



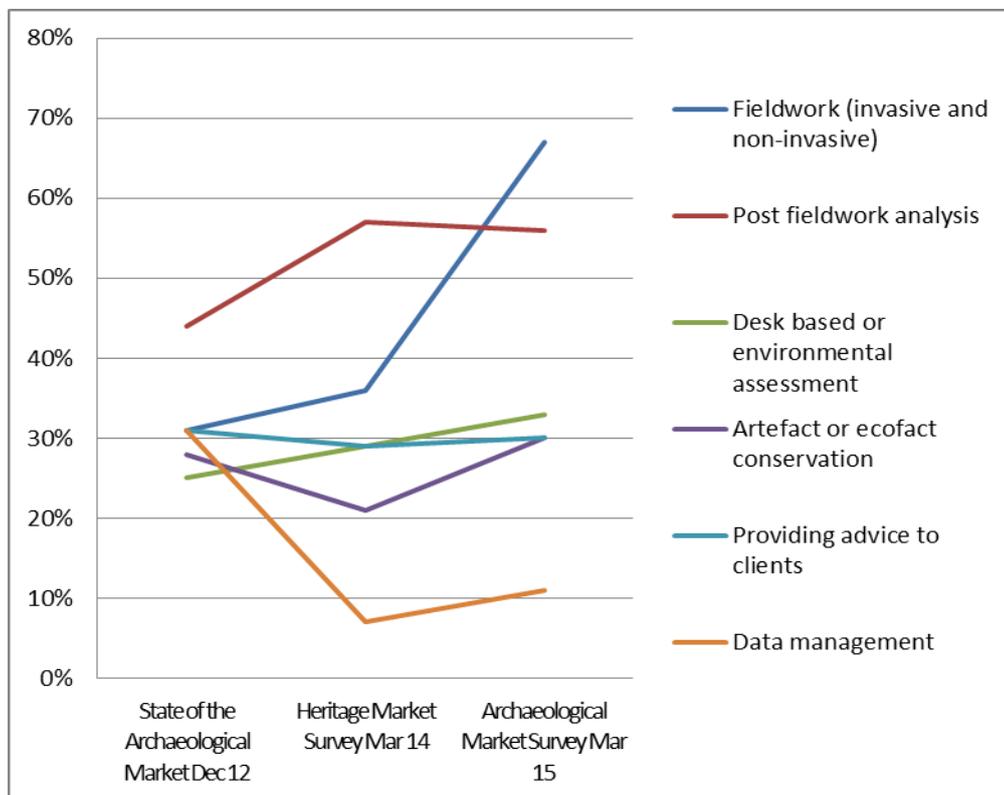
National Infrastructure Development and Historic Environment Skills and Capacity 2015-33: An Assessment

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Overview

- This Assessment was undertaken in response to concerns in the sector over the capacity of the existing workforce to meet the needs of proposed infrastructure projects.
- It provides a factual basis for estimates of existing capacity in the sector and a model for predicting the likely workforce demands of the proposed projects.
- It concludes that the sector is already working at or near capacity as evidenced by existing skills shortages.
- It proposes a number of actions and initiatives to meet or mitigate the predicted future workforce need.
- There is little prospect that the market will balance itself and concerted action on a number of fronts is necessary to ensure an adequately skilled workforce is available at the point it is needed.



Perceived under-provision across archaeological practice 2012 - 2015

Horizon	Horizon 1 (1-3 years) Horizon 2 (3-10 years) Horizon 3 (10+ years)	The assessment covers all presently known infrastructure projects in the UK from 2015-2033
Importance	High	If predicted shortages are to be avoided remedial actions need to be instituted in the near future
Credibility	High	The Assessment draws on existing labour market intelligence and conversations with selected stakeholders together with information on the scope, scale location and timing of planned infrastructure projects
Response	Recommendation:	Establish a coherent strategy with sector partners and develop shared recommendations for rapid action
	Dissemination:	To be released when HE has established corporate position
Links	Horizon Scan 2015 – 11	<i>Archaeological Capacity Issues 2015 - 22</i>
	Other Links: See pp37-8	
Consultees	Historic England: Historic Environment Intelligence Team, Investigation & Analysis, Planning Group, Government Advice Team. External: ALGAO, FAME, CifA and HS2 Ltd/Atkins, ICON, IHBC, Universities Archaeology UK	
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1. INTRODUCTION

There is a perception that the co-incident timings of a number of major infrastructure projects in the near/medium term will lead to a shortage of suitably skilled historic environment practitioners, particularly archaeologists, to undertake the exploratory work. This paper seeks to establish the validity of this view and define areas where skills shortages may occur in order to institute measures to alleviate them. It also proposes a method of calculating the indicative archaeological requirements of a given development based on its capital cost. Initial indications are that there is a projected shortage of between 25 and 64% in the available workforce needed to service the archaeological needs of the proposed projects.

Over 40 major infrastructure projects are planned across the UK in the period 2015–33 with the majority falling in the period 2015–21. The total capital cost is **£464.9bn**. The historic environment specialist input to these projects will typically be needed in the first few years, depending on the specific construction plans of the project. The peak co-incident activity lies in the period **2016–20**. For a diagrammatic breakdown see Appendix 1

There are significant problems with calculating the impact of this. One analysis modelling construction spend in this paper suggests that each **£1.0bn** of ‘new work’ construction spending generates between c **19 and c 25 FTE** years of archaeological employment; another that **£1.0bn** of additional construction spend generates £2.3m of archaeological spend, or about **41 FTE** years of archaeological employment. The estimated national investment of £464.9bn therefore equates to between c 8,800 and c 19,000 FTE years of archaeological employment. Assuming that 50% of this spend falls within the core period of 2016–20, this amounts to between c **4,400** and c **9,500 FTE**, or 880–1,900 FTEs annually over the core period. The current commercial archaeology market supports c **3,000 FTEs** annually in England. **15.7%** of this (c 471FTE) services infrastructure projects already, so the increase will be in the range of 25% - 64% over the core period. The market is unlikely to be able to accommodate this. Particular weak spots which require sector-wide responses are:

- Field archaeologists
- Archaeological specialists
- Project/Contract managers

These are areas where current evidence already indicates skills gaps and skills shortages, so these can be expected to become more acute.

Capacity issues will also emerge within Local Authorities. These are likely to be exacerbated by the public spending squeeze to be implemented in Spending Review 2015. Current capacity is **845 FTE** across both Archaeology and Conservation, and the implications of the infrastructure programme are that an extra workload will be imposed. As this is specific to the timetable of development in local areas it is presently almost impossible to model.

Historic England is a statutory consultee on many Infrastructure projects. The impact on our own capacity is under assessment.

It is unlikely that existing academic qualification routes can deliver the necessary expansion in competent workers in the timescales available. The sector should therefore invest in training its workforce in the skills needed by fully engaging with the nascent apprenticeship under development with key employers. It should also use the coming increase in demand for archaeological and other historic environment services as a means of addressing the below average pay and conditions which have led to previous loss of capacity.

There would be, however, little point in investing in workforce expansion to cover a relatively short term need. Indications are that the incremental rise in baseload housing development will provide continuing employment out to 2030. For example, Cambridgeshire alone plans to deliver 34,480 new homes across that period with the associated transport and other infrastructure.

The ground area covered by these projects and the volume of potential archaeological evidence prompts a reassessment of present approaches to survey, excavation and archiving. Attention should be given at a strategic level to establishing effective and sustainable professional practices to ensure the maximum value is returned for the time and resources expended.

2. CONTEXT

2.1 SCALE OF PROPOSED INFRASTRUCTURE DEVELOPMENT

Over 40 major infrastructure projects are planned in the UK during the period 2015 – 33 with the majority falling in the period 2015-21. The total capital cost is £464.9bn. The archaeological input to these projects will typically fall in the first few years, depending on the specific construction plans of the project. The peak co-incident activity lies in the period 2016-20. These are in addition to significant development projects in the regions, Scotland and Wales.

Table 1: Planned infrastructure projects 2015-33.

Project	Summary	Predicted Capital Cost	Timespan
Roads		£15.9 bn	2015-21
A303/A30/A358 Corridor	New expressway connecting South West	2.1	2019-21
A14 Upgrade	Cambridge to Huntingdon	1.6	2016-20
Strategic Road Network Capacity	Junction bypass and trunk improvements and widening	0.8	2015-20
Accelerated Roads	Motorway projects including junction improvements	0.6	2015-21
Smart Motorways Manchester	Smart Motorways M1 Junctions 39 to 42 improvements	0.1	2015-17
Lower Thames Crossing	Route not decided -		Consultation 2015
Rail		£86.9 billion	2015 - 33
HS2	High speed rail link London-Manchester/Leeds	50.0	2017-33
HS3	Options Costs and timetable for transport for the North east-west rail connection		Plans complete 2017
Thameslink	Increased capacity	6.5	2015-18
Rail Investment Strategy	North of England Programme; Electrifying the great western railway; South West route capacity programme; East-West rail; East coast main line; Mainland Main line	2.5	2015 - 19
Cross Rail	High-frequency rail from Reading/Maidenhead and Heathrow in the west to Shenfield in the east and Abbey Wood in the south east	2.0	2015 - 18/19
Major Stations	Victoria station (London); Bristol Temple Meads; Birmingham New Street	0.9	2015-21
Intercity Express Programme	Gauge track and platform enhancements on the East Coast and Great Western Main lines	0.4	2015-18
European Rail Traffic Management System	Replacement of traditional railway signals with a computer display	0.2	2015-?
Local Transport		£32.3 bn	2015 - 21
Transport for London	Sub-surface upgrades; northern line upgrade; Bank station; Victoria and Jubilee Line (Phase Two)	4.1	2015-20
Local Transport Major Schemes	Heysham M6 Link Road; extensions to Nottingham Express Transit; Leeds bus generation scheme; Norwich NDR; Sunderland Strategic Corridor; Kingskerswell Bypass (A3080); Croxley Rail link; Midland Metro	1.6	2015-17
Northern Line Extension	Northern line extension	1.0	2015-20

Aviation		£6.1 bn	2015-19
	Airports Commission Final report published		2015
	Stanstead Newcastle developments completed		2015
	Aberdeen and Edinburgh Airport developments		2015 -18
	Heathrow western rail access		2017 - 19
Ports		£1.2 bn	2015- 20
	Liverpool 2 development completed		2015
	Felixstowe South Development completed		2015
	Teesport Development		2015 - 17
	Port of Dover Western Docks		2015 - 20
	Green Port Mfg site Hull		2015 - 17
Energy		£274.9 bn	2015 -20
	Smartmeter installation		2015 - 20
Nuclear	Hinkley Point C; Wylfa Newydd; Moorside	44.9	2016 - 30
Wind Offshore	Off shore wind farms Dudgeon & Burbo Bank	6.2	2016 -18
	Hornsea, Beatrice and Walney Offshore projects		2018 - ?
Energy Transmission & Distribution	Western HVDC Link; Beaulieu-Denny 400kv Line; London Power Tunnels	1.8	2015 - 19
Other Renewables	Speyside Biomass CHP; Drax Biomass Conversion; Lynemouth Biomass Conversion; Liverpool Biomass Terminal.	1.1	2015 - 16
Carbon Capture & Storage (CCS)	CCS Commercialisation Programme	1.0	Presently undefined
Floods and Coastal Erosion	Flood Capital investment Plan starts	£3.7 bn	2015 - 21
	Thames Estuary 2100 programme commences		2015
	Rossall Coastal Defence scheme		2015 - 17
	Lincshore Coastal Defence scheme		2015 - 17
	Boston Barrage / barrier works		2015 - 20
	Oxford Western Conveyance scheme start		2018
	Thames Datchet – Teddington Scheme start		2019
Communications	Wi-Fi and Superfast Broadband rollouts	£11 bn	2015-21
	Release of 55MHz below 5 GHz deadline		2020
Water		£30.9 bn	2015- 25
	Thames Tideway Tunnel		2015 - 21
Waste		£2 bn	2015 - 21

2.2 CALCULATING THE ARCHAEOLOGICAL MARKET

This section attempts to estimate:

1. the size of the archaeological market as a percentage of the overall construction market in the UK.
2. how many archaeological jobs (in person years) are generated by a given amount of construction spending.
3. the percentage of the overall costs of infrastructure projects which is spent on archaeology in the UK.

These figures will enable modelling to be undertaken of the numbers of archaeological staff that will be needed, given particular 'spend profiles' for construction generally, and for infrastructure projects in particular, over the next fifteen years.

Three main published sources have been used in this work: ONS statistics on construction output, the *Heritage Market Survey 2014 (HMS14)* and the *Archaeological Market Survey 2015 (AMS15)*.

The size of the archaeological market as a percentage of the overall construction market in the UK

The ONS publishes regular statistics on construction output in England, Wales and Scotland (statistics for Northern Ireland are published separately).

These figures distinguish between 'new work' and 'repair and maintenance'. Within 'new work' they distinguish between 'new housing', 'infrastructure' and 'other new work'. In the 12 months to the end of March 2014, total 'all new work' construction output was £71.207 bn.

HMS14 states (p. 14) that, in March 2014, there were 2896 individuals employed in commercial archaeology in the UK. The report also states (p. 21) that average turnover per member of staff in 2013-14 was £56,237.

This implies that the commercial archaeological market in the UK in 2013-14 was worth around £162.86m (2896 x £56,237). Thus, at the end of March 2014, the commercial archaeological market in the UK was worth 0.23% of 'all new work' construction output.

Three qualifications must be offered to the 0.23% figure. First, the ONS figure of £71.207bn does not include construction output in Northern Ireland, whereas the *HMS14* report figures are UK wide. Second, the ONS figure does not include mining and quarrying output, whereas the *HMS14* figures will include archaeological work on mines and quarries. This is a potentially significant difference. Third, the calculation assumes that

‘repair and maintenance’ (as opposed to new work) generates no archaeological work. All of these qualifications could have the effect of decreasing the 0.23% somewhat, although it is not considered that the effect would be very large.

What percentage of the overall costs of infrastructure projects is spent on archaeology in the UK?

There are very few figures available for the percentage of the overall costs of archaeological work incurred by infrastructure projects. It is believed, on anecdotal evidence, that archaeological costs are almost always in the range 0.1% to 1.0% of overall project costs, and often in the middle or lower half of that range.

Thus, archaeological costs of a major road scheme like the A14 upgrade (£1.5bn) might be between £1.5m and £15m, perhaps around £7.5m; those of a hypothetical new railway scheme costing around £20bn might lie between £20m and £200m, perhaps between £80 - £90m.

This model varies with particular conditions. The 5.6km Bexhill to Hastings Link Road across waterlogged palaeoenvironments had a total cost of c £120m. The 2008 estimated budgets for archaeological work for the scheme totalled £3.2 million; made up of £220k for evaluation, £1 million for basic mitigation and between £1.5 – 2.0 million for ‘worst case scenario for excavation of well-preserved waterlogged timber platform and associated track ways, all fieldwork and reporting’. This has actually been exceeded due to the extensive and very numerous flint scatters. The total cost of archaeology for the scheme was in the order of £4m or 3.33% of construction costs.

In the case of the A14 upgrade the estimated £7.5m cost suggests that it would generate 133 person years of archaeological work (£7.5m divided by £56,237). The £80m - £90m estimate suggests that the hypothetical rail project would generate between 1426 and 1600 person years of archaeological work (£80m - £90m divided by £56,237).

Modelling different possible percentages, each £1.0bn of infrastructure spending will generate the following amount of archaeological spending and employment:

- 0.25% - £2.5m of archaeological spending: 44 person years of archaeological work.
- 0.50% - £5.0m of archaeological spending: 89 person years of archaeological work.
- 0.75% - £7.5m of archaeological spending: 133 person years of archaeological work.
- 1.00% - £10.0m of archaeological spending: 179 person years of archaeological work.

There are many uncertainties in these figures. As noted above, different approaches to the calculations give significantly different results.

The most critical figure used in the calculations here is the *HMS14* report figure (£56,237) for average turnover per employee. The figure for the total size of the UK archaeological market is based on this figure (multiplied by the number of people employed). The figure for the percentage of construction output which archaeological spending represents is in turn based on that figure. The £56,237 figure also provides the basis for estimating how much archaeological employment will be generated by a given amount of construction (and hence archaeological) spending.

It follows that the extent to which that figure is reliable will have a significant impact on the robustness of the overall analysis.

One particular issue of concern is that this is an average figure. This suggests that the actual turnover figure for some staff will be lower. It seems likely that this will apply especially to junior field staff. A lower 'turnover per staff member' figure would have the effect of increasing the amount of archaeological employment that would be generated by a given amount of construction spending. Further work on this point would be desirable. At present, it is possible that the figures given here understate the true picture, as some infrastructure projects may require significant numbers of junior field staff.

An additional consideration is that in practice a key determinant of the proportion of the project cost spent on archaeology is likely to be the size of the area affected, along with the variables of ground conditions and other factors. Building a nuclear power station is an expensive undertaking but its footprint is small relative to its cost. More work is needed on the establishment of appropriate algorithms and sampling strategies.

How many archaeological jobs (in person years) are generated by a given amount of construction or infrastructure spending?

Two different approaches to this calculation have been tried. They give significantly different results.

It is argued above that £1.0bn of additional construction spend generates £2.3m of archaeological spend. £2.3m of archaeological spend equates to about 41 person years archaeological of employment (£2.3m divided by £56,237).

Another approach is to look at total 'new work' construction spending (as reported by ONS) in relation to figures for the number of commercial archaeologists in employment at particular points in the period August 2007 to December 2012 (as given in *HMS14*, p. 14). This analysis suggests that each £1.0bn of 'new work' construction spending generates between 18.55 and 24.59 person years of archaeological employment.

In the twelve months to the end of March 2015, total 'all new work' construction output was £77.896bn. This is an increase of £6.689bn on the year to the end of March 2014. On the basis of the calculations above, this would generate a demand for between 124 and 274 additional archaeological staff in the twelve months to the end of March 2015. This represents about an increase of between 4.3% and 9.5% on the number (2896) employed

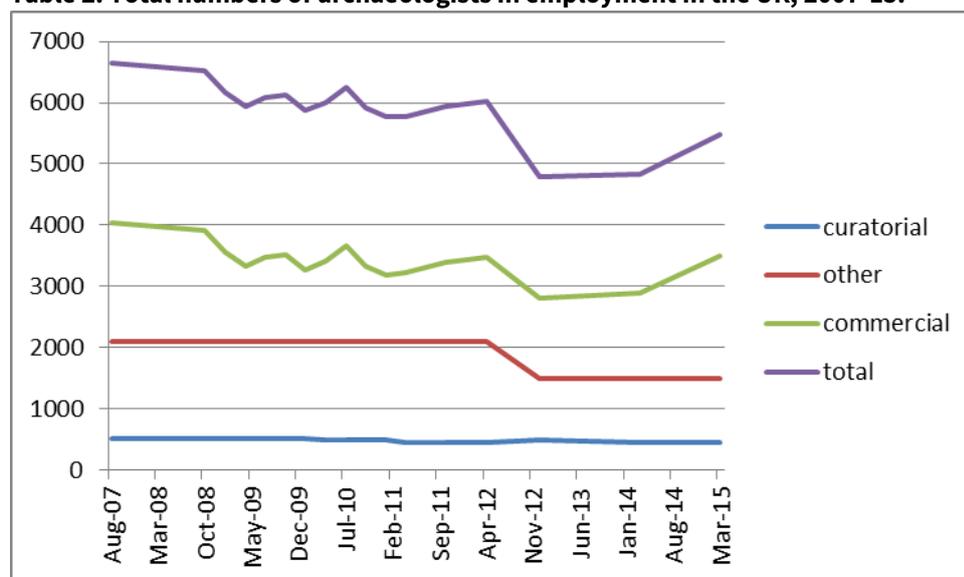
in commercial archaeology in March 2014. In practice the scale of demand meant that in some units the increase was between 15 and 20%. This rate of change could reflect the emergence of the economy from recession and may not be maintained.

2.3 THE CURRENT RESOURCE

The Archaeological Workforce in 2013-15

In March 2015 the estimated archaeological workforce stood at a total of 5,452 individuals. There is an underlying shift in the balance of the various sub-sectors: whereas the applied archaeology sectoral workforce grew by 25% between December 2012 and March 2015 over a comparable period the number of archaeological staff providing expert advice to local planning authorities declined by 5.4%. Combined, these figures indicate a net 20% growth in the number of people working in professional archaeology in the UK over the period from December 2012 to March 2015. The new total represents a decrease of 18% on the estimated workforce of 6,653 in 2007-08, and is about 4.5% lower than the estimated workforce of 5,712 in 2002-03.

Table 2: Total numbers of archaeologists in employment in the UK, 2007-15.



	Aug-07	Oct-08	Jan-09	Apr-09	Jul-09	Oct-09	Jan-10	Apr-10	
curatorial	512	505	505	505	505	505	505	485	
other	2105	2105	2105	2105	2105	2105	2105	2105	
commercial	4036	3906	3561	3323	3472	3526	3270	3404	
total	6653	6516	6171	5933	6082	6136	5880	5994	
	Jul-10	Oct-10	Jan-11	Apr-11	Oct-11	Apr-12	Dec-12	Mar-14	Mar-15
curatorial	485	485	485	442	442	440	485	439	459
other	2105	2105	2105	2105	2105	2105	1495	1495	1495
commercial	3669	3333	3189	3225	3399	3467	2812	2896	3498
total	6259	5923	5779	5772	5946	6012	4792	4830	5452

Source: Archaeological Market Survey 2015, Landward 2015 (AMS15)

Who are they?

The average age of a working archaeologist in 2012-13 was **42**, an increase of four years since 2007-08. By comparison, the average age of the whole UK workforce was 40.5 years. **46%** of archaeologists were female and **54%** were male. This compares to 47% female 53% male across the whole UK workforce in all occupations.

The archaeological workforce does not reflect the diversity of the overall working population: in 2012-13 **99%** of working archaeologists were white. This contrasts with the entire UK workforce of whom 13% were of black or minority ethnic origins. The proportion of people with disabilities working in archaeology is also low at a continued **2%**. For comparison 7% of the entire UK workforce was disabled.

93% of archaeologists working in the UK in 2012-13 were from the UK, **3%** were from elsewhere in the European Union, less than **1%** were from non-EU Europe and **4%** from elsewhere in the world. This represented a relative decrease in the number of archaeologists from non-UK European Union countries (5% of the working population in 2007-08), and a relative increase in the number of archaeologists from elsewhere in the world (2% in 2007-08). However, as the total number of working archaeologists had fallen considerably, the absolute numbers of archaeologists from outside the UK had also fallen.

Who do they work for?

Of 4,792 archaeologists working in the UK in 2012-13, it is estimated that 56% worked for organisations that provided field investigation and research services, 25% for organisations that provided historic environment advice, 2% provided museum and visitor services and 17% worked for organisations that provided education and academic research.

Analysed by employer type, 11% worked for national government agencies, 10% worked in local government, 14% worked for universities, 59% worked for commercial private sector organisations and 6% worked for other types of organisations (civil society organisations or museums).

Table 3: Percentages of professional archaeologists in the UK 2012 by subsector.

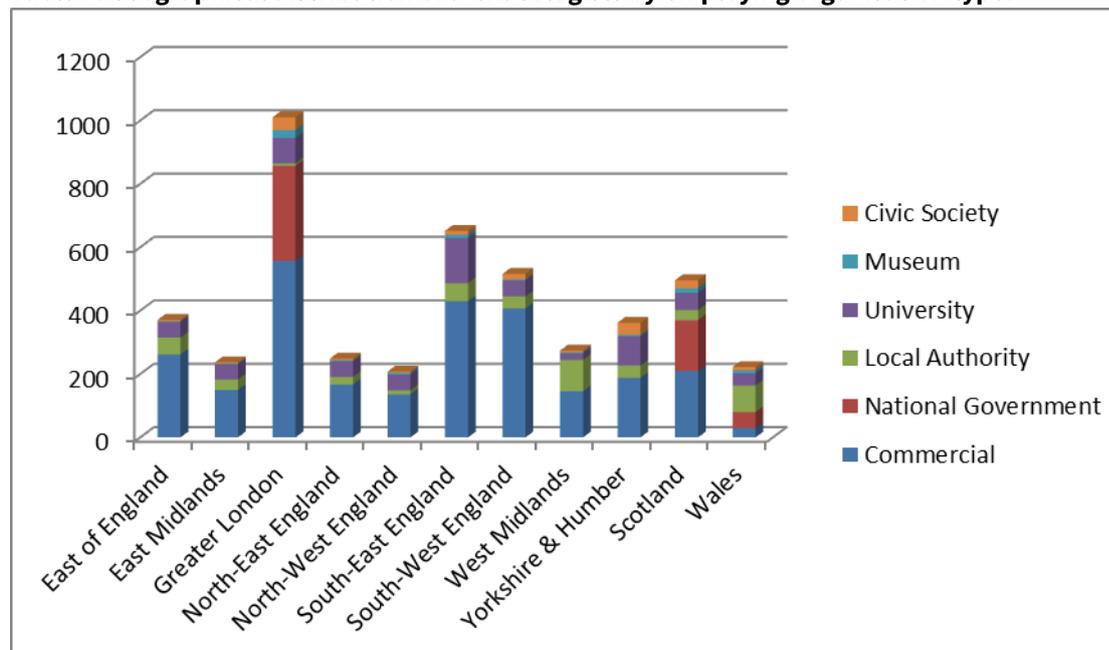
Subsector	responded	estimated additional numbers	total	
university (academic)	185	505	690	14%
local authority	355	130	485	10%
national government	477	68	545	11%
civil society	75	95	170	4%
Museums	25	65	90	2%
Commercial	1513	1299	2812	59%
total archaeologists	2640	2152	4792	

Source: *Profiling the Profession 2012-13 (PtP13)*

Where are they?

More archaeologists worked in London and the south east of England than other areas, which largely reflect the overall pattern of the UK population distribution and the present focus of development. The geographical distribution of archaeologists has not changed significantly over the period of 15 years that the *Profiling the Profession* series of surveys have been undertaken.

Table 4: Geographical distribution of archaeologists by employing organisation type.



Region	Commercial	National Government	Local Authority	University	Museum	Civic Society
East of England	262	0	53	50	2	4
East Midlands	150	0	33	48	2	4
Greater London	557	300	8	80	25	40
North-East England	167	0	24	49	3	6
North-West England	136	0	13	49	6	4
South-East England	430	0	57	142	11	12
South-West England	407	0	38	51	3	17
West Midlands	146	0	99	21	3	5
Yorkshire & Humber	188	0	39	92	5	38
Scotland	210	160	32	54	15	25
Wales	30	50	84	38	10	10
Total	2,683	510	480	674	85	165

Source: *Profiling the Profession 2013*

Although commercial units do work across UK borders, this suggests that the core capacity in England was **c 2400** archaeologists in 2012.

Table 5 Office location and percentages of national workforce, by response.

All Offices Location	head offices	subsidiary offices	total		% workforce
East Midlands	6	4	10	8%	5%
East of England	5	7	12	10%	5%
Greater London	6	7	13	10%	26%
North East England	0	7	7	6%	0
North West England	3	5	8	6%	1%
South East England	8	8	16	13%	23%
South West England	9	7	16	13%	19%
West Midlands	2	7	9	7%	2%
Yorkshire and the Humber	3	8	11	9%	1%
Scotland	5	7	12	10%	12%
Wales	3	2	5	4%	3%
Northern Ireland	1	1	2	2%	<1%
outside the UK	3	1	4	3%	3%
	53	71	124		

Source: Archaeological Market Survey 2015, Landward 2015 (AMS15)

We estimate the commercial archaeology market, the one most immediately relevant to this assessment, to have risen from around 2800 archaeologists in the UK in 2012 to 3500 in 2015, an increase of 25%. Applying the same geographical analysis to the 2015 figures suggests that the figure now stands at **c 3000** archaeologists working in **England** reflecting the same 25% rise in the overall workforce.

What are their working conditions?

The data on average salary was last gathered in 2012-13. For those employed in the private sector, which employed 59% of the archaeological workforce, this was £24,757. By comparison, the average for all UK full-time workers was £32,700 – overall, the average archaeologist earned 85% of the UK average wage as was the case in 2007-08.

In 2012-13 over three-quarters of staff were on permanent contracts, with 23% on fixed term (temporary) contracts, very few ‘casual’ staff and no reported volunteers. Part-time contracts were slightly more common for permanent staff (13% of the total) than for fixed term staff (6%).

Table 6: Numbers of staff by contract type, March 2015.

	full-time		part-time		total	
Permanent	1355	88.5%	176.3	11.5%	1531.3	76.4%
fixed term	365	94.2%	22.4	5.8%	387.4	19.3%
Casual	36	70.6%	15	29.4%	51	2.5%
Volunteer	3	8.8%	31	91.2%	34	1.7%
total	1759	87.8%	244.7	12.2%	2003.7	

Source: Archaeological Market Survey 2015, Landward 2015 (AMS15 (includes non-UK staff))

In contrast to the *Heritage Market Survey* in 2014, the *Archaeological Market Survey 2015* reported the use of some volunteers alongside salaried staff.

2.4 MARKET SECTORS CURRENTLY FUNDING COMMERCIAL ARCHAEOLOGY

Archaeological Market Survey 2015 provides detailed information on which market sectors were generating income for the respondent organisations. The table has been ranked by total, aggregate levels of income by category.

Table 7: Market sectors where applied commercial archaeological practices were working in 2014-15.

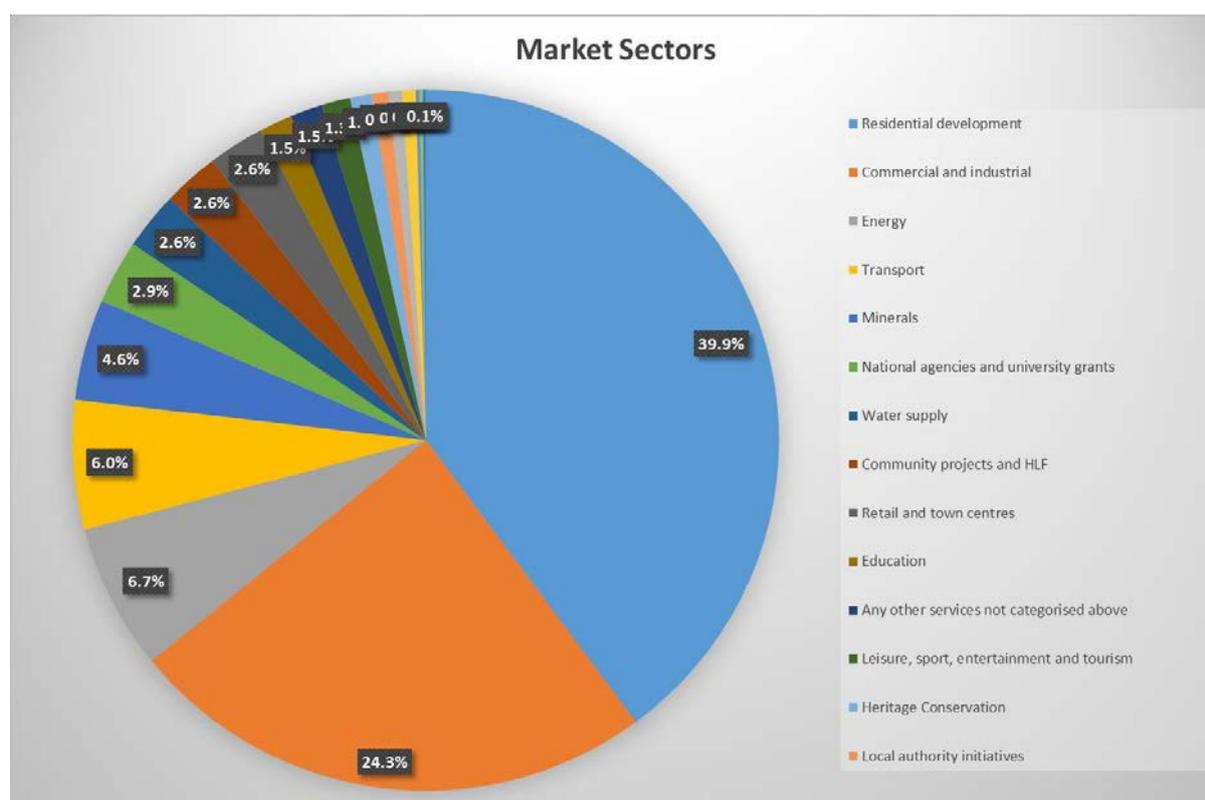
Category	total	%	% 2014	range	average	n=
Residential development	£14,804,304	39.9%	40.5%	£10k - £5m	£870,841	17
Commercial and industrial	£9,022,071	24.3%	5.6%	£17k - £5m	£751,848	12
Energy	£2,494,566	6.7%	11.6%	£10k - £1.4m	£191,890	12
Transport	£2,214,239	6.0%	3.9%	£4k - £1m	£184,520	12
Minerals	£1,725,034	4.6%	4.7%	£8k - £500k	£143,753	12
National agencies and university grants	£1,095,113	2.9%	2.4%	£8k - £290k	£109,511	10
Water supply	£981,859	2.6%	4.6%	£3k - £400k	£122,745	8
Community projects and HLF	£960,768	2.6%	3.8%	£4k - £200k	£73,905	13
Retail and town centres	£957,170	2.6%	5.2%	£5k - £500k	£108,352	9
Education	£560,850	1.5%	2.8%	£2k - £200k	£62,317	9
Any other services not categorised above	£547,177	1.5%	1.1%	£5k - £460k	£91,196	6
Leisure, sport, entertainment and tourism	£489,129	1.3%	6.1%	£5k - £300k	£69,876	7
Heritage conservation	£368,520	1.0%	2.2%	£2k - £200k	£73,704	5
Local authority initiatives	£278,903	0.8%	0.7%	<£1k - £100k	£39,843	7
Assistance to LPAs in delivering development	£231,500	0.6%	1.6%	£48k - £115k	£77,167	3
Other research and public archaeology	£231,113	0.6%	0.9%	<£1k - £80k	£25,681	9
Telecommunications	£61,085	0.2%	0.2%	£5k - £50k	£20,362	3
Waste	£58,665	0.2%	0.8%	£4k - £50k	£19,555	3
Health	£50,985	0.1%	1.4%	£1k - £50k	£25,492	2
aggregate total	£37,133,051					20

Source: *Archaeological Market Survey 2015, Landward 2015 (AMS15)*

'Residential development' represented the largest market sector by far, accounting for over 40% of income, followed by 'Commercial and industrial'. Combined income from these two sectors represented over 64% of the reported revenue of the respondent organisations.

The next most significant sources of income were from Energy and Transport projects. Overall, ONS defined infrastructure categories combined provided **15.7%** of income in the market as a whole down from **21.1%** in 2014. This is likely to be a reflection of the increased response rate to this question in the 2015 survey. The total reported income across all market sectors was more than double the previous year again indicating this better reporting rather than market growth. 67% of income came from private sector clients.

Respondent organisations (FAME members and CIfA Registered Organisations) typically generated approximately £864,000 of revenue per annum, mostly with none of this income being generated outside the UK. Some particularly large turnover figures meant that the average (mean) UK turnover for an applied archaeology company in 2014-15 was £1.88m, with an additional 3% above that being generated from non-UK work. This represents an increase of 14.5% over 2014. However, profit levels were low.



Source: Archaeological Market Survey 2015, Landward 2015 (AMS15)

These data are particularly important in illustrating the origins of demand for archaeological services as until 2014 there had not been any comparable datasets published for nearly 20 years, and the data from the 1990s were generated from numbers of projects rather than value.

3 ISSUES

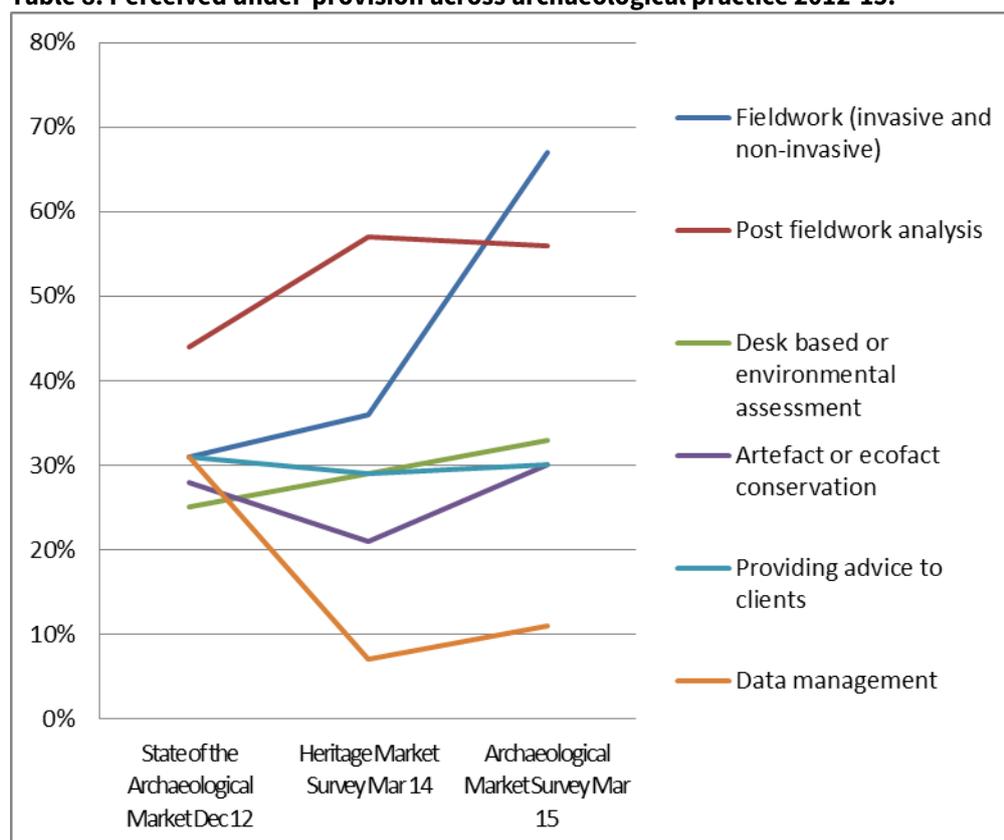
Skills issues: Perceptions and evidence of skills shortages and gaps

Skills gaps (skills that existing staff need but lack) and shortages (where employers cannot find employees with the relevant skills) were identified in both technical, archaeological skills and in generic, professional skills. The severity of these gaps and shortages was categorised as **significant** (where more than 25% of respondents to the question had identified a problem), or **serious** (where more than 50% of respondents to the question had identified a problem).

3.1 SECTOR PERCEPTIONS OF SHORTAGES

Recent consultations gathered data on sector perceptions of skills issues across the archaeological sector. The phrase “skills shortages” was used here in the questionnaire in a non-technical sense to refer to areas where there is a general under-provision of skilled labour.

Table 8: Perceived under-provision across archaeological practice 2012-15.



Skills subsets	State of the Archaeological Market Dec 2012	Heritage Market Survey Mar 14	Archaeological Market Survey Mar 15
fieldwork (invasive or non- invasive)	31%	36%	67%
post-fieldwork analysis	44%	57%	56%
artefact or ecofact conservation	28%	21%	30%
providing advice to clients	31%	29%	30%
desk-based or environmental assessment	25%	29%	33%
data management	31%	7%	11%
other*	9%	29%	19%

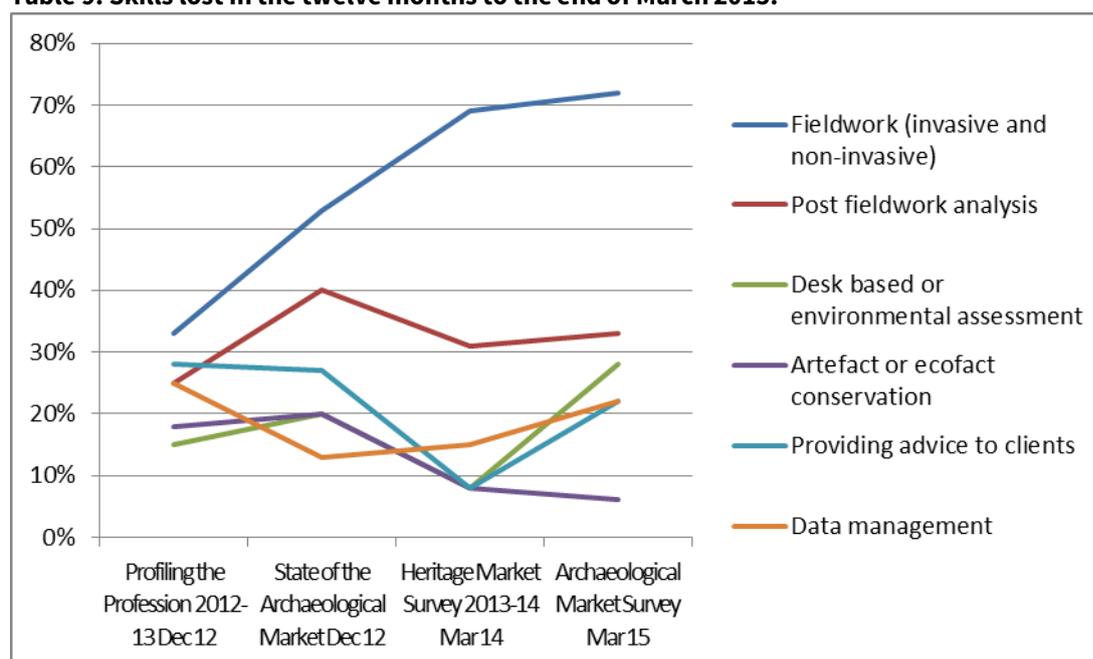
Source: Archaeological Market Survey 2015, Landward 2015

*'Other' categories where skills issues were identified included: financial sustainability planning, loss of local government staff, and project management

Notable from these data is the strong and increasing perception of skills shortages in field investigation.

3.2 EVIDENCE OF SKILLS LOSSES

Table 9: Skills lost in the twelve months to the end of March 2015.



Skills losses	Profiling the Profession 2012-13, Dec 12	State of the Archaeological Market Dec 2012	Heritage Market Survey 2013-14, Mar 14	Archaeological Market Survey 2015
fieldwork (invasive or non- invasive)	33%	53%	69%	72%
post-fieldwork analysis	25%	40%	31%	33%
artefact or ecofact conservation	18%	20%	8%	6%
providing advice to clients	28%	27%	8%	22%
desk-based or environmental assessment	15%	20%	8%	28%
data management	25%	13%	15%	22%
Other (management, outreach)	8%	7%	15%	11%

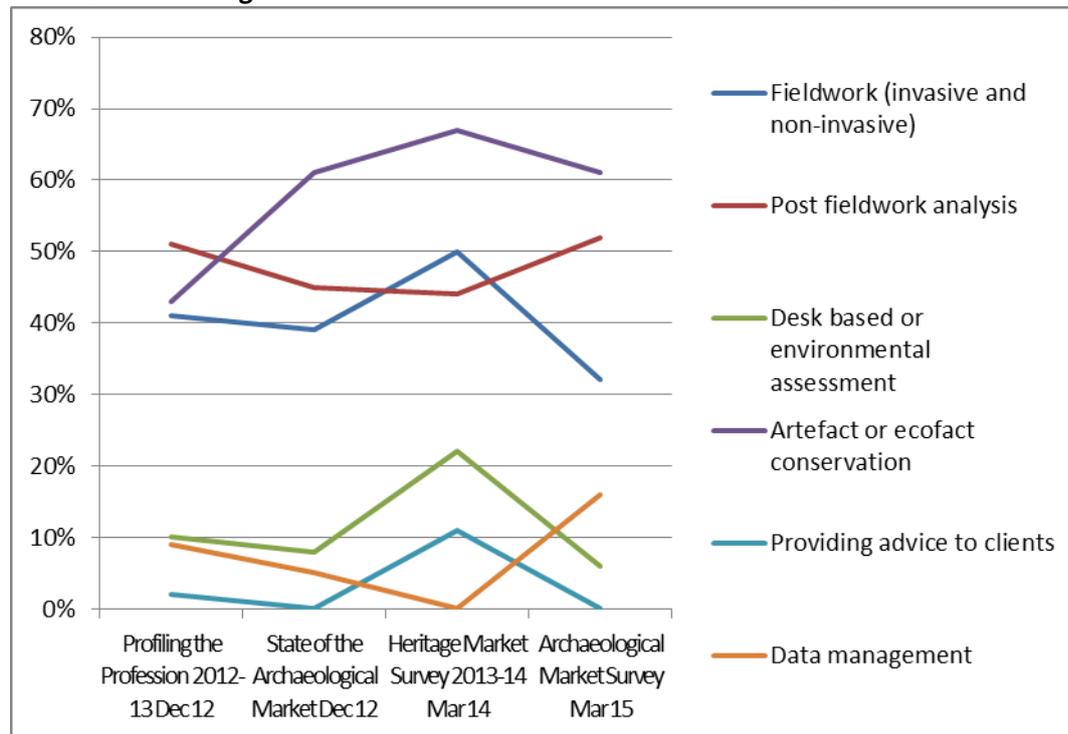
Source: Archaeological Market Survey 2015, Landward 2015

Fieldwork skills continue to be the area of skills loss most frequently reported, and Post-fieldwork analysis continued to be the second most-frequently reported. *HMS14* noted a potential explanation for these being the skills areas where losses have consistently been reported as being the nature of employment and project work. The people working in these areas will sometimes be recruited on relatively short contracts, and may then leave the organisation when those projects end – thus repeatedly resulting in apparent skills losses.

3.3 AREAS OF SKILLS BUY-IN

As in previous surveys, artefact or ecofact conservation continues to be the area where expertise is most often bought in from external providers (and is done so by the majority of respondents who identified that they do buy skills in). Conservation is less of a priority for in-house training, suggesting that it is very much the norm for this to be provided by subcontractors.

Post-excavation analysis was bought in by the majority of respondents suggesting that increased levels of fieldwork meant that in-house capacity had to be augmented. Fieldwork skills were bought in less than in the 2014 survey, suggesting that more fieldworkers were employed than were contracted.

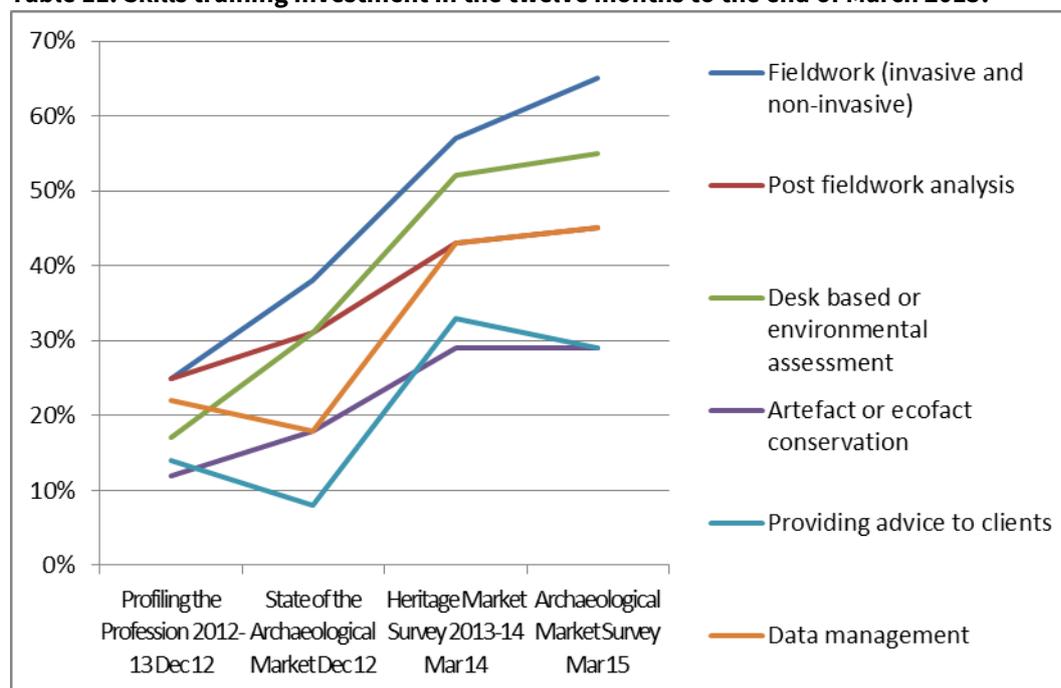
Table 10: Skills bought in in the twelve months to the end of March 2015.

Skills bought in	Profiling the Profession 2012-13, Dec 12	State of the Archaeological Market Dec 2012	Heritage Market Survey 2014	Archaeological Market Survey 2015
fieldwork (invasive or non- invasive)	41%	39%	50%	32%
post-fieldwork analysis	51%	45%	44%	52%
artefact or ecofact conservation	43%	61%	67%	61%
providing advice to clients	2%	0%	11%	0%
desk-based or environmental assessment	10%	8%	22%	6%
data management	9%	5%	0%	16%
Other, Remote sensing, C14 dating	10%	8%	0%	10%

Source: Archaeological Market Survey 2015, Landward 2015 (AMS15)

3.4 PATTERNS OF RECENT TRAINING INVESTMENT

Table 11: Skills training investment in the twelve months to the end of March 2015.



Training Investment	Profiling the Profession 2012-13, Dec 12	State of the Archaeological Market Dec 2012	Heritage Market Survey 2014, Mar 14	Archaeological Market Survey 2015
fieldwork (invasive or non- invasive)	25%	38%	57%	65%
desk-based or environmental assessment	17%	31%	52%	55%
data management	22%	18%	43%	45%
post-fieldwork analysis	25%	31%	43%	45%
providing advice to clients	14%	8%	33%	29%
artefact or ecofact conservation	12%	18%	29%	29%
other*	12%	18%	33%	16%

Source: Archaeological Market Survey 2015, Landward 2015 (AMS15)

*'Other' skills identified as areas where organisations had invested in training included: air photo interpretation, IT, fundraising, conservation, project management and quality management, H+S (fire safety, First Aid).

The majority of respondents to *HMS15* had invested in both fieldwork training and post-fieldwork analysis.

In both 2014 & 15 in comparison with earlier surveys, a much higher proportion of FAME members and ClfA Registered Organisations were investing in training – reflecting an overall more positive experience of the working environment, with organisations typically expanding and increasing the amount of fieldwork (and pre- and post-fieldwork) that they were undertaking.

Across a relatively small sample, the areas where training was focused matched reasonably closely the areas where skills were being reported as being lost - so these are skills gaps (skills that existing staff need but lack), and they are being tackled by investment in training.

When areas of skills training are compared to the areas where outside expertise was being bought in (skills shortages – where employers cannot find staff with the relevant skills), fieldwork and post-fieldwork skills are being both bought in and internally trained up, but conservation was much more likely to be bought in. Looking at the other skill areas where training was taking place, in addition to some narrowly technical areas, respondent organisations were often training staff in professional managerial skills (financial and project management), areas where skills were not reported as being bought in from external suppliers.

3.5 ARCHAEOLOGICAL SPECIALISTS

There are two principal sources of data on archaeological specialists: the labour market intelligence *Survey of Archaeological Specialists 2010-11 (SoAS11)* and the *National Heritage Science Strategy Report 3 Understanding Capacity in the Heritage Science Sector 2009 (NHSS3)*. *SoAS11* included specialists in archaeological science and environmental study and predicted an 18.1% loss of specialist capacity by 2016 due to demographic factors: 9.4% of the workforce was already over 65. Moreover, 39.8% intended to leave the workforce by 2021. The loss of capacity implied by this contraction may be compounded by constraints on entry to the various specialist fields – 35% of those surveyed across all disciplines reported that access to the necessary specialist training was “very difficult” and an additional 28.5% rated access as “quite difficult”.

Overall, the survey indicated that 58.4% of the specialist workforce are sole traders – a profile which gives acute problems in continuity planning. One particular specialist area - the study of metal slag from historic metalworking demonstrates the potential problems of this workforce profile:

- 60% of the workforce had a PhD or post-doctoral qualification.
- 10% were due to retire by 2016.
- 77.8% reported that they had waiting lists for their services of which 14.3% were longer than 1 year.

Unremediated, this will inevitably impose constraints on the ability to deliver the required level of archaeological service to the community, quite aside from the loss of the information which could have been gained.

The report contains a list of the specialisms surveyed. Fieldwork and Surveying were explicitly excluded from the scope of the survey as these specialisms were covered in a wider survey. The list provides a useful summary of the types of jobs undertaken, although not numbers, as some individuals identified themselves as having more than one specialism so were counted more than once (i.e. prehistoric pottery, and roman pottery). Equally, as this survey (in common with *Profiling the Profession 2013*) is based on survey returns, the total number of specialists is probably underestimated.

The *National Heritage Science Strategy (NHSS3)* attempted to estimate numbers of archaeological scientists in the UK.

Table 12: Heritage scientists by specialism.

Subject	Number of UK heritage scientists (FTEs)
scientific dating	10-20
environmental analysis	50-100
analysis of human remains	10-20
bio-molecular analysis	1-5
materials analysis	5-10
geophysical survey	30-50
airborne remote sensing	5-10
artefact and site preservation	5-10
TOTAL	136-275

Source: NHSS report 3 2009

The NHSS3 data are based on sector intelligence (interviews with key individuals and assumptions based on known workers and laboratories). Unlike *SoAS11* and *PtP13* the NHSS3 survey only contains archaeological science specialists, so is missing pottery and other finds study and material culture specialists. However, it includes those working in universities and on research projects, so over-estimates numbers available for work on development-led work.

3.5.1 Skills gaps and shortages

The information in *SoAS11* is now 5 years old, but at the time highlighted losses of specialist skills in photography and illustration, report writing, finds and environmental study and conservation caused by retirement and people leaving the sector. This was compounded by the risks of further reductions in numbers brought about by a fall in workload and reduced income which compromised the economic viability of being a specialist. Given these data reflect the situation in 2010-11, and at least another 3 or 4 years of slump in archaeological activity followed, this situation is unlikely to have improved.

The demand for services indicated skills shortages in certain areas even then. Respondents provided information on backlogs of work or projects waiting for them to start. With environmental specialists for example, 50% had a waiting list, and half of those had backlogs of at least 3 months. This is typical of the situation overall - 47.6% of respondents reported backlogs of which 9% were more than a year. The situation was even more severe in other specialisms.

PtP13 contains less detailed analysis but confirms these perceptions by indicating skills shortages in artefact and ecofact analysis, and significant skills gaps and shortages in post-fieldwork analysis.

In *NHSS3*, the review of shortages was based on sector intelligence and interviews. A wide range of archaeological science specialist shortages were highlighted. In considering these shortages against the current state of the sector we conclude that if there was a dramatic upturn in work (in part from increases in infrastructure work) it is likely that the biggest impacts would come from identified shortages of experts in pollen, charred plants, and snails, as well as geoarchaeology (site and lab-based analysis).

In terms of specialists we feel that the biggest likely impacts are anticipated in those topics where there are already quite a few specialists, so prehistoric, roman and medieval pottery, animal bones, plant macrofossils and pollen, where there is enough existing capacity, but where an additional few hundred thousand contexts worth of material (from large projects) will really cause a problem.

Specific projects will give rise to specific demands for specialist skills. One large project, for example, will require a large number of human remains specialists to help plan, manage and supervise the cemetery excavations on the planned route and then even more for post-excavation. There are a few MSc courses producing students, and these will need to be encouraged to stay in the sector, and perhaps enter training positions assisting with existing or new large scale post-excavation analysis on skeletal remains to ensure there are sufficiently trained staff in a few years when they are needed most.

At the other end of the scale are the really specialist specialists, where there are very few of them (mortaria specialists, numismatists, Bayesian chronological modellers) and where the training time takes longer. For these areas more detail of specific projects is needed in order to understand the likely pressure and predict likely shortages, find bespoke training solutions quite quickly to bring new specialists to a point where they can work independently, and find ways to retain them in the sector after their training is complete. This is a particularly challenging prospect.

Another type of specialists are conservators, who might be needed on site (and should be involved at the site specific WSI stage but usually are not), but who would also largely be involved in post-excavation work. It is anticipated that the need for conservation will be largely dictated by the richness of the sites encountered on large infrastructure projects, and there could easily be a problem if a lot of well-preserved waterlogged sites are discovered.

Finally, there are also the specialists who write up projects and produce publications. The skills required here should not be forgotten, and if those writing these sites up are the senior staff / project staff, this will have an impact on their availability to be involved in new work too.

3.5.2 Present Skills shortages

The *National Heritage Science Strategy Report 3 Understanding Capacity in the Heritage Science Sector (NHSS3)* identified shortages through consultations with various specialists within the archaeology sub-sector. Additional information for England alone comes from a recent informal survey by Historic England which asked Science Advisors and a sample of archaeological unit staff about capacity in different archaeological science disciplines in England.

There are reported shortages in:

- archaeomagnetic dating
- chronological modelling
- ceramic thin section analysis for pottery characterisation
- materials analysis for ancient technology
- analysis of certain classes of environmental material such as pollen, charred plant remains, insects and snails
- geoarchaeological analysis
- bio-molecular analysis and stable isotopes
- advice on preservation *in situ*, the degradation of archaeological materials, monitoring, construction impacts, understanding and management burial environments.

3.6 SKILLS GAPS AND SHORTAGES : CONCLUSIONS

Previously, respondents had been much more likely to consider that there were skills issues across the archaeological profession as a whole than to identify them within their own organisation. *HMS 2014* indicated that the aggregated views of respondents when looking at the sector as a whole were comparable with the reported experiences of their own organisations. The survey noted that it is important that the inward and outward-facing views have aligned – “a recognition that sectoral attitudes to maintaining skills are improving, that this is no longer seen as ‘someone else’s problem’ but that it is something that the employers are addressing”.

Aggregating the reports of skills lost with the reports of skills bought in and training investment (3.1 – 3.4 above) yielded the following:

- A serious skills shortage was identified in fieldwork (invasive or non- invasive).
- Significant skills shortages were identified in post-fieldwork analysis; artefact or ecofact conservation and in information technology.

- Significant skills gaps were identified in fieldwork (invasive or non-invasive) and post-fieldwork analysis.

3.7 DEVELOPING NEW CAPACITY: WHERE DO WE CURRENTLY GET ARCHAEOLOGISTS?

3.7.1 Vocational routes into the industry

The National Vocational Qualification in Archaeological Practice was first awarded in 2009 (this qualification, formerly the EDI Level 3 NVQ Certificate in Archaeological Practice is now awarded by SQA). Respondents to *AMS14* were asked about whether they had previously supported a member of staff gaining such a qualification, and whether they would consider doing so in the future.

Support for the qualification evidently continues but the reduced response rate is reflected in the lower figures.

Table 13: Support for the existing level 3 NVQ.

NVQ support	Archaeological Market Survey 2015 March 2015				Heritage Market Survey 2014 March 2014				State of the Archaeological Market December 2012			
	have supported		would consider in future		have supported		would consider in future		have supported		would consider in future	
yes	11	34%	15	60%	6	33%	11	65%	15	42%	30	71%
no	21	66%	3	12%	12	67%	1	6%	19	53%	6	14%
don't know	0	0%	7	28%	0	0%	5	29%	2	6%	6	14%
total	32		25		18		17		36		42	

Source: *Archaeological Market Survey 2014, Landward 2015*

Support for vocational entry routes into the profession has also been demonstrated in recent months by the engagement of employers with the Trailblazer Apprenticeship in Archaeological Practice. Ownership of drafting the standards has been taken by a consortium of employers, facilitated by Historic England. The proposal is for a 'core + options' structure within the three overarching standards of Investigation, Advice, and Management across Levels 3 - 7. This will allow maximum flexibility. Progress has been rapid and a qualification could be in place in 2016.

Widespread endorsement of the Archaeology Skills Passport by the majority of the main UK archaeological contractors is also testimony to the importance placed on practical skills.

3.7.2 Higher Education entry routes

While the number of jobs in archaeology decreased in the five years before 2012-13, the number of potential new entrants did not significantly change. Potential new entrants in this section are considered to represent the population of graduates with degrees in archaeology. They are described as potential because not every student who obtains an

archaeology degree will attempt or even want to attempt to become a professional archaeologist. Moreover, not every person interested in becoming an archaeologist will pursue a degree in the subject. Even with those caveats it is possible to create estimates, based on reasonable assumptions, which show that there is a theoretical oversupply of potential archaeologists.

There are two principal sources of data for student and graduate numbers. The first is Universities and Colleges Admissions Service (UCAS) which tracks applications and acceptance to degree programmes. These data show a robust demand for archaeology degrees.

In the UCAS data, archaeology is placed under two categories: Physical Sciences, and History and Philosophical studies. Under Physical Sciences archaeological science is combined with forensic science. This combination makes it hard to identify the exact number of archaeology students; a more detailed discussion is presented below (*NB.* application numbers are much higher than the accepted numbers as prospective students can, and normally will, apply to up to five university courses simultaneously).

Table 14: Forensic and Archaeological Science - Group F Physical Sciences.

	2006	2007	2008	2009	2010	2011	2012
Applications	8648	8422	7567	8101	9786	10441	8846
Accepted	1878	1781	1851	2049	2119	2244	2018

Table 15: Archaeology- Group V History & Philosophical studies.

	2006	2007	2008	2009	2010	2011	2012
Applications	3078	2447	1988	2117	2298	2301	2055
Accepted	614	538	558	526	548	511	485

Figures from the Higher Education Statistics Agency (HESA), the second source of data, show that there are far more students enrolled in their first year than could be extrapolated from the UCAS data largely because UCAS only tracks applications, not what happens to students course choices once they have entered a university.

Table 16: HESA data on full-time first year archaeology students.

first year students full-time	postgraduate	first degree	other undergraduate	total
forensic & archaeological science				
2009/10	650	2485	365	3505
2010/11	790	2340	410	3540
2011/12	625	2555	395	3575
Archaeology				
2009/10	700	1015	45	1760
2010/11	680	1015	20	1715
2011/12	710	1035	25	1765

Table 17: HESA data on part-time first year archaeology students.

first year students part-time	postgraduate	first degree	other undergraduate	Total
forensic & archaeological science				
2009/10	300	45	590	935
2010/11	230	30	525	785
2011/12	225	30	310	565
archaeology				
2009/10	205	80	630	915
2010/11	215	75	510	800
2011/12	210	155	290	655

HESA tracks graduation rates by subject area. This shows that 4,700 - 5,400 students graduated annually between 2010 and 2012 with a degree from one of the archaeology subject areas, more than the total of professional archaeologists in work in the UK in 2012-13.

Table 18: Degrees awarded in Forensic & Archaeological Science (F&A) and Archaeology.

degrees awarded	doctorate	other higher degree	other PG	first degree	other UG	total graduates
2009/10 F & A	60	570	120	1710	535	2995
Archaeology	110	565	35	880	185	1775
2010/11 F & A	75	565	195	1755	605	3195
Archaeology	100	59	535	900	200	1830
2011/12 F & A	55	755	130	1940	700	3580
Archaeology	135	585	40	920	150	1830

3.7.3 Heritage Science

Heritage Science has a long qualification and experience path to reach practice in the workplace. In *SoAS11* 35.8% of respondents were qualified at postgraduate level, with an additional 27.4% holding a doctorate. A further 7.1% held a post-doctoral qualification.

NHSS3 noted “Heritage science is a multidisciplinary subject and this is exemplified by the range of training routes by which current and prospective practitioners have, and will enter the profession”. The report also noted that “Most specialisation takes place at the masters and PhD level, with entrants for those courses drawn from both heritage (conservation, art history, archaeology) and science (chemistry, physics, biology, engineering, forensic and earth sciences) backgrounds. Specialisation at the Masters’ level is common in archaeology, where there are a wide range of subject specific courses. By comparison, few specific heritage science masters courses are available for subjects in the movable or built historic environment sectors.”

More than 35 UK archaeology departments were identified offering over 400 single and joint honours undergraduate courses in archaeology. Additionally over 150 Masters’ courses were noted, of which 62 could be described as archaeological science.

Scientific masters courses included:

- archaeological science (general)
- archaeological material science
- archaeozoology
- environmental archaeology / palaeoecology
- geophysics / archaeological prospection
- GIS / archaeological information systems
- geoarchaeology
- human remains / forensic archaeology / forensic pathology.

Having completed one of these taught masters courses graduates may enter the employment market (often in private practice) or continue to undertake further training through PhD study.

Given the resources available to archaeology a particular challenge lies in bridging the gap between science-based institutions and departments and their archaeological counterparts. Where this has been achieved through the CASE doctoral studentships that Historic England has supported with academic partners, there is much to be gained within the heritage science sector from involving students from a broad range of disciplines. A particularly good example is in the field of Ground Penetrating Radar where a student was able to use the latest software tools supplied by the oil industry and made available to him in the Geophysics Department at Leeds, and apply them for archaeological use, achieving excellent results.

4 CAPACITY ISSUES IN ARCHAEOLOGICAL ADVICE

As well as skills issues, it is important to attempt an assessment of the capacity for local authorities, consultants and Historic England to cope with the increased casework that the predicted infrastructure projects will bring.

4.1 LOCAL AUTHORITY ADVISORY AND CURATORIAL CAPACITY

An examination of changes in reported staff numbers from 2007 to 2012 found that local authority organisations providing advice and SMR/HER services lost an aggregate total of 100 positions (some gained and some lost positions). On average, these organisations reported losing 25% of their staff over this period. A further 9.5% have been lost since 2012.

The impact on local authority resources of developing infrastructure projects is difficult to predict. The principal reason for this is that assessing local 'capacity' is complicated as any accurate calculation would need to factor in the efficiency of the service, size of case work, the complexity of that case work, as well as the breadth of roles undertaken by any given service which can extend beyond those responsibilities that just relate to planning (e.g. community engagement and HER services). Given these complexities it is only possible to gain an indicative assessment of capacity, and that is what has been done here. The purpose is to identify which regions (limitations of the data mean that this shouldn't be broken down to a local authority level) are most at risk of excessive pressure on local historic environment specialist capacity resulting from national infrastructure related work. It is built on a presumption that pressure on local services increases due to the presence of developing infrastructure projects (so those regions that are already under greatest strain are most likely to struggle to cope). It is understood that some applications for infrastructure will not be considered by the local authority, but instead, under the Planning Act 2008, be subject to consideration and recommendation by the Planning Inspectorate. In these cases, however, the local authority will still be required to provide expertise as part of that process and so its capacity in that regard remains relevant. It is also assumed that the local authority's role in these cases will be consistent; therefore two applications will result in twice the workload of one.

To assess regional capacity the following data has been used:

- Number of archaeological and built conservation specialist Full Time Equivalent (FTEs) currently advising local authorities within each region (source: ALGAO/IHBC surveys);
- The number of designated heritage assets within a region (source: *Heritage Counts*);
- The number of planning application decisions within a region (source: *Heritage Counts*); and
- The number of Listed Building Consents (LBCs) within a region (source: 76).

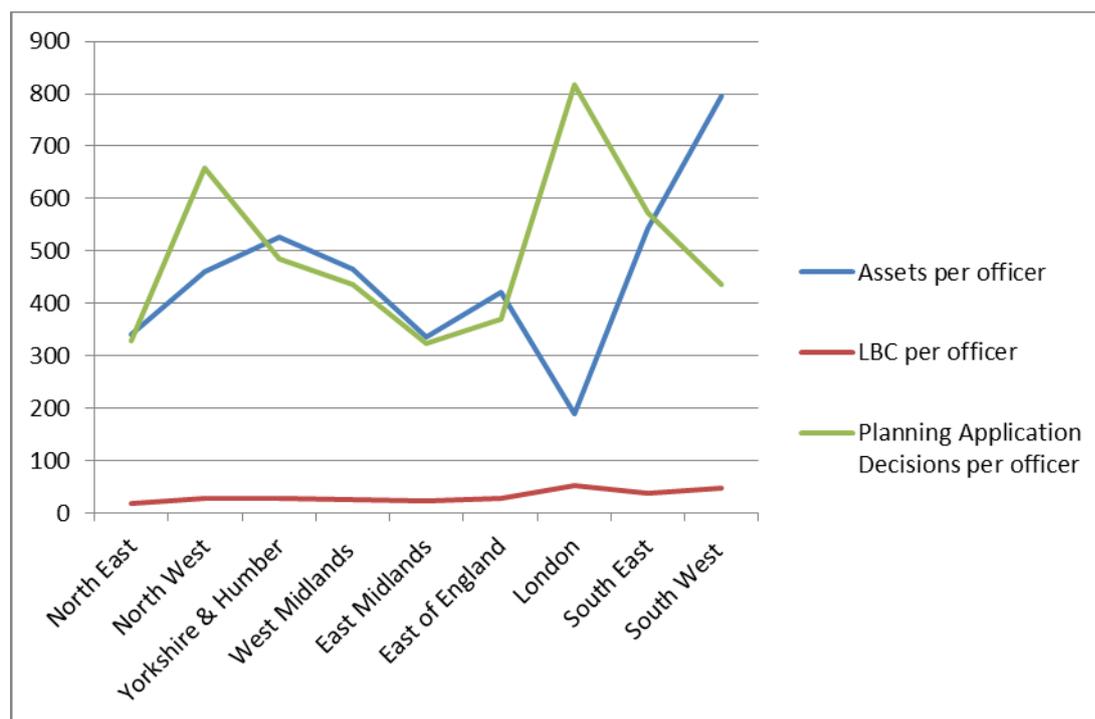
The number of FTEs represents the resource available to the local authority for providing the necessary specialist advice, and together with the number of assets, planning

applications, and LBCs give an indication of the workload pressure currently being exerted on that resource. To get a numerical indication of that capacity different calculations have been made: the number of assets per FTE; the number of planning applications per FTE and the number of LBCs per FTE. The table below provides those calculations. It highlights the pressure on expert advice that exists in the South East (a reflection of a high planning workload and a high number of designated assets). This is counter to the commonly held belief that the expertise in the South East is in a relatively strong position (probably the result of the fact that they have not been hit as hard as other areas by cuts to services). The other potentially significant figures are the high assets and LBCs per officer in the South West and the high number of planning application decisions per officer in the North West and London.

There are limits to this type of analysis, principally that there is no understanding of what is, and what is not, sufficient as to caseload. All we are able to do is to point to heightened levels of risk, and it would appear that currently the South East, London, North West and South West are the areas where there should be most concern. Of course, the FTE data provides a snap-shot of local resource and the infrastructure projects under consideration here are likely to be coming forward over a prolonged time frame. Whilst it is impossible to tell where cuts will be imposed, because of decisions taken by central government regarding the calculation of local government grants, we are able to tentatively conclude that the South East will not have to make cuts as deep as those to be made in some London Boroughs, the South West and the North West. Therefore, and whilst remembering the now lengthy list of caveats, those areas are more exposed to capacity shortfalls than other parts of the country.

Table 19: Analysis of local authority activity.

	Total FTEs (2015)	Total heritage assets	Assets per officer	Number of LBCs	LBC per officer	Planning Applications Decisions	Planning Application Decisions per officer
North East	40.2	13717	341.2	728	18.1	13212	328.7
North West	58.8	27026	459.6	1625	27.6	38769	659.3
Yorkshire & Humber	65	34187	526	1740	26.8	31570	485.7
West Midlands	77.1	35860	465.1	2034	26.4	33609	435.9
East Midlands	93.5	31376	335.6	2032	21.7	30248	323.5
East of England	141.5	59648	421.5	3839	27.1	52422	370.5
London	101.5	19206	189.2	5249	51.7	82827	816
South East	146.2	79415	543.2	5425	37.1	83623	572
South West	122	96997	795.1	5632	46.2	53169	435.8
<i>Average</i>	<i>94.0</i>	<i>44159.1</i>	<i>452.9</i>	<i>3144.9</i>	<i>31.4</i>	<i>46605.4</i>	<i>491.9</i>
England	845.6	397432	470	28304	33.5	419449	496



Source: Historic England Historic Environment Intelligence Team, 2015

4.2 LOCAL AUTHORITY ARCHIVE CAPACITY

The issue of local museum archaeology collections, or more specifically, the lack of available space in museum stores, has been a cause of concern for some time. The extent of the issue is illustrated by the map, linked below, which shows those museums that are still collecting and those that are not:

http://archaeologydataservice.ac.uk/archives/view/sma_map/

This is explored in further detail in the report 'Archaeological Archives and Museums 2012'

<http://www.socmusarch.org.uk/docs/Archaeological-archives-and-museums-2012.pdf>

Whilst the map requires updating, it does highlight the problems regarding deposition that exist in certain areas, problems that may be exacerbated by infrastructure developments. Consideration of this as an issue will need to be factored into any advice provided as part of the planning process. It should be noted, however, that solutions can be identified as part of that process, when dealing with developments of the scale considered in this report. In particular, the curation of archaeological archives has already figured in discussions on HS2 and will be considered in project planning.

4.3 HISTORIC ENGLAND CAPACITY

It has proved difficult to define exact figures for existing Historic England (HE) staff time spent specifically dealing with major infrastructure projects. The following analysis is therefore based on conclusions derived from available information. Figures for the period

FY 2010-11 through to the 2nd quarter of 2015-16 indicate that the average UK (excluding Northern Ireland) expenditure on infrastructure projects is £13.5 bn per annum. Internal figures suggest that infrastructure projects account for c. 270 days of HE staff time (1.2 FTE). It has not been possible to refine the figure for England-only spend in this period, nor the exact HE staff time spent per infrastructure project. Accordingly these figures are only indicative of the potential costs involved. On this basis, HE staff time overall equates to 0.08 FTE per £1bn of UK infrastructure spend.

5 POTENTIAL RESPONSES FOR SECTOR

5.1 COMMERCIAL ARCHAEOLOGY CAPACITY

5.1.1 Overcoming capacity shortages

If one assumes that all the archaeological staff in a particular geographical area (e.g. England) are already fully employed, then there is a limited range of options for increasing capacity in that area.

5.1.2 Recruitment from other areas

This is a common practice across many areas of the economy. If the workers in the other area(s) are not fully-employed, then this can be a beneficial arrangement for both employers and employees. If there is already full employment in the other areas, then this may simply displace the problem to those other areas, rather than addressing its root causes. Nonetheless, from the narrower point of view of simply the employer (who needs staff) and the employee (who may get higher wages or better opportunities) this may be an attractive option.

However, given the disparity between pay in archaeology and other specialist areas in development this is likely to have only marginal impact.

There may also be problems of different working practices in different areas (requiring training, and with a possible risk of not meeting accepted standards). An important additional consideration is familiarity with local conditions. Staff trained to dig on chalk find that digging on clay presents a major challenge as identifying features requires an experienced eye. Similarly, finds specialists who know material from a particular locale may struggle with objects from elsewhere. This is especially true in medieval pottery studies because there are distinct regional differences between pottery types.

For recruitment from non-English speaking countries, there may be issues of language (although many foreign nationals already have English to a very high standard). There may also be a lack of familiarity with the archaeological framework and practices, archaeological materials and conditions in England. None of these problems are insuperable. Recruitment from non-EU countries is now difficult because of visa and immigration restrictions.

5.1.3 Attracting former workers back into the workforce

A significant number of archaeologists left the profession following the economic downturn of 2008. In August 2007, 4036 individuals were employed in commercial archaeology. In December 2012, the figure was 2812. In theory, it might be possible to attract some workers back into the workforce. In practice, once people have left a profession which is notably poorly-paid and insecure, and (presumably) found other employment, many may be reluctant to return to archaeology.

5.1.4 Training new workers

This is always an option, although it does have costs attached to it (the costs of providing the training and level of supervision needed, and of having staff that are less productive until they are fully trained and experienced). The length of time needed to train new staff is very dependent on the nature of the skills required. Basic excavation practice can be taught relatively quickly. More specialised skills (such as surveying and GIS) require more intensive training (and may require a particular level of qualification, such as a Master's degree), to start with. Very specialised skills, such as human osteology, environmental analysis and so on may require many years of training and experience before the worker is fully equipped to work on their own.

5.1.5 Innovation and efficiency improvements

One way of (in effect) increasing capacity is to make the workers you have more productive and efficient. There are various potential ways of doing this. These might include investment in equipment which allows work to be done faster; innovation in how things are done; improvements in efficiency (e.g. changed working practices, better logistics, and better use of IT); better training. All are likely to entail some cost. They may also take time to implement (e.g. the time needed to develop and test innovations, the time and cost of system changes, and so on).

5.1.6 Changing the design of the work

In a sense, this is an aspect of 'innovation and efficiency improvements', but it seems sufficiently important to discuss separately. The question of what and how much to excavate and analyse, and in what ways, is entirely a matter of professional judgement (whether on the part of a curator, a contractor or a specialist). Decisions about this are made at every level, from the high-level selection of sites to be examined, down to day-to-day decisions on site (e.g. whether to remove a particular deposit by trowel or by mattock and shovel). There has been some concern that the 'preservation by record' approach of PPG 16, combined with overly formulaic briefs and specifications, can lead to mechanistic approaches to excavation and analysis (rather than ones driven by judgements about the value of the expected results). There is also a concern that, because of the very large amount of work done under PPG 16 and its successors (PPS5 and NPPF); doing further work of exactly the same kind (i.e. tackling the same kinds of sites in the same kinds of ways) may start to produce results which simply repeat what is already known. One possible example (yet to be proven) is trench evaluation of sites which have already produced clear results from geophysical survey: in some situations, extensive programmes of evaluation trenching may add little to what was already known, or could reasonably be inferred, from the geophysical survey. Equally, the detailed description and

analysis of small assemblages of pottery or animal bone from well-understood site types may add little to existing knowledge.

Thus, one approach to capacity shortages would be to make sure that available staff resources are carefully focussed onto work which will yield advances in understanding, and not used on unproductive or unnecessary tasks. This is, of course, a potentially very controversial area. While it is easy to state this as a principle, making decisions about what work will not be done (or done only in a summary manner) is far more difficult in practice. Nonetheless, it is an issue which should be explored. The conjunction of possible capacity shortages on the one hand, and concerns about whether all development-led archaeology represents good value for money on the other, makes this an opportune moment at which to consider this issue.

5.1.7 Staggered starts

A potential means of alleviating skills pinch points is to ensure that the archaeological intervention is an early consideration in the project planning. As an example, in the case of one large rail infrastructure project the planned route has three distinct areas which are known burial grounds and therefore contain large quantities of human remains. If these are opened sequentially rather than simultaneously then fewer specialists are needed but over a longer time period. This has obvious advantages both to the project in that there is an adequate workforce to undertake the necessary work in a timely fashion and to the profession in replacing a 'peaks and troughs' employment profile with a longer term, sustainable one in which investment is more justifiable.

Overall there remains the requirement to have the capacity to deal with the unexpected. In 2015 a project that was based on an unproductive field evaluation turned into an excavation of a major prehistoric burial site. An element of contingency is therefore important, but it is vital that historic environment specialists are embedded in the design and construction programme.

5.1.8 Higher Education entry

If more graduates can be attracted into the profession then a partial solution to some of the shortage issues could be achieved. However, most graduates are not 'site ready' so training issues remain. These could be addressed through an expanded provision of field schools, placements and the use of NOS to design practical modules that count towards a degree.

5.2 LOCAL AUTHORITY CAPACITY

At present local government curators do seem to have the capacity to handle the current HS2 workload, perhaps because it is distributed across a wide area rather than all focussed in one place. The expectation is that an increase in proposed projects will result in a proportionate increase in workload. Thus, when fieldwork begins, this may become unmanageable.

5.3 HISTORIC ENGLAND CAPACITY

As indicated above in Section 4.3, figures for the period FY 2010-11 through to the 2nd quarter of 2015-16 indicate that the average UK (excluding Northern Ireland) expenditure on infrastructure projects is £13.5 bn per annum. Internal figures suggest that infrastructure projects account for c. 270 days of Historic England staff time (1.2 FTE). It has not been possible to refine the figure for England-only spend in this period, nor the exact HE staff time spent per infrastructure project. Accordingly these figures are only indicative of the potential costs involved. On this basis, HE staff time overall equates to 0.08 FTE per £1bn of UK infrastructure spend or, put another way, each extra £12.5bn spend requires the equivalent of one extra FTE post to deal with it.

Internally in Planning Group, by charging for detailed advice (e.g. from Monuments Inspectors) HE can probably keep up with the increasing demand provided the skills are available externally to buy-in when needed.

6 RECOMMENDATIONS

6.1 RECOMMENDATIONS FOR HISTORIC ENGLAND

To provide support through:

- **Leadership:** provide sufficient and sustained coordination and seek to encourage all interested parties (or their members) to demonstrate resource and commitment to finding practical, achievable ways of developing the necessary capacity.
- **Research :** use Historic England analysts and provide limited funding to help the sector define better the nature, location and timing of the likely impacts; to refine the algorithm used to predict the archaeological costs of development; to explore in more detail other skills pressures (such as conservation in the built environment) and to help the sector be prepared in future for similar surges of investment without Historic England intervention.
- **Practical mechanisms for increasing capacity:** through Apprenticeships development; exploration of career-focused field academies through the Higher Educational sector to create vocational and award-led entry points; influence key specialist undergraduate and post-graduate opportunities and help the sector develop specific e-learning packages with partners.
- **Enhancing efficiency of existing capacity:** act as a catalyst (through leadership and funding) for reviewing field practice, technology and approaches to establish how to shift paradigms to release capacity and increase efficiency.

6.2 RECOMMENDATIONS FOR ACTION BY OTHER SECTOR BODIES

To develop and provide:

Partnership

- Establish key development stakeholders for early discussions regarding partnership. Build early understanding of the problem with affected sectors.

Increase chance of co-funding and shared support. *H2020 task group, in particular FAME, HE, HS2, CIFA, IHBC.*

Practical mechanisms for increasing capacity:

- **Investigate the possibility of establishing an MSC scheme equivalent** to amplify the impact of the skilled workforce. Create skilled labourers (unqualified in an archaeological sense) performing appropriate fieldwork tasks and bringing a different set of - often physical - skills into the market to supplement existing archaeological expertise. *There is presently no resourcing model for this proposal.*
- **Specific promotion of the value of archaeology / heritage qualifications** and career prospects. Utilise the opportunity to drive impact-based recruitment to universities with under-used departmental capacity. *UAUK, CIFA*
- **Develop contractor-based training** (NOS/NVQ based) initiatives for undergraduate courses. Build longer-term flow through of capacity and create an entry level for apprenticeships. Build on current initiatives and explore the establishment of a 4 year degree model incorporating one year's practical experience. *FAME, CIFA, UAUK*
- **Develop early career specialists.** Set up a trust funded from development consortia with an interest to pay sole traders to act as 1:1 mentors. Ensure rapid market readiness of specialists with the focus on key skill priorities. *Developers, CIFA, UAUK, contractors*
- **Recall of trained individuals.** Influence market take-up of key skills outside heritage sector (eg oil industry Bayesian experts for scientific dating). Bring appropriate transferrable skills into the heritage / archaeology market. *FAME, CIFA, developers, contractors*
- **Develop E-Learning modules.** Establish distance-learning capacity in areas of shortages which are amenable to this form of training. *Developers, contractors, CIFA, ICON*
- **Training the trainers.** Increase the sustainability of training investment to ensure interventions by HE and others have long-term viability. *CIFA, FAME, HS2, CCSkills*
- **Harness EU labour market.** Import available capacity and skills from areas of EU experiencing downturn in development-led archaeology. *FAME, CIFA, developers, contractors.*
- **Enhancing existing employment packages.** Increasing attractiveness of and loyalty to careers in the sector through training, allowances, and skills passports as well as salary. *FAME, CIFA, developers, contractors*

7 LINKS AND FURTHER READING

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Projects	Cost	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Intercity Express Programme	0.4																
European Rail Traffic Management system	0.2																
Local Transport	32.3																
Transport for London	4.1																
Local Transport Major Schemes	1.6																
Northern Line Ext	1																
Aviation	6.1																
3 rd runway report																	
Stanstead/ Newcastle developments																	
Aberdeen and Edinburgh Airport Developments																	
Heathrow western rail access																	

Ports	1.2																
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Project		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Liverpool2 Devt																	
Felixstowe South																	
Teesport Development																	
Dover Western Docks																	
Hull Green Port MFG																	
Energy	274.9																
Smartmeter installation																	
Nuclear: Hinkley, Wylfa, Moorside	44.9		Hinkley Starts		Wylfa, Moorside final decision												
Offshore Wind Dudgeon & Burbo Bank	6.2																
Ferrybridge Biomass																	
Carrington CCGT																	

Offshore Wind Hornsea, Beatrice & Walney																		
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Project		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Energy Transmission and Distribution	1.8	Nemo, NSN, Elect Link investment decisions		Western Coast Link Completed		Nemo projected completion											
Biomass Drax, Liverpool, Lynemouth	1.1																
Carbon Capture and Storage		Presently Undefined															
Floods and Coastal	3.7																
Thames Estuary 2100		Starts	?	?	?	?	?	?									
Rossall Coastal Defence Scheme																	
Lincshore Coastal Defence Scheme																	
Boston Barrage/Barrier																	
Project		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030

Oxford Western Conveyance Scheme					Starts	?	?											
Thames Datchet-Teddington Scheme						Start	?	?										

Project		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Communications	11																
Release of 55MHz below 5GHz							Deadline										
Water	30.9																
Thames tideway Tunnel																	
Waste	2																
No detailed projects																	