Chartership Guidance Notes for Land Contamination Specialists

The contaminated land industry provides a wide range of opportunities for geoscientists to apply and expand their geological knowledge and to develop other scientific areas such as in chemistry and biology. The Geological Society of London (GSL) recognises and embraces this diversity and aims to provide a natural home for all contaminated land geoscientists where they may gain professional qualifications, which in turn is important to the future health and success of the Society.

The GSL provides different paths to achieve professional status. This document provides updated guidance for people working in contaminated land to try and help them achieve the qualification of Chartered Geologist (CGeol), Chartered Scientist (CSci); or both.

To become chartered as a practising professional you must be able to demonstrate that you fulfil the qualifying criteria:

- For CGeol, there are geologically focused criteria as well as professional ones. You must show that you understand the complexities of geology and geological processes in time and space in relation to your speciality and that you are able to identify, collect, synthesise and evaluate geoscientific information to generate predictive models.
- For CSci, the criteria are more generically science focused. You must show your use of specialist experimental knowledge and broader scientific understanding, demonstrate your critical evaluation of scientific information and show how you exercise sound judgement.

Further guidance on both chartership routes and how to show attainment of competencies of each can be found at the end of this document; in Appendix 1 for Chartered Scientist and Appendix 2 for Chartered Geologist. If you are unsure which route is appropriate you should seek advice and guidance from your mentor, or from the Chartership Officer at the Society.

Required knowledge

Those specialising in land contamination should understand the scientific methods which inform the assessments they make and the legislation and regulations that apply in the country in which they work. Many regulators throughout the world have produced guidance for practitioners and applicants for Chartership should have a good working knowledge of these documents. For example applicants for Chartership practising in the UK should, as a minimum, be conversant with relevant principles and requirements of the following guidance and standards:

- Environment Agency (2004) Report CLR11 “Model Procedures for the Management of Land Contamination”;
- BS5930:2015: “Code of practice for site investigations”;
- BS 10175:2011+A2:2017 Investigation of potentially contaminated sites
- Environment Agency (2009) Updated technical background to the CLEA model. Science Report SC050021/SR3 and its associated publications;
- Environment Agency (2006) Remedial Targets Methodology, Hydrogeological Risk Assessment for Land Contamination.

In addition, there are specific publications describing how Part 2A of the Environmental Protection Act 1990 is managed in different legislative jurisdictions within the UK (excluding Northern Ireland):

- Defra (2012) Contaminated Land Statutory Guidance;
- Welsh Government (2012) Contaminated Land Statutory Guidance;
- Scottish Executive (2006) Contaminated Land Statutory Guidance.

A similar regime in Northern Ireland is provided by Part 3 of the Waste and Contaminated Land (Northern Ireland) Order 1997 which is however not fully in force. Applicants will need to demonstrate knowledge of the guidance relative to them and have knowledge of the differing regimes in other areas.

The Risk Based Approach

The current land contamination regime operating in the UK and in many other parts of the world advocates a risk-based approach to the management of contaminated sites as described in CLR11. Risk assessment incorporates the source/contaminant - pathway – receptor framework. It is fundamental that land contamination specialists apply their geological skills in the development and updating over time of conceptual ground models. This is because 3D (or 4D) Conceptual Site

Models (CSM) underpin the source-pathway-receptor framework. The preliminary conceptual model, usually derived from Desk Study based research, is then used to design subsequent intrusive investigations. All intrusive investigations should be designed to test or confirm the validity and assumptions in the conceptual model which is then updated with information from logging, aquifer testing, specialist sampling, analytical testing and monitoring (soil, water, ground gas and vapour). The CSM can also be used to inform remediation options appraisal and to demonstrate how remediation has successfully broken a contaminant linkage at a site.

Competencies

There are many different aspects which those specialising in land contamination should be conversant with. Applicants will be expected to have a working knowledge of all areas, with detailed experience in many of the following:

- Health and safety in relation to site investigation, land contamination, asbestos in soils and CDM;
- Legislation regarding land contamination;
- Site Investigation: planning, logging soils and rock, sampling and sample preservation, field and laboratory testing;
- Interpretation of site data and development of conceptual site models including using data to test models and modify as appropriate;
- Contaminant fate and transport processes;
- Risk assessment including derivation and use of generic screening criteria;
- Remediation options appraisal and strategy development, including understanding of remediation techniques and how to assess the feasibility of various options against criteria such as sustainability;
- Remediation implementation, including design, monitoring, verification and validation of the process;
- Environmental management including permitting and waste management;
- An appreciation of other inter-related disciplines including: geotechnics, geophysics, hydrogeology, hydrology (drainage, and flood risk), services, ecology, archaeology etc.

Some applicants may also have a knowledge of radiological risks.

Examples of how to demonstrate the competencies specific to either CGeol or CSci are appended to this document.

Helpful Chartership Guidance

The Land Condition Skills Development Framework has been developed by the Specialist in Land Condition (SiLC) Registration Scheme to define the capabilities pertinent to those operating within the brownfield, reclamation and regeneration industry. Capabilities are high level descriptions of key behaviours, skills and knowledge that underpin effective performance. These define what effective performers understand, apply or demonstrate in most situations, most of the time, to achieve the best results.

The capabilities within the framework are pertinent to all those working in the land contamination industry, encompassing private and public sector. The framework can be used to track and record progress towards achieving competencies in many skills directly applicable to a candidate for CGeol or CSci. Achieving Level 4 in the relevant competencies within the framework would be indicative of a candidate being suitable for Chartered status.

Continuing Professional Development

Gaining Chartership for many of those specialising in land contamination will be the first stage in their professional qualifications and with further appropriate knowledge and experience in land condition, CGeol and CSci will be eligible to apply for SiLC (Specialist in Land Condition) status. A SiLC can become a Suitably Qualified and experienced Person (SQP) under the National Quality Mark Scheme and the new SiLC exam allows examination of both qualifications at the same time.

For more information see www.silc.org.uk about SiLC and www.claire.co.uk for the NQMS.

The CL:AIRE Definition of Waste Development Industry Code of Practice (CoP) sets out a mechanism for managing the reuse of waste materials in development projects. To use this scheme a Materials Management Plan is produced which demonstrates how waste materials are being used in accordance with the CoP. A Materials Management Plan must be registered with the Environment Agency by a Qualified Person; the QP must be Chartered and be registered with CL:AIRE.

The Register of Ground Engineering Professionals (RoGEP) is another post Chartership qualification which demonstrates continued professional development. There are three grades of membership; a ground engineering professional, a specialist and an advisor; denoting an increased level of competence.

Appendix I: Chartered Scientist, CSci

The Geological Society is licenced by the Science Council to charter those who primarily practice as scientists. Please refer to RFP11 Criteria Procedure for Chartered Scientist Agreed 25 February 2018 for the outline of requirements. General advice from the Science Council is available here: http://sciencecouncil.org/scientists-science-technicians/support-with-my-application/

Competency	Generic Science Council guidance	Example of how to demonstrate it
A: Application of knowledge & understanding		
A1: Use specialist experiential knowledge and broader scientific understanding to optimise the application of existing and emerging science and technology	You should provide sufficient detail here to show your specialist experiential knowledge and how you have applied it. Further to this, include any examples of where your broader scientific understanding is applied to your area of practice. Examples could include but are not limited to: • Writing and presenting internal papers, reports or standards • Conducting appropriate research to facilitate design and development of scientific processes	The candidate could explain how and why they use scientific equipment and principals when collecting or analysing data. What improvements have they made over time and why. Describe any internal or external guidance produced by the candidate to improve or standardise how experiments, data collection and/or data is analysed; eg, in-house method standards for collecting samples from the field. An air quality status report or a remedial action plan considering data variations such as weather, roadworks, construction, etc Undertaking a noise assessment considering data variations such as wind, temp, bird song, etc
A2: Exercise sound judgement in the absence of complete information and in complex or unpredictable situations	This competence is asking you to identify and be aware of the limit of your own knowledge and professional competence, to demonstrate an ability to manage your own strengths and weaknesses and to recognise the level of risk attached to your actions. Examples could include but are not limited to: • Considering when you have approached a piece of work or project flexibly and in a novel or different way, or reacted to an unexpected outcome	At all stages of land contamination work, CLR 11 requires information to be reviewed with the following criteria in order to reduce uncertainty in risk assessment: Relevant Sufficient Reliable Transparent The candidate could explain how they have used these principles to collect, evaluate and perhaps reject data. e.g. the description in the borehole log may not match what is expected given the published geological map. The trial pit may not be deep enough to prove deeper geology,

		the chemical results may not be as expected given the conceptual model etc Explain how potential deficiencies have influenced the development of CSM and reports they have produced. How did they deal with or express uncertainties? Give examples of how the candidate has reduced or described uncertainty e.g. the use of statistical probability functions or sensitivity analyses.
A3: Demonstrate critical evaluation of relevant scientific information and concepts to propose solutions to problems	You should think of this competence in terms of selecting the best methodology, the subsequent data analysis and conclusions you draw and how you overcome any barriers or issues. Examples could include but are not limited to: • Engaging in experimental design and testing • Reviewing relevant literature, manuals or designs • Sharing your findings with others	Examples include: • Designing site investigation works based on best practice and the benefits of doing this. • How and why specific field or laboratory equipment and methods were chosen. • How the outcome was presented and why that was successful. • Regulatory responses to planning and permit applications where scientific data has been evaluated.
B: Personal responsibility		
B1: Work autonomously and take responsibility for the work of self and others	It is important for this competence to ensure you describe your contribution, responsibility and impact on a certain task and make it clear what you personally have achieved ie, "I" not "we". In formulating your answers, you should consider the following: • You will be expected to undertake much of your work without day-to-day supervision and so you should demonstrate that you are able to achieve this • You should demonstrate your understanding of when you may need to seek guidance from others and how you would obtain this guidance • If you are responsible for managing the work of others, you should clearly describe how you discharge those responsibilities	See Science Council guidance Examples include: • At what point do you need to be seeking specialist advice, ie, for site specific risk assessment modelling, waste activities, development, site investigation, hydrogeological assessment, toxicology and how you interact with them. • Being responsible for others during a site investigation.
B2: Promote and implement robust policies and protocols relating to health, safety and security	You should demonstrate that you understand the policies and protocols related to health, safety and security that apply to the work you are undertaking and describe any responsibilities that you have related to this.	See Science Council guidance Examples include: • Training others, sharing knowledge and awareness.

	Security can include issues related to data, Intellectual Property, confidentiality, prevention of contamination, traceability of documents and information. In formulating your answers, you should consider the following: These policies and protocols will document how relevant aspects of your work must be carried out. Demonstrate that you know where these policies and protocols are documented, and that you are able to apply them in your practice • What risks you are aware of related to the security aspects of the work you carry out, and how you seek to mitigate these risks • How you "promote" the awareness and application of these policies and protocols with others, especially peers and more junior colleagues	• Awareness, recording, reporting and disseminating H&S and Environmental understanding of the working environment.
B3: Promote and ensure compliance with all relevant regulatory requirements and quality standards	You should demonstrate that you understand which regulatory requirements and quality standards apply to your area of work. In formulating your answers, you should consider the following: • Describe what you do to ensure that these requirements and standards are being followed for those activities for which you are responsible • Describe how you "promote" the awareness of regulatory requirements and quality standards amongst peers and more junior colleagues	See Science Council guidance Examples include: Awareness and understanding of relevant guidance and standards and promotion of them within the working environment.
B4: Oversee the implementation of solutions with due regard to the wider environment and broader context	You should demonstrate an understanding of the potential and actual impacts of your work on your organisation, on the profession, on the general public and on the physical environment. Examples could include but are not limited to: • Indicating that you are aware of the sensitivity of your work and show how this understanding translates into the ways in which you carry out your work • Showing an awareness of how your profession is portrayed and viewed by the public at large, and how you take responsibility for recognising this in the work you do • Describing how you seek to avoid reputational damage related to the work you carry out	Examples could include: • How you interact with the public when in the field and why you behave in that way. • How a ground investigation was designed to accommodate sensitive environmental features.

	• Explaining how you set a good example to others in the way you discharge the responsibilities related to the work you undertake	
C: Interpersonal skills		
C1: Demonstrate the ability to communicate effectively with specialist and non-specialist audiences	A non-specialist audience is anyone working outside of your particular area of expertise, so it would not necessarily be a non-scientist. Your example(s) should indicate how you have communicated in a way that is effective to each type of audience. In formulating your answers, you should consider the following: • Not just the content of the message but also the mode or style of delivery that is adapted according to the audience • The feedback loop to gauge the understanding and improve future communications	See Science Council guidance. Examples of communicating with a non-specialist audience include writing non-technical summaries, taking part in public enquiries or communicating with a non-specialist client.
C2: Demonstrate effective leadership through the ability to guide, influence, inspire and empathise with others	This competence is about understanding your leadership skills and is not reserved for those in management roles; it is applicable to all. Examples could include but are not limited to: • Experiences of mentoring or coaching you have had; you should consider how effective this was and the overall impact • Considering when you have managed change within your organisation or overseen the implementation of any new processes	See Science Council guidance. Examples could include: Where you have managed others in a project delivery team to deliver a technical output
C3: Demonstrate the ability to mediate, develop and maintain positive working relationships	You should describe or define the "working relationship" and provide at least one example which focuses on your handling of a challenging interpersonal situation and demonstrates your ability to mediate and achieve a positive outcome. You should consider how through your approach you have changed or modified the behaviour or attitudes of others to positive effect. Examples could include but are not limited to: • How you have managed the merger or integration of different teams • Managing working relationships across different departments or organisations • Interactions with committees, working groups or other professional body activities • How you have managed and resolved a difficult relationship situation between members of a team for which you are responsible.	See Science Council guidance.
D: Professional practice		

D1: Scope, plan and manage multifaceted projects	Describe a project that you have managed and make it clear the level of autonomy you had while working on the project, especially if you were in a team. You should show how you contributed to determining the resulting courses of action. Examples could include but are not limited to: • An operational project utilising resources across several disciplines • A change management project aligning processes across sites • An industry-wide project establishing guidance on technical standards and requirements	For example, managing a remediation project could include liaising with ecologists, civil engineers, hydrogeologists, geotechnical engineers, water drainage engineers, field technicians, laboratory staff etc...
D2: Demonstrate the achievement of desired outcomes with the effective management of resources and risks	Using the project you have discussed under D1, or another project with which you have been involved, you should describe your roles and responsibilities in managing the activities to achieve the desired outcomes. Examples could include but are not limited to: • Identifying the resources (people and/or money) needed to undertake the activities • Monitoring and surveillance of the progress of the activities • Identification, evaluation and implementation of changes that may be needed to ensure the activities are successfully completed • Identification and management of risks that could impact on the successful completion of the activities	See Science Council guidance.
D3: Take responsibility for continuous performance improvement both at a personal level and in a wider organisational context	Your examples should indicate what actions you take to make improvements to your personal performance and to your organisation as a whole. This could be through encouraging the continuous development of junior staff or through improvements to processes within the organisation. Examples could include but are not limited to: • Identification of lessons learned from activities undertaken by yourself or by others for whom you are responsible, such as what went well, went badly or was lacking • Evaluation of the performance of specialist methods and tools used • Development of recommendations for future enhancements or modifications to procedures or working practices in order to achieve performance improvements • Description of examples where your actions have led to performance improvement by yourself or others	See Science Council guidance.

E: Professionalism		
E1: Demonstrate understanding and compliance with the Society's and other relevant Codes of Conduct	You should describe how the codes of conduct under which you practice relate to the work that you carry out and give examples of how they govern your professional practice. Within this, you should include any ethical considerations, both in terms of scientific and business practices. Examples you may wish to use may relate to: • Standards of professional practice in respect of your profession, employer, clients or patients • Standards of professional behaviour in respect of attitudes, respect and confidentiality • Standards of professional competence in respect of personal development and the development of others	Include examples of behaving according to the Geological Society's Code of Conduct and the positive effect this has had. How has the candidate dealt with people asking you to cut corners or applying pressure to reach the conclusion they want.
E2: Demonstrate a commitment to professional development (CPD) through continuing advancement of own knowledge, understanding and competence	Your answer should provide specific examples of what you have already done in terms of continuing professional development (CPD) and your plans for the coming year. In your examples you should describe how your engagement in CPD has benefited your practice and the users of your work. Examples can be taken from any of the five categories of activity (work-based learning, professional activity, formal/educational, self-directed learning and other)	Use Geological Society's CPD form or work-based scheme that complies with the Science Council's requirements

Appendix II: Chartered Geologist, CGeol

Please refer to RFP02 Criteria Procedure for Validation as a CGeol Agreed 27 February 2018 for an outline of requirements. Further guidance on how to demonstrate the competencies with respect to land contamination in the application form and professional report is given in the table below.

Competency	Generic Geol Soc guidance from RFP02 (Criteria Procedure)	Examples of how to demonstrate it
i. Understanding of the complexities of geology and of geological processes in space and time in relation to the applicant's speciality.	Applicants meeting this criterion will be able to demonstrate competence in the recognition and determination of basic geological processes in three and four dimensions, diagnosis of geological conditions, fundamentals of the Earth's history, understanding of geological problems and their interpretation, creation and interpretation of geological maps and cross sections, compilation and testing of ground models.	This should be fairly easily to demonstrate by providing conceptual site models (CSM) produced by the applicant in the professional report and explaining how producing the CSM fulfils the criteria in the competency report. ie, compiling data from published geological maps and borehole logs to produce a 3D model. A good CSM requires an understanding of the physical properties of the lithological layers and how they were formed and interact with/form sources, pathways and receptors. Other useful evidence is provided by the applicant could include: the production of geological cross sections from borehole logs and geological amps. It is suggested that those candidates working in site investigation who do not usually write interpretive reports can support their application by researching the published geology of one or more site(s) they visit and build their own 3D conceptual site model. They can then supply extracts from field note books and other background sources and show how they have used them to refine the CSM. Regulators will be critically evaluating information submitted for planning/permitting and producing their own conceptual understanding of the site; they could submit memos or letters which detail this process
ii. Critical evaluation of geoscience information to generate predictive models.	Applicants meeting this criterion will be able to demonstrate competence in the acquisition, observation and description of geological data, appreciation of the limitations of and conditions under which the data were collected or how they arrived in their present state, and an assessment of certainty/uncertainty. The	At all stages of Risk Assessment CLR 11 requires all information to be reviewed with the following criteria in order to reduce uncertainty: Relevant

Competency	Generic Geol Soc guidance from RFP02 (Criteria Procedure)	Examples of how to demonstrate it
	geological data may be acquired in or from the field in one or more of the following ways: at outcrop, by intrusive investigations (boreholes, pits, etc), by geophysical/geochemical surveys or other remote sensing. It may also consist of experimental data (including laboratory-based investigations or computer modelling).	Sufficient Reliable Transparent The candidate could explain how they have used these principles to collect, evaluate and perhaps reject geological data; eg, the description in the borehole log may not match what is expected given the published geological map. The trial pit may not be deep enough to prove deeper geology, the chemical results may not be as expected given the CSM, etc Explain how potential deficiencies have influenced CSM and reports they have produced. How did they deal with or express the uncertainties? Calibration of numerical models or ongoing revision of CSM can demonstrate the testing of ground models. Give examples of how the candidate has reduced or described uncertainty in geological numerical modelling e.g. the use of statistical probability functions or sensitivity analyses.
iii. Effective communication in writing and orally	Applicants meeting this criterion will be able to demonstrate competence through the material presented in the professional report and documents accompanying the application together with the impact that the applicant makes at interview.	Make sure the submission and supporting documents are well written without typos/spelling mistakes/formatting problems. Give examples of dealing effectively with colleagues/ clients/ regulatory bodies/consultants. Additionally, this can include communication outside of the workplace or socially. Provide evidence of any oral presentations. The applicant should make sure that their interview presentation is clear both visually and orally.
iv. Competency in the management of Health and Safety (H&S) and Environmental issues and other statutory	Supporting evidence of satisfactory attainment could include:	As described in generic guidance.

Competency	Generic Geol Soc guidance from RFP02 (Criteria Procedure)	Examples of how to demonstrate it
obligations applicable to the discipline or area of work.	• records showing how H&S issues are managed as part of day to day work for the applicant and others; • a summary of the Applicant's H&S responsibilities; • examples of implementation of H&S policies; • responses to incidents (including near misses) and subsequent investigations; • knowledge of Environmental legislation in the area of their work and Environmental protection and management practice. The evidence should also demonstrate sound knowledge of sustainable development best practice and implementation and management of such practices	
v. Clear understanding of the meaning and needs of professionalism, including a clear understanding of the Code of Conduct and commitment to its implementation	Applicants meeting this criterion will be able to demonstrate an understanding of the need to behave professionally and ethically at all times in accordance with the Society's Code of Conduct. They must fully understand the requirements of the Code and be able to give relevant examples of its application in their professional actions, activities and decisions.	As described in generic guidance.
vi. Commitment to Continuing Professional Development throughout the applicant's professional career	Applicants meeting this criterion will be able to demonstrate that they are committed to a continuing and forward-looking programme of development of technical and professional skills for the work they undertake in order to enhance the skills available in pursuance of their career. Applicants are required to submit a minimum of one-year's CPD records as part of their application, using the **plan→act→reflect** cycle. Supporting evidence of satisfactory attainment could include: • records of CPD through a formal reporting scheme supported by evidence of analysis of scientific and professional development needs; and • actions taken to satisfy these needs, including critical review of how successful these actions were.	Explain how CPD activities show commitment and growth in the professional report.
vii. Competence in his/her area of expertise	Applicants meeting this criterion will be able to demonstrate that they are competent in their claimed areas of professional practice at the level appropriate to their level of seniority. Supporting evidence of satisfactory attainment could include:	As described in generic guidance. Explain how the supporting documents show competence in the professional report.

Competency	Generic Geol Soc guidance from RFP02 (Criteria Procedure)	Examples of how to demonstrate it
	• relevant sections from job description and written examples of contributions to key tasks; • examples of the Applicant's role in project planning, organisation of tasks, use of people and resources, managing changing technical and project needs; • written examples of personal contributions to key tasks; • examples of preparing and implementing quality-related processes and • examples of projects for which they had responsibility for design, Implementation, interpretation of data collected and presentation of conclusions.	