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INTRODUCTION

13.1 Chapters 6 to 12 of this ES have set out the findings of the EIA for a range of environmental topics, and in particular, ascertain the potential significance of identified impacts. The topics considered as part of the EIA are set out in Chapter 1 of this Volume (paragraph 1.55). It is possible for a number of the environmental topics to impact upon nearby receptors; whilst individually, the impacts may be within accepted limits, collectively the impacts may be more significant. These are referred to as "*inter-relationships between impacts*". At the same time, potential impacts associated with the proposed development may be acceptable in isolation, but when considered in the context of other developments in the immediate vicinity, may become more significant. These are referred to as "*Cumulative Impacts*".

13.2 This chapter of the ES therefore provides an assessment of the potential cumulative impacts arising through the proposed development. It also summarises the main interactions between the environmental topics that form part of the EIA.

LEGAL BACKGROUND

EIA Regulations

13.3 Within Chapter 1 of this Volume, the statutory requirements regarding the content of an ES have been set out. Part 1 to Schedule 4 of the EIA Regulations provides that an ES may contain a "*description of the likely significant effects of the development on the environment, which should cover … cumulative … effects".* The same Part also states that *"a description of the aspects of the environment likely to be significantly affected by the development including … [the environmental topics] …and the inter relationship between the above factors*".

13.4 These are not a mandatory requirement of an ES, but one which "*is reasonably required to assess the environmental effects of the development and which the applicant can, having regard in particular to current knowledge and methods of assessment, reasonably be required to compile*".

Planning Practice Guidance

13.5 Paragraph 017 (Reference ID: 27-017-20140306) to the web based PPG comments that:

> *"Some parts of a mineral planning authority area may have been subjected to successive mineral development (such as aggregate extraction or surface coal mining) over a number of years. Mineral planning authorities should include appropriate policies in their minerals local plan, where appropriate, to ensure that the cumulative impact of a proposed mineral development on the community and the environment will be acceptable. The cumulative impact of mineral development is*

also capable of being a material consideration when determining individual planning applications."

CUMULATIVE IMPACTS

13.6 There is a broad range of opinion on the definition of cumulative impacts[1]. The widely accepted definition is that provided by the United States Council on Environmental Quality in 1978:

> *'the impacts on the environment which result from incremental impacts of the action when added to other past, present and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time".*

13.7 IEMA goes on to comment that cumulative impacts may occur:

Physical-chemical transport	A physical or chemical emission is transported away from a proposed project where it then interacts with another pollutant (e.g., air emissions, waste water effluent, sediment). Several entirely separate developments can therefore have a cumulative impact at a location some distance away from the project location
Nibbling loss	Occurring as a result of the gradual disturbance and loss of land and habitat (e.g., clearing of land for new housing and roads.)
Spatial and temporal crowding	Cumulative effects can occur when too much is happening within too small an area and in too brief a period of time. Spatial crowding results in an overlap of effects (e.g., noise from a road adjacent to an industrial site, confluence of stack emission plumes). Temporal crowding may occur if effects from different actions overlap or occur before the receptor has had time to recover.
Growth-inducing potential	A project can induce further projects to occur. (e.g., bypass for a town creating new development opportunities)
Combined effects	These occur when different types of effects all affect the same receptor. Assessed individually they may be considered to be insignificant, but when combined result in a significant effect on the receptor (e.g. perceived change in the quality of life of a household or community)

13.8 Cumulative impacts have also been described[2] as being those impacts caused by the sum of the projects impacts on the environment component,

[1] Page 11/4. Guidelines for Environmental Impact Assessment. IEMA
[2] Methods of Environmental Impact Assessment. P Morris and R Therivel. UCL Press 2000

and/or the projects impacts when added to those of other past, present or future projects. Cumulative impacts can be:

- additive, aggregative or "*nibbling*", namely the simple sum of all of the impacts;
- synergistic, where impacts interact to produce an impact greater than the sum of the individual impact; and
- neutralising or antagonistic impact, where the impacts counteract each other, reducing the overall impact.

13.9 Cumulative impacts may therefore result from a number of situations:

- the interaction or proximity of two or more current quarries (not necessarily for the same type of mineral) or developments of a similar nature;
- the continuation of a particular working over time through successive extensions;
- the interaction or accumulation of different impacts at one site, affecting a range of sensitive receptors; and
- a combination of the above scenarios.

LAND USE

Other Mineral Sites

13.10 Hatfield Quarry, operated by CEMEX, lies to the north of the application site. The processing plant is located off Oaklands Lane, approximately 200m to the west of the application site, whilst the extraction area (based on Google Earth) is located adjacent to Symondshyde Great Wood, around 1000m to the north of the application site. There are no other mineral operations in the immediate vicinity of the application site.

13.11 It is understood that the extant planning permission for Hatfield Quarry expires in October 2020 and as such, given the lead in time needed to establish the quarry at Hatfield Aerodrome, there would be little overlap of operations (estimated at around two years). As such the potential for there being significant cumulative impacts is low. Notwithstanding this, consideration has been given throughout the EIA to the potential for cumulative impacts to arise.

Other Developments with Similar Characteristics

13.12 Other types of development that would potentially have similar characteristics to the mining operations would be the construction phase of large housing developments, retail of industrial parks, especially in the context of noise, air quality (dust), movement of plant and machinery and disturbance of the ground (removal of vegetation and soils for example). Planning permission has been granted (on appeal) for a small housing development to the west of the application site, and it is understood that the remainder of the Hatfield Aerodrome site is being promoted in the emerging plan for housing development. For the former, whilst it is located close to the boundary of the

application site, assuming it is developed within the next few years (in line with the planning permission) then there would be significant distance between the site preparation operations and quarry operations.

ENVIRONMENTAL QUALITY

Water

13.13 Chapter 6 of this volume presents the findings of the assessment on the water environment, examining aspects such as the quantity and quality of surface and groundwater resources. Through the design of the site, and following recognised best practices, no significant adverse effect is predicted. Whilst groundwater would be pumped from the workings, it would be recharged to the aquifer. Allied to this, clay would be used to 'seal' the edges of the workings in the Upper Mineral Horizon.

13.14 Accordingly, as no significant adverse effect is predicted, no significant cumulative impacts are predicted with other developments.

Transport

13.15 Consideration has been given to the predicted increase in traffic as a result of the development. The assessment has used data from traffic counts undertaken in 2015; this baseline data will include HGV traffic from Hatfield Quarry, and thus the assessment is cumulative. Whilst other developments, mainly housing, are being promoted into emerging Development Plans the precise details are not currently known and thus it is not possible to assess any likely cumulative impacts. Notwithstanding this, traffic associated with the quarry would be reasonably evenly distributed throughout the day; whereas housing developments tend to have peaks consistent with morning and afternoon 'rush hours'. Allied to this, traffic using visiting the quarry would use the primary road network, such as the A1057.

13.16 Accordingly, as no significant adverse effect is predicted, no significant cumulative impacts are predicted with other developments.

Landscape and Visual Impact

13.17 Chapter 8 of this volume has considered both cumulative landscape and visual effects.

13.18 The presence of "*existing and restored mineral workings*" is already one of the key characteristics of "Area 31 De Havilland Plain". Therefore the addition of the proposed development, to the ongoing operations at Hatfield Quarry, would not give rise to changes in landscape character of such an extent as to have major effects on its key characteristics or transform it into a different character type; it is not considered that the development "*tips the balance*" through its additional effects.

13.19 The only occurrence of simultaneous visibility of the two developments was predicted at two locations. However, in each case the proposed development

would be in a different direction to the elements and features of Hatfield Quarry, meaning that walkers along the route would be looking around to experience any potential coalescence.

13.20 Also the Hatfield Quarry plant site area and associated elements and features (fencing, bunds and conveyor) are expected to be removed as part of the cessation of mineral extraction at the site in c. 2020, at which point there would be no cumulative visual effect of concurrent working with the proposed development.

13.21 The other potential cumulative visual effects are of a sequential nature, for example users of the road network or recreational visitors moving along the rights of way. However, this is also considered to be limited and mitigated by the existing urban fringe character of area, the limited duration of operations at Hatfield Quarry and the nature of the proposals at the application site, as described above.

13.22 Overall there are no significant cumulative visual effects anticipated as a result of the proposed development.

Air Quality

13.23 The vast majority of emissions of dust from the operations (extraction, processing, restoration and associated haulage) would be deposited within 100m of the source[3], although particles of between >10µm and <30µm may travel 250m to 500m. As such the potential for cumulative dust impacts to occur are limited given the separation distance between the operational areas of the quarry and the adjoining Hatfield Quarry. Allied to this, consideration needs to be given to the damp nature of the mineral and associated processing.

13.24 In view of the mitigation measures being proposed (refer to Chapter 9 of this volume), no significant adverse effect is anticipated.

13.25 In relation to HGV movements, the assessment undertaken considers the likely increase in emissions over the current baseline, which includes traffic from Hatfield Quarry, and a 'negligible' significance of impact is predicted at all assessed receptors.

13.26 Accordingly, as no significant adverse effect is predicted, no significant cumulative impacts are predicted with other developments.

Noise

13.27 Like transport considered above, the assessment (Chapter 10 of this Volume) uses measured data, which will include the operation of Hatfield Quarry. As such the assessment is cumulative. The assessment found that the potential increase in ambient levels due to worst-case operational noise

[3] Based upon research document - DETR, The Environmental Effects of Dust from Surface Mineral Workings (Dec 1995)

would be slight at worst at two receptors but generally not significant at the remainder of the nearby noise-sensitive receptors.

13.28 It should be noted that, at Radio Nursery and the proposed new development to the west of the site, the existing measured noise levels were measured away from the working nursery and therefore are considered to be conservative.

Cultural Heritage

13.29 As set out in Chapter 12 of this volume there are considered to be no cumulative effects of the proposed scheme upon cultural heritage.

Ecology

13.30 Whilst the development would result in the loss of habitat, through suitable mitigation, including the restoration of the workings, no cumulative impacts are predicted with other developments.

INTER-RELATIONSHIPS BETWEEN IMPACTS

13.31 As set out above, elements of a development can give rise to inter-related impacts. The approach taken in the EIA has been to assess how a particular type of effect (*e.g.* movement of HGVs) may become a source of impact that results in an effect to a completely different category of receptor. Like cumulative impacts, these inter-relationships have been considered within each of the technical assessments for the environmental topics.

13.32 Examples of inter-relationships are:

- the movement of HGVs within the site can impact upon the noise climate around the site. This is addressed in Chapter 10 of this Volume;
- the movement of HGVs around the site and on the public highway can impact upon air quality. This is addressed in Chapter 9 of this Volume;
- the construction of screening mounds, whilst ameliorating noise impacts, can affect the visual appearance of the site. The potential visual impacts of the development are considered in Chapter 8.

13.33 Finally, interactions between more than one type of impact may be experienced at a particular receptor. As a hypothetical example, a receptor may experience increased levels of noise and deposition, or noise and visual impacts; such impacts may occur simultaneously, sporadically or on separate occasions. There is, however, no physical mutuality between the impacts, other than that both could cause annoyance, whether experienced separately or simultaneously.

13.34 For the proposed quarry, no significant impacts have been identified for any of the environmental topics considered as part of the EIA. Thus, no receptors are likely to experience any significant accumulated impacts from two or more sources.