# APPENDIX 4 TECHNICAL RISK AND OPPORTUNITY REGISTER SCHEDULE

| Project Name: | HDV - Northumberland Park | Assessment Area | | Type | |
|---|---|---|---|---|---|
| Site: | Site Wide - Master Register | H&S | S | Des | Design |
| Facilitator: | Conor McCormack | Environment | E | Con | Construction |
| Stage: | Bid | Programme | P | User | Operations / Maintenance |
| Date of Review: | 14-Sep-16 | Quality / Reputation | Q | Demo | Decommissioning |

| Risk / Opportunity Level | | | Version No: | 1.0 |
|---|---|---|---|---|
| High Risk / Opp | P1 | P1 | | |
| Medium Risk / Opp | P2 | P2 | | |
| Low Risk / Opp | P3 | P3 | | |

| Status |
|---|
| Open |
| Closed |

| Item No. | Risk or Opp | Description | Ass't Area | Type | Probability | Impact | Risk / Opp Level | Proposed Solution to Remove / Mitigate the Risk | Owner | Date | Action Taken (if different to proposed solution) | Owner | Date | Residual Risk (construction, operation or maintenance periods) | Status |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **AVAILABILITY OF EXISTING INFORMATION (AV)** | | | | | | | | | | | | | |
| A.1 | Risk | Survey information to date is limited and is at strategic desktop level. | E | Des | High | High | P1 | Full Survey Strategy to be developed. | DPM | | | | | | Open |
| A.2 | Risk | Title information is limited. The exact setting out of boundaries and third party rights (wayleaves, easements, rights of way etc) that may have an impact on design approach are not fully understood. | E | Des | High | High | P1 | Due diligence on title information is being undertaken | Legal | | | | | | Open |
| | | **EXISTING SITE CONSTRAINTS AND HAZARDS (EX)** | | | | | | | | | | | | | |
| E.1 | Risk | Vegetation relatively abundant and mature for an urban location; currently provides opportunities for biodiversity and delivery of ecosystem services including air purification and mental well-being. Significant development of the scale and scope envisaged could potentially lead to the loss of significant areas of vegetation and green space | E | Con | High | Medium | P2 | Green infrastructure at both ground level and at roof level should be incorporated to ensure delivery of enhanced and additional green space. Detailed analysis of the quantity of habitat to be lost should be set against a likely design to estimate net losses or gains. This should could be based upon the DEFRA offsetting methodology. A detailed ecology survey for NP will be required in the next phase. | DPM | | | | | | |
| E.2 | Risk | Although there are large numbers of trees across the site, no significant wooded areas exist. The majority of trees are in good condition and some larger specimens have the potential to be subject to TPOs. | E | Con | High | High | P1 | A detailed arboricultural report will be required, including proper identification of TPO Tree's. Where possible valuable tree's whould be incorporated into the design. A strategy for protecting retained tree's will also be required during delivery phases. | DPM | | | | | | |
| E.3 | Risk | Sitewide - numerous suitable structures and habitat areas exist for bats suggesting that they may be present in moderate to high numbers considering the urban setting | E | Con | High | High | P1 | Bat surveys will be required for the phases and included as part of the overall detailed ecological survey. Where Bats are found to be present the appropriate mitigation will be required including application for the relevant licences. Broadly the site will need to provide habitat and roosting features for this species group as well as carful consideration of public realm lighting design | | | | | | | |
| E.4 | Risk | Presence of protected species (nesting birds) within the site affecting development works. High numbers of common nesting birds constraining programme of works | | | High | Medium | P2 | Site Clearance works may need to occur during autumn/ winter period; supervision would be required for site clearance activities if undertaken during nesting season. Further detailed survey required. | | | | | | | |
| E.5 | Risk | Local and Borough Wide Air Quality is Poor. Haringey Council declared the whole borough an AQMA for the pollutants of nitrogen dioxide (NO2) and particulate matter (PM10) in July 2001 Traffic and emissions from buildings (heating and power) are the main contributors to poor air quality in the borough. Levels of PM10 are thought to meet the UK's air quality objectives, but there is no current monitoring Levels of NO2 at urban background sites now meet the UK's air quality objective. | E | Des | High | High | P1 | Air Quality Assessment required for Planning and to ensure necessary design measures incorporated into scheme. Development to be designed for walking and cycling, well-connected to existing public transport (so no increase in public transport emissions) and use of and ultra-low emission vehicles e.g. ULEV car clubs, as described in the Haringey Air Quality Action Plan. | DPM | | | | | Negative impact on local and wider air quality with wider impact on Health and Well being | |
| E.6 | Risk | Local and Borough Wide Air Quality is Poor. At roadside sites the objective is generally not met. | | | Medium | Medium | P2 | The GLA's SPGs set requirements on emission limits for local plant and for development emissions to meet the "air quality neutral" benchmarks. Construction and logistics planning to carefully consider air quality issues. Construction and Environmental Managment Plan will need to be developed to address issues of air quality. | | | | | | | |
| E.7 | Risk | Possible presence of archaeological remains within the site. Three Areas of Archaeological Interest intersect the site. | E | | Medium | High | P1 | Archaeological assessment required as part of a planning application inlcuidng early liaison with relevant Archaeological agencies | DPM | | | | | Time and cost. | |
| E.8 | Risk | Four listed buildings present, which may be damaged as a result of ground movements induced by the proposed development. | | | Medium | Medium | P2 | Buildings to be retained. Ensure works and temporary works are adequately designed to minimise risk, and monitor structure during works when working in proximity of these buildings. | | | | | | | |
| E.9 | Risk | WWII Bomb strikes: 3 recorded within the site, many in the area (possible targets: Railway, Gas Holders, and Factories close to site) | | | Medium | High | P1 | Whilst the extent of Post war development minimises UXO risk a further detailed desktop study will be required to identify the appropriate measures for mitigation which may include magnetometer surveys and pile probing. | | | | | | Risk of explosions and death. | |
| E.10 | Risk | The eastern end of Northumberland Park is located in Flood Zone 2 and is located in the Vicinity of Moselle Brook and Pymmes Brook. | E | Con | Medium | High | P1 | A site specific Flood Risk Assessment will be required as part of a planning application. | DPM | | | | | | |
| E.11 | Risk | The site is partially within a 'critical drainage area'. | E | Des | High | High | P1 | Existing local drainage infrastructure is undersized for extreme events, resulting in localised surface flooding.A site specific Flood Risk Assessment will be required as part of a planning application. LBH policy requires stricter controls on surface water discharge The SWMP stipulates that developments in Critical Drainage Areas greater than 0.5ha are "required to reduce runoff to that of a predevelopment greenfield run-off rate" (i.e. restricting flow to typically between 2 and 6 litres/second/ha). This will require large volumes levels of SuDS/attenuation | DPM | | | | | | |
| E.12 | Risk | The site is partially within 'National Reservoir Inundation Flood Zone' which means that no sleeping accommodation is permitted in basements. | E | Des | Medium | Medium | P2 | The SFRA stipulates that a) no sleeping accommodation is permitted in basements, b) internal access to upper levels from basements must be provided, and c) egress from the development to an area outside the mapped flood outline must be provided. A site specific Flood Risk Assessment will be required as part of a planning application. | DPM | | | | | | |

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| Item No. | Risk or Opp | Description | Ass't Area | Type | Probability | Impact | Risk / Opp Level | Proposed Solution to Remove / Mitigate the Risk | Owner | Date | Action Taken (if different to proposed solution) | | | Residual Risk (construction, operation or maintenance periods) | Status |
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| | | | | | | | | | | | | Owner | Date | | |
| E.13 | Risk | Localised potential sources of contamination associated with historical industrial activities in relatively small areas of the site. Much of the site does not show significantly contaminative previous use. The contamination sources are listed in order of potential significance (highest to lowest):<br>1. Existing petrol filling station (south east of the site, between Northumberland Park and Willoughby Lane)<br>2. Historical industry inc. dye works and cooperage in north west of the site)<br>3. Historical backfilled ponds (locally in the north east, central and west of site)<br>4.Small existing dry cleaners (south of site adjacent to Park Lane)<br>5. Historical nurseries (north and central area of the site adjacent to Northumberland Park, and in the south west adjacent to Park Lane and Worcester Avenue).<br>6. Small existing electricity substations (Sitewide)<br><br>The site has undergone at least two phases of development and the site has been subject to bomb damage during World War II. Made Ground is anticipated to be present, which may include a range of contaminants including asbestos. Made Ground is also a potential source of ground gas. | E | Des | High | High | P1 | Consider the potential financial implications of the contamination during site acquisition and effect on value (for instance HCA guide on remediation costs 2015)<br>The following actions would be necessary:<br>i. Site characterisation (desk study and ground investigation)<br>ii. Contamination risk assessment<br>iii. Remediation (if required)<br>iv. Verification of any remediation.<br>A suitable thickness of clean cover soils are likely to be required for any soft landscaping/garden areas. The London Clay is anticipated from surface which will restrict the mobilisation of contamination protecting deeper groundwater in the Chalk. Contamination will be limited to Made Ground (near surface). Ground investigation will be necessary to characterise the contamination status of the site but may occur at a later stages depending on phasing. Strategice Ground investigation works will be required to meet planning and EIA requirements and to develop an appropriate remediation strategy. | DPM | | | | | Significant health risks in construction and operations. | |
| E.14 | Risk | Industrial activities close to the site have included: engineering works; electrical engineering; electrical fittings manufacture; metal works; furniture manufacture; and other related activities an dthere may be incidences of contamination of soil and/or groundwater from off-site sources. The site is underlain by River Terrace Deposits (RTD), which is designated as a secondary A aquifer by the Environment Agency. The RTD is anticipated from surface in the north west of the site and beneath Enfield Silt (unproductive strata) over the remainder of the site. Environmentally sensitive receptors (groundwater in aquifer) | E | Des | Medium | High | P1 | Enhanced remediation may be required to treat groundwater in the secondary aquifer if contamination identified. If groundwater contamination is identified and requires intervention then this can add significant cost to development. Investigation of RTD will be required suring ground investigation syrvey work. | DPM | | | | | | |
| E.15 | Risk | Approximately one third of the site, in the south east, is located within a SPZ 1 (inner catchment). The remainder of the site is within a SPZ 2 (outer catchment), with the exception of the north western area. An active Thames Water abstraction borehole is located approximately 1km to the south east of the site. The abstraction is anticipated to be from the Chalk principal aquifer at depth. Historical abstraction boreholes for potable water are located from approximately 300m of site to the south east. Potential for enhanced scrutiny from the regulator to the development within SPZ. EA has specific policy on disturbance and risk to SPZ1 and may object to specific planning applications.<br>There may be restriction on piling and other deep disturbance (ground source cooling for instance) within the principal aquifer in a SPZ1 | E | Des | Medium | Medium | P2 | The site is underlain by a layer of London Clay (unproductive strata) which will restrict mobilisation of contamination and protect the Chalk principal aquifer at depth. It is considered unlikely that investigation of the deep aquifer for contamination would be required. Even if deep piling is considered through a significant thickness of London Clay this is less significant and may not require investigation. A foundation works risk assessment is likely to be required. Identify if any old wells exist on site which may require decommissioning. | | | | | | | |
| E.16 | Risk | Heave - Stress changes within excavations that penetrate the London Clay leading to differential movement and pressure build up beneath slabs | E | Des | Medium | Medium | P2 | Place heave board beneath slabs, or use a load balance approach to minimise stress changes beneath slabs. Soil testing as part of the ground investigation to identify heave potential | DPM | | | | | | |
| E.17 | | Historical gravel or silt pits present on site where Brickearth has been historically removed from Enfield Silt deposits. Deep deposits of Made Ground may be present where pits were excavated and subsequently backfilled | E | Des | High | High | P1 | Further site investigations reqired to identify areas of particular concern. | | | | | | | |
| E.18 | | | | | | | | | | | | | | | |
| E.19 | | | | | | | | | | | | | | | |
| E.20 | | | | | | | | | | | | | | | |
| E.21 | Risk | Softening in the London Clay. Culverted watercourse (Moselle Brook) below site. Water present in this location may have caused localised softening of the ground. The material in this area may be less stiff than elsewhere, leading to increased movements under loading. There may also still be groundwater present. | E | Des | Medium | Medium | P2 | Site investigation to target the area and identify the extent of any seepage or softening in the area. Material may need to be excavated and replaced or piled through to avoid differential ground movements. | DPM | | | | | | |
| E.22 | | Damage to the Piccadilly line tunnelslocated under High Road, close to eastern site boundary. Groundworks could potentially cause strains in the tunnel lining leading to cracking or damage. | E | Con | Medium | High | P1 | Design the structure and construction sequence giving due consideration to the tunnels. Impact or vibrating piling techniques not likely to be praticable. Liaison with TFL, London Underground to ensure proposed construction methodologies are acceptable/appropriate. Obtain the as built details for the tunnel. Undertake a condition survey prior to and following construction works. Monitor the tunnel during works where required. | DPM | | | | | | |
| E.23 | Risk | Buried obstructions from previous uses of the site - Sitewide. Greatest risks where buildings are known to have been constructed and subsequently demolished, or where buried features (i.e. tanks) may not have been removed. Damage to construction equipment, and increased amount of work required to clear the site prior to development with impact on time and cost. | E | Con | High | High | P1 | Probing/trial pits in advance of works and site investigation works targeted to identify obstructions. Excavating obstructions and filling of voids where required. | DPM | | | | | Ground Risk | |
| E.24 | Risk | Presence of unidentified tunnels. Some 'protected' infrastructure tunnels (e.g. MoD or Post Office tunnels) are not reported in Groundsure reports. Tunnels may impose constraints on new foundation arrangements or construction sequences. | E | Con | Low | High | P2 | Liaise with MoD, Post Office and other key authorities to establish whether any such tunnels exist within the site. | DPM | | | | | Ground Risk | |
| E.25 | Risk | Requirement to connect into proposed District energy centre provided as aprt of the High Road West Development porposals. New district heating distribution network to be installed. Delay of delivery of DEN may require temporary energy solutions. | E | Des | Medium | High | P1 | Liaison with HRW team early and to establish roles and responsibilities, obligations, programme etc and to allow mitigation measures to be devloped in goos time to ensure programme can be met. DEN piework installation to be intalled in coordinatin with other infrastructure. | | | | | | | |

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| E.26 | Risk | Utilties - Limited available capacity in local electricity network. Local utility networks may be at/near capacity and may be unable to meet anticipated demands of the development. Multiple adjacent developments may compound problems. Off-site reinforcement may be required (with developer contributing to costs) | E | Des | High | High | P1 | UKPN has listed capacities of each existing substation on site but would need to do further investigation to indicate potential loads that would be released through demolition of existing properties.<br>Substations existing on the site are fed from two Primary Substations – Tottenham Grid and Bruce Grove (refer to attached for approx. location).<br>Tottenham Grid Primary Substation currently has approximately 8.5MVA available capacity with the potential to increase capacity if required.<br>Bruce Grove Primary Substation has minimal available capacity currently however it is undergoing an upgrade programme which may provide available capacity of 2-3MVA within 2017.<br>Based on a proposed development UKPN initial thoughts indicated that likely demands potentially could be accommodated by a combination of released loads through demolition and available capacity at Tottenham Grid Primary Substation.<br>The nearby Penshurst Rd substation has been decommissions but has potential to be re-commissioned if additional power demand is needed within the area. | | | | | | | |
| E.27 | | 5no. existing UKPN LV substations causing constraints for new development as they may not provide the necessary power requirements in the necessary configuration. Some or all sub-stations may need to be relocated or recomfigured at developers expense. | | | | | | Detailed engagement with UKPN will need to continue as part of woder technical stakeholder engagement and a strategy for maintenance of exisiting supplies developed with them. | | | | | | | |
| E.28 | Risk | Utilities - Existing services beneath buildings causing constraints for new development. There are existing utilities that pass directly under building footprints (i.e. not within highway corridors) throughout the site and including telecoms, foul and surface water. Diversion and/or abandonment of existing services may be necessary (with developer contributing to costs) as build over is not favoured. | E | Des | High | High | P1 | Discussions with utility providers required to establish which services no longer have an ongoing purpose and may be abandoned. Detailed infrstructure phasing strategy to be developed. Catscans, trial pits, hand excavation etc will be required at appropriate phases to properly service locations. | DPM | | | | | | |
| E.29 | Risk | 1no. Existing mobile phone mast causing constraints for new development Roof of building east of Northumberland Grove. | E | Des | High | High | P1 | Early discussion with mobile phone providers to establish opportunities for relocation nearby | DPM | | | | | | |
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| | | **PROPOSED PROJECT SITE (PS)** | | | | | | | | | | | | | |
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| | | **DESIGN ISSUES (DS) - Overall Scheme** | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| **Item No.** | | **DESIGN OPPORTUNITIES (OP) - Overall Scheme**<br>*The following have been identified as potential opportunities in the design to reduce risks through the design, construction and operational phases.* | **Ass't Area** | **Type** | **Probability** | **Impact** | **Opp Level** *(High = Good Low = Poor)* | ***Proposed Solution to realise Opportunity*** | **Owner** | **Date** | **Action Taken** (if different to proposed solution) | **Owner** | **Date** | **Residual Opportunity** (If change in design introduces risks etc) | **Status** |
| O.1 | Opp | The scale and scope of regereation in Northumberland Park together with the proposal to utilise a decentralised energy network provides a significant opportunoty for the new development to significantly enhance Air Quality in this part of the Borough and. | E | Des | Medium | Medium | P2 | All aspects of design to address Air Quality e.g.:<br>Encorage sustainalbe transport (Cycling, walking, ULEV vehicles for car club etc).<br>Energy Strategy to address air quality.<br>Planting<br>Use of materials<br>Seek ways of bettering GLA SPG's emission limits to meet "air quality neutral" benchmark | DPM | | | | | | Open |
| O.3 | Opp | The Site is loctaed near to a number of Green Spaces including the Lee Valley SPA?Ramsar and Tottenham Hale to Northumberland Park Railsides SINC. Other green spaces such as Bruce Grove are also proximate. There is an opportunity to create better ecological and biodiversity linkages across these assets. | E | Con | High | Medium | P2 | Specify planting for new scheme to maximise benefit to local biodiversity and to enhance links with existing green spaces. Consider measures such as:<br>Habitat Corridors<br>Green/Brown Roofs<br>Native Planting<br>SUDS<br>Bird and Bat boxes<br>Pocket Parks | DPM | | | | | | |