Strategic Environmental Assessment
Site Specific Baseline

Berkeley Site

FOREWORD

This document has been prepared to support the NDA's Strategic Environmental Assessment of its decommissioning strategy for the 10 Magnox Sites. This document contains baseline environmental information and other relevant environmental data.

Berkeley Site
Berkeley
Gloucestershire
GL13 9PA

Berkeley Site

Berkeley Site is twin reactor Magnox station undergoing decommissioning, and is located close to the town of Berkeley in the Stroud District of Gloucestershire, South West England. It is situated on the eastern bank of the River Severn, from which it drew cooling water supplies during its operational phase. This power station site covers an area of 11 hectares (27 including Berkeley Centre) [1] [a]. The following describes the key dates for Berkeley Site:

- Construction of Berkeley Site commenced in 1957, and electricity was first supplied to the grid in 1962 [1].
- The site ceased electricity generation in 1989 after 27 years of operation [1].
- Defuelling of the reactors was completed in 1992 [1].
- Additional funds have been made available to Berkeley Site as part of Magnox Optimised Decommissioning Plan (MODP), so certain areas of work have been accelerated to facilitate entry to Care and Maintenance (C&M) by the anticipated date [2].
- Both of the reactor buildings were put into the Safestore state in 2010 [b].
- The Care and Maintenance Preparations (C&MP) phase of the decommissioning process is scheduled to be completed in 2023 at which point the site will enter the Care and Maintenance (C&M) phase [2].
- Final Site Clearance (FSC) is scheduled to commence at the end of the C&M phase. All remaining structures on the site will be cleared by 2085 [2].

1. Magnox Ltd (2011) Berkeley – Facts and Figures. Available at http://www.magnoxsites.co.uk/our-sites/berkeley/facts-and-figures
2. Magnox Ltd. (2011) LC35 Magnox Optimised Decommissioning Plan, Berkeley Site

Site End State Assumption

The planned end state for Berkeley Site is defined in the NDA Strategy Document 2011. This states: *'Radioactive and non-radioactive contamination will be reduced to meet the requirements of the relevant regulatory regime for the next planned use of the site and the current use of adjacent land. Where the next planned use no longer requires a nuclear site licence, radioactive contamination will be reduced to meet the criteria for delicensing, with any remaining radioactive substances being subject to the relevant environmental permitting regime. The physical state of designated land will be made suitable for the next planned use of the site; structures and infrastructure will be made safe or removed where necessary, having first explored opportunities for their re-use.'*

[a] Immediately adjacent to Berkeley Site is the Berkeley Centre complex. Berkeley Centre consists of a redundant laboratory and office complex (formerly the Berkeley Nuclear Laboratories / Berkeley Technology Centre) as well as a number of office and other buildings that are still in use. Berkeley Site and Centre form two separate sites, having separate boundaries, with only Berkeley Site being subject to a Nuclear Site Licence. Even though both of these sites are owned by the NDA, this Strategic Environmental Assessment Baseline considers Berkeley Site only.

[b] As a result of being placed in this state, the reactor buildings are now referred to as the 'Safestore buildings'

Current Environment Baseline

Table 1: Baseline Data for all SEA Objectives for Berkeley Site

SEA Objective	Environmental Baseline Data	References
Air Quality	Radioactive Discharges • Aerial discharges of radioactivity have reduced since the cessation of generation. The reactor cores at Berkeley are enclosed within Steel Pressure Vessels (SPVs), which are in turn contained within concrete structures ('bioshields') designed to protect site personnel from radiation originating from within the cores. During operations discharges of aerial activity resulted from ventilation of the bioshield voids, which released gaseous activation products when the reactors were under load. • Periodic venting of reactor coolant gas was carried out during the operational phase. This has ceased since the end of generation. • Due to the reactors at Berkeley having been placed in the Safestore state only estimation of gaseous discharges from degassing of the graphite cores is now required, rather than active measurements which are required at other decommissioning sites. • Nuclear operations including waste retrieval which are being undertaken as part of the decommissioning works result in minor but regular aerial discharges of radioactivity. Conventional Discharges • Vehicles and diesel generators are employed on Berkeley Site, which are sources of air quality contaminants including NO_x (oxides of nitrogen), SO_x (oxides of sulphur), O_3 (ozone) and PM_{10} (particulate with a diameter <10µm). These sources run only intermittently, and due to the rural nature of the site average levels of these pollutants are likely to be low. • Discharges from these sources will likely remain steady throughout the C&MP phase. • Dust is currently, and will in future, be generated from construction and demolition activities undertaken on the site as part of C&MP. Mitigation of this dust is undertaken in all instances.	
Global Climate Change and Energy	• Throughout its lifetime Berkeley Site has drawn power from the National Grid to satisfy domestic power needs (heavy plant items such as the gas circulators and cooling water pumps were driven by power derived directly from the station's output). The use of this energy has resulted in indirect CO_2 emissions, due to the mixed generation used in the UK. • In addition to grid supplies, the site has several essential items of plant for the provision of back up power, and are fossil fuel powered. At Berkeley Site this auxiliary equipment consists of diesel generators. These machines are not in constant use; instead they are there for emergencies, but are regularly run for testing purposes. • A number of vehicles are based at Berkeley Site, which have associated carbon emissions. Indirect carbon emissions originate from the use of hire vehicles by site personnel when travelling on company business in addition. • Magnox Ltd. has registered under the Carbon Reduction Commitment (CRC) and also has a company-wide Energy Efficiency Policy. Both of these schemes are currently being implemented on a site by site basis, with the aim of minimising greenhouse gas emissions across the company.	
Biodiversity, Flora and Fauna	• Berkeley Site is situated in a predominantly rural setting, and has 4 statutorily designated areas in close proximity. • These designations recognise the fact that the Severn is an internationally-important habitat for migratory fish and wintering birds, with the inter-tidal mudflats being of key importance to the migration of several internationally-protected bird species [1]. • These designated areas are:	1. Magnox South (2010) Berkeley Site Environmental Impact Assessment Baseline

	• Severn Estuary Site of Special Scientific Interest • Severn Estuary Special Area of Conservation • Severn Estuary Special Protection Area • Severn Estuary Ramsar Site [1] • Due to these designations the coastline adjacent to Berkeley is also classified as the Severn Estuary European Marine Site [3 c]. • In addition to the features associated with the estuary, there are extensive stretches of ancient hedgerow and an inland area of reed-bed, both of which are features ecological importance, in close proximity to the site. • The site Biodiversity Action Plan considers how the site manages its impacts on local ecosystems. This document is reviewed and updated on a bi-annual basis. • The Environment Agency (EA) concluded that exposure to ionising radiation from authorised discharges of radioactivity from the UK's nuclear installations did not significantly impact wildlife in England and Wales [2].	2. Environment Agency (2002) Impact Assessment of Ionising Radiation on Wildlife 3. Natural England (2011) England's European Marine Sites, available at http://www.naturalengland.org.uk/ourwork/marine/protectandmanage/mpa/europeansites.aspx
Landscape and Visual	• Berkeley Site is located in Gloucestershire, in a predominantly rural area adjacent to the River Severn [1]. • The immediately surrounding flood plain landscape is flat and open, and consists of arable fields and wet alluvial pastures. The opposite bank of the Severn is characterised by steeply rising ground. • The Cotswold Escarpment is located several km to the east, and higher ground is also located on the opposite bank of the River Severn. • The site is prominent in the landscape locally (and in particular from the Severn Way coastal footpath), especially from the north where vegetation cover is less. At medium-long distances the site is prominent from vistas to the north, south and west (particularly Lydney Harbour).	1. Ordnance Survey (2011) 1:25,000 Sheet 167, Thornbury, Dursley and Yate 2. Magnox South (2010) Berkeley Site EIA Baseline
Cultural Heritage	• There is 1 Scheduled Ancient Monument near to Berkeley Site, at Lydney Harbour on the western bank of the River Severn. • There are 2 Grade I* and 2 Grade II Listed Buildings within 5km of Berkeley Site. • One of the listed buildings in the area is a Grade-II gazebo-type summerhouse, which is situated to the immediate north-west of the site boundary. • There is 1 entry in the draft Register of Landscapes, Parks and Gardens of Special Historic Interest near to Berkeley Site (at Berkeley Castle), as listed by Natural England.	Magnox South (2010) Berkeley Site EIA Baseline
Groundwater, Geology and Soils	• Made Ground directly underlies the site and consists primarily of reworked clay and bedrock. The natural superficial (drift) deposits near Berkeley Site consist predominantly of layers silty clays and peats incorporating isolated pockets of glacial head sediments. • The bedrock at Berkeley Site is the Triassic Mercia Mudstone, which consists of interbedded mud-, silt- and sandstones with gypsum inclusions and is weathered in its upper part. This unit overlies the Devonian Old Red Sandstone. • The superficial deposits at Berkeley Site are considered a Minor aquifer. • The bedrock at Berkeley Site is considered a non aquifer, although the laterally extensive sandstone bands within the Mercia Mudstone are considered to be a Minor Aquifer. This is especially pronounced where the gypsum inclusions have dissolved to form cavities in the rock. Despite the geological units underlying Berkeley Site generally being considered as	Magnox South (2010) Berkeley Site EIA Baseline

[c] Where an SPA or SAC is continuously or intermittently covered by tidal waters or includes any part of the sea adjacent to the UK, the site is referred to as a European Marine Site.

	non-aquifers, there is 1 licenced groundwater abstraction and 2 private abstractions for domestic use with 5km of the site. • The soils in the area surrounding Berkeley Site are classified as seasonally wet deep clays, and are classified as a Grade 3 and 4 agricultural quality soil. <u>Land Quality</u> • Berkeley Site has limited amounts of radioactive and chemical land contamination. • Potentially radioactive land contamination is associated with leaks from the Original Ebb Tide Line, Gravity Active Drain, and Cooling Ponds Recirculation Pipe Trench. • Potentially chemical land contamination is associated with underground storage tanks, transformers and oil-filled cables. Poly-Chlorinated Biphenyl (PCB) contamination has been detected in the area of the former site substation. • New and refurbished boreholes around the site facilitate investigation and monitoring of current and future soil and groundwater contamination.	
Surface Water Resources and Quality	• The nearest watercourse to Berkeley Site is the River Severn. Additionally, the Little Avon River (called Berkeley Pill near to the site) drains into the River Severn approximately 0.4km to the north of the site, and Conigre Pill (which is culverted beneath the site) discharges to immediately to the southwest of site [1]. • The ecological and chemical status of Berkeley Pill is considered poor under the Water Framework Directive [2] • Areas of Berkeley Site could potentially be affected by a 1 in 200 year tidal flooding event, and a study as part of the most recent Periodic Safety Review considered a combined extreme pluvial/fluvial event, and predicted that this could affect the Active Waste Vaults (AWV), so flood barrier protection has been installed. • Aqueous effluent discharges (and cooling water discharges during the operational phase) have always been made to the River Severn. Cooling water discharges were made to an offshore 'cooling tower' (this was demolished in 2001). • Although the Severn adjacent to Berkeley Site is tidal, it is not considered to be the Severn Estuary, as this is generally taken to be everything south of the Severn Bridge approximately 12km to the south of the site. • The dispersion characteristics of the River Severn are affected by factors including flow rate, sediment load, sedimentation rate, freshwater / seawater mixing rate and tidal range and atmospheric conditions. • Waterbodies containing clay mineral-rich sediments may have higher uptake potential for radionuclide anions such as Cs-137.	1. Ordnance Survey (2011) 1:25,000 Sheet 167, Thornbury, Dursley and Yate 2. Environment Agency (2011) Water Framework Directive – River Basin Management Plans – Rivers

Waste	• Both operational and decommissioning activities at nuclear sites generate radioactive and conventional waste.
	• Low Level Waste (LLW) is generated at Berkeley Site from a range of routine operational and decommissioning activities, and comprises a range of different materials.
	• The baseline for LLW is to package the waste and send it to the Low Level Waste Repository (LLWR) near Drigg in Cumbria for disposal [1].
	• Opportunities to characterise or decontaminate to Very Low Level Waste (VLLW) or exempt (for permitted landfill), size reduce, incinerate or metal melt, in order to reduce LLWR consignments, are actively sought [1].
	• The incineration facility at Hythe comprises a disposal route for solid LLW and organic liquids from Berkeley Site.
	• Intermediate Level Waste (ILW) is generated from both operational and decommissioning activities.
	• Intermediate Level Waste (ILW) is generated from both operational and decommissioning activities. It has accumulated at several locations at Berkeley Site. The majority of this will be retrieved during C&MP when an ILW store becomes available on site. The exception to this are some Miscellaneous Activated Components (MAC) stored in the vaults and within the concrete bioshield which will be retrieved for disposal during FSC [1].
	  • Due to the unique design of the fuel elements used at Berkeley, which incorporated graphite struts in addition to the Magnox alloy that comprised the majority of the element, different waste materials are intimately mixed together with the AWV.
	  • Additionally, some unusual and exotic wastes from the adjacent laboratory complex, including wastes from Post
		1. Magnox Ltd (2011) Berkeley Site IWS
		2. DECC (2011) Implementing Geological Disposal Annual Report April 2010 – March 2011
		3. Walters S (2009) Fuel Element Debris Status Overview

	Irradiation Examination of fuels and materials testing (including graphite), were emplaced in the AWV. Site Waste Strategy Baseline • The use of self-shielding Ductile Cast Iron Containers (DCICs) for interim storage and eventual final disposal of solid and wet (which is dried within the container) ILW is being pursued by Magnox Ltd., and is to be implemented at Berkeley Site. This is supported by generic and site-specific options studies, but will also be subject to regulatory approval. • The waste packages will be emplaced in the site ILW store for interim storage pending eventual phased transfer to the UK national Geological Disposal Facility (GDF) circa 2040 (but possibly as early as 2029) [2]. • The Magnox Fuel Element Debris (FED) waste stream at Berkeley Site has a volume of 164m^3 [3]. Dissolution of this waste stream is not planned for implementation at the site. This is due to the relatively small amount of material present and the difficulty associated with sorting this from the other mixed wastes in the AWV. Direct emplacement of all ILW in DCICs will be employed at Berkeley Site instead.	
Traffic and Transport	• The site access road connects to the A38 trunk road via Berkeley village. This road links to the national motorway network at either Jct. 13 or 14, M5 [1]. • The nearest railhead to Berkeley Site is located on the Sharpness Branch Line (which is operational but infrequently used). The nearest passenger rail station is Cam and Dursley station.	1. Ordnance Survey (2011) 1:25,000 Sheet 167, Thornbury, Dursley and Yate
Land Use and Material Assets	• Berkeley Site occupies an area of 11 hectares (on an overall NDA estate of 27 hectares - the adjacent Berkeley Centre, which was delicenced in 2006, occupies an area of 16 hectares) [1]. • Berkeley Site consists of two Safestore buildings, various ancillary buildings, access roads, grassy areas and areas of open hardstanding. • The surrounding area is rural in nature and is used primarily for agriculture and recreational purposes • Notable uses in proximity to Berkeley Site include the Severn Way footpath, which runs around the edge of the Site footprint. The proximity of Sharpness Docks results in commercial shipping passing the site on the River Severn; several navigational aids for this shipping are located on the site. • Berkeley Site incorporates a significant quantity of material that is potentially eligible for direct reuse or recycling: • A proportion of this recyclable metal will or has been made available for recycling during the C&MP phase. This includes a substantial quantity of recyclable metal in the boilers, the gas ducts, the SPV, and as rebar incorporated into large concrete structures such as the bioshield [2]. • During the operational phase the 16 boilers (8 per reactor) were located within structures separate from the reactor buildings, connected by gas ducts. These structures were demolished after shutdown of the station, and the boilers themselves were lowered into cradles in a horizontal position adjacent to the Safestore buildings. One of the boilers was dismantled of disposed of as a demonstration project in the 1990s, but the other 15 remain in situ adjacent to the Safestore buildings. • Work is underway to remove all of these laid down boilers from the site, in order to make the recyclable metal available for recycling during the C&MP period. • The bioshield and the SPV will be dismantled at FSC, so a large quantity of recyclable metal on site will be produced at this time. A proportion of this material will be classified as ILW (activated reactor components in particular) so will likely	1. Magnox Ltd. (2011) Berkeley Site Profile, http://www.magnoxsites.co.uk/our-sites/berkeley 2. Magnox Ltd. (2011) Berkeley Site IWS

	not be suitable for recycling (and will likely be packaged and consigned to the UK GDF), but the remainder will be LLW or exempt, and as such eligible for recycling and reuse within or outwith the nuclear industry [2]. • A large volume of inert concrete and masonry rubble will be produced through demolition activities during C&MP and FSC, and will likely be reused on- or off-site as infill material, or similar [2].	

Noise and Vibration	• The Baseline Noise Survey Data ($L_{Aeq\ 1\ hour}$, dB(A) (Daytime)) (site undergoing decommissioning, 2006) is as follows:
	  • Hamfield Cottages – 51.2
	  • Hamfield Farm – 40.4
	  • Severn Way Footpath – 42.4
	  • Woodlands Farm – 37.6 [1]
	• The criteria for the significance of noise are the proximity of noise sources to the receptors, and the presence of any screening / nature of the ground between the source and the receptor .
	• Noise and vibration originate from a number of sources at Berkeley Site.
	• Since the cessation of generation the profile of noise and vibration from the site has changed, but remains significant due to the nature of decommissioning works.
		Magnox South (2010) Berkeley Site EIA Baseline

Table 2: Environmental Discharge Data for Baseline Years 2008 – 10 for Berkeley Site

In addition to the baseline information, which describes the permanent, semi-permanent and inherent features and impacts of Berkeley Site and its surrounding area, the following table outlines discharge data for the site for particular years, and how these quantities will likely change in future. This is intended to provide a quantitative 'snapshot' of the features of the site and impact that it has (and is anticipated to have in future), in order to supplement the baseline information.

SEA Objective	Environmental Discharge Data	Future Changes in Environmental Discharges	References

Air Quality	• The following describes the composition of radionuclides comprising the total radioactivity released by Berkeley Site to atmosphere in 2008:
	  • 0.00469 TBq of H-3 (23 % of annual limit)
	  • 2.82×10^{-4} TBq of C-14 (5.6 % of annual limit)
	  • 2.73×10^{-7} TBq of beta (1.4 % of annual limit) [1].
	• These 2008 discharges were assessed to result in doses to the critical groups of 22 µSv (from consumption of milk and vegetables, with infants as the most exposed group; 2.2 % of the public dose limit) [d 2].
		• Discharges of radioactivity to the atmosphere decreased significantly upon the cessation of generation.
		• As decommissioning progresses through the C&MP phase the trend will be for discharges to continue to remain steady or decrease.
		• However, certain decommissioning activities such as the as the retrieval, treatment and passivation of wastes may result in short term spikes in aerial discharges of radioactivity. At Berkeley the decommissioning of the Caesium Removal Plant (CRP) and the Active Waste Vault Retrieval (AWVR) projects will be a source of tritium releases, and
			1. FSA (2009) Radioactivity in Food and the Environment 14
			2. Magnox North and South (2008) Monitoring Our Environment

[d] This is a combined figure for Berkeley and Oldbury Sites, as the radiological impact of these stations is assessed together due to their spatial proximity.

		undertaking these works may require a gaseous authorisation variation. • Once the major hazard reduction projects have been completed and the site enters the extended, quiescent C&M phase, aerial discharges of radioactivity will be extremely low. • Dust from demolition and traffic movement may affect the local area during all 3 decommissioning phases. Civil works will be a source of dust. • FSC will result in a temporary increase in aerial discharges of radioactivity. This is because the radioactive reactor cores and associated equipment and infrastructure will be dismantled at this point. Detailed estimates for the discharges from this process have not been made, but will likely comprise particulate as major remaining structures are demolished. • Retrieval of waste packages from site for transfer to the GDF when it becomes available during the C&M phase will result in traffic movements to the site. This retrieval will likely be phased over an extended period of time, so the impact from this is likely to be limited.	
Global Climate Change and Energy	• In 2010 4050 MWh of energy was used at Berkeley Site [1]. • This energy consumption resulted in the indirect emission of 2413 tonnes of CO_2 [1]. • 16.1 tonnes of CO_2 emissions were associated with the transport of waste from site and the use of diesel [1]. • No direct emissions of CO_2 were associated with the site in 2010 [1]. • This gives a gross emission figure of 2413 tonnes of CO_2 [1].	• The site will draw power from the grid and operate plant and vehicles for decommissioning works such as ILW processing and for general domestic needs until the completion of C&MP. • During C&M the site's power usage will be very low, but periodic inspections and maintenance will result in very small spikes in energy usage. • The retrieval of waste packages from the site ILW store during C&M will result in intermittent vehicle movements to and from the site. Energy use and the operation of numerous vehicles will resume on a significant scale during FSC. • However, the types of the vehicles in use and the nature of energy mix in use in the UK at these dates cannot be predicted, thus the associated CO_2 emissions relative to the present are unknown.	1. Magnox Ltd. (2010) Berkeley NSP10
Surface Water Resources and Quality	• The following describes the composition of radionuclides comprising the total radioactivity released by Berkeley Site to the estuarine environment in 2008: • 4.89×10^{-5} TBq of H-3 (<1 % of annual limit) • 3.75×10^{-4} TBq of Cs-137 (<1 % of annual limit) • 0.00125 TBq of other radionuclides (<1 % of annual limit)	• Discharges of aqueous radioactivity decreased significantly upon the cessation of generation and dispatch of all the spent fuel to Sellafield. • As decommissioning progresses through the C&MP phase the trend will be for discharges to continue to decrease.	1. FSA (2009) Radioactivity in Food and the Environment 14 2. Magnox North and South (2008) Monitoring Our

	[1]. • These 2008 discharges were assessed to result in doses to the critical groups of 20 μSv (from external exposure; 2 % of the public dose limit) * [2]. * This is a combined figure for Berkeley and Oldbury Sites, as the FSA assesses the radiological impact of these stations together due to their spatial proximity.	• However, certain decommissioning activities such as the as the retrieval, treatment and passivation of wastes may result in short term spikes in aqueous discharges of radioactivity. • Once the major hazard reduction projects have been completed and the site enters the extended, quiescent C&M phase, aqueous discharges of radioactivity will be very low, but not zero [3]. • It is possible that during the decades-long C&M phase percolating ground- and rainwater may entrain and mobilise activity from contaminated structures such as areas of the Safestore buildings [3]. Routine monitoring and inspection will identify if this is occurring, and intervention will be undertaken in line with the requirements of the C&M Safety Case to ensure that any activity does not migrate off site. • FSC will result in temporary discharge of aqueous radioactivity, primarily from waste treatment as the radioactive reactor cores and associated equipment / infrastructure are dismantled. Detailed estimates for the discharges due to this have not been made, however.	Environment 3. Hunt C. (2011) BPM for Water Management during C&M, Bradwell Site, BRAD/BPM/017 [e]
Waste	• The following waste metrics are for 2010: • Berkeley Site produced 94.5m^3 of LLW from decommissioning activities which has been reused, recycled or disposed of [1]. • 4.5m^3 of LLW metal was recycled, 25m^3 of combustible LLW was treated and 65m^3 of LLW was disposed to LLWR [1]. • 18.6 tonnes of inert waste was produced by the site from decommissioning activities. 100% of this total was recycled [1]. • 1424 tonnes of non-hazardous waste was produced from decommissioning activities [1]. • Both Reactors 1 and 2 are fully defueled [2].	• The anticipated future arisings of radioactive and conventional waste are outlined in Table 4. • Two particular projects will result in quantities of radioactive waste during C&MP: • The AWVR project is major undertaking at Berkeley Site (given that it has a high Safety and Environmental Detriment score). The hazard arises from the large amount of 'exotic' and high-hazard wastes, including materials and items from experimental work at the adjacent laboratories, which was consigned to these vaults in addition to power station operational wastes [2]. • The CRP and shielded area will also be decommissioned in the next few years.	1. Magnox South (2010) Nuclear Industry Sector Plan, Waste Metrics 2. Magnox Ltd. (2011) Berkeley Site IWS

The following table illustrates further parameters that are significant for the site.

Table 3: Additional Data for baseline Years 2008 – 10 for Berkeley Site

[e] This document pertains specifically to Bradwell Site, but the assertions made in this report regarding water management and discharges during the C&M phase are applicable to the whole Magnox fleet.

SEA Objective	Additional Data	Changes in Additional Parameters	References
Surface Water Resources and Quality	• In 2010 the site consumed 12422 m^3 of mains water.	• Water consumption at the site is likely to continue for the duration of the C&MP period at a similar level.	1. Magnox Ltd. (2010) Berkeley NSP10
Economy, Society and Skills	• Berkeley Site is located in rural area of the Stroud District of Gloucestershire. • The major settlements within 10km of Berkeley Site are Berkeley town to the east, Thornbury to the south, and Lydney to the west on the opposite bank of the Severn. There are numerous small villages and settlements in the area in addition to these larger towns [1]. • The population of Stroud District was 111700 during 2010 [2]. • Stroud District had a working population of 60100 during 2010 [2]. • The dominant working sectors in Stroud District during 2008 were Public Administration, Education and Health (10600, 24 %) and Manufacturing / Distribution, Hotels and Restaurants (9400, 21% apiece) • In December 2010, 106 staff, 30 project staff and contractors* were directly employed by Berkeley Site [3]. • Employment in the Electricity, Gas and Water Supply industry in Stroud District was not listed, but the effect of employment at Berkeley Site is likely to be low against the total working population of this district. • In 2010 (23400, 34 %) of the population were employed to NVQ4 level or above. • Stroud District is not subject to Convergence Funding from the EU, or other external assistance [4]. * Contractor numbers are variable, depending on the work being undertaken at the site.	• The number of personnel employed on site will decrease significantly after the completion of C&MP. • Personnel numbers at the site will increase again for the duration of FSC.	1. Ordnance Survey (2011) 1:25,000 Sheet 167, Thornbury, Dursley and Yate 2. Office for National Statistics (2011) Official Labour Market Statistics, available at http://www.nomisweb.co.uk/ 3. Magnox Ltd (2011) Industrial Safety Stats @ December 2010 4. EU (2011) Cohesion Policy 2007 – 13, available at http://ec.europa.eu/regional_policy/atlas2007/index_en.htm
Traffic and Transport	• The Annual Average Daily Traffic (AADT) from all traffic movements on the A38 immediately adjacent to the junction with the B4066 (for access to Berkeley Site) from recent measurements was 7606, of which 419 were Heavy Goods Vehicles (HGV) movements. • The proportion of these total movements that are directly attributable to Berkeley Site is very low, and will continue to be so even during periods of increased work at the site.	• It is anticipated that general traffic and HGV movements will remain steady or increase during the remainder of the C&MP phase at Berkeley Site. • Higher numbers of personnel will be on site due to the requirements of MODP, meaning that the daily commuting movements will likely be maintained. • Movement of materials for potential future major construction or other projects e.g. delivery of DCICs to	Magnox Ltd (2011) Industrial Safety Stats @ December 2010

		site, construction of the site ILW store will generate extra traffic movements, as will movement of demolition waste and other inert material for reuse or conventional disposal. • A similar increase in traffic flows on local roads can be expected for the duration of the FSC phase.	
Health and Safety	• Berkeley Site had 0 reportable Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) incidents during 2010 • The Occupational Safety and Health Administration Total Recordable Incident Rate (OSHA TRIR) for Berkeley Site in 2010 was 0	• The current Health and Safety regime will likely continue to be enforced for the remainder of the C&MP phase. • Comparable Health and Safety standards to the current ones will likely be enforced during the periods of the C&M phase when personnel are on site for waste package retrieval activities, inspections etc. • Comparable Health and Safety standards will likely be enforced during the FSC phase.	

Table 4: Future Radioactive and Conventional Waste Arisings for Berkeley Site [f]

Category of Waste	Time of Arising	Unpackaged Volume (m^3)
LLW	C&MP	3773

[f] Packaged volume is between 20 – 50% greater than the unpackaged volume, depending on the type of container and encapsulant applied (UK Radioactive Waste Inventory, 2007).

	C&M	96
	FSC	17892
ILW	C&MP	1798
	C&M	0
	FSC	3495
Inert, hazardous and non-hazardous conventional	C&MP	64473
	C&M	14282
	FSC	82411

(Berkeley Site IWS, 2011)

Main Environmental Issue for Berkeley Site

Land Quality

- There is an estimated 50m^3 of radioactively contaminated soil at the surface and 140m^3 of subsurface contamination above the Substances of Low Activity exemption level. This radioactive land contamination is associated with:
    - Leaks from the Original Ebb Tide Line
    - The Gravity Active Drain.
    - Contamination of the pond Recirculation Pipe Trench
- Potentially chemically contamination land is associated with:
    - Leaks from hydrocarbon storage tanks, transformers and oil-filled cables
    - PCBs from dismantled site electrical infrastructure
- The installation of 12 new boreholes and refurbishment of 11 previously installed boreholes was carried out in 2008 – 09. Gamma monitoring of these boreholes, for the monitoring and detection of current and future soil and groundwater contamination, is ongoing.

Climate Change and Flooding

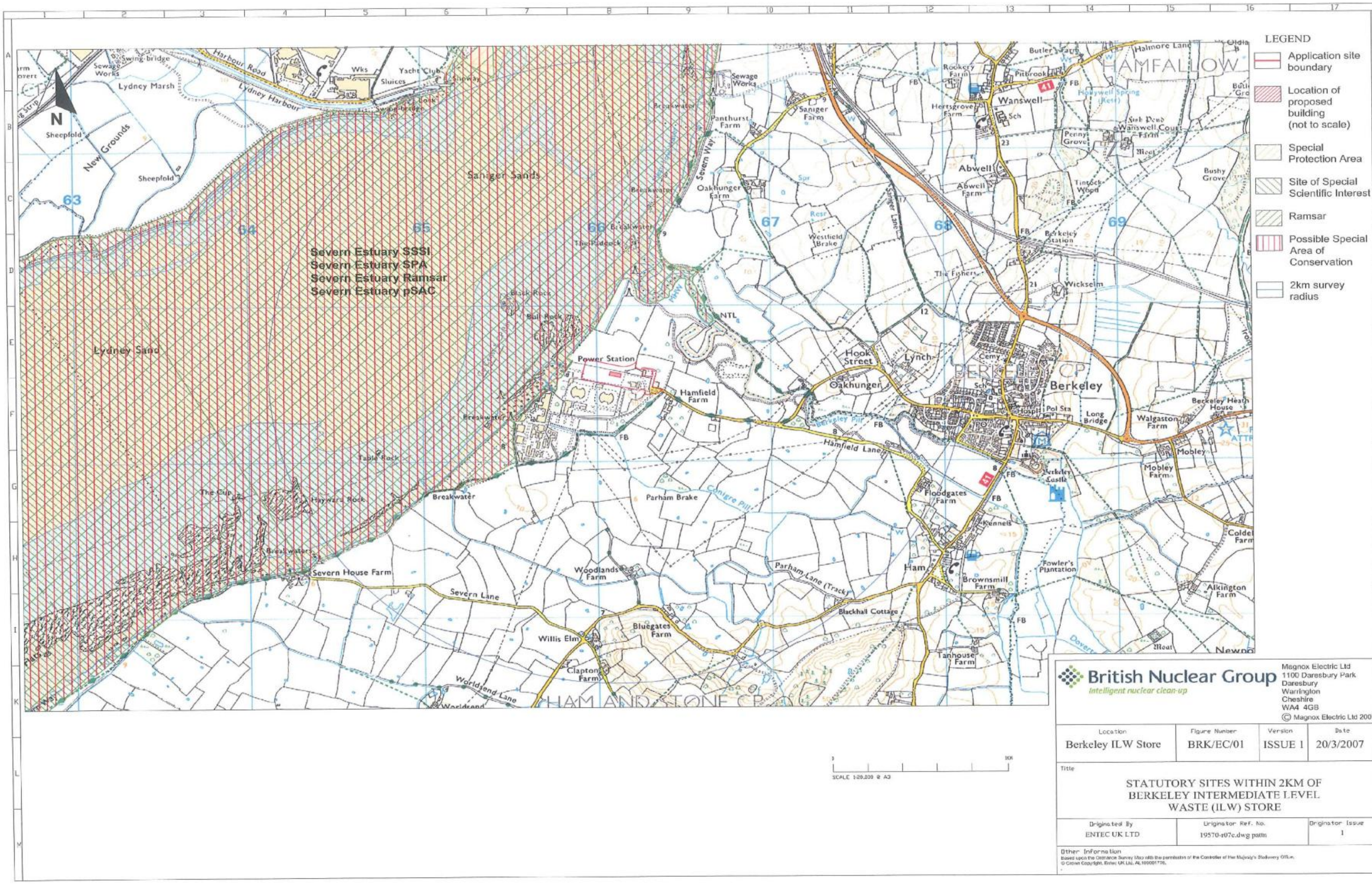
- As with all of the coastal Magnox Sites, an ongoing issue for Berkeley during the C&M phase is the vulnerability of the site to flooding due to raised sea level and more frequent storm surges brought about by the anticipated effects of climate change

in the coming decades. Berkeley Site is situated on the low-lying flood plain of the River Severn, which is highly tidal at that location and historic instances of storm surge flooding (Bristol Channel Flood 1607) means that the site is potentially vulnerable.

- The C&M phase at the site, during which the reactors will be in Safestore, is scheduled to last until 2088, by which approximate time (2090-99) the Intergovernmental Panel on Climate Change has projected that the worst case scenario (emission scenario A1FI) of sea level rise is in the range 0.26 – 0.59m (relative to 1990-99 levels) [1]. The site is situated at an elevation of approximately 10m above Ordnance Datum (mAOD), with the lowest area at 9.75 mAOD. The flood defences, which consist of a continuous embankment along to the shoreline (which curves inland around Berkeley Pill) adjacent to the site, and to the north and south. The minimum height of these defences is 9.72 mAOD [2].
- Any further measures necessary to prevent flooding of the site during the C&M period, such as improvements to the flood defences, will be identified through the Periodic Safety Review. Furthermore, the rise in sea level during the C&M period will be gradual, allowing the advance planning of any necessary mitigation measures.

1. IPCC (2007) Projections of Future Change in Climate, http://www.ipcc.ch/publications_and_data/ar4/wg1/en/spmsspm-projections-of.html
2. Magnox South (2010) Berkeley Site Environmental Impact Assessment Baseline

Figure 1: Statutorily Designated Areas in the Vicinity of Berkeley Site


LEGEND
Application site boundary
Location of proposed building (not to scale)
Special Protection Area
Site of Special Scientific Interest
Ramsar
Possible Special Area of Conservation
2km survey radius
Severn Estuary SSSI
Severn Estuary SPA
Severn Estuary Ramsar
Severn Estuary pSAC
Lydney Sand
Saniger Sands
Power Station
Hamfield Farm
Berkeley
Oakhunger
Hook Street
Wanswell
Severn House Farm
Severn Lane
Parham Brake
Woodlands Farm
Bluegates Farm
Willis Elm
Clapton Farm
Ham
Brownsmill Farm
Blackhall Cottage
Floodgates Farm
Mobley
Walgaston Farm
Berkeley Heath House
Alkington Farm
Wickselm
Berkeley Station
Abwell
Lydney Marsh
Sheepfold
New Grounds
HAM AND STONE CP
BERKELEY CP
HAMFALLOW
British Nuclear Group
Intelligent nuclear clean-up
Magnox Electric Ltd
1100 Daresbury Park
Daresbury
Warrington
Cheshire
WA4 4GB
© Magnox Electric Ltd 2007
Location
Berkeley ILW Store
Figure Number
BRK/EC/01
Version
ISSUE 1
Date
20/3/2007
Title
STATUTORY SITES WITHIN 2KM OF BERKELEY INTERMEDIATE LEVEL WASTE (ILW) STORE
Originated By
ENTEC UK LTD
Originator Ref. No.
19570-r07c.dwg patm
Originator Issue
1
Other Information
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