

PART 12 : SOILS AND AGRICULTURAL LAND QUALITY

12.1 Methodology

12.1.1 The scope of this part of the environmental assessment is limited to agricultural land quality and soil resource conservation issues. Rural economy, land access, severance, drainage and farm viability have been considered separately in the ES in Section 2 Part 6 Land Use.

12.1.2 The approach is based on current UK government guidance to Regional Government and local authorities as to the use and development of agricultural land (Department for Environment, Food and Rural Affairs, 2004 & 2007; Office of the Deputy Prime Minister, 2004) and follows the methodology in accordance with DMRB Volume 11, Section 3, Part 6 (Land Use) and Part 11 (Geology & Soils).

12.1.3 Methodology for assessing the significance of effects is based on HA's Interim Advice Note (IAN) 81/06 as set out in Section 1 Part 3 of the ES, adapted from first principles and experience in environmental assessments of agricultural land quality and soils.

12.1.4 The standard procedure for assessing the importance of the featured attribute and the magnitude of effect of change, and establishing a significance matrix from these, has been carried out for different component parts of the A453 Widening scheme as follows (the section between Clifton to the junction with the A52 is classified as urban and non-agricultural and is not considered here):

- Section of widening of the existing carriageway between M1 J24 & Barton Lane;
- Section of new carriageway between Barton Lane and west of Clifton;
- Junction improvements on existing carriageway;
- Areas for flood compensation.

12.1.5 Standard published survey methodologies were used for determining and describing soil physical condition and assessment of agricultural land quality (Hodgson, 1974; Ministry of Agriculture, Fisheries and Food (MAFF), 1988).

Quality and Importance

12.1.6 Table 2.12.1 below sets out the principal soil attributes, indicators and measures of quality for agricultural use and soil conservation that have been adopted for the A453 scheme:

Table 2.12.1: Attribute & Indicator of Quality

| Feature | Attribute | Indicator of Quality | Possible Measure |
|---------|-------------------------------|---|--|
| Soil | Agricultural use | Climate, landform, soil physical characteristics, | Agricultural Land Classification Grade, extent, within-field pattern |
| | Soil resources (conservation) | Soil material | Soil texture, soil horizons (top, sub-soil), soil stoniness |

12.1.7 The measures set out in Table 2.12.1 above have been ranked according to importance for agricultural land quality and soils. The ranking in Table 2.12.2 below is based on current guidance (MAFF, 1988) as to the versatility for crop production and the determination of soil condition by soil textural groups and their physical characteristics (e.g. wetness and droughtiness). Please note – in Tables 2.12.1 and 2.12.2 ‘within-field pattern’ refers to patterned ground within a field comprising soils of different ALC grades side by side.

Table 2.12.2: Estimating Importance of Agricultural Land Quality & Soils

| Importance | Criteria | Examples |
|------------------|--|--|
| Very High | Attribute as a high quality and/or rarity on regional or national scale. | Land Quality: ALC Grades 1 & 2 with little within-field pattern Soil Resources: Topsoil – loam texture & stoneless. Subsoil – loam, sandy loam, silt loam, sandy clay loam texture; stoneless/slightly stony. |
| High | Attribute as a high quality and/or rarity on Local scale. | Land Quality: ALC Grade 3a with no field pattern or with within-field pattern predominantly ALC Grade 1, 2 Soil Resources: Topsoil: sandy loams, silt loams, sandy clay loams; slightly stony. Subsoil: clay loams, silty loams; moderately stony. |
| Medium | Attribute as a medium quality and/or rarity on Local scale. | Land Quality: Within-field pattern predominantly ALC Grade 3a or ALC Grade 3b with no field pattern. Soil Resources: Topsoil: clay loams, silty clay loams; moderately stony. Subsoil: clays, heavy clay loams; very stony. |
| Low | Attribute as a low quality and/or rarity on Local scale. | Land Quality: Within-field pattern predominantly ALC Grade 3b or ALC Grade 4 with no field pattern. Soil Resources: Topsoil: sand, clays, heavy clay loams; very stony. Subsoil: extremely stony, subsoil absent or parent material or mineral waste. |

Magnitude of Impact

12.1.8 The magnitude of impact (change) of the scheme has been categorised according to the relative loss or degradation of land quality and soil resources. The degree of agricultural impact is influenced by the relative importance of the ‘attribute’ and the following Table 2.12.3 has been weighted accordingly:

Table 2.12.3: Estimating Magnitude of an Impact on an Attribute

| Magnitude | Criteria | Examples |
|----------------------------|---|---|
| Major Adverse | Results in loss of attribute and/or quality and integrity of the attribute. | Loss or degradation of entire regional resource of best and most versatile land (ALC Grades 1, 2, 3a). Loss or degradation of topsoil, upper & lower subsoil resources. |
| Moderate Adverse | Results in loss of part of the attribute and/or quality and integrity of the attribute. | Loss or degradation of entire local resource of best and most versatile land (ALC Grades 1, 2, 3a). Loss or degradation of upper & lower subsoil. |
| Minor Adverse | Results in some measurable change in attribute quality or increase in vulnerability. | Loss or degradation of >20ha of best and most versatile land (ALC Grades 1, 2, 3a). Loss or degradation of lower subsoil. |
| Negligible | Results in no measurable change in attribute, integrity or quality. | Loss or degradation of <20ha of best and most versatile land (ALC Grades 1, 2, 3a). No material loss or degradation of topsoil, upper & lower subsoil horizons. |
| Minor Beneficial | Results in some beneficial improvement in attribute or quality. | Creation of best and most versatile land (ALC Grades 1, 2, 3a). Increase in lower subsoils. |
| Moderate Beneficial | Results in moderate improvement in attribute or quality. | Creation of local resource of best and most versatile land (ALC Grades 1, 2, 3a). Increase in topsoil and upper subsoil. |
| Major Beneficial | Results in major improvement in attribute or quality. | Creation of regional resource of best and most versatile land (ALC Grades 1, 2, 3a). Increase in topsoil, upper and lower subsoil. |

Significance of Effects

12.1.9 The following significance of potential effects matrix shown in Table 2.12.4 has been constructed from the importance and magnitude rankings used above, to assess the significance of the potential effects of the A453 improvement scheme on agricultural land quality and soil resource conservation:

Table 2.12.4: Estimating Significance of Potential Effects

| | | | | | |
|--------------------------------|------------------|-------------------|---------------------|----------------------|----------------------|
| Importance of Attribute | Very High | Slight | Moderate/ Large | Large/ Very Large | Very Large |
| | High | Slight | Slight/ Moderate | Moderate/ Large | Large/ Very Large |
| | Medium | Slight/ Neutral | Slight | Moderate | Large |
| | Low | Neutral | Neutral | Slight | Slight/ Moderate |
| | | Negligible | Minor | Moderate | Major |
| Magnitude of Impact | | | | | |

12.2 Key Guidance and Legislation

- 12.2.1 The general national planning policy framework is laid out in Planning Policy Statement 7 (PPS 7): "Sustainable Development in Rural Areas" (Office of the Deputy Prime Minister, 2004), where paragraph 28 states: "The presence of best and most versatile agricultural land (i.e. Agricultural Land Classification (ALC) Grades 1, 2 & 3a), should be taken into account alongside other sustainable issues (e.g. biodiversity including soil quality) when determining planning applications."
- 12.2.2 It is also recognised that the diversity of soils is inextricably linked to the potential, and flexibility, of land use and hence the importance of maintaining the UK's soil resources. A policy for sustainable use of soils is set out in The First Soil Action Plan for England: 2004-2006 (Department for Environment, Food and Rural Affairs, 2004) where paragraph 75 states: "The objective for this part of the Soils Action Plan is to reduce the impact of the construction and development sectors on the long-term functioning of soils" and "The conservation of soils as a natural resource is part of the overriding objective."
- 12.2.3 There is also an emerging European Directive on the thematic strategy for the protection of soils where significant impacts of compaction, erosion and loss of organic matter (i.e. those most relevant to the proposed development) might be a consideration (European Union, 2006).
- 12.2.4 In the local context the Nottinghamshire & Nottingham Joint Structure Plan (adopted 2006) sets out in Policy 2/9, Chapter 2 (Environment & Natural Resources) that best and most versatile agricultural land (ALC Grades 1, 2 & Sub-Grade 3a) should be protected unless there is no reasonable alternative or other sustainability considerations relating to poorer land outweigh the loss of higher quality land. Similar policy guidance is set out in paragraph 2.55 of the Rushcliffe Borough Council's Local Plan (1996) and Policy EN21 of the Replacement Local Plan.
- 12.2.5 A more detailed assessment of the impact of the scheme on policies and plans is given in the technical report *Environmental Assessment: Impact on Policies and Plans*, Ref. A021959-REP-E-PL-232.

12.3 Consultations

- 12.3.1 As part of the scoping process required for this scheme under The Highways (Assessment of Environmental Effects) Regulations 1999, the Governmental Office for the East Midlands (GOEM), which is responsible for land use & land quality matters for the region, was consulted in writing in May 2006 about the scope and methodology proposals for addressing soil and agricultural land quality issues. The following methodology was proposed:
- for the widening route a desk exercise using published ALC maps supplemented with published (SSEW) soil maps & memoirs to calculate potential ALC grade (especially to differentiate between the two ALC Grade

3 sub-Grades). Soil resources would be assessed from the published information with some ground-truthing of horizon thickness and texture;

- for the intersections/access or where there is more significant land take this would be a combination of desk and field survey following MAFF 1988 procedure & Meteorological Office 1989 Climatic data sets, or depending on land take, just a desk exercise as above.

12.3.2 The approach and methodology was accepted by GOEM in their letter dated 21st June 2006. In addition, an Environmental Statement Scoping Report was sent to GOEM on 27th October 2006, but no further comments were received.

12.4 The Study Area

12.4.1 The assessment of soils and agricultural land quality uses information gained from soil surveys which were undertaken along the route of the proposed road scheme, including carriageway widening areas, the offline section between Thrumpton and Clifton, and areas required for junction improvements.

12.4.2 Some small areas of land included in the scheme fell outside the final survey area, and for these extrapolation has been adopted for assessment purposes. For example some small areas for flood compensation and soil storage as indicated in **Figures 2.12.1 and 2.12.2** lie outside the auger boring and soil pit survey locations.

12.5 Baseline Conditions

12.5.1 A desk exercise was undertaken to gather and compile a data base, and review existing relevant information from a library search of published information and liaison with Defra's Rural Development Service (RDS) team at Reading for information held on the national data base.

12.5.2 Soils surveys were undertaken in two tranches:

- Between 15th August and 26th September 2006 for the carriageway widening from Clifton to the M1 J24;
- Between 4th June and 5th July 2007 for the new carriageway realignment from Clifton to Barton Lane and , the potential flood compensation areas and the junction alterations.

12.5.3 Soil profiles were examined using a hand auger and/or spade. Soil pits were dug in representative soil types to assess subsoil structure and allow the preparation of a statement of soil physical characteristics.

Climatic Data

12.5.4 Climate affects the grading of land through the assessment of an overall climatic limitation and also through interactions with soil characteristics.

12.5.5 The combination of rainfall and temperature result in a no climatic limitation to the agricultural quality of any land within the survey area.

Published Soil Information

12.5.6 The 1:250,000 scale reconnaissance soil map of the area (Soil Survey of England & Wales, 1983) shows the soils along the route. A brief description of each soil association is as follows:

- *Wick 1 Association* (Motorway junction to close to the River Soar flood plain) – Deep well drained coarse loamy and sandy soils, locally over gravel. Some similar soils affected by groundwater.
- *Wharfe Association* (approximately 300m – 600m from the motorway junction) – Deep stoneless permeable fine loamy soils with some similar soils variably affected by groundwater.
- *Fladbury 2 Association* (flood plain and the section alongside most of the power station) – Stoneless clayey soils variably affected by groundwater, some with sandy subsoils, with some similar fine loamy soils.
- *Worcester Association* (a small section from approximately the Midland Mainline railway to the underpass entrance to the power station, and from the coal stocking area of the power station to close to the village of Thrumpton) – Slowly permeable non-calcareous and calcareous reddish clayey soils over mudstone, shallow on steeper slopes. Associated with similar non-calcareous fine loamy over clayey soils.
- *Dunnington Heath Association* (Thrumpton to Clifton) – Reddish coarse and fine loamy over clayey soils with slowly permeable subsoils and slight seasonal waterlogging.

12.5.7 At the time of the initial survey in September 2006 much of the agricultural land was cultivated prior to sowing of the next crop or stubble from the previous crop. Some grass fields were along the proposed route and some sugar beet awaiting harvest. The areas surveyed during June and July 2007 included crops of barley, wheat, oats, oil-seed rape, sugar beet in addition to areas of set-aside land.

12.5.8 Most of the non-agricultural land comprised woodland with some small areas of rough grassland on disturbed areas or abandoned pasture.

Published Land Quality Information

12.5.9 The provisional land quality map was produced prior to the publication of revised guidelines (Ministry of Agriculture, Fisheries & Food, 1988) and was not intended for site specific grading and should only be treated as indicative of the agricultural land quality of large areas. Using the published general soil profile descriptions (Ragg et al, 1984) it is possible to estimate the likely land qualities using the MAFF

(1988) methodology. This exercise was carried out as a means of determining the possibility of best and most versatile land occurring along the A453 route:

- Wick 1 Association: ALC Grade 1 (best & most versatile)
- Wharfe Association: ALC Grade 3a (best & most versatile)
- Fladbury 2 Association: ALC Grade 3b
- Worcester Association: ALC Grade 3b
- Dunnington Heath Association: ALC Grade 2 (best & most versatile)

12.5.10 The exercise indicated that land of high agricultural quality was likely to occur within the study area. This was vindicated by more recent surveys, but of localised coverage of the A453 route, that high grade 'best and most versatile' agricultural land occurred along the entire corridor. Land at Clifton is mainly ALC Grade 2 & 3a (ADAS, 1998). Land west of Long Lane to east of M1 J24 and north of the A453 were mainly best and most versatile (ADAS, 1996a, 1996b).

12.5.11 It was also evident from these surveys there is considerably more local variation in land quality than implied from generalised published maps (MAFF, 1971). On the basis of this spatial pattern it was decided to carry out field surveys in all the land taken by the improvement works.

Field Survey of Soils

12.5.12 The surveys undertaken showed the presence of six distinct soil types along the proposed route. The distribution of these is illustrated on Figure 2.12.2. A statement of soil physical characteristics of each Soil Type I – VI is given in Appendix C of the detailed report A453 Environmental Impact Assessment Soils & Land Quality, Reference A021959-REP-E-ES-231.

Soil Resources

12.5.13 To comply with soil conservation guidance (Department for Environment, Food and Rural Affairs, 2004 & 2007), the soils along the proposed scheme will require separate stripping and storage according to their physical characteristics. The following Table 2.12.5 summarises the target thicknesses for stripping topsoil and subsoil:

Table 2.12.5: Summary of Soil Stripping Units

| Stripping Unit | Material Type | Source | Texture | Median Target Thickness (m) |
|----------------|---------------|-------------------------|------------------------------------|---|
| TS1 | Topsoil | Soil Type I | Clay/heavy clay loam | 0.31 |
| TS2 | Topsoil | Soil Types II and III | Sandy clay loam/ medium sandy loam | Soil Type II = 0.32 Soil Type III = 0.31 |
| TS3 | Topsoil | Soil Types IV, V and VI | Heavy clay loam | Soil Type IV = 0.30 Soil Type V = |

| Stripping Unit | Material Type | Source | Texture | Median Target Thickness (m) |
|----------------|---------------|------------------------------|------------------------------------|---|
| | | | | 0.31 Soil Type VI = 0.25 |
| SS1 | Subsoil | Soil Type I and Soil Type II | Clay | Soil Type I = 0.89 Soil Type II = 0.61 |
| SS2 | Subsoil | Soil Types IV, V and VI | Clay/heavy clay loam | Soil Type IV = 0.32 Soil Type V = 0.89 Soil Type VI = 0.26 |
| SS3 | Subsoil | Soil Types II, III and IV | Sandy clay loam/ medium sandy loam | Soil Type II = 0.27 Soil Type III = 0.32 Soil Type IV = 0.58 |
| SS4 | Subsoil | Soil Type VI | Sandy clay loam | 0.69 |
| SS5 | Subsoil | Soil Type III | Medium sand/ loamy medium sand | 0.57 |

Agricultural Land Classification

12.5.14 The quality of the agricultural land along the proposed route was assessed using the data collected in the field surveys and the current guidelines (Ministry of Agriculture, Fisheries and Food, 1988). Out of 126ha surveyed, 27ha was ALC Grade2 (very good quality agricultural land), 24ha Subgrade 3a (good quality agricultural land), 37ha Subgrade 3b (moderate quality agricultural land) with about 38ha classified as non-agricultural land (developed or previously disturbed areas, planted areas and gardens). Figure 2.12.3 indicates the distribution of ALC grades along the scheme.

Unsurveyed land

12.5.15 Unsurveyed land included land opposite the coal stocking area of the power station and the proposed junction at the Ratcliffe under bridge as access to these areas was not possible, and a small area close to the district of Clifton was not surveyed due to archaeological constraints within the area. Other land unsurveyed included some temporary soil storage areas as indicated on (see Figure 2.12.3).

12.6 Potential Impacts

12.6.1 Potential scheme impacts are considered for each of the component parts of the A453 Widening scheme as described in paragraph 12.1.4 above.

12.6.2 It is assumed that the Defra best practice soil handling guidelines (www.defra.gov.uk/farm/environmentland-use/soilguid/index.htm) will be followed

wherever agricultural soils are to be disturbed and replaced for agricultural use. Chainages referred to are shown on Figures 2.12.1 and 2.12.2.

- 12.6.3 It is intended to maximise the reuse of all excavated materials to reduce the environmental impact of the project. Loss of topsoil during stripping, storage and re-spreading will be kept to a minimum by careful control during construction.

Widening Existing Carriageway (between M1 J24 and Barton Lane)

Chainage 0 – 1300m

- 12.6.4 There will be a loss of predominantly best and most versatile (BMV) grade agricultural land (about 2.0ha out of 2.6ha of land of BMV quality surveyed in this area) due to the widening scheme. Reuse of topsoil resources will be maximised with excess topsoil spread for landscaping purposes over the new embankments, but the subsoil resource will not be recovered and available for landscaping or agricultural use.

Chainage 1340 – 1900m

- 12.6.5 There will be a loss of predominantly best and most versatile grade agricultural land (about 0.9ha out of 1.2ha of land of BMV quality surveyed in this area) due to the widening scheme. Reuse of topsoil resources will be maximised with excess topsoil spread for landscaping purposes over the new embankments, but the subsoil resource will not be recovered and available for landscaping or agricultural use.

Chainage 1920 – 2530m

- 12.6.6 The western and eastern parts of this section are woodland and not classified as agricultural land, the middle part is best and most versatile quality. There will be a loss of best and most versatile grade agricultural land (1.5ha out of 3.2ha of land of BMV quality surveyed in this area) due to the widening scheme. Reuse of topsoil resources, including that from the woodland areas, will be maximised with excess topsoil spread for landscaping purposes over the new embankments, but subsoil will not be recovered and available for landscaping or agricultural use.

Chainage 3200 – 3600m

- 12.6.7 Most of the section from east of the Parkway Junction to the Power Station storage area is woodland with only the eastern end being agricultural land. Here, there will be no loss of best and most versatile grade agricultural land due to the widening scheme. Reuse of topsoil resources, including that from the woodland areas, will be maximised with excess topsoil spread for landscaping purposes over the new embankments. The subsoil will not be recovered and available for landscaping or agricultural use.

Chainage 4600 – 7460m

- 12.6.8 This section is a mixture of best and non-best and most versatile agricultural land. Here, there will be loss of best and most versatile grade agricultural land (6.1ha out of 14.9ha of land of BMV quality surveyed in this area) due to the widening scheme. Reuse of topsoil will be maximised with excess topsoil spread for landscaping purposes over the new embankments. The subsoil will not be recovered and available for landscaping or agricultural use.

New Carriageway (Barton Lane to Clifton)

Chainage 7670 – 8800m

- 12.6.9 The western part of this new section of road is best and most versatile agricultural land whilst the eastern part is non-best. Here, there will be loss of best and most versatile grade agricultural land (11.3ha out of 19.7ha of land of BMV quality surveyed in this area) due to the widening scheme. Reuse of the topsoil and upper subsoil resources will be maximised.

Junctions on Widening Scheme

Chainage 0 – 90m

- 12.6.10 There will be a small loss of land, less than 1,500m² (0.15ha), under the footprint of the extended embankment. Reuse of topsoil resources will be maximised with excess topsoil from the field re-spread, but some subsoil will be lost in the construction of the embankment.

Chainage 2590 – 2900m

- 12.6.11 To the north of the A453 the land is woodland and there would be no loss of agricultural land here. To the south, most of the affected area is also woodland, with some agricultural land of which most is best and most versatile (about 2.4ha out of a total of 14.4ha of land of BMV quality for the junction as a whole). Reuse of topsoil resources will be maximised, but subsoil will not be recovered and available for landscaping or agricultural use.

Chainage 3650 – 4500m

- 12.6.12 Most of this section from the east side of the Power Station waste storage area to the west side of the Ratcliffe Underbridge, is woodland with only the eastern end being non-best and most versatile agricultural land. Reuse of topsoil resources, including that from the woodland areas, will be maximised but subsoil will not be recovered and available for landscaping or agricultural use.

Chainage 7480 – 7620m

12.6.13 This section is a mixture of best and non-best and most versatile agricultural land with an area of woodland at the junction. Here, there will be loss of best and most versatile grade agricultural land (0.2ha out of 0.3ha of land of BMV quality surveyed in this area) due to the widening scheme. Reuse of top soil resources, including that from the woodland areas, will be maximised but subsoil will be used in the construction of the embankments.

Areas for Flood Compensation

Chainage 200 – 500m

12.6.14 The flood compensation area south of the A453 is predominantly best and most versatile agricultural land (5.4ha out of 6.6ha of land of BMV quality surveyed). See Figure 2.12.3. The lowering of the land and increase in flood frequency will downgrade the land quality to non-best and most versatile and probably to ALC Grade 4 due to wetness.

Chainage 1650 – 1900m

12.6.15 The flood compensation area to the north of the A453 is predominantly best and most versatile agricultural land (3.2ha out of 4.0ha of land of BMV quality surveyed). The lowering of the land and increase in flood frequency will downgrade the land quality to non-best and most versatile and probably to ALC Grade 4 due to wetness.

12.7 Design and Mitigation Measures

12.7.1 The environmental resource objectives in the design of the A453 improvement scheme include the minimisation of the loss or degradation of best and most versatile agricultural land and loss or degradation of soil resources (in terms of topsoil and subsoil materials and characteristics in a land use context). The baseline environmental performance is the implementation of best practice for land planning and soil resource conservation in the scheme design and construction, these include:

- Department for Environment, Food and Rural Affairs (2004), The First Soil Action Plan for England: 2004 – 2006. Defra, London;
- European Union (2006), Thematic Strategy for Soil Protection <http://ec.europa.eu/environment/soil/index.htm>;
- Department for Environment, Food and Rural Affairs (2007), Soils in the Built Environment, www.defra.gov.uk/environment/land/soil/built-environ/index.htm;
- Ministry of Agriculture, Fisheries & Food (2000), Good Practice Guide for Handling Soils by Machine (2000), www.defra.gov.uk/farm/environmentland-use/soilguid/index.htm.

12.7.2 Essential measures that are appropriate and that have been included in the delivery of the A453 scheme are:

- Inclusion of soils in the scheme's Outline Construction Environmental Management Plan (CEMP);
- Minimisation of land-take;
- Avoidance of best and most versatile land where possible;
- Recovery and retention of all topsoil resources;
- Segregation of contrasting soil types in storage and replacement;
- Topsoil storage mounds to be no more than 3m high and subsoil mounds no more than 5m high;
- Storage mounds to be shaped to shed water and seeded to reduce weed growth, maintain structure and for stabilisation;
- Restoration of temporary soil storage areas to same or improved physical characteristics and land quality;
- Compliance with Ministry of Agriculture, Fisheries & Food 'Good Practice Guide for Handling Soils by Machine' (2000).

12.7.3 Desirable measures that have been included and enhance the scheme are:

- Enhancement of land quality where possible;
- Recovery and retention of subsoil resource where possible;
- Adoption of use of back-acter and dump trucks methods for handling agricultural soils (see Sheets 1-4, www.defra.gov.uk/farm/environmentland-use/soilquid/index.htm);
- Appointment of professional soil consultant to advise and audit implementation of measures to protect and conserve agricultural soils as set out in an Environmental Management Plan (EMP), a CEMP & a Handover Environmental Management Plan (HEMP).

12.7.4 The approach adopted in the A453 scheme is based on the application of best practice, and as a result only residual impacts are left at the impact assessment stage with little further mitigation options available for the type of development. The scope for improvement in schemes such as the A453 is limited to locally increasing soil depths, but the scale is too small to be materially significant. Another opportunity might have been the restoration of agricultural land on former brownfield areas within the scheme, but these are not present in this scheme or have been developed for other purposes (e.g. the Parkway).

12.7.5 Monitoring measures to be put in place will be checking compliance with the EMP, CEMP & HEMP, and implementation of best practice guidance at key stages.

12.8 Environmental Value and Magnitude of Impact

- 12.8.1 Using the criteria adopted in Table 2.12.1 and Table 2.12.2, the agricultural land quality along the carriageway widening, new route and flood compensation areas is assessed as of 'Medium' importance, with the exception of the Junction improvement proposals where the importance is 'Low' owing to their non-agricultural use (woodland).
- 12.8.2 There is a greater range of importance in terms of soil resources, from 'Low' for the disturbed soils at the Parkway Junction to having textural groups within the 'Medium' and 'High' categories associated with the carriageways and the flood compensation areas respectively, as shown in Table 2.12.6 below:

Table 2.12.6: Ranking of Importance of Land Quality and Soil Resources

| Scheme Component | IMPORTANCE | |
|---------------------------------------|--|-------------------------|
| | Land Quality | Soil Resources |
| Widening of existing carriageway | Medium | Medium /High |
| Upgraded junctions on widening scheme | Low (Parkway) Low (Ratcliffe) Medium (Barton Lane) | Low Medium Medium |
| New carriageway | Medium | Medium/High |
| Flood compensation areas | Medium Medium | High High |
| Wetland pond | Medium | Medium |
| Overall | Medium | Medium |

- 12.8.3 The magnitude of impact on the land quality is variable according to which part of the scheme is being assessed, although overall, the magnitude is Minor Adverse using the criteria shown in Table 2.12.3. The Junction upgrades along the existing carriageway have Negligible impact due to the extent of non-agricultural land. The carriageway widening and new carriageway have Minor Adverse impacts due to the extent of agricultural land take, whereas the flood compensation areas have a Major Adverse impact due to the degradation in quality affecting a field unit. The land used for the temporary storage of soils in conjunction with the construction of the flood compensation areas will be reinstated and consequently they are assessed as having Negligible impact.
- 12.8.4 Similarly for soil resources, there is a range of magnitude of effects from Negligible to Moderate depending on the scheme component, but overall, the effect is Minor to Moderate Adverse.
- 12.8.5 Table 2.12.7 below summarises the magnitude of impact on land quality and soil resources:

Table 2.12.7: Ranking of Magnitude of Impact on Land Quality and Soil Resources

| Scheme Component | MAGNITUDE | |
|---------------------------------------|----------------------------|---------------------------|
| | Land Quality | Soil Resources |
| Widening of existing carriageway | Minor Adverse | Moderate Adverse |
| Upgraded junctions on widening scheme | Negligible | Moderate Adverse |
| | Negligible | Moderate Adverse |
| | Negligible | Moderate Adverse |
| New carriageway | Minor Adverse / Negligible | Minor Adverse |
| Flood compensation areas | Major Adverse | Minor Adverse |
| | Major Adverse | Minor Adverse |
| Wetland pond | Moderate Adverse | Negligible |
| Overall | Minor Adverse | Minor to Moderate Adverse |

12.9 Significance of Effects

12.9.1 The matrix shown in Table 2.12.4 is used to assess the significance of the potential effects of the A453 improvement scheme on agricultural land quality and soil resource conservation. In terms of land quality, the upgrading of the Junctions along the existing carriageway are assessed to be of 'Neutral' significance, as is the temporary use of land for soil storage, and the new carriageway and widening of the existing A453 is of 'Slight' significance. The construction of the flood compensation areas and the wetland pond are of 'Large' and 'Moderate' significance respectively. Overall, the significance of the A453 improvement scheme for land quality is assessed to be Slight.

12.9.2 The significance for soil resources is more variable due to the differences in amount of soil resource lost during construction. The significance for the flood compensation areas and the wetland pond is 'Slight to Moderate' and 'Slight' respectively and the new carriageway road is assessed to be 'Slight to Moderate'. Given the loss of subsoil in the widening scheme and the upgraded junctions, the significance is 'Moderate' to 'Moderate to Large', and 'Moderate' respectively, with the exception of the Parkway junction where it is only 'Slight' due the disturbed nature of the soils. Overall, for soil resources, the significance of the scheme is assessed to be 'Slight to Moderate' depending the weighting given to the scheme components.

12.9.3 Table 2.12.8 summarises the significance of effects on land quality and soil resources:

Table 2.12.8: Significance of Potential Effects on Land Quality and Soil Resources

| Scheme Component | IMPORTANCE | | MAGNITUDE | | SIGNIFICANCE | |
|---------------------------------------|----------------------|----------------|-----------------------------|-----------------------------------|----------------------------|---------------------------|
| | Land Quality | Soil Resources | Land Quality | Soil Resources | Land Quality | Soil Resources |
| Widening of existing carriageway | Medium | Medium/High | Minor Adverse | Moderate Adverse | Slight | Moderate/Moderate - Large |
| Upgraded junctions on widening scheme | Low (Parkway) | Low | Negligible | Moderate Adverse | Neutral | Slight |
| | Low (Ratcliffe) | Medium | Negligible | Moderate Adverse | Neutral | Moderate |
| | Medium (Barton Lane) | Medium | Negligible | Moderate Adverse | Slight - Neutral | Moderate |
| New carriageway | Medium | Medium/High | Minor Adverse or Negligible | Minor Adverse | Slight or Slight - Neutral | Slight |
| Flood compensation areas | Medium | High | Major Adverse | Minor Adverse | Large | Slight - Moderate |
| | Medium | High | Major Adverse | Minor Adverse | Large | Slight - Moderate |
| Wetland pond | Medium | Medium | Moderate Adverse | Negligible | Moderate | Slight - Neutral |
| Overall | Medium | Medium | Minor Adverse | Minor Adverse to Moderate Adverse | Slight | Slight - Moderate |

12.10 Summary

12.10.1 The A453 improvement scheme to the west of Clifton will affect agricultural land and soils through the widening of part of the existing carriageway and modification of its junctions, and the construction of a new offline section. The scheme has been designed according to best practice in terms of minimising land take, methods of handling soils, and segregation and retention of soil resources. A Construction Environmental Management Plan and other EMP's will be prepared to ensure implementation of the essential and desirable environmental protection measures which are incorporated in the scheme. The environmental impact of the scheme has been undertaken using appropriate attribute and quality indicators, and ranking importance and magnitude of change values to derive objective measures of significance.

Value / Sensitivity

12.10.2 Agricultural land quality is an important quality measure of the value for agricultural use along the route of the scheme, as is the type and physical characteristics of soil material for soil conservation purposes.

12.10.3 The value and sensitivity of land quality and soil resources have been assessed using the MAFF (1988) Agricultural Land Classification grading system. Given the relatively small land-take, the value and sensitivity of agricultural land quality is at a local scale in the A453 improvement scheme. At this scale, most of the scheme is

assessed to be of Low to Medium importance according to the distribution and pattern of the higher 'best and most versatile' grades (i.e. ALC Grades 2 & 3a), but Medium for the overall scheme. The extent of land quality potentially affected by the scheme is summarised in the Table 2.12.9 below, which shows that 36.2ha of 'best and most versatile' land would be lost out of a total of 59.1ha of agricultural land affected (approximately 61%):

Table 2.12.9: Summary of Extent of Agricultural Land Quality Potentially Affected

| ALC Grade (ha) | | | | Total Land Take (ha) |
|----------------|----------|----------|------------------|----------------------|
| Grade 2 | Grade 3a | Grade 3b | Non-Agricultural | |
| 16.4 | 19.8 | 22.9 | 28.0 | 87.1 |

12.10.4 Similarly, for soil resources, the scale is at a local level. Due to the physical characteristics the soils are of Medium to High importance according to soil type and pattern, and Medium overall.

Magnitude of Impact (Degree of Change)

12.10.5 At the local scale the affect on agricultural land quality as an environmental resource is loss through construction of the scheme. The magnitude of impact is assessed to be Negligible to Minor Adverse for most of the scheme, and Minor Adverse overall. Only very locally is the magnitude greater (Major Adverse/Moderate Adverse) where there is a degradation of land quality due to the construction of the flood compensation areas and a wetland pond complex.

12.10.6 For most of the scheme the magnitude of impact on soil resources is Moderate Adverse as subsoil is used for construction purposes. Where the soils are retained but redistributed as in the flood compensation areas and the wetland, the magnitude is lower as Minor Adverse and Negligible respectively. The scheme's impact on soil resources is, overall, Minor to Moderate Adverse.

Significance of Residual Effects

12.10.7 Using a matrix of 'importance x magnitude' the majority of the scheme is assessed as having a Neutral to Slight residual effect on local land quality, and a Slight effect overall. The exceptions are the flood compensation areas where the effect is Large, and Neutral for the upgraded junction areas and areas used for temporary soil storage.

12.10.8 Despite approximately 61% of the total agricultural land potentially affected by the scheme being 'best and most versatile', this is made up of small fragmented areas of typically patterned land. An overall assessment of Slight effect on local land quality is therefore considered justified since any increased effect would be misrepresentative of the local situation.

12.10.9 The residual effects on the soil resource are more varied according to the use of subsoil in construction of the widening scheme, being assessed typically as Slight to Moderate. Greater residual effects can be expected as a result of the widening and associated upgraded junctions, where the significance is assessed as Moderate / Moderate – Large. The residual effect on the newly constructed parts and the wetland pond is Slight and Slight to Neutral respectively owing to the replacement of soils.

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