AtkinsRéalis

Volume 3, Appendix 11.1 – Ground Conditions and Contamination context

Manchester City Council

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# FORMER CENTRAL RETAIL PARK – THE PARK

AtkinsRéalis - Sensitive / Sensible

# Notice

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# 1. Definitions of probability and consequence for land contamination

**Table 1-1 Risk Estimation - classification of probability/likelihood**

| Classification | Definition of the probability of harm / pollution occurring |
|---|---|
| High Likelihood | The pollutant linkage exists and it is very likely to result in harm/pollution in the short term, and/or will almost inevitably result in harm/pollution in the long term, and/or there is current evidence of harm/pollution. Likelihood is defined as more likely than not and meets the definition of 'significant possibility' under Part 2A of EPA 1990. |
| Likely | The source, pathway and receptor exist for the pollutant linkage and it is probable that harm/pollution will occur. Circumstances are such that harm/pollution is not inevitable, but possible in the short term and likely over the long term. Likelihood is defined as reasonably possible and meets the definition of 'significant possibility' under Part 2A of EPA 1990. |
| Low Likelihood | The source, pathway and receptor exist and it is possible that harm/pollution could occur. Circumstances are such that harm/pollution is by no means certain in the long term and less likely in the short term. |
| Unlikely | The source, pathway and receptor exist for the pollutant linkage but it is improbable that harm/pollution will occur even in the long term. |

**Table 1-2 Risk Estimation - classification of consequence**

| Classification | Definition of consequence |
|---|---|
| **Human Health Receptors – Site end use or other more sensitive receptor** | |
| Severe | Acute damage to human health based on the effects on the critical human health receptor. Concentrations of contaminants above appropriate site specific assessment criteria. Harm meets definition of 'significant harm' under Part 2A of EPA 1990. |
| Medium | Chronic damage to human health based on the effects on the critical human health receptor. Concentrations of contaminants above appropriate site specific assessment criteria. Harm meets definition of 'significant harm' under Part 2A of EPA 1990. |
| Mild | No appreciable impact on human health based on the potential effects on the critical human health receptor. Concentrations of contaminants above generic assessment criteria but below appropriate site specific assessment criteria. |
| Minor | No appreciable impact on human health based on the effects on the critical human health receptor. Concentrations of contaminants below appropriate generic assessment criteria. |
| **Human Health Receptors – Site construction workers** | |
| Severe | Exposure to hazardous substances resulting in a reportable death, major injury, 3-day injury or illness/disease under RIDDOR. |
| Medium | Exposure to hazardous substances resulting in a dangerous occurrence reportable under RIDDOR. Exposure to hazardous substances resulting in exceedance of a workplace exposure limit. |
| Mild | Exposure to hazardous substances resulting in limited effects such as headache, dizziness, nausea. Exposures below the workplace exposure limits. Not reportable under RIDDOR. |
| Minor | Minor exposure to hazardous substance resulting in no appreciable ill health effects. |
| **Controlled Water Receptors** | |
| Severe | Pollution of a Principal aquifer within a source protection zone or potable supply characterised by a breach of drinking water standards.<br>Pollution of a surface water course characterised by a breach of an EQS at a statutory monitoring location or resulting in a change in GQA grade of river reach. Discharge of a List I or List II substance to groundwater. Pollution meets Part 2A definition. |
| Medium | Pollution of a Principal aquifer outside a source protection zone or a Secondary A aquifer characterised by a breach of drinking water standards.<br>Pollution of an industrial groundwater abstraction or irrigation supply that impairs its function. Substantial pollution but insufficient to result in a change in the GQA grade of river reach. Pollution meets Part 2A definition. |
| Mild | Low levels of pollution of a Principal aquifer outside a source protection zone or an industrial abstraction, or pollution of a Secondary aquifer.<br>Low levels of pollution insufficient to result in a change in the GQA grade of river reach, pollution of a surface water course without a quality classification. |
| Minor | No appreciable pollution, or pollution of a low sensitivity receptor such as a non-aquifer or a surface water course without a quality classification |
| **Property Receptors – Buildings, Foundations and Services** | |

| Classification | Definition of consequence |
|---|---|
| Severe | Catastrophic damage to buildings, such as explosion. Catastrophic failure of foundations and services. Substantial damage to a Scheduled Monument significantly impairing the by reason of which the monument is scheduled. Harm meets definition of 'significant harm' under Part 2A of EPA 1990. |
| Medium | Substantial damage to buildings and foundations rendering the structures unsafe. Substantial damage to services impairing their function. Significant damage to a Scheduled Monument significantly impairing the reason of which the monument is scheduled. Harm meets definition of 'significant harm' under Part 2A of EPA 1990. |
| Mild | Significant damage to buildings and foundations but not resulting in them being unsafe for occupation. Damage to services but not sufficient to impair their function. Damage to a Scheduled Monument but no significant impairment to the reason of which the monument is scheduled. |
| Minor | Easily repairable damage to buildings, foundations and services |
| **Property Receptors – Crops and Livestock and Ecological Receptors** | |
| Severe | Substantial loss in the value of crops or domestically-grown produce. Death to livestock, domesticated animals or wild animals subject to shooting or fishing rights. A short-term risk to a particular ecosystem or organism forming part of such ecosystem. Harm meets definition of 'significant harm' within the Part 2A Contaminated Land Statutory Guidance. |
| Medium | Substantial diminution in yield (over 20% reduction) of crops or domestically-grown produce. Serious disease or other serious physical damage to livestock, domesticated animals or wild animals subject to shooting or fishing rights. A significant change in a particular ecosystem, or organism forming part of such ecosystem. Harm meets definition of 'significant harm' within the Part 2A Contaminated Land Statutory Guidance. |
| Mild | Harm to crops but not resulting in a substantial loss in value or diminution in yield (less than 20% reduction). Limited harm in terms of disease or other physical damage to ecosystems, livestock, domesticated animals or wild animals subject to shooting or fishing rights. |
| Minor | No appreciable harm, or harm to a low sensitivity receptor. |

**Table 1-3 Definition of risk**

| Classification | Definition of risk |
|---|---|
| Very High Risk | There is a high probability that severe harm may arise to a designated receptor or there is evidence that severe harm to a designated receptor is currently happening. This risk is likely to result in a substantial liability. Urgent investigation (if not already undertaken) and remediation are likely to be required. |
| High Risk | Harm is likely to arise to a designated receptor. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not already undertaken) is required and remedial works may be necessary in the short term and are likely over the longer term. |
| Moderate Risk | It is possible that harm may arise to a designated receptor. It is either relatively unlikely that any such harm will be severe, or if any harm were to occur, it is more likely that the harm will be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term. |
| Low Risk | It is possible that harm will arise to a designated receptor, but it is likely that this harm will be mild. Further investigation is not necessarily required, and should be considered to confirm that there is no unanticipated contamination present. |
| Very Low risk | The possibility of harm to the designated receptor is either not plausible or, if the possibility of harm is plausible, risk is considered to be very unlikely with attenuation along the exposure pathway. Further investigation is not necessarily required, and may be considered to confirm that there is no unanticipated contamination present. |

# 2. Conceptual site models

**Table 2-1 Construction phase conceptual site model**

| Source Description<br>*Potential Contaminants* | Receptor | Pathway | Consequence | Probability / Likelihood | Risk Category | Comments |
|---|---|---|---|---|---|---|
| **On-site**<br>Unidentified contamination from historical industrial land uses on-site<br>Potential introduction of new sources during construction | **Human Health**<br>**On-site:**<br>Pedestrians / trespassers<br>Site visitors | Direct contact / ingestion of contaminants within Made Ground / soils or groundwater | Minor | Low | Very low | Construction activities, such as earthworks, may expose the soil therefore increasing the risk of direct contact/ingestion of contaminants, inhalation of vapours and dust.<br>Construction of the proposed basement will require the removal of Made Ground, removing a potential source of contamination.<br>No exceedances of the human health screening criteria for a commercial land use were recorded during the e3p ground investigation. |
| | | Inhalation of organic vapours from Made Ground / soils, soil derived dust, and groundwater | Minor | Low | Very low | |
| | | Inhalation of dust and fibres from Made Ground / soils, soil derived dust | Minor | Low | Very low | |
| | | Inhalation of ground gas | Minor | Low | Very low | Ground investigations undertaken by e3p indicate a CS1, very low hazard potential. |
| | | Inhalation of asbestos fibres | Severe | Low | Moderate / Low | No asbestos was identified during the during the e3p.<br>Based on the historical land uses of the Site and as Made Ground is present, the potential presence of asbestos cannot be completely dismissed. Construction activities, such as earthworks or piling, may disturb any potential asbestos fibres present. |
| | **Human Health**<br>**Off-site:**<br>Members of the public, neighbouring residents and commercial workers | Direct contact / ingestion of contaminants within soils derived dust or groundwater migrating off-site | Minor | Unlikely | Very low | Construction activities, such as earthworks, could result in increased dust generation which may be blown off-site. However, no exceedances of the human health screening criteria for a commercial land use were recorded during the e3p ground investigations.<br>A CEMP will be produced to ensure reduction of risks during the construction phase. |
| | | Inhalation of organic vapours and asbestos fibres migrating off-site | Minor | Low | Very low | |
| | | Inhalation of ground gases migrating off-site | Minor | Unlikely | Very low | The degradation of contaminants in the Made Ground within the Site may result in ground gas production. Ground investigations undertaken by e3p indicate a CS1, very low hazard potential. |

| Source Description<br>*Potential Contaminants* | Receptor | Pathway | Consequence | Probability / Likelihood | Risk Category | Comments |
|---|---|---|---|---|---|---|
| | **Groundwater**<br>**On-site:**<br>Superficial Secondary Undifferentiated Aquifer<br>Bedrock Principal Aquifer<br>**Off-site:**<br>Superficial Secondary Undifferentiated Aquifer<br>Bedrock Principal and Secondary B Aquifer | Leaching/dissolution from contaminated soils, followed by vertical migration<br>Lateral migration of contaminants in groundwater<br>Migration via preferential pathways e.g. existing drainage. | Mild | Low | Low | The superficial deposits are identified as a Secondary Undifferentiated aquifer due to the variability of the rock type. The bedrock deposits are identified as a Principal aquifer which indicates the strata has the potential to provide significant quantities of drinking water.<br>As Made Ground is present across which may be exposed following breaking out of hardstanding, there is potential for leaching of contaminants into groundwater. Contaminants may be disturbed and mobilised further by activities such as earthworks, piling, installation of drainage and other below ground services, as well as potential for introduction of new pathways as a result of such activities.<br>Superficial deposits across the Site comprise of predominantly clay, reducing the likelihood of contaminants within the Made Ground percolating down to the principal bedrock aquifer.<br>No exceedances in groundwater samples from the Made Ground, taken by e3p, were identified when screened against Drinking Water Standards. . |
| | **Surface Water**<br>**Off-site**<br>Rochdale Canal<br>Islington Wharf Marina<br>Ashton Canal | Leaching/dissolution from contaminated soils, followed by vertical migration<br>Surface water run-off mobile contaminants<br>Migration via preferential pathways e.g. existing drainage. | Minor | Low | Very low | During construction activities, there is potential for increased soil erosion and surface water runoff with a high sediment load, which may impact nearby surface waters, as a result of earthworks.<br>However, as there are limited leachate exceedances, the presence of cohesive deposits are likely to inhibit the vertical and lateral migration of contaminants present within shallow groundwater.<br>The CEMP will mitigate against contaminant migration to the surface water bodies. |
| **Off-site**<br>Disturbed ground, Made Ground and worked ground<br>Historical discharges to surface water<br>Historical industrial land uses adjacent to the Site as defined in paragraph **Error! Reference source not found.**. | **Human Health**<br>**On-site:**<br>Pedestrians / trespassers<br>Site visitors | Ingestion and inhalation of contaminants within Made Ground / soils, soil derived dust, vapours, fibres or groundwater migrating onto Site | Minor | Low | Very low | Although the likelihood is low, there are a number of historical and current developments adjacent to the Site where contamination may have migrated from. |
| | | Inhalation ground gas migrating onto Site | Minor | Unlikely | Very low | Potential for migration of gases to migrate on to the Site, if sufficient Made Ground is present.<br>Gases generated by off-site sources have the potential to accumulate within enclosed/confined spaces that are established during the construction phase. |
| | **Groundwater**<br>**On-site:**<br>Superficial Secondary Undifferentiated Aquifer<br>Bedrock Principal Aquifer | Leaching/dissolution from contaminated soils, followed by migration<br>Lateral migration of contaminants in groundwater<br>Migration via preferential pathways e.g. drainage. | Mild | Low | Low | The potential for contamination off-site to migrate to the Site in the underlying aquifers and impact groundwater on-site is low given the limited exceedances recorded in the groundwater beneath the Site. |

**Table 2-2 Operational phase conceptual site model**

| Source<br>*Potential Contaminants* | Receptor | Pathway | Consequence | Probability / Likelihood | Risk Category | Comments |
|---|---|---|---|---|---|---|
| **On-site**<br>Unidentified contamination from historical industrial land uses on-site<br><br>Potential introduction of new sources during operation. | **Human Health**<br>**On-site:**<br>Site visitors<br>Future site users | Direct contact / ingestion of contaminants within Made Ground / soils or groundwater | Minor | Unlikely | Very low | No exceedances of the human health screening criteria for a commercial land use were recorded during the e3p ground investigation, therefore no sources have been identified.<br>Any remediation required will be completion prior to operation.<br>There is potential for unidentified sources to be present onsite and the introduction of new sources on-site which may present a risk to human health. These will be managed by appropriate embedded mitigation and The future conditions of the Site, pre-construction, will consist largely of bare earth and some small areas of hardstanding in the dog-leg of the Site along Great Ancoats Street,. and landscaping, thereby breaking the PCL to humans.<br>Material used for soft landscaping will undergo the appropriate chemical testing to ensure no exceedances of the human health GACs prior to placement. Areas of landscaping will be covered by clean cover, therefore the SPR linkage will not be present. |
| | | Inhalation of organic vapours from Made Ground / soils, soil derived dust, and groundwater | Minor | Unlikely | Very low | |
| | | Inhalation of dust and fibres from Made Ground / soils, soil derived dust | Minor | Unlikely | Very low | |
| | | Inhalation of ground gas | Minor | Unlikely | Very low | Ground investigations undertaken by e3p indicate a CS1, very low hazard potential.<br>The proposed development will not include enclosed spaces where gasses may accumulate. gases are likely to dissipate into the atmosphere. |
| | | Inhalation of asbestos fibres | Severe | Unlikely | Moderate / low | Any soils containing asbestos encountered during the construction stage will be remediated during construction. The future conditions of the Site, pre-construction, will consist largely of bare earth and some small areas of hardstanding in the dog-leg of the Site along Great Ancoats Street, therefore breaking the pathway.<br>Landscaping will involve placement of clean material therefore breaking the pathway. |
| | **Human Health**<br>**Off-site:**<br>Members of the public, neighbouring residents and commercial workers | Direct contact / ingestion of contaminants within soils derived dust or groundwater migrating off-site | Minor | Unlikely | Very low | No exceedances of the human health screening criteria for a commercial land use were recorded during the e3p ground investigation, therefore no sources have been identified.<br>Any remediation required will be completion prior to operation.<br>However, there is potential for unidentified sources to be present onsite and the introduction of new sources on-site which may present a risk to human health. These will be managed by appropriate embedded mitigation The future conditions of the Site, pre-construction, will consist largely of bare earth and some small areas of hardstanding in the dog-leg of the Site along Great Ancoats Street. , therefore reducing the likelihood for wind blown dust, fibres and vapours to reach off-site receptors.<br>Material used for soft landscaping will undergo the appropriate chemical testing to ensure no exceedances of the human health GACs prior to placement. Areas of landscaping will be covered by clean cover, therefore reducing the risk of contaminants carried in windblown dust. |
| | | Inhalation of organic vapours and asbestos fibres migrating off-site | Minor | Unlikely | Very low | |

| Source<br>*Potential Contaminants* | Receptor | Pathway | Consequence | Probability / Likelihood | Risk Category | Comments |
|---|---|---|---|---|---|---|
| | | Inhalation of ground gases migrating off-site | Minor | Unlikely | Very low | Ground investigations undertaken by e3p indicate a CS1, very low hazard potential. It is considered unlikely that significant concentrations of gases would migrate off-site. |
| | **Groundwater**<br>**On-site:**<br>Superficial Secondary Undifferentiated Aquifer<br>Bedrock Principal Aquifer<br>**Off-site:**<br>Superficial Secondary Undifferentiated Aquifer<br>Bedrock Principal and Secondary B Aquifer | Leaching/dissolution from contaminated soils, followed by vertical migration<br>Lateral migration of contaminants in groundwater.<br>Migration via preferential pathways e.g. existing drainage. | Mild | Low | Low | The superficial deposits are identified as a secondary undifferentiated aquifer due to the variability of the rock type. The bedrock deposits are identified as a Principal aquifer which indicates the strata has the potential to provide significant quantities of drinking water.<br>As Made Ground is present across there is potential for leaching of contaminants into groundwater. The future conditions of the Site, pre-construction, will consist largely of bare earth and some small areas of hardstanding in the dog-leg of the Site along Great Ancoats Street. which reduces the risk of contaminant mobilisation via percolation. Furthermore, the superficial deposits across the Site predominantly comprise clay, further reducing the risk of contaminant migration into the principal bedrock aquifer.<br>No exceedances in groundwater samples from the Made Ground, taken by e3p, were identified when screened against Drinking Water Standards. A slight exceedance of arsenic was reported in a sample taken in the bedrock.<br>Any remediation required will be completion prior to operation. |
| | **Surface Water**<br>**Off-site**<br>Rochdale Canal<br>Islington Wharf Marina<br>Ashton Canal | Leaching/dissolution from contaminated soils, followed by vertical migration<br>Surface water run-off mobile contaminants<br>Migration via preferential pathways e.g. existing drainage. | Minor | Low | Very low | The future conditions of the Site, pre-construction, will consist largely of bare earth and some small areas of hardstanding in the dog-leg of the Site along Great Ancoats Street., reducing the risk of mobilising contaminants by surface water run-off.<br>A remediation required will be completion prior to operation and the presence of cohesive deposits are likely to inhibit the vertical and lateral migration of contaminants present within shallow groundwater. |
| **Off-site**<br>Disturbed ground, Made Ground and worked ground<br>Historical discharges to groundwater and surface water<br>Historical industrial land uses adjacent to the Site as defined in paragraph **Error! Reference source not found.**. | **Human Health**<br>**On-site:**<br>Pedestrians / trespassers<br>Site visitors | Ingestion and inhalation of contaminants within Made Ground / soils, soil derived dust, vapours, fibres or groundwater migrating onto Site | Minor | Low | Very low | Although the likelihood is low, there are a number of historical and current developments adjacent to the Site where contamination may migrate from during the operational phase. |
| | | Inhalation ground gas migrating onto Site | Minor | Unlikely | Very low | Potential for migration of gases to migrate on to the Site throughout the operational phase, if sufficient Made Ground is present.<br>The proposed development does not comprise enclosed spaces where gases generated by offsite sources have the potential to accumulate onsite. |
| | **Groundwater**<br>**On-site:**<br>Superficial Secondary Undifferentiated Aquifer<br>Bedrock Principal Aquifer | Leaching/dissolution from contaminated soils, followed by vertical migration<br>Lateral migration of contaminants in groundwater.<br>Migration via preferential pathways e.g. drainage. | Mild | Low | Low | Potential for contamination off-site to migrate to the Site in the underlying aquifers and impact groundwater on-site is low given the limited exceedances recorded in the groundwater beneath the Site. |

**Table 2-3 - Impact assessment table (with embedded mitigation)**

| Source Description<br>*Potential Contaminants* | Receptor | Pathway | Baseline | | | Construction | | | | Operation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Consequence | Probability / Likelihood | Risk Category | Consequence | Probability / Likelihood | Risk Category | Classification of Effect | Consequence | Probability / Likelihood | Risk Category | Classification of Effect |
| **On-site**<br>Unidentified contamination from historical industrial land uses on-site | **Human Health**<br>**On-site:** Pedestrians / trespassers / Site Visitor | Direct contact / ingestion of contaminants within Made Ground / soils or groundwater<br>Inhalation of organic vapours, ground gases, dust from Made Ground / soils, soil derived dust, and groundwater | Minor | Unlikely | Very low | Minor | Low | Very low | Negligible | Receptor Not Present | | | Negligible[1] |
| | | Inhalation of asbestos fibres | Severe | Unlikely | Moderate / low | Severe | Low | Moderate / low | Negligible | | | | |
| | **Human Health**<br>**On-site:** Future site users / Stie visitors | Direct contact / ingestion of contaminants within Made Ground / soils or groundwater<br>Inhalation of organic vapours, ground gases dust and fibres from Made Ground / soils, soil derived dust and groundwater | Receptor Not Present | | | Receptor Not Present | | | Negligible | Minor | Unlikely | Very low | Negligible[2] |
| | | Inhalation of asbestos fibres | | | | | | | | Severe | Unlikely | Moderate / low | Negligible |
| | **Human Health**<br>**Off- site:**<br>Members of the public, neighbouring residents and commercial workers | Direct contact / ingestion of contaminants within soils derived dust or groundwater migrating off-site<br>Inhalation of ground gases migrating off-site | Minor | Unlikely | Very low | Minor | Unlikely | Very low | Negligible | Minor | Unlikely | Very low | Negligible |
| | | Inhalation of organic vapours and asbestos fibres migrating off-site | Minor | Unlikely | Very low | Minor | Low | Very low | Negligible | Minor | Unlikely | Very low | Negligible |
| | **Groundwater**<br>**On-site& Off-site:**<br>Superficial Secondary Undifferentiated Aquifer<br>Bedrock Principal Aquifer and Bedrock | Leaching/dissolution from contaminated soils, followed by vertical migration<br>Lateral migration of contaminants in groundwater.<br>Migration via preferential pathways e.g. existing and new drainage. | Mild | Low | Low | Mild | Low | Low | Negligible | Mild | Low | Low | Negligible |

[1] Removal of this receptor at operational stage automatically triggers a minor beneficial effect. However, professional judgement has been exercised and this effect has been reduced to negligible.

[2] Introduction of this receptor at operational stage automatically triggers a minor adverse effect. However, professional judgement has been exercised and this effect has been reduced to negligible.

| Source Description<br>*Potential Contaminants* | Receptor | Pathway | Baseline | | | Construction | | | | Operation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Consequence | Probability / Likelihood | Risk Category | Consequence | Probability / Likelihood | Risk Category | Classification of Effect | Consequence | Probability / Likelihood | Risk Category | Classification of Effect |
| | Secondary B Aquifer (offsite) | | | | | | | | | | | | |
| | **Surface Water**<br>**Off-site**<br>Rochdale Canal<br>Islington Wharf Marina<br>Ashton Canal | Leaching/dissolution from contaminated soils, followed by vertical migration<br>Surface water run-off mobile contaminant<br>Migration via preferential pathways e.g. existing and new drainage. | Minor | Low | Very low | Minor | Low | Very low | Negligible | Minor | Low | Very low | Negligible |
| **Off-site**<br>Disturbed ground, Made Ground and worked ground adjacent to the Site<br>Historical discharges to groundwater and surface water<br>Historical industrial land uses adjacent to the Site as defined in paragraph **Error! Reference source not found.**. | **Human Health**<br>**On-site:**<br>Pedestrians / trespassers<br>Site visitors | Ingestion and inhalation of contaminants within Made Ground / soils, soil derived dust, vapours, fibres or groundwater<br>Inhalation ground gas | Minor<br>Minor | Low<br>Unlikely | Very low<br>Very low | Minor<br>Minor | Low<br>Unlikely | Very low<br>Very low | Negligible<br>Negligible | Minor<br>Minor | Low<br>Unlikely | Very low<br>Very low | Negligible<br>Negligible |
| | **Groundwater**<br>**On-site:**<br>Superficial Secondary Undifferentiated Aquifer<br>Bedrock Principal Aquifer | Leaching/dissolution from contaminated soils, followed by vertical migration<br>Lateral migration of contaminants in groundwater.<br>Migration via preferential pathways e.g. existing and new drainage. | Mild | Low | Low | Mild | Low | Low | Negligible | Mild | Low | Low | Negligible |

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