11 WATER QUALITY

11.1 INTRODUCTION

11.1.1 This chapter has been prepared by Arup and describes the assessment of potential environmental impacts of the Heyford Park development with regards to quality of all forms of water resources (surface and underground water resources). The chapter considers the current baseline conditions relating to the water quality of the site. Based on the understanding of the proposed Heyford Park development the chapter predicts and assesses the potential impacts from both construction and operational activities. Mitigation measures required during the construction and operational phase of the proposed development are recommended in order to ensure the environmental status is not compromised.

11.2 PLANNING POLICY FRAMEWORK

11.2.1 The water environment in the UK is protected by a number of different legal and planning instruments. This is to ensure that proposed and existing activities do not compromise water resources used by populations for public water supply as well as water habitats essential to natural ecosystems.

11.2.2 This section of the chapter considers current planning and legislative context, illustrates the legal and policy instruments that make the assessment necessary and highlights the key guidance material used in its preparation.

11.3 EUROPEAN LEGISLATION

Water Framework Directive

11.3.1 It has been acknowledged that past EU legislation has been irregular and inconsistent with differing and sometimes conflicting methods, definitions and aims. These problems have been compounded by the inconsistent implementation of the various directives throughout the EU. This situation has led to the creation of the Water Framework Directive (WFD)[1].

11.3.2 The aim of the WFD is to take a holistic approach to water management, as water flows through a catchment from lakes, rivers and groundwater towards estuaries and then to the sea. Surface and groundwater are to be considered together, in both qualitative and quantitative terms. Its key objectives are to prevent further deterioration, protect and enhance the status of aquatic ecosystems and associated wetlands, promote sustainable water consumption and contribute to the mitigation of the effects of floods and droughts.

11.3.3 The WFD should have been transposed into the national law of member states by 2003. Each member state has then been given until 2009 to finalise River Basin Management Plans. In preparation of these plans a number of activities are required. These include the characterisation of each river basin, programmed for 2004, establishment of monitoring networks and public consultation to start in 2006, ready for draft documents to be published in 2008, including programme of measures. It is then required for pricing policies to be introduced in 2010 and the programme of measures to be made operational by 2012. The major

milestone is for all environmental objectives to be met by 2015. The first management cycle is due to end in 2021.

11.3.4 The UK is well placed to implement the demands imposed by the WFD. This is because the UK has managed the water environment on a catchment basis since the advent of the National River Authority in 1989, the predecessor to the Environment Agency (EA).

11.3.5 The EA have been given the task of implementing the WFD in the UK and are currently working on co-ordinating efforts so that the environmental objectives can be met by 2015.

11.4 NATIONAL LEGISLATION AND POLICY

11.4.1 The EA was established under the Environment Act (1995)[2]. Under this act the EA have the following duties:

- Contribute to sustainable development;
- Responsible for matters related to flood defences, for rivers demarcated as 'main' and groundwater;
- Compile information related to pollution and follow developments in technology and techniques;
- Implement procedures for the identification, investigation and remediation of contaminated land.

Water Quality and Pollution

11.4.2 The Water Resources Act, 1991 regulates water resource management by specifying that causing or allowing polluting matter to enter 'controlled waters' without permission is a criminal offence. Controlled waters describe rivers, estuaries, coastal waters and groundwater. Accordingly the EA have set discharge limits for particular substances.

11.4.3 In addition, the Groundwater Regulation 1998[3] the Water Act 2003[4] aims to improve water resource management and promote water conservation.

Water Supply

11.4.4 The Water Industry Act 1991[5] ensures that the provision of public water supply and sewerage treatment is adequately regulated.

11.4.5 The Private Water Supplies Regulations[6] address the quality of water from private supplies in England and Wales for drinking, washing, cooking or food protection purposes. The Regulations supplement Chapter III of the Water Industry Act 1991. The responsibility for enforcing the Private Water Supplies Regulations lies with the Local Authorities.

Regional and Local Planning Framework

11.4.6 The regional and local planning framework is explored in detail in Chapter 4.

Other Relevant Guidance material

11.4.7 The EA have produced an extensive series of 'Pollution Prevention Guidelines' (PPG's). These give prescriptive guidance on how to avoid certain types of pollution. The guidelines of relevance to the water environment and the proposed development are;:

- PPG1 – General Guide to the Prevention of Pollution[7]
- PPG03 – Use and Design of Oil Separators in Surface Water Drainage Systems[8]
- PPG5 – Works In, Near or Liable to Affect Watercourses[9]
- PPG6 – Working in Construction or Demolition Sites[10]

11.4.8 As well as EA guidance, there are also other bodies which supply guidance, which inform how the impact of development on the water environment can be limited. One such organisation is the Construction Industry Research and Information Association (CIRIA), who have produced the following relevant publications:

- C630 – Sustainable Water Management in Land Use Planning[11]
- C515 – Groundwater control – Design and Practice[12]
- C609 – Sustainable Drainage Systems. Hydraulic, Structural and Water Quality Advice[13]
- C624 - Development and Flood Risk - Guidance for the Construction Industry' (C624)[14]

11.5 ASSESSMENT APPROACH

11.5.1 The approach to assess the potential impacts upon the water quality throughout the life of the proposed development has been divided in to three stages:

- Demolition of structures and site preparation phase – the demolition of the intended buildings within the redevelopment area
- Construction phase – Construction of new development
- Operational phase – following redevelopment when the site and the facilities are fully functional

11.5.2 The impact of these phases and the activities within them on water quality will be considered without mitigation measures (mitigation is over and above standard practice) and considered with appropriate mitigation measures.

11.5.3 To assess the potential impacts that may occur due to development of the site and to provide data for comparison it is necessary to determine the existing baseline conditions. The water quality baseline conditions have been assessed from both groundwater and surface water.

11.5.4 The baseline figures of the water environment have been ascertained and described by reference to the appropriate existing sources of information.

11.5.5 These include:

- 1:25000 scale Ordnance Survey Map, Sheet 191 Explorer Series
- Geological Maps Published by British Geological Society (BGS)
- Site investigation information on ground conditions from previous intrusive investigations these include:
  - Surface and Groundwater Monitoring at Upper Heyford - Results from Sampling (Aspinwall & Company, October 1999)
  - Surface and Groundwater Monitoring at Upper Heyford - Results from Sampling (Enviros & Aspinwall, November 2000)
  - Surface and Groundwater Monitoring at Upper Heyford - Results from Sampling (Enviros Consulting, May 2003)

- Surface and Groundwater Monitoring at Upper Heyford - Results from Sampling (Enviros Consulting, October 2003)
- Surface and Groundwater Monitoring at Upper Heyford - Results from Sampling (Enviros Consulting, May 2004)
- Surface and Groundwater Monitoring at Upper Heyford - Results from Sampling (Enviros Consulting, October 2004)
- Surface and Groundwater Monitoring at Upper Heyford - Results from Sampling (Enviros Consulting, November 2005)
- RAF Upper Heyford Groundwater Quality Monitoring Assessment – Final Report (Aspinwall & Company, September 1998)
- Former Upper Heyford Environmental Statement (The Barton Wilmore Planning Partnership, June 1999)
- Data held on the EA website such as indicative floodplain mapping, water quality data and groundwater zone maps.

11.5.6 Based on this information it is possible to:

- Identify and locate all sources of water quality contamination to groundwater and surface water;
- Determine the existing water quality status in terms of environmental quality standards (EQS);
- Identify areas of poor water quality;
- Identify groundwater units, aquifers and possible sub-surface flow paths.

Significance Criteria

11.5.7 Assessing the significance of a development on the water environment is not clearly defined. There are no national standards against which to make comparisons for many of the observed effects. It is broadly accepted, however, that the significance and severity of an effect reflects the relationship between two factors:

- The magnitude of an impact (i.e. the actual change taking place to the environment); and
- The values (importance) of the affected resource or receptor and it's sensitivity to the impact.

11.5.8 This approach has been reinforced by the Environmental Impact Assessment Regulations 1999[15], which provide guidance on the eligibility of projects for assessment on the basis of their scale and character, and the sensitivity and status of the location.

11.5.9 The assessment of the magnitude of the expected effects is dependent on the predicted effects of the development on the exposed attributes. The magnitude of the potential impact is completely independent of the value of the attribute affected and therefore gives no indication of significance when considered alone. Qualitative criteria for assessing the magnitude of the expected effect are given in Table WQ1.

Table WQ1: Criteria for Impact Magnitude

Magnitude	Impact
Major	An effect which in isolation could cause a permanent change in the regional water quality

Medium	An effect which could cause permanent local scale changes or temporary regional changes in water quality
Minor	An effect which on its own would have negligible influence but combined with other effects could have temporary changes on a local scale
Negligible	No perceptible changes

11.5.10 The significance of a potential impact is estimated by its magnitude and the importance of the affected attribute. Following the implementation of standard practice mitigation measures, the assessment of the significance of the residual impacts is made using the qualitative criteria outlined in Table WQ2.

Table WQ2: Significance Criteria

Degree of Significance	Impact
Severe	Severe irreversible detrimental effect irreversible reduction in the quality of a potable groundwater or surface water resource of local, regional or national importance. Irreversible or severe detrimental effect on animal or plant populations. Irreversible detrimental effect to nationally important aquatic habitat.
Major	Severe temporary or irreversible reduction in the quality of a potable groundwater or surface water resource of local, regional or national importance. Irreversible or severe temporary detrimental effect on animal or plant populations. Irreversible detrimental effect to nationally important aquatic habitat.
Moderate	Slight or moderate, local-scale reduction in the quality of potable groundwater or surface water resources of local, regional or national importance, reversible with time. Reversible widespread reduction in the quality or quantity of groundwater or surface water resources used for commercial or industrial abstractions. Medium-term, reversible detrimental effect on animal or plant populations. Medium-term, reversible detrimental effect to nationally important aquatic habitat.

Minor	Temporary, slight or moderate detrimental effect in the quality of groundwater or surface water resources that are used for, or have the potential to be used for, commercial or industrial abstractions. Short-term, reversible detrimental effect on animal or plant populations. Short-term, reversible detrimental effect to nationally important aquatic habitat.
Negligible	No perceptible changes

Limitations, Constraints and Assumptions

11.5.11 The chapter is limited by the information that is currently available. The constraints and limitations imposed by the information gathered have been documented.

11.5.12 Detailed construction information and methods for the site are not yet known, this will directly affect the potential impact on groundwater from the construction activities therefore the construction impact assessments undertaken and mitigation proposals provided will be reviewed and revised when construction details and methods are further developed as part of the detailed proposals.

Scoping Report and Consultation

11.5.13 Whilst undertaking completion of this chapter the following organisations have been consulted;:

- The Environment Agency
- Cherwell District Council
- North Oxfordshire Consortium
- Thames Water Ltd

11.6 BASELINE CONDITIONS

11.6.1 By inspection of maps of the area and examining previous reports on the application site and neighbouring developments, the following existing surface water features have been identified. These are shown in figure WQ.A00.

Surface Water Features

11.6.2 The major water features in the vicinity of the Heyford Park development have been described below and are shown in Figure WQ.A00.

Spring Series

11.6.3 A series of springs rise around the plateau surface on which the former airbase is located (Shown in Figure W.A01). The series of springs are a result of a layered aquifer system. There are at least 13 active springs within 1km of the site boundary (20 were identified in 1999). These rise at elevations of between 90 and 125m

AOD, the lower elevation springs generally being to the west of the site. The range in water levels for these springs suggest that they represent discharge points for a number of aquifer layers and that there is no one single water table beneath the site.

11.6.4 Several of the springs (at locations B, K, G, I and L on figure W.A01) are associated with site storm outfall points, some of which are understood to discharge off site via oil interceptors. Historic site drainage plans show some sections of the drains which discharge to the outfalls to be French Drains. These may have been installed to capture springs present in the area prior to construction of the air base, or possibly to locally lower groundwater levels.

11.6.5 Springs C2, D, F, P and R located west of the site, flow a short distance before entering the River Cherwell.

11.6.6 Spring N (north of the site) flows dominantly eastward through the village of Ardley to form the Padbury Brook, which is a tributary of the River Great Ouse.

11.6.7 Springs A, M, T and U on the southern side of the site form the Gallos and Gagle Brooks which are a tributary of the River Ray which eventually enters the River Cherwell.

Rivers and Streams

11.6.8 The surface water quality is classified using the River Ecosystem (RE) Classification System which is a regulation set by the Water Resources Act 1991[16]. The (RE classification) system is based on the river's ability to support various fish populations. From these regulations River Quality Objectives (RQO's) are set of which there are four determining the standard of the biological, chemical, nutrient and aesthetic at monitoring points within the water course.

11.6.9 The assessment of the water quality is clarified by employing the General Quality Assessment (GQA) Scheme this classifies the water quality of the river or canal so that it is comparable with other rivers and canals. There are GQA schemes to assess the biology, chemical, nutrients and aesthetic quality of the river or canal.

River Cherwell

11.6.10 The River Cherwell is 1km at its nearest point west of the Heyford Park site (Shown on Figure W.A00). The River Cherwell is a north-south flowing river that is a tributary of the River Thames. DEFRA[17] have identified the River Cherwell as part of the Upper Thames Tributaries Environmentally Sensitive Area (ESA) which is an area that has been identified to have a rich and diverse mix of landscape features, wildlife and ecological value, and a wide range of historical features, that combine to form a strong riverine character. DEFRA's classification of the area as an ESA aims to maintain and often to enhance the conservation, landscape and historical value of the key environmental features of an area.

Oxford Canal

11.6.11 The Oxford Canal runs adjacent to the River Cherwell (only separated by the embankment and a footpath at their closest positions) in the Cherwell valley and it connects to the Coventry Canal. The Oxford Canal is

approximately 1km to the west of the Heyford Park site. The Oxford Canal is an important link between the Midlands to the Thames and to London. The canal is a crucial asset in terms of amenity and recreational value.

Padbury Brook

11.6.12 The Padbury Brook flows in a west-east direction towards Buckingham where it becomes a tributary of the River Great Ouse.

Gallos Brook

11.6.13 The Gallos Brook is a north-south flowing brook starting from the southern boundary of Heyford Park until it enters the River Ray which is a tributary of the River Cherwell.

Gagle Brook

11.6.14 The Gagle Brook is a south-east flowing brook that flows in to the River Ray and eventually the River Cherwell.

River Ray

11.6.15 The River Ray is a south–west flowing river flowing 32km to its confluence to the River Cherwell. The River Ray joins the River Cherwell at Islip it is the largest tributary .The Gallos Brook and the Gagle Brook are both tributaries of the River Ray.

11.6.16 Table WQ3 shows the overall RE target grade and the GQA grades of the monitored rivers in the surrounding vicinity of the site.

Table WQ3: The River Ecosystem Classifications for the water courses in the vicinity of RAF Upper Heyford Source: www.environment-agency.gov.uk

Location	RE River Quality Classification	Equivalent Biology GQA Grade	Equivalent Chemistry GQA Grade	Equivalent Nitrate GQA Grade	Equivalent Phosphates GQA Grade	River Quality Objectives Compliance
River Cherwell	3 - Fair. High class coarse fish species	A - Very Good	Overall B – Good Ammonia – A Dissolved Oxygen – A Biochemical Oxygen Demand - B	6 - Very High	5 - Very High	Compliant
Padbury Brook	3 - Fair. High class coarse fish species	A - Very Good	Overall B – Good Ammonia – A Dissolved Oxygen – A Biochemical Oxygen Demand – B	4 - Moderate	6 -Excessively High	Compliant
Gallos Brook	3 - Fair. High class coarse fish species	C - Fairly Good	Overall B – Good Ammonia – A Dissolved Oxygen – B Biochemical Oxygen Demand – C	4 - Moderate	4 - High	Compliant
River Ray	4 - Fair. Low class coarse fish	B - Good	Overall D – Good Ammonia – A Dissolved Oxygen – D Biochemical Oxygen Demand – B	6 - Very High	4 - High	Compliant

11.6.17 The Environment Agency Website has awarded three of the surface water bodies a RE classification of 3 (fair) this means the water is suitable to support an ecosystem of high-class coarse fish. The River Ray has the RE objective of 4 which is fair/low which means the ecosystem can support a low class of coarse fish. The water quality of the River Ray does not consistently comply with the RE standards and the RQO's. From the Environment Agency's monitoring, in 2002 the results showed that most river reaches met their RQO's. The

River Ray is thought to have a problem with the percentage of dissolved oxygen due to the discharge from Bicester sewage treatment works into the confluence of Langford Brook.

11.6.18 The River Cherwell has faced problems with failing its chemical RQO's due to low flows affecting the dissolved oxygen levels.

Minor Water Features

11.6.19 In addition to the aforementioned water features there are a small number of ponds and pools located off site. The Crowfoot pond north of the site (NGR SP 5263 2737), Trow Pool (NGR SP 5466 2492) and several smaller ponds and pools around Ardley and on local farms.

Other Surface Water Features

11.6.20 Ardley Cutting and Quarry to the east of Heyford Park, has been designated by Natural England as a SSSI site. This means it is an area of national nature or geological conservation importance notified by the Statutory Conservation Agency under the Wildlife and Countryside Act 1981. Ardley Cutting and Quarry is of particular geological importance for its exposures of Jurassic rocks and it has biological interest associated with limestone grassland, scrub, and ancient woodland and wetland habitats. Natural England has commented on the quarry face and the effect of surface water on the quarry face. The quarry face is clearly exposed in the area closest to the road. Agricultural runoff seems to be gathering in the pool at the base of the exposed face. There are no surface water courses flowing in to Ardley Cutting and Quarry, just runoff from higher ground.

11.6.21 There are two tributaries for the Padbury Brook which cut across the Ardley Cutting SSSI site. The sources of the water for the tributaries are both springs (B and N on figure W.A01) which flow to the Padbury Brook then into the river Great Ouse.

11.6.22 The River Cherwell and the certain areas of land surrounding the river have been designated Environmentally Sensitive Areas (ESAs). ESAs were introduced under Section 18 of the 1986 Agriculture Act to help safeguard areas where the landscape, wildlife or historic interest is of national importance; because it was recognised that agriculture can have a major influence on the conservation and enhancement of the landscape, wildlife and historical features. The ESA scheme is voluntary and farmers who wish to participate agree to enter into an l0-year management agreement with DEFRA. They are paid according to the amount and type of land they enter into the scheme. Since no two ESAs are the same, the land management practices which farmers in the scheme must follow are tailored to suit the needs of each particular ESA. Many of the management practices aim to reduce the amount of nitrates entering the local water bodies and these areas will be sensitive to any changes in practice.

11.6.23 The Environment Agency (EA) has a number of monitoring points along the main brooks and rivers in the area. The water quality from most of the surrounding surface water bodies has been obtained from the EA website[18].

11.6.24 Kennel Copse located to the northeast of the site is a UK biodiversity action plan (UK BAP) priority habitat of lowland mixed deciduous woodland. This means the site is managed to conserve, protect and enhance the biological diversity meaning this area could be sensitive to any change in water quality that drains into the BAP area.

11.6.25 The quality of the spring water issued from all the springs identified in figure W.A01 has been regularly tested since 1997 following the land quality assessment at RAF Upper Heyford. Samples are regularly taken from springs B, C2, D, G, I, M, P, R, T and U. The samples collected are tested to determine water temperature, pH, electrical conductivity, dissolved oxygen, redox and turbidity.

11.6.26 Aspinwall & Company[19] surface water analysis did not identify any determinand greater than the limit of detection in any of the ten spring/outfall locations that were sampled.

Groundwater Quality

11.6.27 The groundwater quality of the site has been monitored every six months since 1997. Samples have been taken from boreholes 1 to 7 that are shown on figure W.A01 to investigate the extent of groundwater pollution. The samples are tested for the following compounds;

- Extractable Petroleum hydrocarbons (EPH)
- Gasoline range organics (GRO)
- Benzene
- Toluene
- Ethyl benzene
- Total xylene (BTEX)
- Methyltertiary butyl ether (MTBE)

11.6.28 Groundwater sampling has been undertaken to investigate the extent of any contamination beneath the site. Aspinwall & Company[20] concluded from their analysis that their main area of concern was that contamination could arise from the Petrol, Oil and Lubricant (POL) system. This is an approximately 13km long pipe network with 27 tanks (above and below ground) which is believed to be filled with approximately 8 million US gallons of water.

11.6.29 Enviros Consulting[21] results of the groundwater monitoring at Heyford Park boreholes 1 – 6 do not have concentrations greater than those acceptable without mitigation of any of the compounds that have been tested for (outlined above).

11.6.30 The only groundwater contamination which has been identified is located at borehole 7 and the area surrounding this including samples taken from boreholes 9, 10, and 11 (extra boreholes drilled around Borehole 7). The samples tested in this area all had elevated levels of extractable petroleum hydrocarbons (EPH), however the concentrations measured are below concentrations where mitigation measures need to be employed immediately meaning these concentrations are deemed acceptable without immediate action.

11.6.31 Contamination at borehole 7 has been detected previously in October 2003 by Enviros Consulting[22] and this repeat in the elevated concentrations would suggest that the results are not anomalous results.

Petrol, Oil and Lubricant System

11.6.32 The petrol, oil and lubricant (POL) system that serves Heyford Park is an above and below ground system (Shown in Figure WQ.01) with extensive infrastructure of pipework, pumps, valves, storage tanks and aircraft refuelling ancillaries across the airbase. The POL system was originally connected to the national fuel grid, although the connection has been decommissioned. It is reported in the Buchanan Report[23] that the system has been cleaned and filled with approximately 8 million US gallons of water. The specification of the cleaning or certificates of completion are not available.

11.6.33 Specific and detailed testing on this system will be undertaken as part of the detailed proposals for the site and from this, an appropriate remediation strategy will be formulated and implemented if required as part of the development. All stages of the monitoring and implementation will be undertaken in agreement and liaison with the Environment Agency and all other appropriate bodies.

11.7 IMPACT ASSESSMENT

11.7.1 The following provides a description of the key potentially significant impacts of the proposed Heyford Park development may cause with regard to the water quality of the site. Impacts have been predicted and assessed assuming simultaneous development of all facilities and therefore may be considered to represent the 'worst case' scenario. Operational impacts are also described.

Construction Phase

11.7.2 During construction there is a potential risk of groundwater pollution from spillages or leakages of construction materials or machinery fuels and lubricating oils. Any contaminants that are spilt or leak onto the ground could potentially migrate into the aquifers and affect groundwater quality. The risk to groundwater quality would be greatest when working in open excavations, and where any protective superficial deposits will have been removed. The risk of contamination incidents significantly affecting groundwater quality will be highest when excavations are deepest and before basal slabs are cast.

11.7.3 Excavation and construction activities could generate dust, which could be washed into the ground and enter groundwater by surface run-off and infiltration. This might potentially cause a local increase in turbidity in the groundwater.

11.7.4 There is the potential for any existing water supply or sewer networks to leak due to physical damage to pipe work, either during excavation or due to the weight of construction traffic. Any leakage resulting from such events could have a moderate significant adverse impact upon groundwater quality and the magnitude would be minor.

11.7.5 Disposal of water from the dewatering process may cause pollution of surface waters. Given that disposal will be undertaken with consultation of statutory agencies and in accordance with appropriate licences and permits, the significance of the impact is likely to be negligible with a negligible magnitude.

11.7.6 Excavations may disturb sediment, which can be transported and deposited within water bodies and watercourse across and downstream of the site. Additional sediment inputs may reduce visibility and light penetration, bury habitats and reduce dissolved oxygen, ultimately harming aquatic life. Given the temporary nature of the impact and the sensitivity of aquatic species in the area surrounding Heyford Park, this would be expected to result in an impact of minor adverse significance and minor magnitude.

11.7.7 Construction activities may introduce the potential risk of surface water and groundwater pollution from spillages or leakages of construction related materials. Spilt fuel and oils may potentially migrate into watercourses and groundwater, either through direct infiltration or via mixing with rainwater run-off. A significant spillage incident, located close to sensitive receivers would result in an impact of major adverse significance. Impacts of less significant spillages and more isolated receptors would result in moderate adverse and minor adverse impacts. The impact caused by residual spillages and contamination throughout the construction phase would be expected to be negligible and would be of minor magnitude.

Operational Phase

11.7.8 Residual and ongoing release of contaminants to the surface water environment may be expected as a result of increased human intervention and vehicular activity across previously undeveloped areas. The impact of this is potentially of minor adverse significance and of minor magnitude.

11.8 MITIGATION MEASURES

Construction Phase

11.8.1 A Code of Construction Practice (CoCP) will describe a range of measures to mitigate potential impacts of construction activities and be developed in accordance with all relevant legislation for the protection of surface water and groundwater prior to commencement of site activities. Despite remediation, the construction phase drainage system will also have to include pollution control measures, this may include the creation of temporary sedimentation tanks and sediment fences. These will control movement of dust, sediment and surface water effluent, bearing in mind the presence of leachable pollutants within the ground that could contribute to contamination of surface and groundwater sources. The residual impact is considered to be of minor adverse significance and of minor magnitude.

11.8.2 The CoCP during construction and any remediation of contaminated land will ensure good practice and emphasise environmental protection. The CoCP will be adhered to by all contractors and will include:

- Site health and safety provisions and training, including those for workers, visitors and surrounding people;
- Locations of site construction compounds;
- Methods to limit unauthorised access to areas of excavation;
- Measures for handling and storage of contaminating materials including fuels in line with current EA guidance and good practice;
- Regulations for transport and disposal of materials, including contaminated soil;
- Approved sources of inert fill for use in earthworks; and,
- Appropriate measures for management of dust, contaminated dust, drainage and rainwater run-off.

11.8.3 Chemicals and fuel oils will be stored in a bunded area within the site compound. This area will also be used for refuelling of the vehicles. The bund will be designed according to CIRIA guidelines on Construction of Bunds for Oil Storage Tanks and the design would be agreed with the Environment Agency prior to construction. The area would be secured to prevent unauthorised access or vandalism and fuel tanks would be locked when unattended. The bunded area would be constructed to ensure that no infiltration into the ground could occur and that all drainage would be collected and passed through both a petrol interceptor (fitted with a stop valve) and silt trap prior to discharge. Maintenance, including regular inspection, of the bunded area would be undertaken.

11.8.4 All site personnel would be trained in both normal and emergency procedures in order to reduce the likelihood and minimise the impact of a pollution incident.

11.8.5 Pollution control equipment would not only be stored in the site compound, but also on machinery, as appropriate. Drip trays would also be carried and used on all machinery.

11.8.6 All repair and maintenance work to machinery would be carried out off site, where practicable. Only emergency repairs would be carried out on site.

11.8.7 These procedures should reduce the risk of a large spillage and ensure that the significance of the impact of day-to-day activities is negligible and the magnitude of the impacts is negligible.

Operational Measures

11.8.8 Contamination of watercourses by day day-to to-day releases of contaminants and sediments will be mitigated against by employing petrol interceptors and sediment traps within the design of the surface drainage system designed for the site. The installation of these will ensure that the impact of the development is negligible and of negligible magnitude.

11.8.9 Services at risk from shallow groundwater would be located above ground or at very shallow depths to prevent ingress of water. The residual impact will be of negligible significance and of negligible magnitude.

Residual Effects

11.8.10 Based on the full implementation of mitigation measures proposed above, it is expected that there would be no significant residual impacts.

11.9 SUMMARY

11.9.1 The Environmental Statement Chapter describes the assessment of potential environmental impacts from the Heyford Park masterplan with regards to the quality of all forms of water resources (surface and underground water resources). The chapter considers:

- The current baseline conditions;
- The impacts caused during construction;

- The impacts caused by the operational phase;
- The impacts of the construction phase with mitigation measures in place;
- The impacts of the operational phase with mitigation measures in place.

11.9.2 The assessment considers the significance and magnitude of the impacts. The impacts of construction and activity the operational phase were assessed to be of minor significance and of minor magnitude. The assessment of the construction and operational phase considering mitigation measures concluded that there would be no significant residual impacts from the development.

REFERENCES

[1]European Commission, 2000. Water Framework Directive, Official Journal of the European Commission. December 2000. Brussels

[2]Environment Act (1995). Her Majesty's Stationery Office. (HMSO).

[3]Groundwater Regulations, 1998. Her Majesty's Stationery Office (HMSO)

[4]HMSO, 2003. Water Act, Her Majesty's Stationery Office. (HMSO).

[5]HMSO, 1991. Water Industry Act, Her Majesty's Stationery Office

[6]HMSO, 1992. Private Water Supplies Regulations, 1992, Statutory Instrument 1991 No. 2790, Her Majesty's Stationery Office

[7]PPG1 – General Guide to the Prevention of Pollution.

[8]PPG03 – Use and Design of Oil Separators in Surface Water Drainage Systems

[9]PPG5 – Works In, Near or Liable to Affect Watercourses.

[10]PPG06 – Working in Construction or Demolition Sites

[11]CIRIA (2004). C630 - Sustainable Water Management in Land Use Planning.

[12]CIRIA (2000). C515 - Groundwater Control - Design and Practice.

[13]CIRIA (2004). C609 - Sustainable Drainage Systems. Hydraulic, Structural and Water Quality Advice

[14]CIRIA (2004). C624 - Development and Flood Risk – Guidance to the Construction Industry.

[15]DETR (1999). The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations. HMSO, London.

[16]Water Resources Act 1991, Her Majesty's Stationery Office. Crown Copyright.

[17]DEFRA Website http://www.defra.gov.uk/erdp/schemes/esas/stage4/upper.htm

[18]www.environment-agency.gov.uk

[19]Aspinwall & Company, October 1999. Surface and groundwater Monitoring at Upper Heyford – Results from Sampling.

[20]Aspinwall & Company, October 1999. Surface and groundwater monitoring at Upper Heyford – Results from Sampling.

[21]Surface and Groundwater Monitoring at Upper Heyford - Results from Sampling (Enviros Consulting, November 2005)

[22]Surface and Groundwater Monitoring at Upper Heyford - Results from Sampling (Enviros Consulting, October 2003)

[23]Buchanan Consulting Engineers, June 1998. RAF Upper Heyford, Fuel and Facilities and Associated Pipelines Proposals For Remediation.

[24]P A Mason, H J Amies, G Sangarapillai et al, (1997) Construction of Bunds for Oil Storage Tanks, CIRIA R163