

Merton College

GEO-ENVIRONMENTAL DESK STUDY

Land West of Yarnton



70048642-R01 REV 4 SEPTEMBER 2021

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Land West of Yarnton

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CONTENTS

11.

| 1 | INTRODUCTION | 1 |
|---|--|----|
| 2 | SITE INFORMATION | 3 |
| 3 | HISTORICAL LAND USE | 6 |
| 4 | REGULATORY INFORMATION AND CONSULTATION | 7 |
| 5 | ENVIRONMENTAL SETTING | 9 |
| 6 | RISK ASSESSMENT | 12 |
| 7 | CONCLUSIONS AND RECOMMENDATIONS | 16 |
| | | |

APPENDICES

Appendix A - Drawings

Appendix B - Site Photographs

Appendix C - Envirocheck Report

EXECUTIVE SUMMARY

Merton College has instructed WSP UK Limited (WSP) to undertake a Geo-environmental Desk Study to support a proposed local plan allocation for a residential development, and to assess potential geo-environmental constraints and opportunities at the land west of Yarnton, Oxfordshire ('the site').

Our assessment is based on the PR9 development layout, as proposed in Drawing DE234_02, (September 2020) and is included in **Appendix A**. The development comprises residential dwellings, school playing pitches, amenity space and public open space.

The site currently comprises undeveloped agricultural land, and a site walkover was undertaken by WSP during October 2018.

A review of historical maps revealed little development since the earliest available mapping in 1876. Historically, within 500m of the site, there has been significant residential development directly to the East (Yarnton village). Gravel pits are to the east and agricultural farmland abuts the site to the north, west and south.

Published geological mapping indicates superficial deposits to be present locally comprising sand and gravel. Bedrock across the site is recorded to be Oxford Clay Formation and West Walton Formation (undifferentiated). Bedrock is designated as Unproductive Strata, whereas superficial deposits are designated as Secondary A Aquifers.

Regulatory consultation has found no discharge consents, historic contamination events or records of contaminated land for the site. No evidence was found of recorded abstraction licences on site or within 500m. The site does not lie within 1km of any SSSI sites. The site does not lie within a Coal Authority reporting area, nor an area of increased Radon probability.

The site is considered to pose a low risk in respect of contaminated land and geotechnical risks. It is recommended that a ground investigation is carried out to attain more certainty in these assessments and obtain site-specific data to support any planning application for the site, earthworks and foundation design.

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1 INTRODUCTION

1.1 AUTHORISATION

Merton College instructed WSP UK Limited (WSP) to undertake a Geo-environmental Desk Study in September 2018. The works have been requested to support the proposed Local Plan allocation of land at Yarnton, Oxfordshire (the site) for residential development. This report assesses the potential geo-environmental constraints and opportunities to the proposed development.

1.2 PROPOSED DEVELOPMENT

Our assessment is based on the PR9 development layout, as proposed in Drawing DE234_02, (September 2020) and is included in **Appendix A**. The development comprises residential dwellings, school playing pitches, amenity space and public open space.

1.3 OBJECTIVES AND SCOPE OF WORKS

The objective of this assessment is to provide information on anticipated ground conditions and potential contamination at the site to support:

- A preliminary assessment of potential risks to human health, controlled waters, ecology and built environment receptors;
- Design of a ground investigation; and
- A preliminary assessment of potential geotechnical constraints.

The scope of this report comprises the following:

- A review of existing readily available public information;
- A review of third party data obtained within an Envirocheck Report;
- A review of relevant regulatory databases and consultation with relevant regulatory authorities;
- A site walkover survey of accessible areas;
- Development of a preliminary conceptual site model and contaminated land risk assessment;
- A preliminary geotechnical risk assessment; and,
- Recommendations for further work, focused on planning and development requirements.

1.4 SOURCES OF INFORMATION

Table 1 - Publicly Available Information

| Source | Report |
|-----------------------|---|
| Public Information | British Geological Society (BGS) 1:50,000 Series geological map Sheet 236 'Witney [Oxford]' (Solid & Drift edition) BGS 'Geology of Britain' online viewer accessed on 19 October 2018. Zetica 'Regional unexploded bomb risk map' website accessed 19 October 2018. Cherwell District Council web based Planning Portal, accessed 19 October 2018. Public Health England UK Maps of Radon website, accessed 19 October 2018. Defra's Multi-Agency Geographic Information for the Countryside MAGIC website, accessed 19 October 2018. |
| Notes: | This report contains British Geological Survey materials ©NERC 2018 and Environment Agency information ©Environment Agency and database right. |

1.5 LIMITATIONS

This report is addressed to and may be relied upon by Merton College. It may not be relied upon or transferred to any other parties without the express written agreement of WSP. No responsibility will be accepted where this report is used, either in its entirety or in part, by any other party. WSP cannot be held liable for third party information.

2 SITE INFORMATION

2.1 SITE DETAILS

The site description and site location details are summarised as Table 2 below:

Table 2 - Site Details

| Item | Details |
|------------------|--|
| Grid Reference | 446990, 212760 |
| Size | 99 hectares (approximately) |
| Site Location | The site lies to the north and west of Yarnton, Oxfordshire. |
| Current Site Use | The site is currently undeveloped agricultural land. |

Figure 1 - Site Location and Proposed Site Allocation Boundary



WSP September 2021 Page 3 of 16

2.2 SITE RECONNAISSANCE

An unaccompanied walkover survey of accessible parts of the site was undertaken by WSP personnel on 25 October 2018.

2.2.1 SITE DESCRIPTION

The majority of the site is undeveloped farmland. With fields to the east and south containing arable crops (seeded at the time of walkover) and fields to the north being open grassland or containing livestock. Representative site photographs and locations are outlined in **Appendix B**. Fields were numbered from 1 to 11 approximately north to south, (numbering system outlined in **Appendix B**). The table below presents details of each field.

| Field Number | Notes |
|-----------------|---|
| 1 | Comprised a mix of hardstanding, tarmac and soft landscaping at surface. Bordered by vegetated embankments on three sides with gated access to Spring Hill Road. Embankments are formed of unknown material. A water tanker was located in this field alongside a blue plastic water pipe visible at surface. Topographically flat. |
| 2 | Vegetated field with a public footpath cutting through. Low voltage electricity pylons overhead. Generally, topographically flat. |
| 3 | Vegetated field. No livestock in at time of walkover; however, trough situated in northeast corner. Slight incline to the west. |
| 4 | Ploughed field, young vegetation present at time of walkover. Low voltage pylons overhead (northwest corner) and following track to the south. |
| 5 | Vegetated field. Low voltage electricity pylons overhead. Generally, topographically flat. |
| 6 | Vegetated field livestock field (sheep). Low voltage pylons overhead. Topographic rise to the west. |
| 7 | Ploughed field, young vegetation present at time of walkover. Slight topographic rise to the south. |
| 8 | Vegetated livestock field (sheep). Topographic rise to the west. |
| 9 | Ploughed field, young vegetation present at time of walkover. Topographic undulation across field. Low voltage pylons along north of site. Hardcore visible at surface at western boundary between Field 9 and 11. |
| 10 | Ploughed field, young vegetation present at time of walkover. Topographic rise to the south. |
| 11 | Field containing arable crops (likely cabbage). Topographic high point in the centre of the field. Hardcore visible at surface at western boundary between Field 9 and 11. |

Boundaries between fields were generally demarked by tree lines and barbed wire fences. At a number of locations blue plastic water pipes were noted on the ground surface between fields. Black plastic drainage pipes were also noted at a number of locations. Overhead electricity pylons cross several fields (as detailed above).

Although a number of streams and issues were marked on mapping, none were observed on site. This could have been due to the abnormally dry weather experienced before the site walkover.

2.2.2 BULK HAZARDOUS MATERIAL STORAGE

None observed.

2.2.3 ASBESTOS CONTAINING MATERIALS

None observed.

2.2.4 INVASIVE SPECIES

None observed. A formal ecological survey is outside the scope of this report.

2.3 SURROUNDING LAND USE

Surrounding land uses comprise:

- Yarnton village to the south-east, including residential and commercial properties;
- Begbroke village to the north;
- A44 Woodstock Road to the east;
- Railway line to the south-west;
- Begbroke Wood to the west;
- London Oxford Airport 1km to the north-east; and,
- Agricultural undeveloped land to the south and west.

3 HISTORICAL LAND USE

3.1 SITE HISTORY

3.1.1 HISTORICAL MAP REVIEW

Historical maps provided as part of the Envirocheck report were reviewed. It was noted that the site has been agricultural undeveloped land since the earliest mapping in 1883 and no major changes in use are indicated. Some small presumed agricultural buildings are indicated along the northern and north-western site boundaries from the earliest map edition reviewed (1876).

One minor change noted during the site history is the construction of Dolton Lane in the north of the site, by 1900. Dolton Lane remains today and is shown on mapping as a grassed track. During the walkover it was noted that the portion of Dolton Lane running east to west was comprised of hardcore.

A number of small unnamed water features (ponds) are also shown on historical mapping along the northern and western boundaries. Some appear to have been infilled with unknown material in the 1960s and 70s, and some may still be present in denser undergrowth. None of these features were distinguishable during the site walkover. Surface water drains are also shown running west to east in the north of the site, with one also present in the south-east. These features remain to present day.

Windmill Hall Farm extends onto the very south of the site in 1899, with the buildings becoming Hill Farm by 1974 which is still present. This portion of the site was inaccessible at the time of walkover.

Two wells are denoted on the 1899 map in the north-western corner of the site adjacent to a rectangular block of buildings. The wells are not marked on the 1922 map and may have been infilled or capped; however, the buildings remain in the same configuration until between 1936 and pre-1974. On the 1974 map, the rectangular block has been demolished and the other buildings denoted to be residential dwellings. Two additional residential dwellings are also shown at the same location, and all dwellings remain to the present day.

3.2 SURROUNDING AREA HISTORY

Earliest mapping (1883) shows roads in approximately the same configuration surrounding the site as there is presently. The Great Western Railway (Oxford, Worcester and Wolverhampton Branch) appears approximately 550m south-west of the site from 1883 to present day.

Gravel pits appear on the map approximately 250-500m east by 1900 and are no longer shown on the 1981 map.

Yarnton village, to the east of the site, comprises a collection of farms from 1883 to 1948. Residential development appears to begin by 1948, but Yarnton undergoes significant development between 1961 and 1981 to its current configuration.

A sewerage treatment works is shown approximately 500m west of the site by 1992, adjacent to the railway line, and remains until the present day.

4 **REGULATORY INFORMATION AND CONSULTATION**

4.1 REGULATORY DATABASE

The following information has been obtained from a summary of information databases contained within the Envirocheck Report obtained for the site. The regulatory database information is included within **Appendix C**.

| Data Type | Onsite | Within 500m | Comments |
|---|--------|----------------|--|
| Discharge Consents | 1 | 1 | One on site to the south (Medical Practice) discharging treated sewerage to tributary of Yarnton Stream One for service station (not motor vehicle) discharge of other-matter surface water to a tributary of Oxford Canal. |
| Local Authority Pollution Prevention Control | 0 | 2 | Two Petrol filling stations approximately 470m east (on the A44) |
| Historical Landfill Sites | 0 | 1 | One Historic landfill of inert waste (377m east), operation dates not supplied. |
| Recorded Mineral Sites | 0 | 3 | Historic opencast aggregate quarries (Sand and Gravel) 300-450m |
| Active Trade Directory Entries | 0 | 9 | Including domestic cleaning services, swimming pool contractors, car dealers, book binders, petrol filling stations and tyre dealers. |

No pollution incidents have been recorded within 500m since 2000. No water abstraction licences were recorded within 500m.

4.2 CONSULTEES

4.2.1 LOCAL AUTHORITY ENVIRONMENTAL HEALTH OFFICER

Cherwell District Council were contacted on 22 October 2018 and responded on 02 November 2018. Cherwell District Council hold no historical environmental reports for the site and the site, nor surrounding land has been identified as potentially contaminated under Environment Agency Part 2A.

4.2.2 PLANNING INFORMATION

A search of Cherwell District Council's planning portal showed no current or historic applications (since 01 January 2000) on site and no pertinent neighbouring off-site applications in progress.



4.2.3 ENVIRONMENT AGENCY FLOODING DATA

4.2.4 COAL AUTHORITY

The Coal Authority website was accessed on 19 October 2018, which confirmed that the site is not located within a Coal Authority designated mining area.

4.2.5 UNEXPLODED ORDNANCE

The Zetica Bomb Risk Maps (available from the Zetica Limited website) have been reviewed to provide a preliminary assessment of potential Unexploded Ordnance (UXO) risks. The maps indicated that the site is within a 'low' risk area from UXO. It should be noted that this does not constitute a formal UXO risk assessment and specialist advice should be sought if there is any uncertainty regarding the possibility of ordnance materials being present.

5 ENVIRONMENTAL SETTING

5.1 HYDROLOGY

Surface water features both within the site boundary and in the vicinity (within 500m) of the site are summarised below in **Table 5**.

Table 5 - Summary of Hydrological Features within 500m

| Surface Water Features | Quality* | Distance | Direction | Flow Direction |
|----------------------------|----------------|----------|-----------|-------------------|
| Unnamed Streams and issues | Not Classified | On site | - | Unknown |
| Rowel Brook | Not Classified | 250m | East | East |

* Chemical water quality under the EA's General Quality Assessment (GQA) Scheme

The site lies within a designated drinking water protected area and safeguard zone for surface water.

5.2 GEOLOGY

British Geological Survey (BGS) maps and the published geological memoir indicate that the site and surrounding area are underlain by the geological sequence summarised in **Table 6**. The spatial distribution of the deposits is shown in **Figure 2**.

| Table 6 - S | Summary o | of Anticipated | Geological | Strata |
|-------------|-----------|----------------|------------|--------|
| | , | | | |

| Group | Unit | Description | | |
|----------------------|--|--|--|--|
| Made Ground | None recorded | | | |
| Superficial Deposits | None recorded across the centre of the site | | | |
| | Hanborough Gravel Member | Sand and Gravel including clasts of Middle Jurassic limestone (locally decalcified) and quartz. | | |
| | Summertown-Radley Sand and Gravel Member | Sand and Gravel including clasts of Middle Jurassic limestone, quartz and flint. | | |
| Bedrock | Oxford Clay Formation and West Walton Formation (undifferentiated) | Silicate-mudstone, grey, generally smooth to slightly silty, with sporadic beds of argillaceous limestone nodules. Rich in organic materials including fine-grained shell and plant material with subordinate 'bituminous' beds. | | |





Figure 2 - Published Geology

5.3 HYDROGEOLOGY

5.3.1 AQUIFER STATUS

The Environment Agency designate the bedrock as unproductive strata. Sand and Gravel deposits of the Hanborough Gravel Member and Summertown-Radley Sand and Gravel Member are designated as Secondary A Aquifers with a Minor Aquifer Intermediate vulnerability.

5.3.2 GROUNDWATER ABSTRACTIONS

No Groundwater abstractions or source protection zones are noted within 1km of the site in the Envirocheck Report (ultimately sourced from Environment Agency data).

5.4 SURROUNDING FEATURES

The site does not lie within 1km of any Sites of Special Scientific Interest (SSSI) sites. A school and medical centre (both considered sensitive land uses) are visible on current mapping adjacent to the site. Residential development of Yarnton village is adjacent to the north and southern boundaries.

5.5 ECOLOGY

The MAGIC website (sourced from DEFRA) indicates that no Statutory ecological sites are located within the site boundary.

Begbroke Wood to the north of the site is designated Ancient and Semi-Natural Woodland. Brown Hairstreak are targeted as priority by countryside stewardship on site. Other species in the area include Curlew, Grey Partridge, Lapwing, Redshank, Tree Sparrow, Turtle Dove and Yellow Wagtail.

5.6 GROUND STABILITY

The ground stability hazards summarised in **Table 7** were outlined as part of the Landmark Envirocheck Report (ultimately sourced from the BGS).

Table 7 - Summary of Ground Stability Hazards

| Hazard | Potential |
|----------------------------------|----------------------|
| Potential for Collapsible Ground | Very Low |
| Compressible Ground Stability | No Hazard |
| Ground Dissolution | No Hazard |
| Landslide | Low - Very Low |
| Running Sands | Low - No Hazard |
| Shrinking or Swelling Clay | Moderate - No Hazard |

5.7 RADON

Public Health England records indicate that the site lies within a lower probability Radon area (less than 1% of homes are estimated to be at or above the Action Level). No Radon protective measures are likely to be necessary in the construction of new dwellings or extensions.

6 **RISK ASSESSMENT**

6.1 PRELIMINARY CONCEPTUAL SITE MODEL

The methods used within this preliminary risk assessment follow a risk-based approach, with the potential environmental risk assessed qualitatively and quantitatively using the 'contaminant-pathway-receptor pollutant linkage' concept introduced in the Environmental Protection Act 1990. For a site to be determined as Contaminated Land a plausible linkage between the identified Contaminants, Pathways and Receptors must be demonstrated.

6.2 PLAUSIBLE POLLUTANT LINKAGES

An evaluation of those potential contaminant linkages that we consider to be plausible given our current site understanding is summarised in Table 8.

| Source | Pathway | Receptor |
|--|---|--|
| On site | | |
| Agricultural use | Direct contact with impacted soils | Future site users |
| Potential contaminants likely to include: | Ingestion/ inhalation of impacted soils and soil- derived dust | |
| Pesticides, herbicides, localised petroleum hydrocarbons (TPH), and Polycyclic Aromatic Hydrocarbons (PAH) | | |
| | Migration into groundwater following disturbance | Groundwater within superficial aquifers |
| | | Groundwater-fed surface water features |
| | Migration into surface water following disturbance during development of the site | Surface water quality on-site and off-site |

Table 8 - Plausible Pollutant Linkages

| Source | Pathway | Receptor |
|--|---|--|
| Contaminants within localised Made Ground (used for access tracks and potentially infilled land) Potential contaminants likely to include: Asbestos, metals, TPH and PAH | Direct contact with impacted soils | Future site users |
| | Ingestion/ inhalation of impacted soils / fibres | |
| | Migrating into groundwater following disturbance during development of the site | Groundwater within superficial aquifers |
| | | Groundwater fed surface water features |
| | Migration into surface water following disturbance during development of the site | Surface water quality on-site and off-site |

Offsite sources comprising an historic landfill site and two petrol stations are considered to be too far from the site to represent a potential risk to the proposed development.

6.3 CONTAMINATED LAND RISK ASSESSMENT

The contaminated land risk assessment presented in **Table 9** has been prepared based on the proposed mixed use (including residential) development. The risk categories presented in this report take into account both probability and severity, as set out in CIRIA C552.

| Receptor Group | Risk Classification | Commentary |
|---------------------------|----------------------------|---|
| Human Health | Low | Site derived contamination, if present, is considered likely to be predominantly localised and associated with agricultural land use or within Made Ground deposits. The use of herbicides/pesticides has the potential to have been site-wide. |
| | | Contamination migration on to site from off-site sources is considered unlikely due to the anticipated geology and distance from site; however, these cannot be fully discounted. |
| Controlled Waters | Low | The presence of site derived contamination cannot be fully discounted, however, contamination (if present) is likely to be localised reducing its potential to impact surface water and groundwater quality. Localised contamination may migrate via leaching to groundwater, or via overland flow to unnamed streams and issues (on-site), and migrate off-site. Contaminant migration onto site from the adjacent land uses is considered unlikely due to the anticipated localised superficial deposits, but cannot be discounted. |
| Buildings and Services | Very Low | Localised hydrocarbon contamination in shallow soils, if present, could represent a potential risk to proposed potable water supply pipes. |
| Third Party Land | Very Low | Widespread contamination is considered unlikely at the site, although localised contamination may be present. The likelihood of future off-site migration impacting the surrounding land is considered to be very low. |
| Ecology | Very Low | The site does fall within a zone of species protection for farmland assemblage birds. On-site streams appear to be seasonal as they were dry at the time of walkover and are therefore considered unlikely to be of high ecological sensitivity. |
| Overall Risk | Low | 'Low' indicates that the site is unlikely to represent a potential risk of contaminated land liability, is unlikely to be designated as contaminated land and is unlikely to represent risks to human health or controlled waters. Whilst potential receptors are present at the site and potential pathways may exist, the general absence of potential contamination sources on-site and in the surrounding area support this risk designation. |

Table 9 - Contaminated Land Risk Assessment

6.4 PRELIMINARY GEOTECHNICAL APPRAISAL

A preliminary assessment of potential geotechnical hazards based on the expected ground conditions and an assumed commercial redevelopment is provided in **Table 10**.

| Potential Issue / Constraint | Commentary |
|--|--|
| High Groundwater Table | BGS mapping indicates that the Hanborough Gravel Member and Summertown-Radley Sand and Gravel Member comprising sand and gravel are present locally beneath the site. Springs and Issues are recorded on historical mapping at the interfaces between the granular deposits and surrounding cohesive materials. There is therefore potential for a high groundwater table to be present in these areas. Groundwater has a bearing on the ease and stability of excavations, and the bearing capacity of the ground. In addition, should pad foundations be placed on the underlying Oxford Clay Formation or West Walton Formation, groundwater ingress may soften the exposed surface after excavation. |
| Bedrock Geology | The site is underlain by mudstone from the Oxford Clay Formation and West Walton Formation. The formations are likely to be weathered in their upper horizons which could result in differing strength and composition within the optimal zone for spread or pad foundations. |
| Aggressive Ground | The bedrock at the site is part of the Lias Group which has the potential for pyrite and elevated concentrations of sulphates, which may require a higher specification of concrete to reduce the risk of damage from sulphate attack. |
| Ground Stability & Future Foundations | Shallow strip or pad foundations may be possible onto the Oxford Clay Formation/ West Walton Formation provided they are present at shallow depth. More heavily loaded structures may require piled foundations into the bedrock. Mature trees are present on the site and may require removal as part of redevelopment of the site. Any underlying cohesive deposits may be susceptible to swelling or shrinkage, and this should be assessed via laboratory analysis of samples of cohesive materials as part of a ground investigation. Historical mapping shows several ponds on the site historically. Some of these features could not be located during the site walkover and may have been backfilled with non-engineered materials which could be compressible. |
| Geotechnical Risk | Low - It is considered unlikely that any of the potential geotechnical hazards identified will represent a significant constraint to development of the site provided the natural characteristics of the ground are taken into consideration. |

Table 10 - Preliminary Geotechnical Appraisal

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

Widespread contamination is not expected on the site based on the historical agricultural land use. Contamination, if present, is likely to be localised to areas of potential Made Ground or associated with historical agricultural use (e.g. localised machinery fuel spills, use of herbicides/pesticides). Potential off-site sources of contamination are considered unlikely to represent a notable risk to the site due to their distance from the site.

Based on existing information, it is considered unlikely that any of the potential geotechnical hazards identified will represent a significant constraint to residential led development, provided the characteristics of the ground are taken into consideration.

Based on the available desk study information and the proposed allocation, the site is classified overall as having;

- A low risk with respect to contaminated land, and;
- A low risk with respect to geotechnical issues.

7.2 RECOMMENDATIONS

Once any planning application is made, some intrusive ground investigation will be required to support the development design (including earthworks and foundation design) and to confirm low risks from potential contamination sources. It is recommended that the ground investigation includes the following:

- Characterisation of the ground and groundwater conditions to ascertain more certainty in geotechnical and contaminated land assessments;
- Sampling and analysis of soil and groundwater samples to confirm the presence / absence of contaminants associated with an agricultural historical land use (e.g. herbicides and pesticides) across the site;
- Characterisation of the extent of superficial deposits on site and groundwater in these areas; and,
- Preparation of a quantitative assessment of risks to human health and controlled waters.

Appendix A

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DRAWINGS



Appendix B

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SITE PHOTOGRAPHS



PERTINENT PHOTOGRAPHS FROM SITE WALKOVER







Field 1- Hardstanding in the foreground with tarmac surface in the background and soft ground to the right. Tanker is marked as containing water.



Field 2- Looking east towards A44. Low voltage electricity pylons can be seen.





Field 11- Looking west





Field 11- Area of hardcore in the northwest corner of Field 11, looking to the north (towards Field 9)



Field 9- Visible drainage in boundary





Field 6- Livestock field with electricity pylons



Field 5- Water pipe visible at boundary

Appendix C

ENVIROCHECK REPORT

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