highly as a reason for the shortage of candidates. One respondent wrote:

“Closure of several MSc courses in recent years has led to a temporary shortage of junior level staff. The situation is being addressed in part by new courses (Leeds, Newcastle etc) but a cohort with 3-6 year experience is missing.”

The majority of respondents felt that the demand for suitable candidates will continue to increase over the next few years. Two respondents felt that demand will stabilize at the current level, possibly due to a decline in the rate of economic growth and because the peak in legislative drivers will pass.

4 Groundwater-related post-graduate degree courses

One of the reasons most commonly cited by respondents for the current skills shortage was the lack of candidates with relevant postgraduate degrees. Therefore, it is useful to look more closely at this issue.

4.1 Course provision

The first hydrogeology MSc course in the UK was at University College, London (UCL). It was followed soon after in 1972 by the course at the University of Birmingham. Following the increased demand for hydrogeologists in the 1980s and 1990s, the Universities of Newcastle, Reading and East Anglia also started relevant MSc courses. However, following withdrawal of support by the Natural Environment Research Council (NERC) and internal university re-organisation, only the Birmingham course was still active in 2003.

The role played by NERC in exacerbating the skills shortage in hydrogeology was criticised during a review conducted by the House of Commons Science and Technology Select Committee in 2002-03. Part of NERC’s remit is to support training in the environmental sciences in the UK, which it does through provision of financial sponsorship of studentships (it supports around 1400 post-graduate students each year at UK universities). NERC removed support from the hydrogeology courses at UCL and East Anglia in order to concentrate studentships into the remaining courses. Without NERC studentships to encourage applications, the UCL and East Anglia courses were no longer able to guarantee student numbers and were closed down. At the same time, the courses that received additional studentships were not able to significantly increase their intake of students as they were already working at capacity. The Geological Society estimated that 50% of UK MSc places in hydrogeology were lost as a result of NERC actions.

The report by the House of Commons Science and Technology Select Committee concluded that:

“The fact that skills shortages in the earth sciences have developed suggests that NERC has not been giving sufficient priority to this part of its mission over recent years...We recommend that NERC takes immediate action to focus its support for masters students to support those disciplines in which there are clearly identified and agreed shortages”.

The last few years have seen the introduction of new groundwater-related MSc courses. These include the Hydrogeology course at Leeds University that started in September 2004, the Environmental Hydrogeology course at Cardiff University and the MSc in Contaminant Hydrogeology offered since 2005 at the University of Sheffield. The University of Newcastle upon Tyne also offers a flexible learning option for an MSc in Applied Hydrogeology.

Currently, the only groundwater-related MSc course that enjoys NERC support is the course at the University of Birmingham, with an allocation of 11 studentships. This was 4% of the total MSc studentships awarded by NERC in 2006. Other NERC-supported courses that contain groundwater modules are the Environmental Water Management course at Cranfield University (5 studentships) and the course in Sustainable Management of the Water Environment at Newcastle University (4 studentships).

4.2 Alternative funding for hydrogeology students

One potential way of increasing the pool of qualified candidates for groundwater-related posts would be for employers to generate funding to sponsor MSc and PhD students. Four of the twelve respondents stated that they already provide such sponsorship in some form, ranging from partial support for staff who go on an MSc course, to full sponsorship for MSc and PhD students. In addition, five other respondents mentioned that they would consider sponsoring (or co-sponsoring) MSc or PhD studentships. A common concern, however, was the issue of how to ensure that the student worked for the organisation that had sponsored him/her after completion of the degree. One organisation also noted that they would only sponsor candidates if they were involved in the selection process.

4.3 Students with necessary levels of numeracy

The availability of financial support may not be the only factor constraining admissions into hydrogeology MSc courses. Prof. John Tellam of the University of Birmingham advised that the other major factor constraining the number of students on their Hydrogeology MSc course is the lack of applicants with the required numeracy skills. One option being considered is to approach those graduating from courses in subjects such as mathematics and physics who will have such skills.

In the questionnaire employers were asked for their views on whether the typical work profile of entry-level candidates with MSc degrees required a high level of numeracy. Seven of the nine respondents answered positively while two said a high level of numeracy is not required.

5 Conclusions and recommendations

This review is based on the response of 13 organisations that completed a questionnaire on the availability of candidates for groundwater-related jobs as well as published articles and informal discussions through the network of contacts held by the UK Groundwater Forum steering committee.

The number of completed questionnaires was small (~5% return) but the results are consistent in many aspects. The review has found that a significant number of the recruitment exercises reported on (59%) did not result in the positions being filled or, where they were filled, recruits had lower levels of skills or experience than initially wanted by the employers. This was the case with posts across all levels of experience although it was a particular problem at junior level and above. It may be that the larger proportion of filled posts at entry level is partly to do with the lower expectations of employers due to the experience from past recruitment exercises.

The recruitment problem stems from the increased demand for groundwater specialists driven by greater awareness of groundwater issues, the pressure to develop new water resources and the requirements of legislation, such as the Water Framework Directive and Habitats Directive. The majority of respondents believe this demand will only increase further in the future. The main reasons given by respondents why this demand is not currently being met are the shortage of graduates from relevant university courses and the lack of people entering the profession, primarily because of pay levels. The number of postgraduate groundwater-related courses has increased in recent years although this still does not appear to be producing enough graduates to meet the demand. In the case of at least one university, the limitation on places on the Hydrogeology MSc course is the inadequate numeracy skills of the applicants. In relation to the issue of pay levels, employers report that salaries have increased significantly in response to the competition for recruits and that progression within organisations for groundwater specialists is fast.

Raising of salaries and introduction of other benefits is one of the strategies that employers have introduced to address the recruitment problem. In addition employers are undertaking more training of existing staff and recruiting from overseas, particularly mainland Europe.

Sponsorship of staff and students to undertake relevant postgraduate courses has also been identified as a means to address the lack of suitable job candidates. Many respondents expressed the view that the number of students graduating from groundwater-related postgraduate degree courses needs to increase. This would address to some degree the difficulties in finding entry and junior level candidates, but would take some time to filter through to more senior level posts. The review has indicated that employers may be receptive to increasing their sponsorship of students if they could ensure direct benefits to themselves.

The implications of this review are serious, indicating the great difficulty that will be experienced in the future in managing the groundwater resources of the UK, given the reported shortfall in adequately trained personnel. Through the review the UK Groundwater Forum has identified a number of initiatives that it is considering to help address the problems being experienced by employers of groundwater specialists:

- Examine what support the Forum can give to universities and careers officers to help promote applications to groundwater-related postgraduate courses by undergraduates with adequate numeracy skills;
- Lobby influential organisations to try to increase the number of studentships on groundwater-related post-graduate courses, e.g NERC;
- Explore opportunities to broker financial support for studentships by employers of groundwater specialists;
- Continue to provide careers information through the UK Groundwater Forum web site.

6 References

Environmental Industries Unit (2005). Mapping the UK environmental goods and services sector: The Environmental Industry Unit's analysis of the sector in 2004 in conjunction with the English RDAs and Devolved Administrations. DTI/Defra. Available on-line at <http://www.dti.gov.uk/sectors/environmental/index.html>.

Environmental Industries Unit (2006). Study of emerging markets in the environmental sector. DTI/Defra. Available on-line at <http://www.ukceed.org>.

Skinner A.C. (*in preparation*). Groundwater: still out of sight but less out of mind. 2006 Ineson Lecture. Quarterly Journal of Engineering Geology and Hydrogeology.

APPENDIX



SURVEY OF AVAILABILITY OF CANDIDATES TO FILL GROUNDWATER-RELATED POSTS IN YOUR ORGANISATION

The UK Groundwater Forum (www.groundwateruk.org) exists to raise awareness of groundwater and issues relating to its management in the UK. Part of its remit is also to promote careers in groundwater-related professions. To this end, we are compiling information on the current state of the groundwater job market by means of a survey of employers. Responses to the survey will form the basis of a report, to be published on the Forum website. We hope that the report will provide useful information for those who are in or want to pursue hydrogeology-related careers.

It is widely thought that there is currently a shortfall in the availability of candidates for groundwater-related posts. Through this survey, we hope that employers will let us know whether they have been affected by the shortfall and the impact it has had on them. By simultaneously engaging in a dialogue with hydrogeology course providers, we also intend to establish some reasons for the shortfall. It is hoped that this process will be a useful starting point for the Forum to lobby those who can influence the skills shortage, such as the Natural Environment Research Council (NERC) which supports training in the Earth Sciences.

Your response to this survey would be very much appreciated. Please be assured that the information you provide will be treated in confidence; no specific companies or individuals will be named in the report based on information from the survey. Please tick the box below if you would like to receive a copy of the report.

Thank you in anticipation for your involvement. Please call Panchali Guha at 01491 692226 or email contact@groundwateruk.org if you have any questions or concerns. Please return completed questionnaire by **Friday, September 8** to: UK Groundwater Forum, Maclean Building, Wallingford, Oxfordshire OX10 8BB.

Please send me a copy of the report

A. Recruitment in your organisation

1. Which of the following methods does your organisation use to recruit for groundwater-related posts? Please tick all that apply.

- Advertise on own website
- Advertise in print or electronic media (please specify)
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- Use recruitment agencies
- Recruit from campus
- Other (please specify)
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2. *Over the last five years, do you think that your organisation has been affected by a shortage of candidates to fill groundwater-related posts?*

Yes/No

(If yes, go to next question; if no, go to question 4)

3. *In your opinion, what are the main reasons why your organisation has been affected? Please tick all that apply and provide explanations in the spaces provided.*

Overall shortage of suitable candidates

Type of organisation: commercial/academic/public sector

Size of organisation (please explain)

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Geographical location (please explain)

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Other (please specify)

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4. *Are there particular types of work/functions/roles (e.g. groundwater modellers, GIS experts) for which suitable candidates are especially difficult to find? Please specify.*

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5. *Does your organisation recruit candidates from abroad to fill groundwater-related posts?* **Yes/No**

If yes, what are the main benefits associated with this?

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Are there any particular difficulties or issues associated with this?

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6. *In the long run, generating more funding for MSc and PhD students may be one way of increasing the pool of qualified candidates for groundwater-related posts. Would your organisation consider sponsoring (or co-sponsoring with others) MSc or PhD studentships?* **Yes/No**

Why/why not?

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7. This question invites you to consider the last three recruitment exercises (going back no further than August 2001) that you have undertaken for groundwater-related posts. Please provide information about them in the table below.

	<i>Date post advertised (month & year)</i>	<i>Title of post</i>	<i>Desired qualifications (please tick all that apply)</i>	<i>Result of recruitment exercise</i>
Recruitment exercise 1			Graduate in relevant subject MSc in hydrogeology MSc in other subject (specify) PhD in hydrogeology PhD in other subject (specify) No work experience necessary Up to 2 years work experience 2-5 years work experience 5-10 years work experience Over 10 years work experience Experience in project management Experience in staff management Experience in business development Other (please specify)	Filled post with candidate who matched original requirement Filled post but accepted candidate who didn't fulfil original requirement Did not fill post because of lack of suitable candidates
Recruitment exercise 2			Graduate in relevant subject MSc in hydrogeology MSc in other subject (specify) PhD in hydrogeology PhD in other subject (specify) No work experience necessary Up to 2 years work experience 2-5 years work experience 5-10 years work experience Over 10 years work experience Experience in project management Experience in staff management Experience in business development Other (please specify)	Filled post with candidate who matched original requirement Filled post but accepted candidate who didn't fulfil original requirement Did not fill post because of lack of suitable candidates

	<i>Date post advertised (month & year)</i>	<i>Title of post</i>	<i>Desired qualifications (please tick all that apply)</i>	<i>Result of recruitment exercise</i>
Recruitment exercise 3			<i>Graduate in relevant subject</i> <i>MSc in hydrogeology</i> <i>MSc in other subject (specify)</i> <i>PhD in hydrogeology</i> <i>PhD in other subject (specify)</i> <i>No work experience necessary</i> <i>Up to 2 years work experience</i> <i>2-5 years work experience</i> <i>5-10 years work experience</i> <i>Over 10 years work experience</i> <i>Experience in project management</i> <i>Experience in staff management</i> <i>Experience in business development</i> <i>Other (please specify)</i>	<i>Filled post with candidate who matched original requirement</i> <i>Filled post but accepted candidate who didn't fulfil original requirement</i> <i>Did not fill post because of lack of suitable candidates</i>

B. Entry-level recruitment

This section includes questions on salary. We appreciate that this is sensitive information; please be assured that it will be collated to report industry averages only.

8. *In the last five years, have you recruited any graduates (undergraduate degree only – no MSc) without work experience for groundwater-related posts? Yes/No*
(If yes, go to next question; if no, go to question 14)

9. *Have you employed graduates with the following undergraduate degrees? Please tick all that apply.*

- Geology*
- Geophysics*
- Engineering (please specify branch)*
- Chemistry*
- Physics*
- Environmental Sciences*
- Geography*
- Information Technology*
- Other (please specify)*

10. Currently, what is the average starting salary for such employees in your organisation?

- Less than £10,000*
- £10,000 - £14,999*
- £15,000 - £19,999*
- £20,000 or more*

11. Please provide a brief description of the type of work that such candidates are typically recruited for.

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12. Typically, what are the opportunities for progression for such candidates within your organisation? Please provide a brief description.

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13. Would you say that there are certain specific skills, or knowledge of particular subject areas, that most entry-level graduates seem to lack?

Yes/No

If yes, please tick all that apply.

- Numeracy*
- Hydrogeology*
- Hydrology*
- Geology*
- Ecology*
- Chemistry*
- Modelling*
- Software use (please specify)*
- Other (please specify)*
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14. In the last five years, have you recruited any post-graduates (MSc/PhD) without work experience for groundwater-related posts? **Yes/No**

(If yes, go to next question; if no, go to question 20)

15. Have you employed post-graduates with degrees in the following primary subject areas? Please tick all that apply.

MSc:

Hydrogeology

Geology

Geophysics

Engineering (please specify branch)

Chemistry

Physics

Environmental Sciences

Geography

Information technology

Other (please specify)

PhD:

Hydrogeology

Non-hydrogeology (please specify)

16. Currently, what is the average starting salary for such employees in your organisation?

Less than £15,000

£15,000 - £19,999

£20,000 - £24,999

£25,000 - £29,999

£30,000 or more

17. Thinking about the work profile of entry-level candidates with MSc degrees, would you say that their work requires a high level of numeracy (A-level Maths or higher)?

Yes/No

18. In general, how would you rate the level of numeracy of such candidates?

Most candidates have a higher level of numeracy than required by the job

Most candidates have an adequate level of numeracy for the job

Most candidates do not have an acceptable level of numeracy for the job

Level of numeracy varies widely by candidate

19. Continuing to think of entry-level candidates with MSc degrees, would you say that there are certain specific skills, or knowledge of particular subject areas, that most such candidates seem to lack?

Yes/No

If yes, please tick all that apply.

Numeracy

Hydrogeology

Hydrology

Geology

Ecology

Chemistry

Modelling

Software use (please specify)

Other (please specify)

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20. Over the last five years, have you experienced a shortage of entry-level candidates (graduates or post-graduates without work experience) to fill groundwater-related posts? **Yes/No**

(If yes, go to next question; if no, go to section C)

21. How has your organisation attempted to deal with the shortage of such candidates? Please tick all that apply and provide details in the spaces provided.

Offered higher salary to attract suitable candidates
Offered other benefits to attract suitable candidates (please specify)

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Accepted candidates with less than required qualifications and provided training to fill the gaps

Provided sponsorship for individuals to obtain required qualifications (please specify)

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Trained existing staff to take over additional roles

Recruited more candidates from abroad

Other (please specify)

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C. Junior-level recruitment

22. In the last five years, have you recruited any candidates with 2-5 years work experience for groundwater-related posts? **Yes/No**

(If yes, go to next question; if no, go to question 24)

23. Would you say that there are certain specific skills, or knowledge of particular subject areas, that most such candidates seem to lack?

Yes/No

If yes, please tick all that apply.

Numeracy

Hydrogeology

Hydrology

Geology

Ecology

Chemistry

Modelling

Project management experience

Staff management experience

Business development experience

Software use (please specify)

Other (please specify)
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24. *Over the last five years, have you experienced a shortage of candidates with 2-5 years work experience to fill groundwater-related posts?*

Yes/No

(If yes, go to next question; if no, go to question 26)

25. *How has your organisation attempted to deal with the shortage of such candidates? Please tick all that apply and provide details in the spaces provided.*

Offered higher salary to attract suitable candidates
Offered other benefits to attract suitable candidates (please specify)
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Accepted candidates with less than required qualifications and provided training to fill the gaps

Provided sponsorship for individuals to obtain required qualifications (please specify)
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Trained existing staff to take over additional roles

Recruited more candidates from abroad

Other (please specify)
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26. *What do you see as the key issues with junior-level recruitment (candidates with 2-5 years work experience) for groundwater-related posts in your organisation?*

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27. *How has your organisation attempted to deal with these issues?*

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D. Middle-level recruitment

28. *In the last five years, have you recruited any candidates with 5-10 years work experience for groundwater-related posts?* **Yes/No**

(If yes, go to next question; if no, go to question 30)

29. Would you say that there are certain specific skills, or knowledge of particular subject areas, that most such candidates seem to lack?

Yes/No

If yes, please tick all that apply.

Numeracy

Hydrogeology

Hydrology

Geology

Ecology

Chemistry

Modelling

Project management experience

Staff management experience

Business development experience

Software use (please specify)

Other (please specify)

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30. Over the last five years, have you experienced a shortage of candidates with 5-10 years work experience to fill groundwater-related posts? **Yes/No**

(If yes, go to next question; if no, go to question 32)

31. How has your organisation attempted to deal with the shortage of such candidates?

Please tick all that apply and provide details in the spaces provided.

Offered higher salary to attract suitable candidates

Offered other benefits to attract suitable candidates (please specify)

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Accepted candidates with less than required qualifications and provided training to fill the gaps

Provided sponsorship for individuals to obtain required qualifications (please specify)

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Trained existing staff to take over additional roles

Recruited more candidates from abroad

Other (please specify)

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32. What do you see as the key issues with middle-level recruitment for your organisation?

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33. *How has your organisation attempted to deal with these issues?*

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E. Overview

The following questions relate to the industry as a whole, rather than your organisation in particular.

34. *Thinking about the industry as a whole, would you say that the demand for candidates to fill groundwater-related posts has been increasing over the last five years?*

Yes/No/Don't know

35. *In your opinion, what will happen to the demand for candidates to fill groundwater-related posts over the next five years?*

- Demand will start to increase*
- Demand will continue to increase*
- Demand will remain about the same*
- Demand will decline*
- Can't say*

Why do you think so?

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36. *For the industry as a whole, do you think that there is currently a shortage of candidates to fill groundwater-related posts, relative to the demand?*

Yes/No/Don't know

(If yes, go to next question; otherwise go to question 38)

37. *What would you say are the main reasons for this shortage? Please rank in order of importance, with 1 being the most important.*

Reason	Rank
<i>a. Rapid expansion of the environmental sector has created more demand for candidates than can be filled</i>
<i>b. Competition from higher-paying professions attracts candidates away from the industry</i>
<i>c. Enough people are not entering the profession because of a lack of interest in or awareness of groundwater</i>
<i>d. A shortage of places on the relevant MSc courses means that not</i>

- enough people are getting qualified*
- e. Lack of maths qualifications at A-levels means that many candidates are not numerate enough*
- f. Other (please specify)*
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38. *Please use this space to provide additional comments*

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F. Details about your organisation

Name:

Primary work area(s):

Location of head office:

Other locations:

Number of employees:

Number of employees in groundwater-related posts:

G. Your details

Name:

Job title:

Address:

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Telephone:

Fax:

Email:

Website:

Don't include our website in a listing of 'potential employers of hydrogeologists' on the Groundwater Forum website

Thank you! *Please return completed questionnaire to: UK Groundwater Forum, Maclean Building, Wallingford, Oxfordshire OX10 8BB.*