CON/2001/4463

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ENVIRONMENTAL IMPACT ASSESSMENT

M4 GREAT WOOD
MAIDENHEAD

MOTORWAY SERVICE AREA

Volume 2

JUNE 2001

CON/2001/4463

M4 Great Wood
Maidenhead

Motorway Service Area

Environmental Impact Assessment

Consultants to Swayfields Ltd:
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June 2001

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Volume 2

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APPENDICES

The following Appendices were prepared for an Environmental Statement submitted in July 1997 in support of a Planning Application for an MSA designed to serve both carriageways of the M4 motorway, and can best be described as representing a 'worst case' in terms of environmental impact.

APPENDIX	A	Consultations
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Appendix F2 was prepared to summarise the changes in Noise and Air Quality Impacts as a result of changes brought about by the removal of the eastbound access roads together with the subsequent reduction of traffic usage.

APPENDIX	F2	Air Quality and Noise Update

APPENDIX A

LIST OF CONSULTATIONS

Consultations have in most cases been informally undertaken by means of correspondence and dialogue with the following bodies and organisations.

Cultural Heritage

- Babtie Group (acting on behalf of Berkshire County Council)

Ecology and Nature Conservation

- English Nature
- the Environment Agency
- Babtie Group (acting on behalf of the County Ecologist)
- the Berkshire, Buckinghamshire and Oxfordshire Naturalists' Trust
- the Royal Society for the Protection of Birds
- the Reading Bat Group

Water Quality and Drainage

- the Environment Agency
- National Rivers Authority

APPENDIX B

CULTURAL HERITAGE

LIST OF SMR RECORDS

The following sites of archaeological or historical interest are located within the proposed development site:

SMR No	Grid Reference SU	Proximity to Proposed site	Description
667	85400 75559	South end of western portion of site	Linear spread of late or post Medieval tile and brick fragments. May be cobbling for a footpath
703	85600 75400	South end of eastern portion of site	Prehistoric flint tool found during fieldwalking in 1983.
2585	86000 75700	East end of site	Prehistoric flint/pot boiler found near Howlane Bridge
	8540 7580	Cultivated areas of proposed site	Areas of parallel lines reminiscent of Medieval or Post-Medieval ridge and furrow.

The following sites of archaeological or historical interest have been located within 1km of the proposed development site:

SMR No	Grid Reference	Proximity to Proposed site	Description
704	86400 75000	1km SE	Roman pottery found during fieldwalking. No further information
4045	86000 76120	0.45km NE	Littlefield farmhouse. Listed Building Grade II, Mid C16 Hall House
457	85220 76770	0.9km NW; North of Great Wood	One Neolithic pit containing bone flint, pottery and charcoal found during construction of gas pipeline. Included small fragment of human bone. This may be a cremation deposit and suggest Neolithic occupation on or near here.
431	84660 76130	1km NW	Medieval moat surviving as earthwork, with timber-framed house within enclosure. Scheduled ancient monument 12028.
431	84700 76150	1km NW	C16 timber-framed barn. Listed Grade II
702	84790 76289	0.9kkm NW	Scatter of Late Mesolithic/Early Neolithic flint tools found during fieldwalking in advance of gas pipeline. May suggest Prehistoric occupation in this vicinity
2579	845000 76100	1.2km NW	Medieval to Post-Medieval Brick Kiln near Smewins Farm
666	84730 76510	1.1km NW	C12 - C13 pottery, animal bone found on during excavation of pipeline. Debris may suggest some occupation of this date here.
3453	85210 74280	1.2km S	Cropmark of enclosure. This is depicted as circular on the SMR maps/
6043	84800 74800	1km SW	Previously unrecorded features including trackway, borrow pits, and bank in Great Hazes Wood
668	85870 75370	Field immediately south of The Cut	Spread of Roman pottery found during topsoil removal for pipeline. Scatter suggests existence of villa in existence from early 3rd to 4th century AD.

APPENDIX C

ECOLOGY

C1 Plants recorded during 1997

C2 Species recorded from Great Wood (Data from County Ecologist)

Appendix C1 Plants recorded during 1997

Species		The Cut	Hedges	Great Wood	Motorway Verge	Grassland	Scrub
Scientific name	Common Name						
Acer campestre	Field maple	o	a-d				f
Acer pseudoplatanus	Sycamore	f					
Agrostis capillaris	Common bent					lf	
Ajuga repens	Bugle			o			
Alliaria petiolata	Garlic mustard	o	o				
Alnus glutinosa	Alder	f					
Anthriscus sylvestris	Cow parsley	+	lf				
Arctium sp.	Burdock species	r					
Arrhenatherum elatius	False oat-grass		d		f-ld	a	
Artemisia vulgaris	Mugwort				lf		
Arum maculatum	Lords-and-Ladies	o	o	o			
Betula pendula	Silver birch		r	lf			r
Brachypodium sylvaticum	False brome	lo	lo	o			
Carex sp.	Rush species				r		
Carpinus betulus	Hornbeam			r			
Castenea sativa	Sweet chestnut			la			
Cirsium arvensis	Creeping thistle	o			la	f	
Cirsium vulgare	Spear thistle					+	
Cladophora sp.	Blanket weed	a					
Conium maculatum	Hemlock	lf				lf	
Corylus avellana	Hazel		lf	a			
Crataegus monogyna	Hawthorn	lf	a	r	o		f
Cupressus sp.	Cypress species		lf				
Dactylis glomerata	Cock's-foot	lf	lf		lf	a	f
Dipsacus fullonum	Wild teasel	lo	r			lo	
Dryopteris dilatata	Broad buckler-fern	o		o			
Dryopteris filix-mas	Male-fern	o					
Elytrigia repens	Common couch				la	a	
Epilobium hirsutum	Great willowherb	lf					ld
Euonymus europaeus	Spindle				lr		
Euphorbia amygdaloides	Wood spurge			o			
Fagus sylvatica	Beech		r	r			
Festuca rubra	Red fescue						lo
Filipendula ulmaria	Meadowsweet				lf		
Fraxinus excelsior	Ash	o		o-f	lo		r-o
F. excelsior (seedlings)	Ash seedlings			lf			
Glechoma hederacea	Ground ivy		o	o		lf	o
Hedera helix	Ivy	f					lf
Heracleum sphondylium	Hogweed		o			o	
Holcus lanatus	Yorkshire-fog	a-d	lf	lf			
Hyacinthoides non-scripta	Bluebell		lf	a			
Hypericum tetrapterum	Square-stalked St John's wort						r
Ilex aquifolium	Holly		r	lo			
Juncus effusus	Soft rush				lf		
Lamium pupureum	Red dead-nettle	lf					
Lonicera periclymenum	Honeysuckle			la			
Lysimachia nemorum	Yellow pimpernel			o			
Malus sp	Apple species			r			
Mnium hornum	A moss			lf			
Moehringia trinervia	Three-nerved sandwort			r			
Populus tremula	Aspen			lf			
Potentilla erecta	Tormentil			r			
Potentilla reptans	Creeping cinquefoil						r
Potomogeton sp (cf. pectinatus)	(Fennel) pondweed	la					
Primula vulgaris	Primrose			r			
Prunus spinosa	Blackthorn		lf				f
Pteridium aquilinum	Bracken			la	lf		
Quercus robur	Pedunculate oak	o	lf	o-f	o		o
Ranunculus ficaria	Lesser celandine	lo		r			
Ranunculus repens	Creeping buttercup			r			
Rhamnus catharticus	Buckthorn			r			
Rosa arvensis	Field rose	lo	lf				
Rosa canina	Dog rose		r				
Rubus fruticosus	Bramble	o	la	la	a-ld		ld
Rumex obtusifolius	Broad-leaved dock	o	o				
Salix cinera	Grey willow						o

Appendix C1 cont'd. Plants recorded during 1997

Species		The Cut	Hedges	Great Wood	Motorway Verge	Grassland	Scrub
Scientific name	Common Name						
Salix fragilis	Crack willow	o					
Sambucus nigra	Elder		r	r			
Senecio jacobaea	Common ragwort					r	
Stellaria holostea	Greater stitchwort	o	lo	lf			
Taraxacum sp.	Dandelion species					o	
Typha latifolia	Bulrush				r		
Ulex europeaus	Gorse		r				
Ulmus procera	English elm	lf	lf				
Ulmus sp	Elm species	lf	o		o-la		
Urtica dioica	Nettle	la	a	lf	a	lf	a
Viburnum opulus	Guelder-rose			r			
Vicia sativa	Comon vetch						r
Vicia sepium	Bush vetch	r					
Viola riviniana	Common dog violet			o			
Viola sp	Violet species	lf		lf			

Key
d = dominant
a = abundant
f = frequent
o = occasional
r = rare
l = local(ly)

Appendix C1 cont'd Bird species recorded during April 1997

Common Name	Scientific Name	WCA Schedule I	RDB Species	Annex I Birds Directive
Blackbird	*Turdus merula*		+	
Blackcap	*Sylvia atricarpilla*			
Blue tit	*Parus caeruleus*			
Bullfinch	*Pyrrhula pyrrhula*		+	
Chaffinch	*Fringilla coelebs*			
Chiffchaff	*Phylloscopus collybita*			
Cuckoo	*Cuculus canorus*			
Great spotted woodpecker	*Dendrocopus major*			
Great tit	*Parus major*			
Green woodpecker	*Picus viridis*		+	
Greenfinch	*Carduelis chloris*			
Kingfisher	*Alcedo atlhis*	+	+	+
Long-tailed tit	*Aegithalos caudatus*			
Mallard	*Anas platyrhynchos*			
Pheasant	*Phasianus colchicus*			
Robin	*Erithacus rubecula*			
Skylark	*Alauda arvensis*		+	
Song thrush	*Turdus philomelos*		+	
Stock dove	*Columba oenas*		+	
Swallow	*Hirundo rustica*		+	
Willow tit	*Parus montanus*			
Wren	*Troglodytes troglodytes*			
Yellowhammer	*Emberiza citrinella*			

Key:

WCA Schedule I	Species appear on Schedule I of the Wildlife and Countryside Act 1981.
RDB Species	Species appear on either the original Red Data Bird species list (Batten *et al* 1990) or the subsequent updates (JNCC 1996, RSPB 1996).
Annex I	Species appear on Annex I of the EC Birds Directive (EC 1979).

Appendix C1 cont'd. Other animal species recorded during 1997

Species	
Common name	**Scientific name**
Insects	
Black ant	*Lasius niger*
Small tortoiseshell	*Aglais urticae*
Small white	*Pieris rapae*
Peacock	*Inachis io*
Amphibians	
Toad	*Bufo bufo*
Mammals	
Rabbit	*Oryctolagus cuniculus*
Roe deer	*Capreolus capreolus*
Badger	*Meles meles*

Appendix C2 Species recorded from Great Wood (Data from County Ecologist)

Recorder site no: 777/1

File code: SU87N01

Site name(s): Great Wood

Grid reference(s): SU853764

Modern county(s): Berkshire

Site status(es): Wildlife Heritage Site

Site Description

A wood of limited interest - neglected. Its semi-natural state modified by substantial amounts of plantation. Ground flora unexciting being largely dominated by bramble. Wild service trees occur sparingly (including one huge specimen), aspen locally abundant forming thickets. Hornbeam occurs as coppice and rarely standards, but always along margins of rides. Some oak standards quite large. A1111 Oak/mixed - Hazel/mixed - Various. A1113 Oak/ash - Hazel - Bramble/bluebell. A1113 Hazel/various - - Bluebell/mixed. A122 Mixed - - Bracken/mixed. A1113 Sweet chestnut/field maple - Hazel/mixed - Mixed.

Sceintific name	Common name	Species Status
Pteridium aquilinum (L.) Kuhn	Bracken	Unknown
Dryopteris filix-mas agg. (L.)	Male Fern	Unknown
Dryopteris dilatata (Hoffm.) A	Broad Buckler-fern	Unknown
Picea abies (L.) Karsten	Norway Spruce	Unknown
Pinus sylvestris L.	Scots Pine	Unknown
Taxus baccata L.	Yew	Unknown
Ranunculus repens L.	Creeping Buttercup	Unknown
Ranunculus flammula L.	Lesser Spearwort	Unknown
Ranunculus ficaria L.	Lesser Celandine	Unknown
Urtica dioica L.	Common Nettle	Unknown
Fagus sylvatica L.	Beech	Unknown
Castanea sativa Miller	Sweet Chestnut	Unknown
Quercus cerris L.	Turkey Oak	Unknown
Quercus robur L.	Pedunculate Oak	Unknown
Betula pendula Roth	Silver Birch	Unknown
Betula pubescens Ehrh.	Downy Birch	Unknown

31 DEC 1996

Alnus glutinosa (L.) Gaertner	Alder	Unknown
Carpinus betulus L.	Hornbeam	Unknown
Corylus avellana L.	Hazel	Unknown
Moehringia trinervia (L.) Clai	Three-nerved Sandwort	Unknown
Stellaria media (L.) Villars	Common Chickweed	Unknown
Stellaria holostea L.	Greater Stitchwort	Unknown
Stellaria graminea L.	Lesser Stitchwort	Unknown
Lychnis flos-cuculi L.	Ragged Robin	Unknown
Rumex crispus L.	Curled Dock	Unknown
Rumex sanguineus L.	Wood Dock	Unknown
Viola sp.	a violet or pansy	Unknown
Viola riviniana Reichb.	Common Dog-violet	Unknown
Viola reichenbachiana Jordan e	Early Dog-violet	Unknown
Populus tremula L.	Aspen	Unknown
Salix caprea L.	Goat Willow	Unknown
Salix cinerea L.	Grey Willow	Unknown
Alliaria petiolata (M.Bieb.) C	Garlic Mustard	Unknown
Capsella bursa-pastoris (L.) M	Shepherd's-purse	Unknown
Primula vulgaris Hudson	Primrose	Unknown
Lysimachia nemorum L.	Yellow Pimpernel	Unknown
Ribes rubrum L.	Red Currant	Unknown
Ribes uva-crispa L.	Gooseberry	Unknown
Rubus fruticosus agg.	Bramble	Unknown
Potentilla anserina L.	Silverweed	Unknown
Potentilla erecta (L.) Raeusch	Tormentil	Unknown
Fragaria vesca L.	Wild Strawberry	Unknown
Geum urbanum L.	Herb Bennet	Unknown
Rosa arvensis Hudson	Field Rose	Unknown
Rosa canina sensu str.L.	Dog Rose	Unknown
Prunus spinosa L.	Blackthorn	Unknown
Prunus avium (L.) L.	Wild Cherry	Unknown
Pyrus communis L.	Pear	Unknown
Malus sylvestris sens.str.(L.)	Crab Apple	Unknown
Sorbus torminalis (L.) Crantz	Wild Service-tree	Unknown
Crataegus monogyna Jacq.	Hawthorn	Unknown
Vicia sepium L.	Bush Vetch	Unknown
Chamerion angustifolium (L.) H	Rosebay Willowherb	Unknown

Circaea lutetiana L.	Enchanter's-nightshade	Unknown
Cornus sanguinea L.	Dogwood	Unknown
Euonymus europaeus L.	Spindle	Unknown
Ilex aquifolium L.	Holly	Unknown
Mercurialis perennis L.	Dog's Mercury	Unknown
Euphorbia amygdaloides L.	Wood Spurge	Unknown
Acer campestre L.	Field Maple	
Acer pseudoplatanus L.	Sycamore	Unknown
Oxalis acetosella L.	Wood-sorrel	Unknown
Geranium robertianum L.	Herb-robert	Unknown
Anthriscus sylvestris (L.) Hof	Cow Parsley	Unknown
Heracleum sphondylium L.	Hogweed	Unknown
Solanum dulcamara L.	Bittersweet	Unknown
Myosotis arvensis (L.) Hill	Field Forget-me-not	Unknown
Lamium album L.	White Dead-nettle	Unknown
Lamium purpureum L.	Red Dead-nettle	Unknown
Ajuga reptans L.	Bugle	Unknown
Glechoma hederacea L.	Ground-ivy	Unknown
Prunella vulgaris L.	Selfheal	Unknown
Mentha arvensis L.	Corn Mint	Unknown
Fraxinus excelsior L.	Ash	Unknown
Scrophularia nodosa L.	Common Figwort	Unknown
Scrophularia auriculata L.	Water Figwort	Unknown
Veronica officinalis L.	Heath Speedwell	Unknown
Veronica chamaedrys L.	Germander Speedwell	Unknown
Veronica montana L.	Wood Speedwell	Unknown
Veronica persica Poiret	Common Field-speedwell	Unknown
Galium uliginosum L.	Fen Bedstraw	Unknown
Galium palustre L.	Common Marsh-bedstraw	Unknown
Galium aparine L.	Cleavers	Unknown
Sambucus nigra L.	Elder	Unknown
Viburnum opulus L.	Guelder-rose	Unknown
Lonicera periclymenum L.	Honeysuckle	Unknown
Succisa pratensis Moench	Devil's-bit Scabious	Unknown
Arctium minus (Hill) Bernh.	Lesser Burdock	Unknown
Cirsium vulgare (Savi) Ten.	Spear Thistle	Unknown
Cirsium palustre (L.) Scop.	Marsh Thistle	Unknown

Taraxacum officinale agg. Webe	Dandelion	Unknown
Hieracium sp.	a hawkweed	Unknown
Matricaria recutita L.	Scented Mayweed	Unknown
Senecio jacobaea L.	Common Ragwort	Unknown
Senecio vulgaris L.	Groundsel	Unknown
Arum maculatum L.	Lords-and-ladies	Unknown
Juncus effusus L.	Soft Rush	Unknown
Luzula multiflora (Ehrh.) Lej.	Heath Wood-rush	Unknown
Carex remota L.	Remote Sedge	Unknown
Carex ovalis Gooden.	Oval Sedge	Unknown
Carex sylvatica Hudson	Wood-sedge	Unknown
Milium effusum L.	Wood Millet	Unknown
Poa annua L.	Annual Meadow-grass	Unknown
Poa trivialis L.	Rough Meadow-grass	Unknown
Dactylis glomerata L.	Cock's-foot	Unknown
Melica uniflora Retz.	Wood Melick	Unknown
Arrhenatherum elatius (L.) P.B	False Oat-grass	Unknown
Deschampsia cespitosa (L.) P.B	Tufted Hair-grass	Unknown
Holcus lanatus L.	*Yorkshire-fog*	*Unknown*
Holcus mollis L.	Creeping Soft-grass	Unknown
Anthoxanthum odoratum L.	Sweet Vernal Grass	Unknown
Agrostis stolonifera L.	Creeping Bent	Unknown
Brachypodium sylvaticum (Hudso	False-brome	Unknown
Hyacinthoides non-scripta (L.)	Bluebell	Unknown
Dactylorhiza fuchsii (Druce) S	Common Spotted-orchid	Unknown
Orchis mascula (L.) L.	Early-purple Orchid	Unknown
Inachis io Linnaeus	Peacock	Common
Polygonia c-album Linnaeus	Comma	Common
Accipiter nisus (L.)	Sparrowhawk	Unknown
Falco tinnunculus L.	Kestrel	Unknown
Phasianus colchicus L.	Pheasant	Unknown
Gallinula chloropus L.	Moorhen	Unknown
Streptopelia turtur (L.)	Turtle Dove	Unknown
Cuculus canorus L.	Cuckoo	Unknown
Athene noctua (Scopoli)	Little Owl	Unknown
Strix aluco (L.)	Tawny Owl	Unknown
Picus viridis L.	Green Woodpecker	Unknown

Dendrocopos minor (L.)	Lesser Spotted Woodpecker	Unknown
Anthus trivialis (L.)	Tree Pipit	Unknown
Troglodytes troglodytes (L.)	Wren	Unknown
Erithacus rubecula (L.)	Robin	Unknown
Luscinia megarhynchos Brehm	Nightingale	Unknown
Turdus merula L.	Blackbird	Unknown
Turdus philomelos Brehm	Song Thrush	Unknown
Turdus iliacus L.	Redwing	Unknown
Turdus viscivorus L.	Mistle Thrush	Unknown
Sylvia curruca (L.)	Lesser Whitethroat	Unknown
Sylvia communis Latham	Whitethroat	Unknown
Sylvia borin (Boddaert)	Garden Warbler	Unknown
Sylvia atricapilla (L.)	Blackcap	Unknown
Phylloscopus collybita (Vieill	Chiffchaff	Unknown
Phylloscopus trochilus (L.)	Willow Warbler	Unknown
Regulus regulus (L.)	Goldcrest	Unknown
Muscicapa striata (Pallas)	Spotted Flycatcher	Unknown
Aegithalos caudatus (L.)	Long-tailed Tit	Unknown
Parus palustris L.	Marsh Tit	Unknown
Parus montanus Conrad	Willow Tit	Unknown
Parus ater L.	Coal Tit	Unknown
Parus major L.	Great Tit	Unknown
Sitta europaea L.	Nuthatch	Unknown
Certhia familiaris L.	Treecreeper	Unknown
Garrulus glandarius (L.)	Jay	Unknown
Pica pica (L.)	Magpie	Unknown
Corvus monedula L.	Jackdaw	Unknown
Corvus frugilegus L.	Rook	Unknown
Corvus corone agg. L.	Carrion Crow	Unknown
Sturnus vulgaris L.	Starling	Unknown
Passer domesticus (L.)	House Sparrow	Unknown
Passer montanus (L.)	Tree Sparrow	Unknown
Fringilla coelebs L.	Chaffinch	Unknown
Fringilla montifringilla L.	Brambling	Unknown
Carduelis chloris (L.)	Greenfinch	Unknown
Carduelis carduelis (L.)	Goldfinch	Unknown
Carduelis spinus (L.)	Siskin	Unknown

Carduelis cannabina (L.)	Linnet	Unknown
Carduelis flammea (L.)	Redpoll	Unknown
Pyrrhula pyrrhula (L.)	Bullfinch	Unknown
Coccothraustes coccothraustes	Hawfinch	Unknown
Emberiza citrinella L.	Yellowhammer	Unknown
Oryctolagus cuniculus L.1758	Rabbit	Common
Sciurus carolinensis Gmelin 17	Grey Squirrel	Naturalised
Capreolus capreolus L.1758	Roe Deer	Common
Muntiacus reevesi Ogilby, 1839	Muntjac	Naturalised

Number of species: 173

Appendix C2 cont'd.

APPENDIX D

AGRICULTURAL LAND QUALITY

D1 Preliminary Appraisal of Probable Agricultural Land Quality in the Locality

D2 Survey of Agricultural Land Quality

Reading Agricultural Consultants

Races Farm, Aston Street, Aston Tirrold, Didcot. Oxon. OX11 9DJ Tel. (01235) 851515 Fax. (01235) 851511

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APPENDIX D1

PROPOSED MOTORWAY SERVICE AREA
ADJACENT TO M4
GREAT WOOD
MAIDENHEAD
BERKSHIRE

PRELIMINARY APPRAISAL
OF PROBABLE
AGRICULTURAL LAND QUALITY
IN THE LOCALITY

June 1997

Directors: T R. Worthington, BScHonsAgricSci, MIBiol; C. J. Duncan, BSc. NDA. MIAgrM. *Secretary:* S. J. Fordham, BSc, Dip Agric Sci (SoilSci).
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A. R. Staniforth, BSc, AICTA.
Reading Agricultural Consultants Ltd Registered Office as above Company No. 3282982 Registered in England

Recycled

METHOD AND BACKGROUND

Introduction

The area appraised is a fairly broad corridor of land containing the M4 and extending for approximately 5 miles (8km) north-east and south-west of the proposed site between Junctions 7 and 10.

This preliminary appraisal attempts to separate categories of probable predominant land quality that are significant in terms of national development planning policy. This normally seeks to conserve the "best and most versatile" agricultural land against development, especially irreversible development, in the long-term national interest. "Best and most versatile" land comprises that which is in grades 1, 2 and subgrade 3a of the Ministry of Agriculture's Agricultural Land Classification (ALC) system.

Reference is normally first made to the published Provisional 1" to 1 mile ALC maps for broad indications of land quality. However, these do not separate subgrades 3a and 3b within grade 3, and their use for predicting land quality in the national policy context is thus limited. The appraisal has therefore been made mainly by interpretation of published soil and agroclimatic information.

The results are shown on the attached Plans RAC NE and RAC SW. These overlap slightly, for clarity and ease of use. Please note that the keys are not quite identical.

Information sources

1. **Agricultural Land Classification of England and Wales** - Revised guidelines and criteria for grading the quality of agricultural land. Published by MAFF in October 1988, for application from January 1989.

2. **Climatological Data for Agricultural Land Classification** - Grid point data sets of climatic variables, at 5km intervals, for England and Wales. Published by the Meteorological Office in January 1989. These data were interpolated for five representative points along the corridor.

3. **Provisional Agricultural Land Classification** map at a scale of 1" to 1 mile - Sheets 159 and 169 (The Chilterns and Aldershot).

4. **Reconnaissance Soil Survey information: Regional Soil Association Map of South East England (1: 250,000 scale)** - and accompanying descriptive Bulletin No. 15 - Soils and their Use in South East England. Published by the Soil Survey of England and Wales.

5 **Semi-detailed Soil Survey information**: Soils of the Reading District - sheet 268 - and accompanying descriptive Memoir.

The reconnaissance scale map shows soil information for the whole of the area, whilst semi-detailed soil information is available west of easting reference SU 815.

Agroclimatic characteristics

The local climate is relatively warm and dry with the average annual rainfall less than the national average throughout the area. The moisture deficits are relatively large (between 114 and 116mm for wheat and 109 and 112mm for potatoes) across the area, whilst the local FCD regime is not severe (between 136 and 141 days) for the "average" soils. However, where there are poorly permeable and/or heavy-textured soils, the land would normally become wetter than "Field Capacity" somewhat earlier in autumn and remain wetter for longer in spring, giving a relatively extended FCD period.

BRIEF DESCRIPTION OF THE LAND QUALITY UNITS

Predominantly higher quality land (Red on Plan RAC NE)

Land in this category occurs between Junctions 7 and 8/9 on low-lying land adjacent to the River Thames.

The reconnaissance soil map shows the area to be covered by one soil association, **Sutton 2**. It occurs on level or gently sloping ground where soils are well drained, fine or coarse loamy and developed on river terrace gravels. There are five main soil series: **Sutton**, **Rougemont**, **Maplestead**, **Ludford** and **Wick**. **Sutton series** is predominantly fine loamy, whilst **Rougemont series** is coarse loamy over gravel within 80cm depth. **Maplestead** and **Wick** are deeper and coarse loamy. **Ludford series** has deep fine loamy, non-calcareous soils, whilst **Panton**, a minor series, is similar but calcareous. There are two other minor series which are developed in calcareous river alluvium and variably affected by groundwater. **Usher series** is predominantly fine loamy, whilst **Thames series** is predominantly clayey.

The main soil series are well drained (WC 1) and are most likely to be constrained by droughtiness, limiting land to mainly higher quality subgrade 3a and grade 2. The minor series are imperfectly to poorly drained WC 3 or 4 and are likely to be mainly lower quality in subgrade 3b constrained by wetness/workability and locally seasonal flooding limitations. They would only occupy a very limited total extent.

Predominantly grade 3 land (Orange on Plan RAC NE and SW)

Land in this category is the most extensive and occurs between Junctions 8/9 and 10.

This is land where it is not generally possible to predict the relative extent of subgrades 3a and 3b without detailed field survey to determine topsoil texture (medium or heavy loamy) and soil Wetness Class, the latter depending upon the depth to poorly permeable subsoil. Nor is it possible to determine soil profile depth and stoniness over gravel, which may alter over relatively short distances. These soil profile characteristics, together with texture, are important to determine the droughtiness limitation.

The reconnaissance soil map shows two main soil associations **Wickham 4** and **Hurst**.

Wickham 4 Association has soils developed in fine loamy drift over Tertiary clay (Reading Beds and London Clay). There are three main soil series: **Wickham**, **Denchworth** and **Windsor**. **Wickham series** is fine loamy over clayey whilst Denchworth and Windsor are predominantly clayey throughout and differ only in subsoil colour. There are seven minor soil series: clayey, calcareous **Evesham**; coarse loamy over clayey **Kings Newton**; fine loamy over clayey **Oxpasture**; sandy **Cuckney**; coarse loamy **Curdridge** and fine loamy **Shabbington**. The main soils are imperfectly to poorly drained (WC 3 or 4) constrained by wetness/workability limitation. They are likely to be mainly a mixture of higher and lower quality land in subgrades 3a and 3b but with locally significant patches of grade 2.

Hurst Association has soils developed in low-lying river terrace gravel. There are five main soil series: coarse loamy over gravel **Hurst** and **Breamore**; fine loamy over gravel **Southminster**; deeper coarse loamy **Swanwick** and fine loamy **Waterstock**. Other minor soil series include unmottled coarse loamy over gravel **Hucklesbrook**; organic, sandy **Sollom**; fine loamy **Shabbington**; fine loamy over clayey **Wickham**; and coarse loamy over clayey **Loquiers**.

These soils are likely to be well or moderately well drained (WC 1 or 2) limited mainly by droughtiness and there is likely to be a mixture of higher and lower quality land, in mainly subgrades 3a and 3b.

The semi-detailed soil map shows four main soil series **Wickham, Hurst, Enborne** and **Titchfield Complex** each with contrasting characteristics.

Wickham series occurs on the middle and upper slopes and soil profiles are derived from variable thicknesses of medium and heavy loamy drift over clay. They are generally imperfectly drained (WC 3), but can be poorly drained (WC 4). Topsoils are likely to be mainly medium clay loam, giving mainly subgrade 3a; however it is possible that heavy clay loam topsoils may occur in places giving subgrade 3b. Wetness/workability is the main limitation.

Hurst series occurs on the flatter lower ground, where soil profiles are derived from varying thicknesses of coarse loamy drift overlying river terrace gravel. Soil profiles are generally well (WC 1) or moderately well drained (WC 2) and typically comprise sandy loam upper layers over sandy loam or sandy clay loam lower layers over gravel usually within 800mm depth. Soil profile stoniness generally increases towards the gravel. Where soil profiles are relatively thick over gravel the land

is likely to be mainly higher quality in subgrade 3a; however where soil profiles are thin over gravel they will probably be lower quality, in subgrade 3b. Droughtiness is the main limitation.

Enborne series occurs along part of the floodplain of a tributary leading to the River Loddon at Emm brook. Soil profiles are developed in stoneless, fine loamy alluvium and are likely to be affected by wetness/workability and seasonal flooding limitations.

A small area of **Titchfield complex** occurs close to Warren Farm. There are two main soil series included within this complex: **Wickham series** in fine loamy Eocene drift and **Titchfield series** in gravelly drift. These soils are likely to be mainly affected by wetness/workability limitations and a mixture of higher and lower quality land.

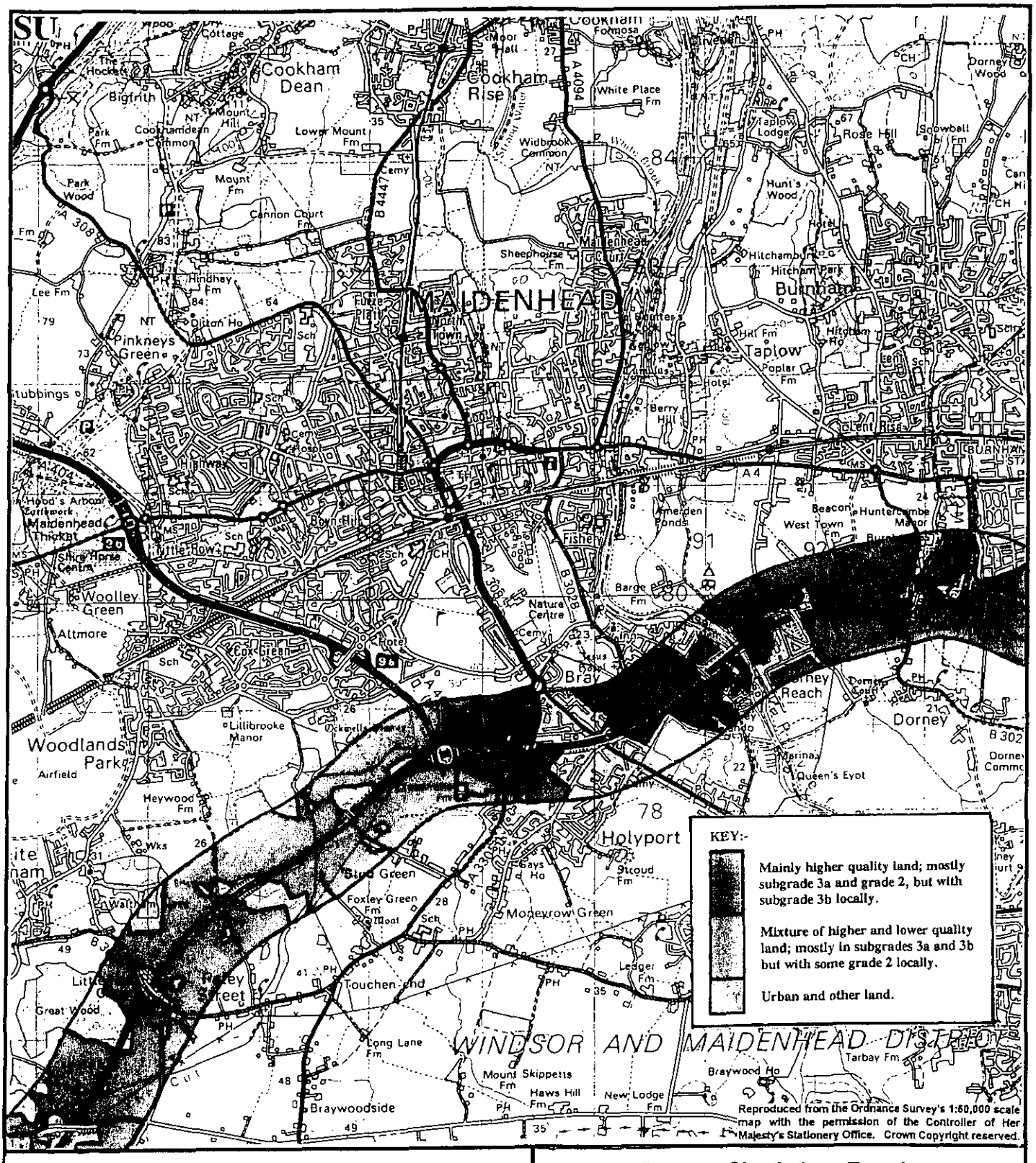
Predominantly lower quality land (Green on Plan RAC NE and SW)

Land in category has mainly heavier textured, seasonally wet soils and is likely to be predominantly in subgrade 3b.

The semi-detailed soil map shows four main soil series. The most extensive are **Windsor and Woolhampton series** which have soil profiles that are predominantly clayey, gleyed and poorly permeable from relatively shallow depth (WC 4). In places a thin layer of drift can occur over the clay, but usually heavy-textured topsoils lie directly over clay.

Ferrel series has soil profiles which are also predominantly clayey, but upper layers are generally slightly stony over clay, reflecting their "drift" origin.

The main limitation to land quality is relatively severe seasonal wetness affecting the land's workability, most probably to subgrade 3b. In places, very severe wetness/workability limitations may prevail, limiting the land to grade 4 at best. Elsewhere, local patches of better quality subgrade 3a land may occur, but these are considered unlikely to be extensive.



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PLAN RAC NE: Probable predominant agricultural land quality

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LAND ADJACENT TO THE M4 BETWEEN GREAT WOOD AND JUNCTION 7

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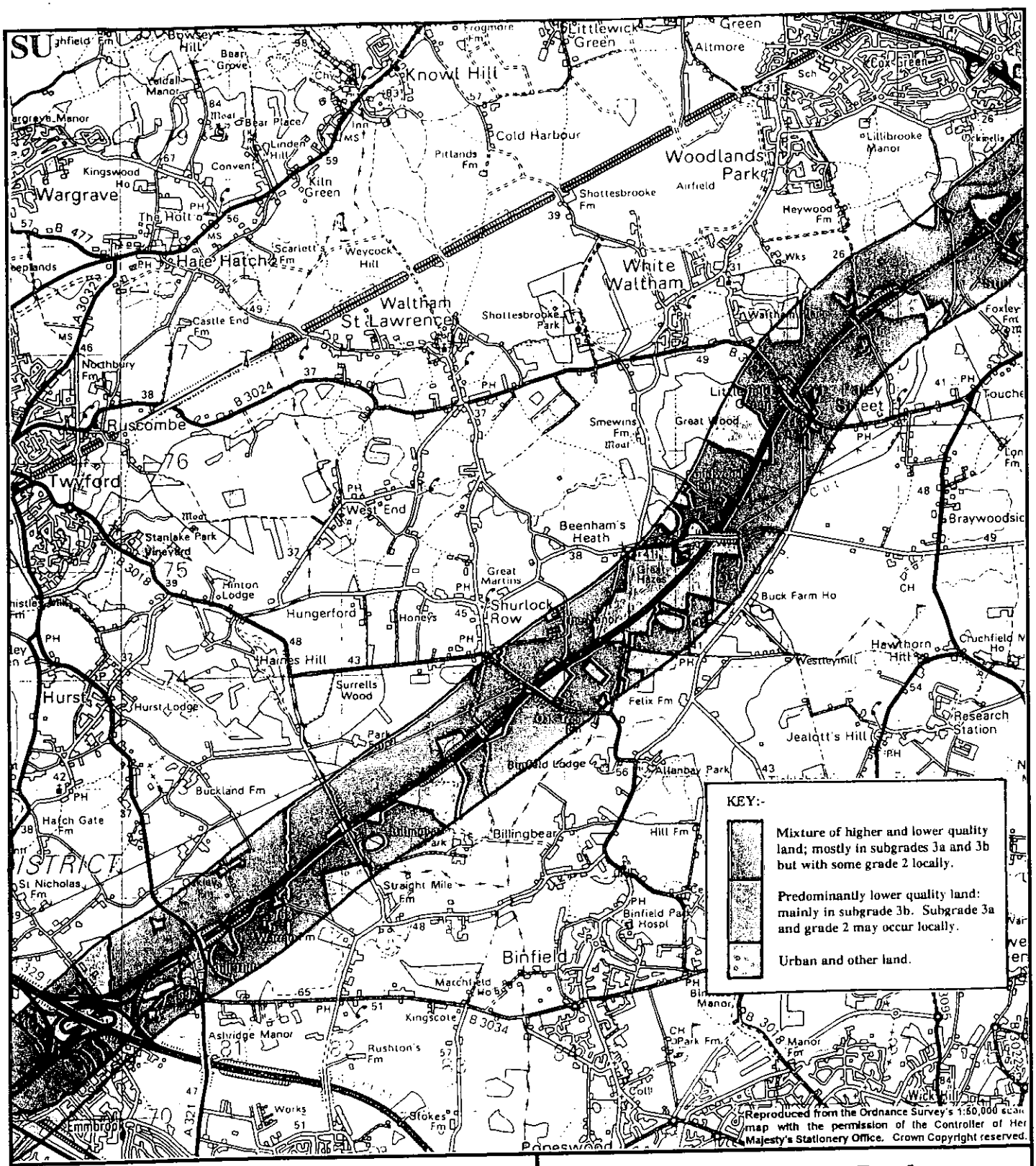

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PLAN RAC SW: Probable predominant agricultural land quality

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APPENDIX D2

LAND ADJACENT
TO THE M4
GREATWOOD
MAIDENHEAD
BERKSHIRE

AGRICULTURAL LAND QUALITY

June 1997

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1. SITE AND CLIMATIC CHARACTERISTICS

1.1 General features and land form

The site lies between Junctions 8 and 9 of the M4 motorway, to the south-west of Maidenhead and to the south of White Waltham on land adjacent to Great Wood.

The area surveyed extends to about 48ha; about 10.3ha to the west of the motorway and 37.7ha to the east. Most (44.1ha) is agricultural land in arable cultivation growing winter cereals and field beans, with two small grass fields in the south-west. The remaining land (3.9ha) comprises woodland and a large drainage ditch called The Cut. The grass field to the west of the main drain appeared to be disturbed, with dumped rubbish scattered across it and also found in heaps mixed with brick rubble.

The site is bounded to the north partly by Great Wood and Littlefield Farm; to the east by Howe Lane and to the south by a minor road and a track leading to Pondwood Farm. Elsewhere, the site is bounded by other agricultural land.

The higher ground is in the north and east at about 42m aOD. The land then slopes very gently towards the south and west to the lower ground at about 40m aOD.

Over much of the site surface form is mainly smooth, however in the two grass fields to the south-west it is more uneven.

1.2 Main soil parent materials

The most extensive soil parent material across the site is Tertiary clay (London Clay and Reading Beds) which is covered by varying thicknesses of fine loamy drift.

On much of the land to the north and partly to the south soil profiles typically comprise moderately thick, fine loamy upper layers over predominantly clayey and sandy clay lower layers. Locally,

in the south the fine loamy drift is thicker and slightly to moderately stony. Across the centre of the site the drift is thin or absent and soils profiles are typically predominantly clayey throughout.

Across most of the site natural drainage is initially by free vertical percolation through the upper soil profile layers then by lateral subsurface seepage across poorly permeable subsoil layers and then to ditches and drains.

1.3 Climatic factors

Climatic factors affecting land quality, especially by their interaction with soil factors, are set out below. These have been interpolated from the Met. Office's standard 5km grid point data set for the representative location **SU 858757**, at about **40m aOD**.

Average annual rainfall (AAR): 659mm
Accumulated temperature > 0°C (ATO): 1473day°
Field Capacity Day regime (FCD): 140days
Average moisture deficit - winter wheat (MD_w): 116mm
Average moisture deficit - potatoes (MD_p): 110mm

The local climate is warm and moist. The moderately large number of FCD reflects the winter rainfall.

2. LAND QUALITY AND MAIN SOIL CHARACTERISTICS

2.1 Survey methods

Fifty-three soil profile observations were made with an Edelman (Dutch) auger at the approximate locations shown on Plan RAC 1. Soil profiles characteristics were also examined in more detail in three soil inspection pits (at or near the same location as selected auger borings): these are also shown on Plan RAC 1. Overall observation density is about 1.2 per hectare.

Texture; significant stoniness; colours (especially gley mottle colours indicating seasonal wetness); density, degree of fissuring and macroporosity (together indicating structural conditions, permeability and rooting opportunities); free calcium carbonate; organic matter content; and thickness were assessed for each main soil horizon to 1.2m depth or to very stony material whichever was the shallower.

Soil Wetness Class (WC) was inferred from the presence or absence of, and depth to, greyish and ochreous gley mottling and/or poorly permeable subsoil layers at least 150mm thick.

Samples were taken from six locations for particle-size analysis, to check field estimates of soil texture.

2.2 Agricultural Land Classification (ALC) and main limitations

Soil, site and climatic constraints were evaluated mainly by reference to MAFF's 1988 revised ALC guidelines and criteria.

The most extensive limitation is seasonal wetness affecting the land's workability and accessibility for livestock grazing. The wetness limitation derives from moderately or poorly permeable subsoil impeding drainage to different degrees of severity (depending on the depth of occurrence) and causing seasonal waterlogging of the upper soil profile layers. Seasonal wetness combines with heavy topsoil texture to restrict the land's workability. This constraint

limits the land mainly to subgrade 3a, since poorly permeable subsoil extensively starts at moderate depth, but also to subgrade 3b and grade 2.

Locally, droughtiness on its own or in combination with a wetness/workability limitation constrains land to grade 2 quality.

In the south, on a small area of land which appears to be disturbed, a combination of an excessively stony surface and badly compacted subsoil severely limits cropping and has therefore been double symbolled subgrade 3b/grade 4.

Just under two thirds of the site (59%) is higher quality land in subgrade 3a (17.7ha: 40%) and grade 2 (8.4ha: 19%). The remaining land (41%) is lower quality in subgrade 3b (14.5ha: 33%) and subgrade 3b/grade 4 (3.5ha: 8%).

2.3 Brief description of the land quality map units

Grade 2

Land in this grade in the least extensive and occurs in two small areas on land to the east of the M4 and across the centre of the land to the west of the M4.

Soil profiles typically comprise dark brown, slightly stony, sandy loam or sandy clay loam topsoils over gleyed, similarly-textured upper subsoils over slightly to moderately stony, sandy clay loam or sandy clay (occasionally loamy sand and sand) lower subsoils.

These soils are moderately well to imperfectly drained (WC 2 or 3) and constrained by a slight wetness/workability and/or slight droughtiness limitations.

Subgrade 3a

This subgrade is the most extensive and occurs mainly in the northern half of the land to the east and also in the southern half of land to the west.

Soil profiles typically comprise sand clay loam or medium clay loam topsoils over similarly-textured upper subsoils over predominantly clayey, gleyed and poorly permeable lower subsoils. These soils are imperfectly drained (WC 3) and constrained by a wetness/workability limitation.

Subgrade 3b

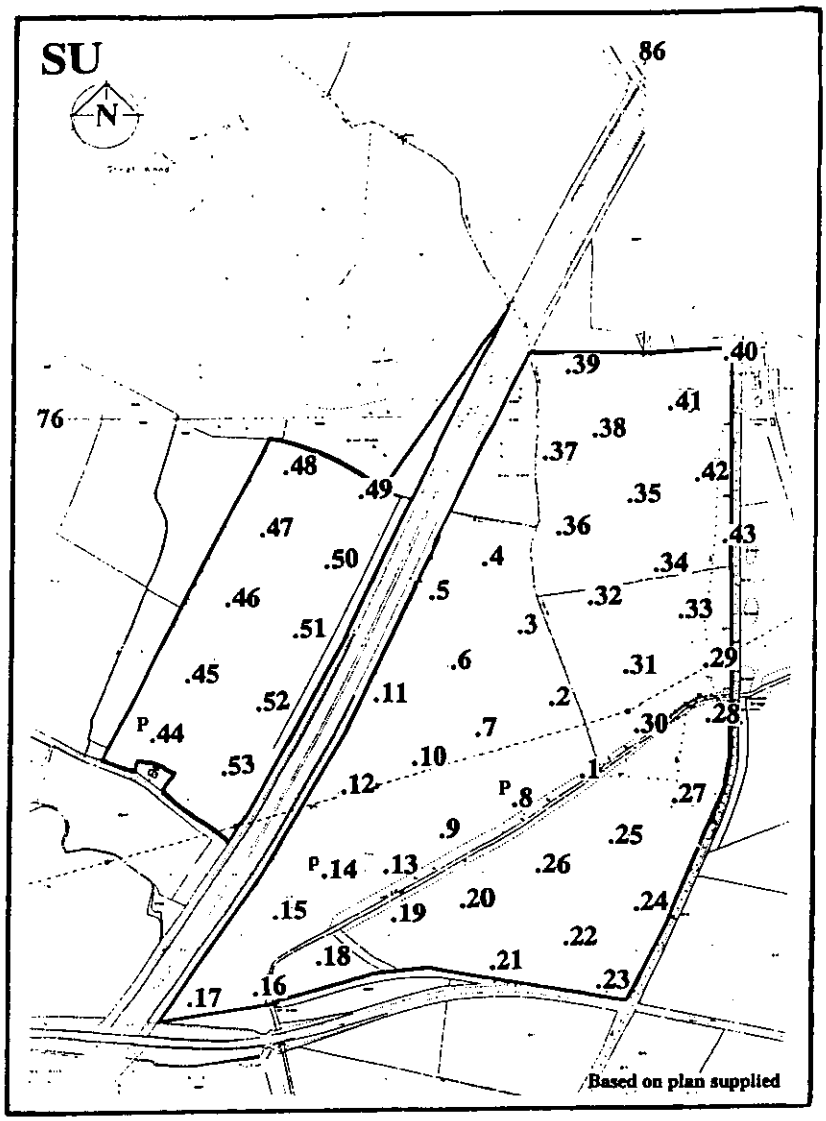
The largest area of subgrade 3b land occurs in the east extending from the south-eastern corner across the centre of the site. It also occurs in a small area of land to the west.

Soil profiles typically comprise dark greyish brown, stoneless to very slightly stony, heavy clay loam or clay topsoils over predominantly clayey, gleyed and poorly permeable lower subsoils. These soils are poorly drained and in WC 4 and constrained by moderately severe wetness/workability limitations.

Subgrade 3b/Grade 4

In the south-west, where the land is thought to be disturbed, soil profiles typically comprise thin, moderately stony, sandy clay loam, heavy clay loam or clayey topsoils, partly mixed with subsoil in places, over similarly-textured, stony subsoils over very stony material at between 30 and 50cm depth.

A combination of topsoil stoniness and badly compacted subsoil, producing droughtiness limitations through restricted rooting, limits the cropping potential of the land and has therefore been graded subgrade 3b/grade 4.



KEY:-

.1	auger boring
P	pit

PLAN RAC 1: OBSERVATION POINTS (approximate locations)

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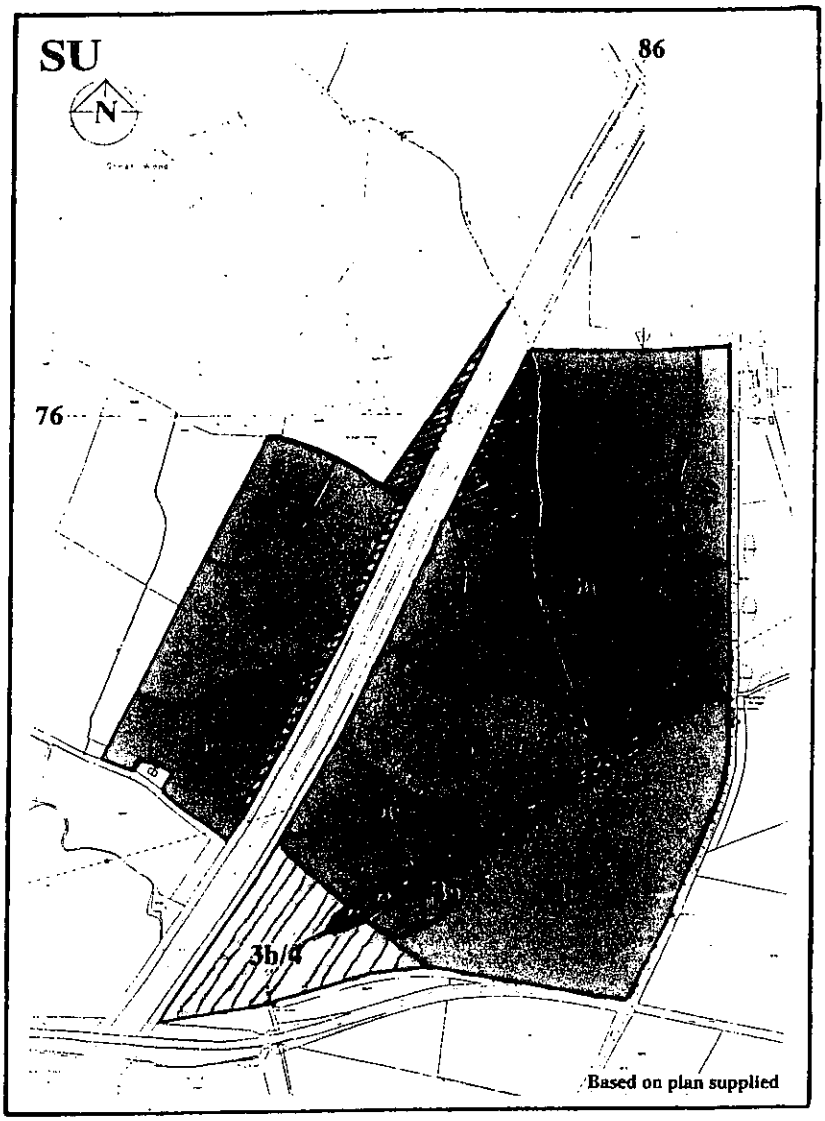

KEY:-

1	Very good quality land: slight wetness/workability and/or droughtiness limitations.
2	Good quality land: wetness/workability limitations.
3b	Moderate quality land: moderately severe wetness/ workability limitation.
3b/4	Moderate to poor quality land: excessively stony surface and badly compacted subsoil which severely limits cropping.
W	Woodland and large drainage ditch.

PLAN RAC 2: AGRICULTURAL LAND CLASSIFICATION (ALC)

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APPENDIX E

AIR QUALITY ASSESSMENT

APPENDIX E

CONSULTING SERVICES BY ENVIRONMENTAL RESOURCES MANAGEMENT

Swayfields Limited

Air Quality Assessment: *Maidenhead MSA*

June 1997

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DRAFT FINAL REPORT

Swayfields Limited

Air Quality Assessment:
Maidenhead MSA

June 1997

Reference 4485

For and on behalf of Environmental Resources Management	
Approved by:	D. ACKROYD
Signed:	
Position:	TECHNICAL DIRECTOR
Date:	6th JUNE 1997

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1 INTRODUCTION

1.1 SCOPE OF THIS ASSESSMENT

The construction and operation of the proposed MSA will result in emissions of pollutants to air. This section assess the air quality impacts of the proposed development, addressing the following issues:

- dust associated with the construction of the proposed MSA;
- exhaust gases emitted from vehicles using the proposed MSA;
- volatile organic compounds emitted from the refuelling facility;
- gases produced upon combustion of fuel in boilers associated with the amenity building and lodge; and
- odours associated with the catering facility in the amenity building

These potential air quality impacts are considered in the context of the existing air quality in the region, which is heavily influenced by the proximity of the M4 motorway.

The assessment is undertaken with reference to air quality standards and guidelines for the protection of human health, as presented in *Section 1.5.*

1.2 POLLUTANTS INCLUDED IN THE ASSESSMENT

The assessment addresses those air pollutants which are likely to be released from the sources outlined above. The pollutants likely to be released from each source are presented in *Table 1.1.*

Table 1.1 Potential Sources of Atmospheric Pollutants from the Proposed MSA

Pollutant	Source
Nitrogen dioxide	Vehicle exhausts, boilers
Carbon monoxide	Vehicle exhausts
Volatile organic compounds (including benzene, 1,3-butadiene, toluene, ethylbenzene and xylenes)	Vehicle exhausts, refuelling area
Particulate matter (including dust and fine particulate matter, PM_{10})	Construction, vehicle exhausts, boilers
Sulphur dioxide	Boilers, vehicle exhausts
Lead	Vehicle exhausts
Odours	Catering facilities

1.3 POTENTIAL RECEPTORS

Those properties closest to the proposed MSA, which are most likely to be affected by it are as follows:

- Pondwood Cottage and Magpie Cottage, bordering the western section of the proposed MSA;
- Pondwood Farm, some 200 m from the western section of the application site boundary for the MSA;
- How Lane Farm and How Lane Farm Units, approximately 200 m to the east of the application site boundary.

1.4 SOURCES OF INFORMATION

For the purposes of this assessment, information has been obtained from the following sources:

- Baseline air quality data were obtained from the Environmental Health Unit of the Royal Borough of Windsor and Maidenhead and air quality surveys undertaken by AEA Technology and funded by the Department of the Environment.
- Ordnance Survey maps of the local area.
- Information relating to the proposed MSA was provided by Swayfields Ltd.

1.5 AIR QUALITY STANDARDS AND GUIDELINES

1.5.1 *European Union Standards*

The only air quality standards which have any legal status in the UK, via *The Air Quality Standards Regulations 1990*, are those laid down in European Union (EU) Directives 80/779/EEC, 85/203/EEC and 85/210/EEC regarding sulphur dioxide and suspended particulates, nitrogen dioxide and lead, respectively. These standards are summarised in *Table 1.2*.

1.5.2 *EPAQS, NAQS and WHO Standards and Guidelines*

In addition to EU standards applicable to the substances included in this assessment, there are other sources of guidelines for air quality which may be applied.

The Department of the Environment's Expert Panel on Air Quality Standards (EPAQS). The EPAQS advises the Department of the Environment on the establishment and application of air quality standards in the UK, for the purposes of developing policy on air pollution control and increasing public

knowledge and understanding of air quality. The guidelines recommended by EPAQS are summarised in *Table 1.3.*

The United Kingdom National Air Quality Strategy [1] . This document, produced by the Department of the Environment, provides air quality standards and objectives for levels of air pollutants, with the aim of improving air quality in the UK. The standards have not yet achieved full legal status in the UK, although they are likely to do so in the near future. Many of the standards are derived from the EPAQS recommendations. The standards of relevance to pollutants emitted from the proposed MSA are presented in *Table 1.4.*

Air Quality Guidelines for Europe, the World Health Organisation (WHO) [2][3]. These guidelines are intended to provide background and guidance to governments in making risk management decisions, particularly in setting air quality standards. World Health Organisation (WHO) air quality guidelines for the substances which might be emitted from the proposed MSA are presented in *Table 1.5.*

1.5.3 *Dust Deposition*

There are no legal standards or guidelines for dust deposition rates in the UK, although deposition rates exceeding 200 mg m^{-2} day^{-1} (expressed as a monthly mean) are considered likely to provoke nuisance complaints from residents [4]. Deposition rates will fluctuate during any given month, hence the maximum daily or weekly deposition rates will exceed the monthly average. The nuisance threshold of 200 mg m^{-2} day^{-1} as a monthly mean allows for daily and weekly average deposition rates to exceed this value.

1.5.4 *Odours*

With respect to odorous emissions, *Part III* of *the Environmental Protection Act (1990)* contains the main UK legislation on statutory nuisance and covers:

"any...smell....arising on industrial, trade or business premises and being prejudicial to health or a nuisance".

The act enables local authorities and individuals to take action to secure the abatement of a statutory nuisance.

(1) Department of the Environment and the Scottish Office (1997) The United Kingdom National Air Quality Strategy, The Stationary Office

(2) WHO (1987) Air Quality Guidelines for Europe, WHO Regional Publications, European Series No 23.

(3) WHO (1995) Update and Revision of the Air Quality Guidelines for Europe, Meeting of the Working Group, Classical Air Pollutants Bilthoven, The Netherlands 11-14 October 1994.

(4) Schofield C, and Shillito D (1990) Guide to the Handling of Dusty Materials in Ports, British Materials Handling Board

Table 1.2 ***UK Air Quality Standards Based on EU Directives 80/779/EEC, 85/203/EEC and 85/210/EEC***

Substance	Reference Period and Criteria	Limit Value [a] ($\mu g\ m^{-3}$)	Guide Value [b] ($\mu g\ m^{-3}$)
Sulphur dioxide	Median of daily mean values over a year	80 (particulates >40) 120 (particulates <40)	-
	Arithmetic mean of daily mean values over a year	-	40-60
	98th percentile of daily mean values over a year	250 (particulates >150) 350 (particulates <150)	-
	24 hour daily mean value	-	100-150
Nitrogen dioxide	50th percentile of hourly mean values over a year	-	50
	98th percentile of hourly mean values over a year	200	135
Lead	Annual mean concentration	2	-
Suspended particulates (as measured by the gravimetric method)	95th percentile of daily mean values over a year	300	-
	Arithmetic mean of daily mean values over a year	150	-
Suspended particulates (as measured by the OECD black smoke method)	98th percentile of daily mean values over a year	250	-
	Arithmetic mean of daily mean values over a year	-	40-60
	Annual median of daily mean values over a year	80	-
	24 hour daily mean value	-	100-150

(a) Limit values must not be exceeded throughout the territory of the Member States during specified periods and under conditions laid down in the Directives

(b) Guide values are intended to serve as long term precautions for health and the environment

Table 1.3 ***EPAQS Recommended Guidelines***

Substance	Reference Period	Guideline ($\mu g\ m^{-3}$)
Sulphur dioxide	15 minute average	267
PM_{10}	24 hour running average	50
Carbon monoxide	Eight hour average	11,700
Benzene	Running annual average	16
1,3-Butadiene	Running annual average	2.21
Ozone	Eight hour average	100
Nitrogen dioxide	Hourly average	287

Table 1.4 ***NAQS Proposed Standards and Specific Objectives***

Substance	Standard		Objective to be Achieved by 2005
	Concentration ($\mu g\ m^{-3}$)	Reference Period	
Benzene	16	running annual mean	air quality standard
1,3-Butadiene	2.2	running annual mean	air quality standard
Carbon monoxide	11,700	running 8-hour mean	air quality standard
Lead	0.5	annual mean	air quality standard
Nitrogen dioxide	287	1 hour mean	air quality standard (a)
	40	annual mean	air quality standard (a)
Ozone	100	running 8-hour mean	100 $\mu g\ m^{-3}$ as 97th %ile (a)
PM_{10}	50	running 24-hour mean	50 $\mu g\ m^{-3}$ as 99th %ile (a)
Sulphur dioxide	267	15 minute mean	267 $\mu g\ m^{-3}$ as 99.9th %ile (a)

(a) Objectives to be treated as provisional

Table 1.5 ***WHO Air Quality Guidelines***

Substance	Reference Period	Guideline ($\mu g\ m^{-3}$)
Sulphur oxides (as SO_2)	10 minute mean	500
	24 hour mean	125
	Annual mean	50
Nitrogen oxides (as NO_2)	1 hour mean	200
	Annual mean	40-50
Carbon monoxide	15 minute mean	100,000
	30 minute mean	60,000
	1 hour mean	30,000
	8 hour mean	10,000
Ozone	8 hour mean	120
Lead	Annual mean	0.5 - 1.0

2 EXISTING AIR QUALITY

2.1 INTRODUCTION

The existing air quality in the region of the proposed MSA is principally defined by the proximity of the M4 motorway. Emissions of pollutants such as nitrogen oxides, carbon monoxide, benzene and particulate matter from motor vehicles contribute a high percentage of the total emissions of these pollutants to the environment.

Clearly, for the impact of emissions from the proposed MSA upon air quality to be properly assessed, they must be considered in the context of the existing pollution sources. Where possible, therefore, the data presented in this section are drawn from air quality measurements made in the region of this section of the M4, or close to other busy roads.

2.2 NITROGEN DIOXIDE

2.2.1 *Continuous Monitoring Studies*

Windsor and Maidenhead, Slough, South Bucks and Wokingham local authorities commissioned a three month continuous air quality monitoring programme in April 1995, in response to a proposal to widen the M4 motorway to four lanes in each direction, between junctions 5 and 10.

The monitoring locations are detailed below (grid references are presented in brackets):

- *Priors Way* (SU 895 787) 4.5 km to the north east of the proposed MSA;
- *Winnersh Grove* (SU 779 703) 10 km to the south west;
- *Dorney Reach* (SU 917 796) 6.5 km to the north east; and
- *Chalvey* (SU 969 793) 11.5 km to the north east.

Monitoring at Priors Way and Winnersh Grove was undertaken for a 3 month period, whereas at Dorney Reach and Chalvey, the monitoring period was 6 weeks.

The results of the monitoring study are presented in *Table 2.1.*

Table 2.1 ***Nitrogen Dioxide Concentrations Recorded During Continuous Monitoring Study ($\mu g\ m^{-3}$)***

Statistical Parameter	Priors Way	Winnersh Grove	Dorney Reach	Chalvey
Mean (a)	51.8	45.5	49.7	38.5
50th percentile of hourly means (a)	45.6	39.4	45.3	34.5
98th percentile of hourly means (b)	150	120	146	97.3
Maximum hourly mean (c)	409	227	231	167

(a) The EU guide value for NO_2 is 50 $\mu g\ m^{-3}$ as a median of hourly means over a year; a median is equivalent to a mean for a normal distribution. The NAQS standard for the annual mean is 40 $\mu g\ m^{-3}$ as a annual mean.

(b) The EU 98th percentile of hourly means limit value for NO_2 is 200 $\mu g\ m^{-3}$ and the guide value is 135 $\mu g\ m^{-3}$

(c) The WHO recommends a maximum hourly mean concentration of 200 $\mu g\ m^{-3}$. The EPAQS and NAQS present a guideline of 287 $\mu g\ m^{-3}$ for the maximum hourly mean.

The monitoring period for this study was a maximum of 3 months, so a direct comparison with guidelines which apply over a full calendar year should be undertaken cautiously. Nevertheless, the results indicate that there may be exceedances of the NAQS annual mean guideline of 40 $\mu g\ m^{-3}$. Furthermore, the WHO maximum hourly mean guidelines of 200 $\mu g\ m^{-3}$ was exceeded on occasion at during the monitoring period. The NAQS maximum hourly mean of 287 $\mu g\ m^{-3}$ was exceeded at Priors Way, but not at the other locations during the monitoring period. This observation reflects the fact that the monitoring location was close to the road, within the "corridor" of elevated concentrations which exists alongside of busy roads.

2.2.2 *Diffusion Tube Monitoring*

Monitoring of monthly mean NO_2 concentrations using diffusion tubes is undertaken through the UK Nitrogen Dioxide Survey. Annual mean NO_2 concentrations measured in the survey in the region of the proposed MSA, during the years 1994 and 1995 are presented in *Table* 2.2.

Concentrations are monitored at various distances from roads, to indicate the impact of vehicle sources on NO_2 concentrations, as follows:

- *Kerbside*, 1 - 5 m from the kerb of a busy road;
- *Intermediate*, 20 - 30 m from the same or an equivalent road; and
- *Background* (normally 2 sampling locations), more than 50 m from any busy road, and typically in a residential area.

The 98th percentile of hourly mean NO_2 concentrations (for comparison with the EU Directive standard) can be approximated by multiplying the annual mean by a factor of 2.4, as suggested by the Quality of Urban Air Review

Group (QUARG) [1]. The 98th percentile concentrations estimated in this way are also presented in *Table* 2.2.

Table 2.2 *Nitrogen Dioxide Concentrations Recorded Using Diffusion Tubes ($\mu g\ m^{-3}$)[a]*

	1994		1995	
Location [b]	**Mean [c]**	**Estimated 98th %ile [d]**	**Mean [c]**	**Estimated 98th %ile [d]**
Maidenhead				
• K	46	110	48	115
• I	36	86	44	106
• B	25	60	22	53
Slough				
• K	48	115	52	125
• I	38	91	34	82
• B	34	82	33	79
Bracknell				
• K	44	106	33	79
• I	34	82	33	79
• B	33	79	32	77

(a) AEA, **UK Nitrogen Dioxide Survey 1995**, AEA Technology, 1997 and personal communication; average of monthly means measured in 1994 and 1995.
(b) K = kerbside, I = intermediate, B = background (average of two sites)
(c) The EC guide value for NO_2 is 50 $\mu g\ m^{-3}$ as a median of hourly means over a year, and is equivalent to the annual mean for a normal distribution. The NAQS standard is 40 $\mu g\ m^{-3}$ as a annual mean.
(d) The EC 98th percentile of hourly means limit value for NO_2 is 200 $\mu g\ m^{-3}$ and the guide value is 135 $\mu g\ m^{-3}$

The NO_2 diffusion tube monitoring data indicate the following:

- Annual mean NO_2 concentrations recorded in the diffusion tube survey exceeded the NAQS standard of 40 $\mu g\ m^{-3}$ at all the kerbside sites, while at the intermediate and background sites, the NAQS standard was exceeded at one site (Maidenhead) during 1995 only.
- The estimated 98th percentile of hourly means at all sites were below the EU Directive limit and guide values of 200 $\mu g\ m^{-3}$ and 135 $\mu g\ m^{-3}$ respectively.

2.3 *CARBON MONOXIDE*

Measurements of carbon monoxide concentrations were made over a six week period in 1995 using a continuous monitoring technique as part of the survey undertaken by Windsor and Maidenhead, Slough, South Bucks and Wokingham councils into pollution concentrations close to the M4. At one of the monitoring locations, carbon monoxide concentrations had also been recorded in a previous survey, undertaken in 1994.

The maximum hourly means recorded during the survey are presented in *Table* 2.3. The concentrations recorded were well below the EPAQS and NAQS maximum 8 hour mean guidelines and the WHO maximum hourly mean guideline.

(1) QUARG (1993) **Urban Air Quality in the United Kingdom, First Report of the Quality of Urban Air Review Group, Prepared at the Request of the Department of the Environment**

Table 2.3 ***Carbon Monoxide Concentrations Recorded During the Continuous Monitoring Study (mg m^{-3})***

Statistical Parameter	Dorney Reach 1994	Dorney Reach 1995	Chalvey 1995
Maximum hourly mean [a]	2.14	1.69	1.76

(a) The EPAQS and NAQS recommend a maximum running 8 hour mean of 11.7 mg m^{-3}; the WHO maximum hourly mean guideline is 30 mg m^{-3}

2.4 PM_{10}

Measurements of PM_{10} concentrations were made over a six week period at Dorney Reach and Chalvey during the local authority survey of pollutant concentrations near the M4 in 1995. The results of the survey are not reported in terms of maximum running 24 hour means for direct comparison with the EPAQs and NAQS guidelines. However, examination of graphs presenting the diurnal variation in PM_{10} concentrations indicates that the highest diurnal average concentration recorded was of the order of 30 µg m^{-3}, which is within the guideline of 50 µg m^{-3}. Moreover, the report states that the EPAQS guideline was not exceeded during the survey.

2.5 BLACK SMOKE

Black smoke is a measure of the blackness of particulate matter, and black smoke concentrations have been monitored in the UK for many years through the UK Smoke and SO_2 Monitoring Network. Measurements are currently recorded at Slough, and the data measured in the period 1994/1995 are presented in *Table 2.4*. Reference to the EU standards indicates that black smoke concentrations at Slough during the monitoring period were small in comparison to the standards and guidelines.

Table 2.4 ***Black Smoke Concentrations Recorded in the UK Smoke and SO_2 Monitoring Programme in 1994/1995 (µg m^{-3})[a]***

Location	Mean [b]	98th %ile of Daily Means [c]	Maximum daily mean [d]
Slough	10	33	52

(a) AEA, UK Smoke and Sulphur Dioxide Monitoring Networks; Data retrieved from the Internet

(b) The EU guide value for the arithmetic mean of daily means over a year is 40-60 µg m^{-3}, whereas the EU limit value for the median of daily mean is 80 µg m^{-3}

(c) The EU limit value for the 98th percentile of daily mean values is 250 µg m^{-3}

(d) The EU guide value for the maximum daily mean is 100-150 µg m^{-3}

2.6 SULPHUR DIOXIDE

2.6.1 Continuous Monitoring Study

Measurements of sulphur dioxide concentrations were recorded at Dorney Reach in the summer of 1994 using a continuous monitoring technique. The

results of the survey are presented in the report into pollutant concentrations near the M4 commissioned by Windsor and Maidenhead, Slough, South Bucks and Wokingham councils. The results of the survey are presented in terms of hourly average statistics, and are therefore not directly comparable to the EU standards and guidelines for SO_2 (which are expressed in terms of daily averages) or the EPAQS and NAQS 15 minute mean standard. Nevertheless, the available data are presented in *Table 2.5*.

Table 2.5 ***Sulphur Dioxide Concentrations Recorded During the Continuous Monitoring Study ($\mu g\ m^{-3}$)***

Statistical Parameter	Dorney Reach
Mean [a]	11.0
Median [b]	3.4
98th percentile [c]	20.3

(a) The EU guide value for the arithmetic mean of daily means over a year is 40-60 $\mu g\ m^{-3}$
(b) The EU limit value for the median of daily mean values which applies (for particulate concentrations ≤ 40 $\mu g\ m^{-3}$) is 120 $\mu g\ m^{-3}$
(c) The EU limit value for the 98th percentile of daily mean values which applies (for particulate concentrations ≤ 150 $\mu g\ m^{-3}$) is 350 $\mu g\ m^{-3}$

Sulphur dioxide concentrations have been measured in the UK for many years through the UK Smoke and SO_2 Monitoring Network. Measurements are currently recorded at Slough and the data measured in the period 1994/1995 are presented in *Table 2.6*. Reference to the EU standards indicates that sulphur dioxide concentrations at Slough during the monitoring period were small in comparison to the standards and guidelines.

Table 2.6 ***Sulphur Dioxide Concentrations Recorded in the UK Smoke and SO_2 Monitoring Programme in 1994/1995 ($\mu g\ m^{-3}$)[a]***

Location	Mean [b]	98th %ile of Daily Means [c]	Maximum Daily Mean [d]
Slough	20.0	36.9	48.9

(a) AEA, UK Smoke and Sulphur Dioxide Monitoring Networks: Data retrieved from the Internet
(b) The EU guide value for the arithmetic mean of daily means over a year is 40-60 $\mu g\ m^{-3}$ and the EU limit value for the median of daily mean values which applies (for particulate concentrations ≤ 40 $\mu g\ m^{-3}$) is 120 $\mu g\ m^{-3}$
(c) The EU limit value for the 98th percentile of daily mean values which applies (for particulate concentrations ≤ 150 $\mu g\ m^{-3}$) is 350 $\mu g\ m^{-3}$
(d) The EU guide value for the maximum daily mean is 100-150 $\mu g\ m^{-3}$

2.7 OZONE

Ozone concentrations were recorded at Dorney Reach and Chalvey during the local authority M4 monitoring survey. While the results of the survey are not reported in a manner suitable for comparison with the EPAQS and NAQS guidelines, the report states that, on occasion, the guidelines were exceeded.

Concentrations of ozone are generally higher in rural areas than in urban areas, and the highest concentrations in the UK are recorded in the south of England.

2.8 VOLATILE ORGANIC COMPOUNDS

Concentrations of volatile organic compounds were recorded for a 3 month period in 1995, as part of the report into pollutant concentrations near the M4 commissioned by Windsor and Maidenhead, Slough, South Bucks and Wokingham councils. The results of this survey, conducted using diffusion tubes, are presented in *Table 2.7*. The measured mean benzene concentrations measured over the 3 month period were well below the EPAQS and NAQS annual mean guideline of 16 $\mu g\ m^{-3}$.

Table 2.7 ***Annual Mean Concentrations of Volatile Organic Compounds Recorded During the Diffusion Tube Survey($\mu g\ m^{-3}$)***

Substance	Priors Way	Winnersh Grove	Dorney Reach	Chalvey
Benzene [a]	7.5	3.5	5.0	4.9
Toluene	13.6	12.7	9.7	13.0
Ethylbenzene	2.4	1.2	1.6	1.8
m+p-xylene	8.8	4.2	5.2	6.3
o-xylene	3.5	1.7	2.2	2.5

(a) The EPAQS and NAQS recommend a running annual mean of 16 $\mu g\ m^{-3}$ for benzene.

2.9 DUST DEPOSITION

Since dust is naturally present in air, deposition occurs even in areas where there are no apparent local sources. *Table 2.8* presents typical deposition rates for urban and rural locations (expressed as monthly means) [1] . The assessment criterion of 200 mg m^{-2} day^{-1} has been set at a rate below which dust deposition rates are unlikely to cause a nuisance.

Table 2.8 ***Typical Ambient Dust Deposition Rates***

	Deposition Rate (mg m^{-2} day^{-1}) [a]
Urban	30 - 80
Rural	10 - 50

(a) Deposition rates exceeding 200 mg m^{-2} day^{-1} are considered likely to provoke nuisance complaints

Dust deposition rates in the region of the proposed MSA are expected to be in the range 10 to 50mg m^{-1} day^{-1} at present; actual rates will depend on the recent and prevailing weather conditions

(1) Parret PW (1992) Dust Emissions - A Review Computational Mechanics Publications

3 ASSESSMENT OF THE IMPACTS OF THE PROPOSED MSA UPON AIR QUALITY

3.1 CONSTRUCTION DUST IMPACTS

3.1.1 Introduction

The construction of developments such as the proposed MSA has the potential to lead to the generation of dust particles. Because dust deposition can cause soiling at properties close to construction activities, dust emissions are an important consideration with respect to air quality.

The potential for dust to be emitted during the construction phase is strongly dependent on the type of construction activities taking place, the prevalence of hot, dry weather during the construction period, the prevailing windspeed and whether winds carry emitted particles toward potentially sensitive receptors.

The types of construction activities most likely to generate dust are

- grading and levelling of ground prior to construction of the underpass, link roads and buildings;
- removal of spoil;
- site stripping; and
- earthworks.

Other construction activities with a lesser potential for dust emissions are as follows:

- site excavations;
- concreting operations; and
- site reinstatement and road construction.

The magnitude of dust emissions, and hence deposition rates, are very dependent on the suppression measures employed during the construction activities. Possible mitigation measures are discussed later in this section.

3.1.2 Potential Receptors

The nearest residential receptors with the potential to be affected by dust emissions from the proposed MSA are presented in *Table 3.1*, together with the distance of the receptors from the slip roads and the site boundary.

Table 3.1 ***Receptors Closest to the Proposed MSA with the Potential to be Affected by Construction Dust***

Approximate distance from (m)	Pondwood Cottage / Magpie Cottage	Pondwood Farm	How Lane Farm	How Lane Farm Units
Slip roads	200	350	300	400
Site boundary	10	200	150	250

3.1.3 *Potential for Impacts*

The emissions of dust from construction activities is, by its very nature, very variable, depending as it does on the type of activity, the state of the ground and the prevailing windspeed. Consequently, methodologies for predicting dust impacts are not straightforward.

At wind speeds above 3 m s^{-1}, particles of dust may become airborne and may be transported from their initial source. Of the particles which become airborne, for a typical mean windspeed of 4 m s^{-1}, particles of diameter greater than 100 μm are likely to settle out within 6 to 10 m and those with diameters between 30 and 100 μm are likely to settle out within 100 m of the source. Smaller particles, particularly those below 10 μm, are more likely to have their settling rate retarded by atmospheric turbulence and to be transported further off-site. In high winds, some of these fine dust particles could be deposited at a distance of 500 m from the site and high winds will cause more dust to be created at source, where there are dry surfaces.

Virtually all particles with a diameter of more than 30 μm emitted directly from the construction site are likely to be deposited within a distance of 100 m. Pondwood Cottage and Magpie Cottage lie approximately 10 m from the application site boundary, and 200 m from the proposed slip road. The possibility therefore exists that particles with diameters of 30 - 100 μm will be transported as far as these properties, depending on the extent of construction activities close to the site boundary. Other properties are more than 100 m from the site boundary and are therefore less likely to be affected by such particles.

Finer particles with a diameter of less than 30 μm may be transported further from the site during wind speeds above a typical value of 4 m s^{-1}.

The potential for a significant impact to arise as a result of particles of diameter less than 100 μm depends on:

- the amount of rainfall (during rainy periods the potential for dust emissions is reduced); and
- the extent of application of *good site practices* to minimise initial particle emissions, as discussed in *Section 4*.

Indirect transport of particles, due to dust adhering to the wheels and chassis of vehicles accessing the site and involved in the removal of spoil, may lead to increased dust emissions along access routes. This phenomenon is dependent on several factors including:

- the number of vehicles accessing the site;
- the cleanliness of the on-site haul routes;
- the adoption of wheel and chassis washing units; and
- the prevailing weather conditions.

Further potential for dust generation exists due to:

- blow-off and spillage from vehicles during import of aggregate and any export of surplus soil material; and

- wind blow from bare dry construction areas.

3.1.4 *Conclusions*

There are two properties which lie close to the application site boundary, namely Pondwood Cottage and Magpie Cottage. These properties could potentially experience a small level of nuisance as a result of dust emissions during construction of the proposed link road. Such nuisance would be exacerbated by certain meteorological conditions including:

- dry weather;
- wind blowing towards the property; and
- fairly high windspeeds.

The impacts of dust emissions would be significantly reduced by careful management of the site during the construction phase. Possible mitigation measures are discussed in *Section 4*.

3.2 *OPERATIONAL IMPACTS*

3.2.1 *Introduction*

The proposed MSA includes several facilities which result in pollutant emissions to air, including:

- a car park and an HGV park;
- a refuelling facility;
- boilers associated with the amenity building and lodge; and
- a catering facility in the amenity building.

The proposed MSA will be serviced by link roads from the eastbound and westbound carriageways of the M4.

This section discusses the potential impacts of each of these operational emissions upon air quality at the receptors closest to the facility. The impacts are considered in the contact of the main pollution source in the area, namely

vehicles using the M4. Vehicle emissions include nitrogen oxides (NO_x), carbon monoxide (CO), particulate matter (PM), volatile organic compounds (VOCs), sulphur dioxide (SO_2) and lead. The existing concentrations of these pollutants in the area were discussed in *Section 2*, where monitoring data were available.

The approximate distances of properties from the edge of the M4 motorway and the facilities associated with the MSA are presented in *Table* 3.2.

Table 3.2 ***Receptors Closest to the Proposed MSA with the Potential to be Affected by Operation Emissions***

Approximate distance from (m)	Pondwood Cottage/ Magpie Cottage	Pondwood Farm	How Lane Farm	How Lane Farm Units
M4	150	400	125	250
Slip roads	200	350	300	400
Site boundary	10	200	150	250
Car park	400	600	300	350
HGV park	400	650	500	450
Refuelling facility	400	650	700	650
Amenity building	400	675	500	450
Lodge	500	725	275	350

3.2.2 *Vehicular Emissions*

The MSA is not expected to generate traffic upon the M4 motorway and it is estimated that only 7.5% of the traffic using the M4 will make use of the MSA. Vehicles using the MSA are therefore *relocated* with respect to the properties mentioned above. While they will reside in the area for a longer time period than they do at present, they do not represent additional pollution sources in the area. It should be noted, however, that emissions of carbon monoxide and volatile organic compounds increase at lower vehicle speeds, so emissions of these compounds in the car park and HGV park, where vehicles will be travelling more slowly than on the motorway, will be increased compared to emissions from motorway vehicles.

Examination of the data presented in *Table* 3.2 reveals that, with the exception of Pondwood Farm, all of the properties are closer to the M4 than they are to link roads, the car parks and the HGV parks associated with the MSA. Therefore, in most cases, vehicles using the MSA will be further from properties than when they are travelling on the motorway.

The *Design Manual for Roads and Bridges* (DMRB) [1] contains a methodology which facilitates prediction of pollutant concentrations near to roads. The methodology indicates that roads which are more than 200 m from a property have a negligible effect on the air quality at the property. Where roads are closer to properties, they will affect the air quality.

(1) Design Manual for Roads and Bridges, Vol 11 - Air Quality, Jointly published by The Highways Agency, The Scottish Office Industry Department, The Welsh Office and the Department of the Environment for Northern Ireland, June 1993, as amended August 1994.

Therefore, considering the properties close to the MSA and the M4, Pondwood Cottage, Magpie Cottage, How Lane Farm and the associated units all lie within 200 m of the M4, and will experience air quality impacts as a result. The extent of the impact depends on the distance of the property from the road. With respect to the link roads associated with the MSA, Pondwood Cottage and Magpie Cottage lie 200 m from the eastbound carriageway link road. The other properties are more than 200 m from both link roads. All of the properties are at least 300 m from the MSA car park and HGV park.

Clearly, therefore, vehicles travelling along the M4 are the dominant pollution sources with respect to these properties, and the additional effect of emissions from vehicles using the MSA will be small.

3.2.3 *Volatile Organic Compounds from the Refuelling Facility*

A monitoring study of benzene concentrations in the vicinity of petrol stations was recently undertaken on behalf of the Department of the Environment [1]. Benzene concentrations were monitored close to petrol pumps, on the edges of the forecourt and at roadsides adjacent to the stations, at distances of approximately 100 m from the station. The highest concentrations recorded during the survey were measured at the pumps, due to emissions of benzene released during refuelling. Elevated emissions were also recorded on the forecourts and at roadsides. The report estimates that the NAQS standard of 16 $\mu g\ m^{-3}$ as a rolling annual mean would be exceeded at the fuel pumps at nine of the twelve stations studied. However, exposure to benzene for vehicle drivers and passengers is short-lived and therefore contributes only in a minor way to their overall exposure.

With respect to the proposed MSA, the influence of emissions of benzene due to refuelling will not have a significant effect on users of the facility, owing to the short time periods for refuelling. The refuelling area is 400 m from the nearest residential receptors (Pondwood Cottage and Magpie Cottage) and is therefore too far away to exert an influence on benzene levels experienced at these receptors.

European Council directives aimed at controlling emissions of volatile organic compounds from refuelling stations are in preparation, and should result in a considerable reduction of emissions from this source and consequent reduced exposure of individuals using stations. The directives are discussed further in *Section 4*.

3.2.4 *Combustion Products from Boilers Associated with the MSA*

The combustion of fuels within boilers associated with on-site heating and catering facilities at the amenity building, together with heating associated with the lodge, will result in emissions of combustion gases to the environment. The pollutants emitted will depend on the fuel used, and may

(1) Stanger Science and Environment March 1997) Benzene Levels in the Vicinity of Petrol Stations, Department of the Environment

include small quantities of nitrogen oxides (NO_x), sulphur dioxide (SO_2) and particulate matter (PM). Compared to the emissions of the same pollutants from vehicles using the nearby motorway, the boiler emissions are not likely to be significant.

3.2.5 *Odours*

The main potential source of odours from the site are the catering facilities associated with the amenity building. In order to comply with the Environmental Protection Act (1990) the control of odours from this facility should be achieved, and is discussed in *Section 4.*

3.2.6 *Conclusions*

The existing M4 motorway is the dominant source of air pollution in the region of the proposed MSA. The operation of the MSA would not generate additional vehicle movements along the M4, but would result in vehicles being relocated, with respect to the properties closest to the MSA. However, owing to the distances from the MSA to these properties, the M4 will continue to be the major source of air pollution, and the additional contribution of the MSA will be small in comparison.

Emissions of volatile organic compounds from the refuelling area and odours from the catering facilities can be significantly reduced, by the application of mitigation measures. Such measures are discussed in *Section 4.*

4 MITIGATION OF AIR QUALITY IMPACTS

4.1 CONSTRUCTION DUST

To minimise the nuisance caused by construction dust, particularly to nearby receptors such as Pondwood Cottage and Magpie Cottage, a series of *good site practices* for management of the construction site should be adopted. Such measures, a number of which are detailed below, would significantly reduce the generation and entrainment of dust. They include:

- the adoption of construction equipment designed to minimise dust generation;
- water spray dampening of soils to prevent dust blow during hot, dry weather conditions;
- careful management of stockpiles of soil and similar materials;
- mixing of large quantities of concrete undertaken in enclosed or shielded areas;
- sealing and/or re-vegetation of completed earthworks as soon as reasonably possible;
- careful maintenance of site machinery, and machinery turned off when not in use;
- limitation of vehicle speeds on unhardened roads and surfaces to less than 20 mph;
- sheeting of lorries during transportation of friable construction materials and spoil;
- minimising drop heights for material transfer activities such as unloading of friable materials;
- cleaning of surfaced roads and stabilisation of unsurfaced roads to reduce off-site transport of soils and to avoid dust generation; a reduction level of 88% of emissions from haul roads is possible through effective use of dust suppression methods;
- wheel washing facilities for vehicles leaving the site; and
- routing of vehicles away from sensitive receptors where possible.

4.2 OPERATIONAL IMPACTS

4.2.1 *Emissions of Volatile Organic Compounds from the Refuelling Facility*

The European Parliament and Council Directive 94/63/EC addresses the control for volatile organic compounds resulting from the storage of petrol and its distribution from terminal to service stations ("Stage I" Controls). The Directive aims to reduce emissions from these sources by 90% over ten years. A further directive ("Stage II") to reduce emissions from petrol station refuelling is also to be prepared, requiring petrol stations to fit vapour recovery equipment initially capable to recovering 70% of vapour. By 1 January 2006, compatibility of filling necks and petrol pump nozzles would be mandatory, ensuring a hermetic seal. This is expected to enable 95% vapour recovery. The proposed MSA would be required to comply with these directives, ensuring that emissions of volatile organic compounds from the refuelling facility were successfully mitigated.

4.2.2 *Odours*

The use of extraction fans and carbon filters should be adopted, before emissions are released *via* a flue to the external environment. If such equipment is utilised, the potential for odour nuisance will be effectively minimised.

5 KEY ISSUES

5.1 CONSTRUCTION ACTIVITIES

The two properties known as Pondwood Cottage and Magpie lie close to the site application boundary. These properties could potentially experience dust levels sufficient to cause a small level of nuisance, as a result of the construction of the proposed development, unless careful mitigation measures are employed and adhered too.

5.2 OPERATIONAL EMISSIONS

Emissions of pollutants arise from a number of sources within the proposed MSA, including:

- vehicles using the MSA link roads and car and HGV parks;
- the refuelling facility;
- boilers associated with the amenity building and the lodge;
- catering facilities in the amenity building.

Vehicles using the M4 motorway represent the dominant source of air pollution in the area. The additional pollutant emissions from the MSA will be small compared to the motorway emissions, and are unlikely to result in a noticeable effect on air quality at the properties in the area. Nevertheless, mitigation measures which reduce as far as possible emissions from the MSA will be adopted.

APPENDIX F

NOISE AND VIBRATION ASSESSMENT

APPENDIX F

CONSULTING SERVICES BY ENVIRONMENTAL RESOURCES MANAGEMENT

Swayfields Limited

Noise and Vibration Assessment: *Maidenhead MSA*

June 1997

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ERM

DRAFT FINAL REPORT

Swayfields Limited

Noise and Vibration Assessment: *Maidenhead MSA*

June 1997

Reference 4485

For and on behalf of
Environmental Resources Management

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1 INTRODUCTION

Environmental Resources Management (ERM) has been appointed by Swayfields Ltd to undertake a noise assessment in support of their application for planning permission for a Motorway Service Area (MSA) between junctions 8/9 and 10 on the M4 motorway in Berkshire.

The proposed site lies on level ground (39-41m AOD) to the south east and north west of the M4. The M4 is partially visible from the proposed site.

1.1 SCOPE OF ASSESSMENT

This assessment evaluates noise and vibration impacts arising from the construction and operation of the MSA. Although vibration is addressed, it has not been considered in detail since no major sources of vibration are expected to be within 100 m of the nearest sensitive receptors during either construction or operation.

The construction phase will produce vibration if some form of driven piling is used. However, there are no sensitive properties close enough to be significantly affected. The operational phase of the MSA will produce negligible change to vibration levels beyond the site boundary.

The assessment includes:

- the results of a baseline noise survey;
- criteria developed to set acceptable noise levels at sensitive receptors for both operational and construction phases of the project;
- predicted noise levels for construction and operation; and
- evaluation of the effects of noise and vibration during both these phases.

1.2 SOURCES OF INFORMATION

The information used in carrying out the assessment was obtained from the following sources:

- a survey of the baseline noise environment carried out by ERM;
- operational noise data measured by Symonds Travers Morgan Ltd in relation to a proposed MSA at junction 22 of the M6;
- consultation and discussion with the Royal Borough of Maidenhead and Windsor;
- Ordnance Survey maps of the local area; and
- Planning Policy Guidance note PPG24, British Standard BS 5228, Department of the Environment Advisory Leaflet (AL) 72, Minerals

Planning Guidance Note MPG11, British Standard BS 4142, British Standard BS 6472, criteria proposed by the World Health Organisation and British Standard BS 7385.

2 BASELINE NOISE CONDITIONS

2.1 INTRODUCTION

A noise survey was carried out between 21st and 26th May 1997 to establish the existing noise levels at residential properties and other noise-sensitive receivers near the site. The survey covered typical daytime, evening and night-time periods. The equipment used to carry out the survey consisted of a Bruel & Kjaer type 2260 sound level meter and associated field calibrator.

2.2 NOISE SENSITIVE RECEPTORS

The proposed site is located between junctions 8/9 and 10 of the M4, near an area known as Great Wood. The following have been identified as the most sensitive receptors in the area:

- How Lane Farm (taken as representative of both How Lane Farm and How Lane Farm Units);
- Pope's Farm;
- Pondwood Farm;
- Pondwood Cottage and Magpie Cottage (for this assessment Pondwood Cottage is used, though the results of the assessment are applicable to both);
- Smewins Farm;
- various dwellings on the B3024, entitled in this assessment Littlefield Green; and
- dwellings on Mare Street.

These receptors are shown on *Figure 10*.

Table 2.1 below indicates approximate distances to the site boundary and to the main features of the proposed MSA indicated on the application plan; these features include the amenity building, the lodge and the refuelling area. These features have been chosen as they are likely to provide a more concentrated source of noise during both the construction phase and the operational phase of the MSA.

Table 2.1 ***Approximate Receptor to Site Distances (m)***

Receptor	Distance to:			
	Site Boundary	Lodge	Amenity Building	Refuelling Area
How Lane Farm	150	275	500	700
Pope's Farm	450	925	775	550
Pondwood Farm	200	725	675	550
Pondwood Cottage	10	575	375	250
Smewins Farm	725	1100	1125	1175
Littlefield Green	475	750	925	1175
Mare Street	500	1000	800	625

The noise monitoring locations used are representative of these locations and are also shown on *Figure 10*.

2.3 SURVEY RESULTS

The results are summarised in *Table 2.2*.

Table 2.2 Noise Survey Results - free-field values (dB)

Location	Period	L_{Aeq}	L_{A90}	L_{A10}	L_{Amax}
1	Day	71	59	73	90
	Evening	64	53	62	84
	Night	56	49	55	80
2	Day	68	53	72	86
	Evening	64	50	59	85
	Night	62	54	60	81
3	Day	57	47	59	79
	Evening	43	39	44	66
	Night	51	47	52	75
4	Day	68	56	66	90
	Evening	65	51	60	87
	Night	56	53	58	65
5*	Day	69	57	69	88
	Evening	-	-	-	-
	Night	49	38	44	76
6*	Day	63	56	65	84
	Evening	-	-	-	-
	Night	56	52	57	66

* - Evening measurements were not made at locations 5 and 6.

Full monitoring results are given in *Annex A*.

2.4 SURVEY CONDITIONS

Weather conditions varied between clear and slightly overcast with very light winds. The measurements are therefore representative of typical low wind conditions (at receptor locations close to trees, moderate wind speeds can affect background noise by causing foliage to rustle as can turbulence at the microphone. Wind can also influence the propagation of existing noise).

2.5 NOISE SOURCES

The dominant source of noise at all locations irrespective of the time of day was traffic on the M4 motorway. During the day, aircraft approaching Heathrow airport overflew the proposed site at regular intervals (at the peak these were approximately one a minute).

Cars travelling on local roads contributed to the L_{Aeq} measured but there were not many cars during the course of a typical fifteen minute measurement so the L_{A90} may be considered representative of the baseline level.

2.6 SUMMARY OF BACKGROUND NOISE LEVELS

A summary of the background noise levels in the area surrounding the proposed site is presented in *Table 2.3*.

Table 2.3 ***Summary of Background Noise Levels (free-field dB)***

Location	Daytime L_{A90}	Evening L_{A90}	Night-time L_{A90}
1	59	53	49
2	53	50	54
3	47	39	47
4	56	51	53
5	57	-	38
6	59	-	52

3 CRITERIA

3.1 CONSTRUCTION NOISE CRITERIA

3.1.1 Introduction

The construction phase of a development is often the period over which any potential noise impact is greatest. There are difficulties in applying the same noise control measures to temporary construction activities as are applied to fixed and permanent installations or operations. The reasons for this are as follows:

- construction work is of a nature whereby noise control measures can be restrictive and could result in unreasonable prolonging of the site works and construction programme;
- work sites are not fixed and change according to the demands of the construction programme;
- work, in the initial stages at least, is conducted out of doors without the benefits of fixed plant houses; and
- mobile plant is used which imposes a limit on the scope for noise control measures.

Advice and guidelines to local planning authorities and developers in UK can be found in Planning Policy Guidance Note PPG 24 [1], British Standard BS 5228 [2] and Department of the Environment (DoE) Advisory Leaflet (AL) 72 [3]. AL 72 is out of print, but remains as a paper giving guidance on acceptable levels of noise. PPG24 refers to the guidance in BS5228 in respect of construction noise.

British Standard BS 5228

BS5228 Part 1 does not specify suitable daytime noise levels from construction sites, but lists a number of factors which might affect the acceptability of noise and vibration from construction sites. These factors are:

- site location;
- existing ambient noise levels;
- duration of site operations;
- hours of work;
- attitude to site operator; and

(1) Planning and Noise, DoE 1994
(2) British Standard BS 5228 Noise control on construction and open sites, BSi 1997
(3) Advisory Leaflet 72 (1976) Noise control on building sites, DoE

- noise and vibration characteristics of the work.

Although BS 5228 does not propose noise criteria for daytime, it suggests that acceptable noise levels in the evening (1900-2200 hours) may need to be 10 dB(A) lower than daytime levels. It also suggests that noise levels at the facades of occupied dwellings may need to be as low as 40 dB L_{Aeq} to avoid sleep disturbance of the occupants. These noise levels imply that windows are open. Thus for closed single glazing a facade level of 55 dB (L_{Aeq}) would result in low risk of sleep disturbance within the building [1].

DoE Advisory Leaflet AL 72

DoE Advisory Leaflet (AL) 72 gives advice as to maximum levels of construction site noise at residential locations during daytime hours (0700-1900). Since the criterion of speech interference forms the basis of the recommendations, they can be taken as applicable to commercial buildings. The leaflet states that the noise level outside the nearest occupied room should not exceed:

- 75 dB(A) in urban areas near to main roads in heavy industrial areas; or
- 70 dB(A) in rural, suburban and urban areas away from main road traffic and industrial noise.

These levels are generally taken as being facade L_{Aeq}. AL72 also suggests that in the evening period a level of 10 dB(A) below that during the day may be appropriate.

Minerals Planning Guidance MPG11

Further guidance can be found in MPG 11 which deals with minerals excavation operations, these being similar to some of the activities used in construction, *eg* earthmoving.

MPG 11 proposes different criteria for short-term and longer-term activities. It states that the daytime noise limit at noise-sensitive properties should normally be 55 dB $L_{Aeq,1\ hour}$ (free-field), but also states that there are circumstances in which higher limits may be appropriate for short periods. Free-field daytime noise levels of 70 dB L_{Aeq} for up to 8 weeks in a year may be considered in these situations.

3.1.2 *Adopted Criteria for Construction Noise*

A summary of the relevant criteria for the assessment of the impact of construction noise is set out in *Table 3.1*. These criteria are applicable to all the sensitive receptors. It has been assumed that there will be no construction activities outside of the hours 0700 to 1900.

(1) The sound reduction of an open window in a conventionally constructed building has been assumed to be at least 10 dB(A).

Table 3.1 *Adopted Construction Noise Criteria*

Period	Facade Noise Level dB(A)	Averaging period (hours)
Daytime (0700-1900)	70	12
Evening (1900-2300)	60	4
Night (2300-0700)	45	1

The suggested noise levels given in *Table 3.1* are not aimed at providing noise limits for construction activities, but are proposed as criteria for the assessment of the noise impacts associated with the construction programme.

It should also be noted that the local authorities have powers under the *Control of Pollution Act 1974* to control noise from construction sites. These powers should ensure that the *best practicable means* (1) are used to reduce or counteract the effects of the noise.

3.2 OPERATIONAL NOISE CRITERIA

3.2.1 *Introduction*

There are two types of noise source that need to be considered when defining criteria against which the operation of the MSA will be assessed. These are traffic noise and permanent/semi-permanent fixture noise.

Planning Guidance Note PPG24

PPG24 establishes Noise Exposure Categories which are applicable in the case of new residential developments affected by transport noise or by mixed noise sources in which industrial noise does not dominate. In the case of proposed noise-producing development affecting existing noise-sensitive premises, PPG24 advises that British Standard BS 4142 can be used, within its own terms of reference, to predict the likelihood of complaints. PPG24 draws attention to the greater potential for complaints to arise if industrial noise has tonal or impulsive characteristics.

British Standard BS 4142

The test that is generally applied to assess the potential for noise from fixed installations to give rise to community response is contained in British Standard BS 4142: 1990 (2). This standard predicts the likelihood of complaint due to noise from a new or modified source.

BS 4142(1) describes a method for determining industrial and background noise levels outside residential buildings and for assessing whether the industrial noise is likely to give rise to complaints from the occupants.

(1) Defined in *Section 72* of the Control of Pollution Act 1974

(2) British Standard BS 4142 (1990) Method for rating industrial noise affecting mixed residential and industrial areas.

The BS 4142 assessment methodology involves comparing the existing background level with the noise predicted to result from the new development. This predicted level is adjusted to allow for any tonal or impulsive characteristics, and is called the *Rating Level*. The difference between the two levels is quantified according to the likelihood of complaints arising, *eg* predicted level 10dB greater than the background level, complaints likely; or predicted level 10dB less than the background level is a positive indication that complaints are unlikely.

British Standard BS 4142 requires that daytime assessments are based on the highest L_{Aeq} from the noise source over a period of 1 hour, while at night an assessment period of 5 minutes is specified.

World Health Organisation

In 1980 the World Health Organisation proposed environmental health criteria for community noise including consideration of noise levels at which sleep disturbance may take place. A review of this document by an International Working Group was published in 1995 (1). The 1980 guidance suggested that an internal L_{Aeq} below 35 dB was required to preserve the restorative process of sleep. The review observes that measurable effects on sleep start from an internal noise level of about 30 dB L_{Aeq} or 45 dB L_{Aeq} at the facade. This is equivalent to a free-field level of about 42 dB L_{Aeq}. A conservative criterion to prevent sleep disturbance is therefore an external free-field level of approximately 40 dB L_{Aeq} assuming open windows.

3.2.2 *Adopted Criteria for Operational Noise*

In view of the nature of the noise sources associated with the MSA and taking account of the approaches to setting criteria outlined above, the adopted criteria are as follows.

Traffic Noise

The existing noise climate in the vicinity of the MSA is dominated by road traffic on the M4. Noise from vehicles within the MSA, and entering or leaving the MSA, should be compared with the traffic noise levels from the M4 traffic to determine whether or not the MSA traffic noise will be noticeable or give rise to any significant increase in overall traffic noise levels.

Traffic noise is conventionally measured on the L_{A10} (18 hour) scale and can be predicted using the DTp/Welsh Office Memorandum Calculation of Road Traffic Noise (2).

(1) This review was submitted to the WHO which has not adopted or ratified it.

(2) Calculation of Road Traffic Noise, HMSO 1988

Other Sources

Noise from fixed or semi-fixed noise sources such as chiller units on trucks is assessed both in terms of an increase over ambient levels and in absolute terms. The various criteria are set out in *Table* 3.2.

Note that in order to achieve a total noise level of 40 dB outside the receptors it is necessary to consider the combined noise from the MSA and the existing noise sources.

Two situations are therefore considered for night-time (1) :

- existing noise levels below 40 dB; and
- existing noise levels at or above 40 dB.

Firstly, where the existing noise levels are below 40 dB, criteria are proposed for the MSA noise levels which when combined with the existing noise levels, will not lead to a combined L_{Aeq} value more than 1 dB above the WHO-based criterion of 40 dB.

In the second case, where existing noise levels are already at or above 40 dB, criteria are proposed which will not lead to an increase in these levels of more than 1 dB as a result of the operation of the facility.

Table 3.2 ***Criteria for Operational Noise - free-field dB***

Location	Daytime L_{A90}	Daytime Criterion ($L_{Aeq, 1hour}$)	Night-time L_{A90}	Night-time Criterion ($L_{Aeq, 1hour}$)
How Lane Farm	59	53	49	43
Littlefield Green	53	47	54	48
Smewins Farm	47	41	47	41
Pondwood Farm	-	-	49*	43
Pondwood Cottage	-	-	49*	43
Pope's Farm	57	51	38	35
Mare Street	56	49	52	46

* - estimated level, see text below.

The night-time L_{A90} values at Pondwood Farm and Pondwood Cottage have been estimated using the noise climate data measured at the surrounding properties, notably How Lane Farm which is a similar distance from the motorway, Smewins Farm which is the same direction from the M4 and Mare Street which is also a similar distance from the M4, though the properties here benefit from some screening of the M4.

(1) Note that in this assessment the existing L_{A90} has been used in preference to the L_{A90} since the latter is more likely to be affected by non-steady noise sources.

The estimates are likely to be conservative since Pondwood Farm and Pondwood Cottage are considerably closer to the dominant noise source in the area, *ie* the M4.

4 PREDICTED IMPACTS

4.1 CONSTRUCTION

Table 4.1 lists the noise levels predicted from construction activities for the site preparation phase, at the closest distance to the site boundary, as well as listing the criteria previously described. The site preparation phase is typically the noisiest phase of construction that lasts for a significant length of time (typically 8-12 weeks). The levels given in *Table 4.1* are a worst case prediction since the work will not be conducted at the site boundary for the duration of the works.

Annex B lists the assumed construction plant; this should be considered indicative of the activities that may occur and may change as the MSA design is developed.

Table 4.1 ***Predicted Construction Noise Levels for Site Preparation Phase - facade dB(A)***

Location	Distance (m)	Predicted Level	Criterion
How Lane Farm	150	70	70
Pope's Farm	450	60	70
Pondwood Farm	200	67	70
Pondwood Cottage	20*	87	70
Smewins Farm	725	56	70
Littlefield Green	475	60	70
Mare Street	500	59	70

* - the distance given is an average to the assumed positions of the plant. The distance to the site boundary is 10m, but it has been assumed that it would not be possible to locate all the plant at this distance.

Table 4.2 lists the predicted noise levels from the piling operations that might be expected to occur where substantial foundations are required, *eg* the lodge, the amenity building and the refuelling area. The predicted levels for the piling represent a worst case since the levels are predicted for the closest piling to each receptor. It is not expected that these operations would occur at these distances for more than one to two weeks.

Table 4.2 ***Predicted Construction Noise Levels for Piling Phase - facade dB(A)***

Location	Distance (m)	Predicted Level	Criterion
How Lane Farm	275	71	70
Pope's Farm	550	65	70
Pondwood Farm	550	65	70
Pondwood Cottage	250	72	70
Smewins Farm	1100	59	70
Littlefield Green	750	63	70
Mare Street	625	64	70

It can be seen from *Table 4.1* that there is potential for impacts at Pondwood Cottage from the site preparation phase. Until precise details of the construction process are clarified, it is not possible to accurately define the extent or duration of the impact, but the worst case calculation above

indicates that clearance work at the site boundary will cause an exceedance of the assumed criterion by 17 dB, which would be a significant impact. This worst-case prediction may overestimate the amount of plant that may be present on site on the west side of the M4, as well as placing all the plant at an average distance of 20 metres.

Noise levels in excess of the assumed criterion have also been predicted at both How Lane Farm and at Pondwood Cottage for the piling phase of construction. The predictions can be assumed to be conservative (*ie* higher than would occur in practice) as no ground attenuation has been taken into account. It should also be noted that the existing L_{Aeq} recorded at How Lane Farm during the daytime was 71 dB, and this coupled with the short duration of the works at the closest distance, together with the likely overestimate of noise levels, would indicate that these will not be significant impacts.

4.2 *OPERATIONAL*

There are three main areas considered in this assessment that fall under the category of operational noise:

- traffic noise associated with the MSA;
- plant associated with building services;
- irregular and mobile sources such as lorry refrigeration units and noise generated by the patrons of the MSA.

4.2.1 *Traffic Noise*

It is not expected that the MSA will generate extra traffic along the M4 as a result of its operation. However, traffic entering and exiting the MSA will contribute to the overall noise level since the vehicles will travel at lower speeds and the vehicles will be closer to the receptors than if they were on the M4.

Traffic data has been supplied to ERM by Highway Solutions Limited in the form of 18 hour and peak hour traffic flows, percentage HGVs, and speed. The data is supplied for the years 1999 (opening year) and 2014 (15 years after opening) with both high and low estimates.

The methodology contained in the Calculation of Road Traffic Noise has been used to predict the noise levels deriving from the M4.

In order to assess the possible impact, the change in noise level must be established. The traffic noise levels with the MSA and without the MSA have been predicted using the 18 hour traffic flows for the two years mentioned above. The traffic flows are contained in *Annex C*.

To predict the noise emanating from the slip roads and the service area, it has been assumed that each can be represented by a single road on which all the vehicles predicted to use the MSA are deemed to travel at a speed of 20 kph.

In this way, it is possible to simulate the orientation of the service area in relation to the receptors, as well as the traffic handled by the service area given that all the traffic using the service area will enter and leave at some point in time.

Table 4.3 below gives the predicted 18 hour noise levels derived using the traffic flows supplied by Highway Solutions Ltd. Noise levels were predicted for the years 1999 and 2014, both with and without the MSA. The high estimates were used throughout the prediction, though the results would have been similar relative to each other if the low estimates had been used.

Table 4.3 ***Predicted Changes in Traffic Noise $L_{A10,\ 18\ hour}$ dB***

Receptor	Approx Distance to M4	1999 without	1999 with cont. from M4	1999 with cont. from MSA	Total	2014 without	2014 with Cont. from M4	2014 with cont. from MSA	Total
How Lane Farm	150	67	67	36	67	66	66	38	66
Pope's farm	475	60	60	34	60	59	59	36	59
Pondwood Farm	450	60	60	39	60	59	59	40	59
Pondwood Cottage	150	67	67	44	67	66	66	45	66
Smewins Farm	1025	55	55	33	55	54	54	35	54
Littlefield Green	100	70	70	31	70	69	69	33	69
Mare Street	100	70	70	33	70	69	69	35	69

It can be seen from *Table 4.3* that the noise level predicted for the with and without situations do not change. The noise levels predicted for the year 2014 are shown to be slightly lower than those predicted for 1999. Although the number of vehicles using the M4 is predicted to increase, the speeds are predicted to be lower (50 mph instead of the current 70 mph) due to the motorway reaching its congestion capacity. Hence, the lower noise levels.

The marginal widening of the carriageway to accommodate the slip road on the south east side will not significantly affect the results. The slip roads on the north west side have been included in the calculation above.

It can be concluded, therefore, that noise from vehicles using the MSA will not give rise to any significant noise impact.

4.2.2 *Building Services Plant*

Refrigeration units, or air conditioning units, are typical of the type of services commonly found located on buildings where food is stored or consumed. Typically units of this nature emit noise levels between 50 and 63 dB $L_{Aeq,\ period}$ at a distance of 20 metres. This would translate to a facade level of 41 dB at the closest receptor (Pondwood Cottage 375 metres away). This assumes no excess attenuation due to intervening structures or noise attenuating structures. The closest receptor on the east side of the motorway (How Lane Farm 500 metres away) would receive a facade level of 38 dB.

Locating the service units such that they face away from sensitive receptors, *eg* facing the M4, and applying acoustic shrouding to them should ensure that

the noise levels are reduced to below the criteria specified in *Table* 3.2 (41 dB and 43 dB respectively at night).

This source of noise can also be assessed using the methodology contained in BS 4142. This methodology can be used to evaluate the likelihood of this noise to give rise to complaints. Assuming the building services plant is intermittent, a 5 dB adjustment is added to the basic level of 38 dB. The resulting rating level of 43 dB is 6 dB below the estimated existing L_{A90} of 49 dB. This is significantly below the BS 4142 quantified 'marginal' case of 5 dB above existing background level, and similar to the 'unlikely to give rise to complaints' case of 10 dB below the existing background level.

4.2.3 *Patron Noise*

Possible impacts that fall into this category include: slamming car doors; vocal noise; revved engines *etc.* It is difficult to accurately predict noise from these sources since they are not readily quantifiable. However, if a worst case car door slam were to be assumed to be an L_{Amax} 80 dB(A) at 10m, and was assumed to occur at the closest reasonable point to the closest receptor (How Lane Farm 250m away from the nearest possible car parking space), then this would translate to a free-field level of approximately 52 dB(A). This maximum level is substantially below the daytime and evening measured L_{Aeq} values and only slightly higher than the night-time level. Pondwood Cottage is a similar distance from the closest car parking space to it, so this level is considered representative of this location.

This estimation has not included any correction for ground attenuation and so can be assumed to overestimate the level at the receptor.

The second type of patron noise to be considered is mobile refrigeration, or chiller units.

Mobile chiller units are typically located near the top of the trailer between the lorry cab and the trailer unit. A typical noise level produced by a mobile chiller unit is given below in *Table* 4.4. The chiller unit analysed below is of the 'Petter' type, an older model that is noisier than more up to date models that may be up to 10 dB(A) quieter.

Table 4.4 also shows the predicted attenuation that would result from the distance between the proposed location of the lorry park and the closest receptor, as well as the atmospheric and ground attenuation associated with this distance. The closest receptor is is Pondwood Cottage, 250 metres from the HGV parking zone. The attenuation has been calculated using the method contained in the Engineering Equipment and Materials Users Association (EEMUA, formerly OCMA) publication Number 140 - Noise Procedure Specification.

Table 4.4 *Typical Mobile Chiller Noise*

	63	125	250	500	1k	2k	4k	8k
SPL at 10m	86	77	73	72	71	68	61	60
Distance	-28	-28	-28	-28	-28	-28	-28	-28
Atmospheric Absorption	-0.08	-0.16	-0.3	-0.6	-1.25	-2.5	-5	-10
Ground Absorption	-	-3	-6.8	-6.8	-5	-5	-3	-1.8
Total	**57.9**	**45.8**	**37.9**	**36.6**	**36.8**	**32.5**	**25.0**	**20.2**

Converting the resultant octave band sound pressure levels into an A-weighted level gives a level of 41 dB(A). This level is below the criterion for permanent or semi-permanent sources for Pondwood Cottage (43 dB(A)).

Although the methodology is not strictly applicable in this case, the methodology contained in BS 4142 can be used to evaluate the likelihood of this noise to give rise to complaints,. Assuming that the chiller unit operates intermittently during the a typical night (feasible given that some form of thermostatic control would be used) a 5 dB adjustment can be added to the basic level of 41 dB. The resulting rating level of 46 dB is 3 dB below the estimated existing L_{A90} of 49 dB which is significantly below the BS 4142 quantified 'marginal' case of 5 dB above the existing background level.

Based on this figure, no more than two 'Petter' chiller units should be placed next to each at the closest point to the receptor.

4.2.4 *Cumulative Impacts*

The existing background level is dominated by traffic noise from the M4, and since the change in traffic related noise level resulting from the operation of the MSA will be negligible and there are not expected to be noise impacts from other aspects of the MSA, there are not expected to be any cumulative impacts.

4.3 *VIBRATION IMPACTS*

4.3.1 *Construction*

Measurements of vibration from construction plant have shown that, even from percussive piling equipment, levels typically fall to imperceptibility beyond approximately 100 m from the vibration source. Imperceptible levels are reached at much smaller distances from other sources of vibration, such as excavators, bulldozers and Heavy Goods Vehicles (HGVs).

There will be no major sources of vibration within 100 m of the nearest receptors.

4.3.2 *Operation*

There are not expected to be any significant sources of vibration associated with the operation of the MSA. Traffic movements and building services equipment should not give rise to perceptible levels of vibration beyond the site boundary.

5 CONCLUSIONS

During the construction phase, and adopting worst case assumptions, there is potentially a significant impact at Pondwood and Magpie Cottages. Mitigation measures and site management plans should be instigated once the details of the construction process have been finalised.

Although high noise levels from construction are predicted at other receptors, notably How Lane Farm, they are expected to be of short duration and comparable to existing daytime noise levels so are not considered significant.

Traffic using the MSA, once it is operational, will not give rise to any significant change in the overall noise levels in an area already dominated by noise from motorway traffic, since noise resulting from traffic movements in the service area and on the slip roads is substantially less than the noise from the motorway traffic.

The noise from HGV-mounted chiller units at the point closest to the closest receptor is not predicted to cause adverse impacts even at night, provided that no more than two of the older, 'Petter' type of unit are positioned at this location. If it is anticipated that more than two of these units will be operating simultaneously at night, an alternative location should be identified.

Noise from building services plant and patrons is not predicted to cause any significant impacts, even at night.

Annex A

Tabulated Survey Results

Table A1 ***Full Tabulated Survey Results***

Location	Time	L_{Aeq}	L_{A90}	L_{A50}	L_{A10}	L_{AE}	L_{Amax}
1	1405-1415	67	60	63	70	95	83
	1415-1425	67	59	61	69	95	85
	2210-2220	64	53	55	62	91	84
	0815-0825	73	57	69	76	100	90
	0825-0835	72	58	68	76	100	84
	0052-0059	55	48	51	55	82	80
	0059-0107	56	49	51	54	82	76
2	1438-1448	67	52	56	71	95	85
	1448-1458	67	51	54	71	94	82
	2257-2307	64	50	54	60	92	85
	0923-0933	70	57	63	74	98	86
	2307-2315	63	57	59	63	90	80
	2315-2322	63	56	58	62	89	81
3	1504-1514	55	41	51	57	83	79
	1514-1524	55	47	52	57	83	76
	2240-2250	43	39	41	44	71	66
	0906-0916	59	53	59	62	67	63
	2327-2334	49	47	49	51	76	60
	2334-2341	52	47	49	52	79	75
4	1530-1540	65	55	57	60	93	89
	1540-1550	63	55	57	61	91	83
	2226-2236	65	51	53	60	93	87
	0842-0852	71	57	61	72	99	90
	0852-0902	70	56	58	71	98	87
	2350-2357	56	54	56	58	93	65
	2357-0005	55	52	54	57	81	64
5	0940-0950	68	57	59	70	96	83
	0950-1000	69	57	60	68	97	88
	0030-0037	52	39	41	45	78	76
	0037-0045	41	37	40	42	68	66
6	1007-1017	63	56	57	62	91	81
	1017-1027	65	56	59	67	93	84
	0007-0014	55	50	54	57	81	64
	0014-0022	56	53	55	57	82	66

Annex B

Construction Plant Inventory

Table B1 *Assumed Construction Plant Inventory - Site Clearance*

Plant Item	Sound Power Level	Number of Plant Items	% on-time	Effective Sound Power Level
Bulldozer	104	2	50	104
Pneumatic Breakers	112	4	40	114
Compressors	105	4	100	111
Dump Trucks	106	2	50	106
Grader or Scraper	110	2	50	110
Lorries	112	2	40	111

Table B2 *Assumed Construction Plant Inventory - Piling Phase*

Plant Item	Sound Power Level	Number of Plant Items	% on-time	Effective Sound Power Level
Piling Rig	125	2	50	125
Compressors	105	2	100	108

Annex C

Traffic Flow Data

9705151 0006 2

HIGHWAY SOLUTIONS LIMITED

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Tel: 0115 941 7244
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FAX MESSAGE

To: TONY FINCH

Fax No: 01522 510799

From: STEVE DUDHILL

No of Sheets including this one: 4

Date: 9 MAY 1997

M4 MAIDENHEAD - NOISE ASSESSMENT

1. Herewith a summary of the traffic forecasts for use in the noise assessment work (Sheets TN8, TN9 and TN10). Please note the following:-

   i) The 18 hour figures are estimated from a 1995 AADT, using a locally derived 24 hour to 18 hour factor. No capacity restraint has been assumed for this data, but it would be prudent if ERM were to assume a traffic speed of, say, 50mph for the 2014 assessments.

   ii) The peak hour flows are assumed to be capped at the congestion threshold (CT) of 6150 vph for D3. Again, where the CT is reached, an assumed traffic speed of, say, 50mph may be appropriate.

2. At this stage, we cannot provide details relating to construction activity. However, from our work on the vertical alignment of the underbridge scheme, it seems likely that the cut-and-cover method will have to be adopted as it is difficult to achieve a sufficient depth of cover for the thrust bore method.

3. You have copies of previous noise assessments by STM which contain information on traffic noise and noise related to activity within the site. These details will prove useful to ERM.

4. As discussed on 8 May 1997, ERM should check the noise assessment work for the Avalon site at Great Hazes to seek to determine what the Borough Council have been willing to accept.

5. I trust you will find the above and the attached helpful.

Regards.

Steve Dudhill

Enc

HSL✓

HIGHWAY SOLUTIONS LIMITED

Consultants in Transportation Planning & Traffic Engineering

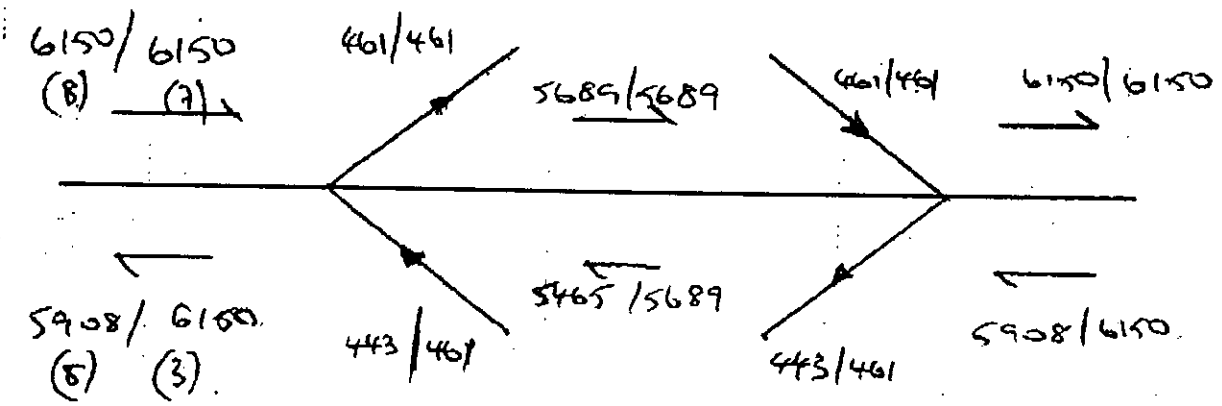
Client : SWANFIELDS LIMITED – MK. MAIDENHEAD.

Project : TRAFFIC DATA FOR NOISE ASSESSMENTS

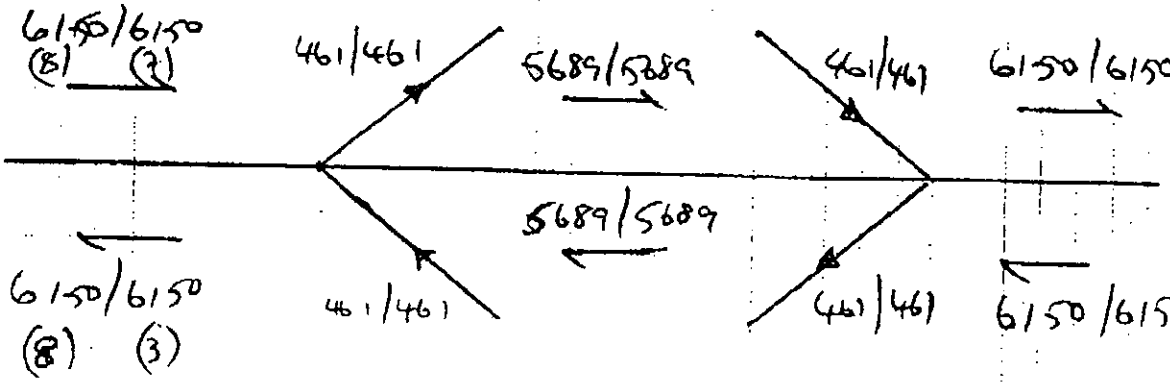
Prepared	SRJ	Checked		Passed		Project No.	00062.
Date	9/5/97	Date		Date		Sheet No.	TWO.

5) MVA Traffic Flows (Continued)

2014 Low (Am / Pm).
(Y. M)



2014 High.



HSL✓

HIGHWAY SOLUTIONS LIMITED

Consultants in Transportation Planning & Traffic Engineering

Client : SWANFIELDS LIMITED – M4 MAIDENHEAD.

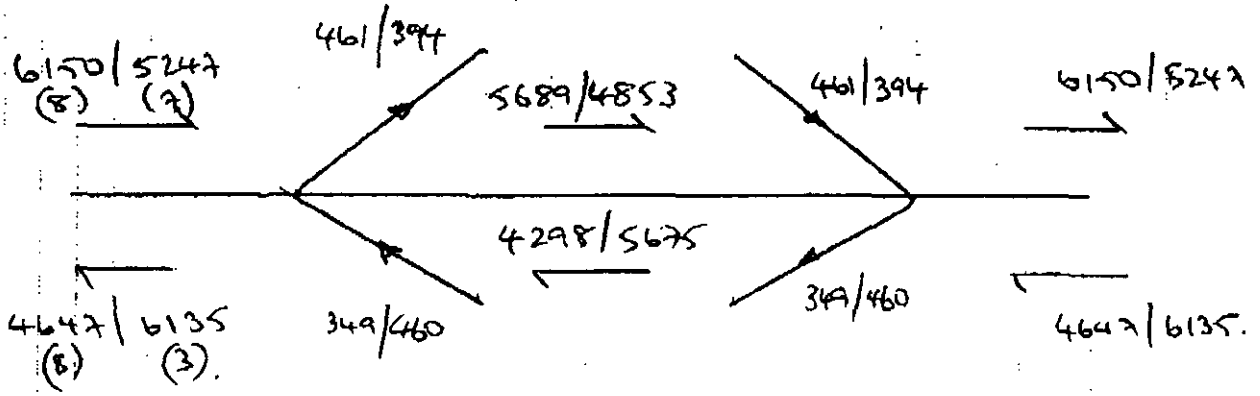
Project : TRAFFIC DATA FOR NOISE ASSESSMENTS.

Prepared	SD	Checked		Passed		Project No.	B0062.
Date	9/5/97	Date		Date		Sheet No.	TN9.

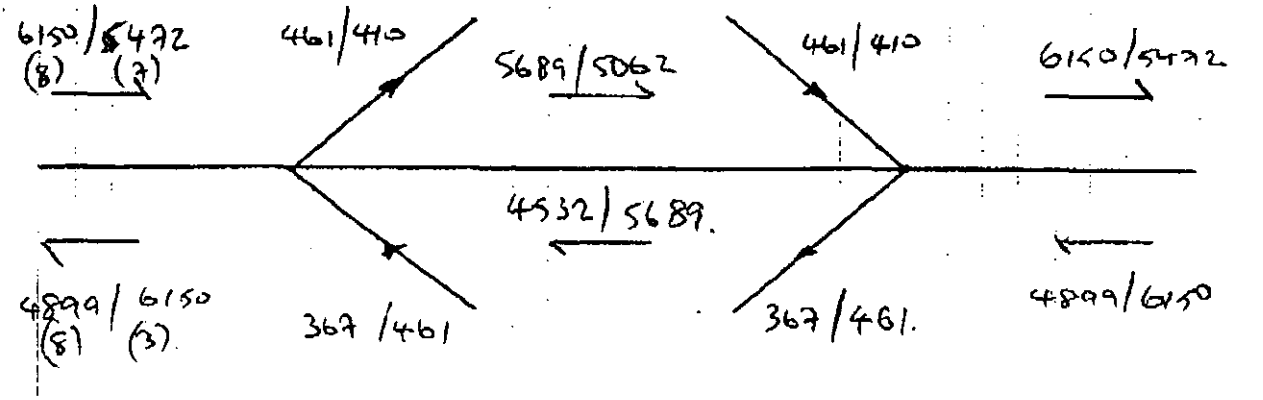
5) M4 Traffic Flows (continued)

ii) Peak Hour Flows

1999 Low (AM/PM (F/S NWD))



1999 High (AM/PM (F. H))



HSL✓

HIGHWAY SOLUTIONS LIMITED

Consultants in Transportation Planning & Traffic Engineering

Client : SWANFIELDS LIMITED - M4 MAIDENHEAD.

Project : TRAFFIC DATA FOR NOISE ASSESSMENTS.

Prepared	SP	Checked		Passed		Project No.	00062
Date	9/5/99	Date		Date		Sheet No.	TN 8

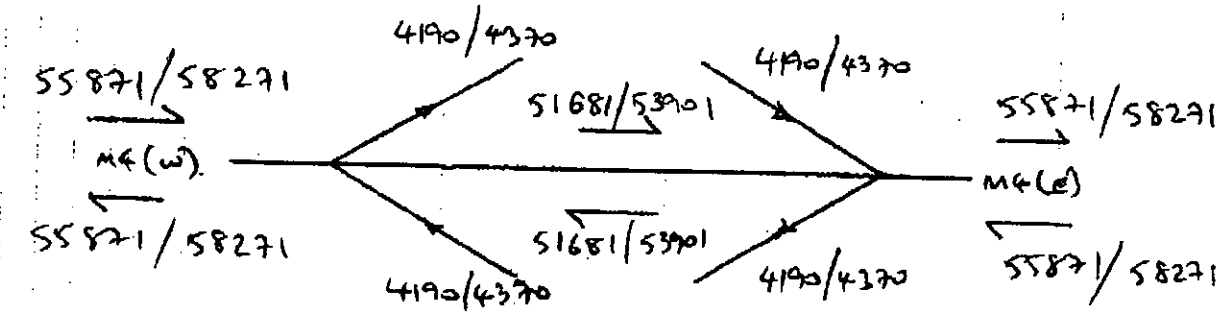
5) M8A Traffic Flows.

Annual M8A HGV = 7.5 %, daily & in peaks.

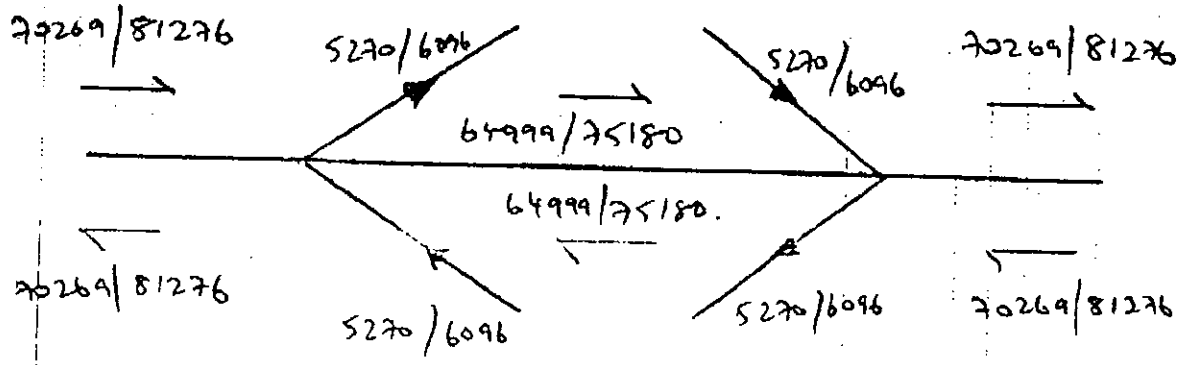
Thus, traffic flows are as follows:-

1) 18 Hour Data. (All @ 10.8% HGVs)

1999. Low/High.



2014 Low/High (50mph ; 10.8 % HGVs)



HSL✓

APPENDIX F2

AIR QUALITY AND NOISE UPDATE

APPENDIX F 2

1 PROPOSED MOTORWAY SERVICES TO BE LOCATED AT M4 J 8/9 AND 10, MAIDENHEAD

1.1 CHANGES IN NOISE AND AIR QUALITY IMPACTS

1.1.1 Introduction

The changes in the effects of noise and air quality (dust) during construction as a result of site layout changes at the Maidenhead MSA (located on the M4 between junction 8/9 and 10) are summarised in this document. The changes are limited to removal of the eastbound access road loop and an associated reduction in usage of the MSA. It has been assumed that the number of vehicles using the MSA will reduce to about 50% of the value assumed in the Environmental Statement.

1.1.2 Noise Impacts

Construction

Due to the increase in separation distance between the site preparation phase and the nearest noise sensitive receptor, the predicted noise levels are now below the criterion of 70 dB(A). No significant impacts are therefore expected during this phase with new site layout.

Since the piling works were assumed to occur at the location of the major buildings on site, the separation distance between the piling and receptors has not changed as a result of the layout changes. The predicted noise level at Pondwood Cottage during the piling phase remains 2 dB above the 70 dB(A) criterion. This results in a minor impact. It should be possible to mitigate this impact during the detailed design of the construction site.

Operation

No significant changes in traffic noise levels in the area were predicted in the Environmental Statement. Reduction in the number of vehicles using the site and increase in the separation between the nearest on-site road and the receptors to the west of the site will reduce the effect of the on-site roads.

ERM

1.1.3 *Air Quality Impacts*

Construction

Since all the properties are now over 100 m from the construction site, in general, no construction impacts will occur due to dust. However, impacts cannot be completely ruled out as in high winds fine dust particles can be deposited at a distance of 500 m from the source. Good site management (as described in the Environmental Statement) should be adopted to reduce the potential for dust nuisance. The necessity to produce dust close to receptors on the western side of the motorway has been reduced by the changes to the MSA construction.

Operation

The Environmental Statement for the scheme demonstrated that there would be no air quality impacts at sensitive receptors during the operation of the MSA. With the revised scheme there is an assumed reduction in the number of vehicles using the site. The sensitive receptors to the west will be further from the MSA and its associated on-site and access roads. Therefore no air quality impacts are predicted to occur during operation of the revised scheme.

ERM

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TRANSPORTATION ELEMENT

2040 PLAN

MID-OHIO VALLEY

MID-OHIO VALLEY REGIONAL PLANNING COMMISSION

MID-OHIO VALLEY METROPOLITAN PLANNING ORGANIZATION

MID-OHIO VALLEY TRANSPORTATION MANAGEMENT AREA

MID-OHIO VALLEY SERVICE AREA

VOLUME 1

JUNE 2004

CON/2001/4463

M4 Great Wood
Maidenhead

Motorway Service Area

Environmental Impact Assessment

Consultants to Swayfields Ltd:
Gifford and Partners
Derek Lovejoy Partnership
Penny Anderson Associates
Reading Agricultural Consultants
ERM Ltd
Matthews and Goodman

Swayfields Ltd
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June 2001

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NON-TECHNICAL SUMMARY

INTRODUCTION

A Motorway Service Area (MSA) is proposed on land adjacent to the M4 to the south of Maidenhead near Great Wood, White Waltham, and is currently the subject of an outline planning application. The services are located to the east of the motorway.

This is a summary in non-technical language of a more detailed document, the Environmental Impact Assessment (EIA), which describes the proposed development and the likely environmental effects on the area within which the development would be sited together with mitigation measures which would reduce the identified impacts.

The proposed MSA would increase the frequency, availability and choice of service area facilities on this section of the M4 and is entirely commensurate with Government advice that encourages the private sector to initiate new MSAs.

THE PROPOSED DEVELOPMENT

The Great Wood MSA would provide more than the minimum facilities required under Government Planning Guidance including facilities for the disabled and would be open 24 hours a day, every day of the year.

Provision would be made for the following:

- An amenity building with a family restaurant, shop, tourist information, public telephones and free toilet facilities.
- A travel lodge providing overnight accommodation.
- Comprehensive refuelling facilities with kiosk.
- Car, HGV, caravan, coach and disabled parking to meet the required levels of demand.
- A picnic area.

Entrance to and from the on-line service areas would be via slip roads from the M4 motorway, designed to meet Department of Transport standards.

The development would be lit using full cut-off lanterns that would limit the spread of light and would be agreed with the Local Planning Authority

The development would be largely contained by existing woodland and hedgerows that would be reinforced and enhanced with new landscaping.

The environmental effects of the proposed development are now summarised under the assessment category headings as follows:

CULTURAL HERITAGE

To establish whether any features of archaeological or historic interest are present in the general area of the proposed development a study of archaeological and listed buildings records together with cartographic and topographic information has taken place.

This study has shown that three archaeological finds and features, visible on aerial photographs, exist on the proposed development site. In view of this and the known evidence of Roman activity in the region, the potential for remains being encountered on the proposed site was believed to be high. Without a suitable scheme of archaeological mitigation, such remains, if they exist, may well be encountered and disturbed by the proposed development.

During November 1997 Swayfields Ltd commissioned Gifford and Partners Ltd to organise a geophysical survey. This was in response to questions raised at the Public Inquiry of two competing motorway service areas. The work was carried out by Oxford Archaeotechnics Ltd and the *'Results of the Geophysical Investigation' were* compiled in a report by Gifford and Partners Ltd summary (Report No. B 1053A.R01).

The geophysical survey took the form of magnetic susceptibility and gridded magnetometer survey over a 16.25 hectare area. This area covers the land expected to be disturbed by structural ground works. The survey located two recently removed hedgerows, two weak lines at the south of the site (which do not appear archaeological) and an area of burnt flint. It is possible that the area of burnt flint may merit further recording. However, no other archaeological features have been found.

The Report complete with Geophysical Survey were submitted to the Consultants (Babtie Group) acting for the Royal Borough of Windsor and Maidenhead who confirmed by letter dated 16 April 1998 that

> *'the archaeological potential was less than that suggested by the desk based assessment The presence of a possible burnt mound does still imply that further remains may not have been detected by the geophysical survey. As a consequence limited trenching would still be required in order to elucidate the nature of the burnt mound, the survival of any related features, to check the results of the geophysical survey and to provide the basis for full mitigation I recording strategy should it be required. As it is unlikely that remains warranting preservation-in-situ survive on the site, the evaluation need not be undertaken prior to the public inquiry'.'*

In addition, and also prior to construction, it is proposed to discuss these results and conclusions with Berkshire County Council and if necessary to design and implement an appropriate and approved scheme of archaeological mitigation prior to and if necessary during construction.

TOPOGRAPHY AND GEOLOGY

There would be no significant changes to topography that would have widescale implications. Topographical changes would be localised, the excavation of the balancing pond and new ground - modelling to screen the development. The outer slopes of all mounding would be graded out gently into the surrounding land.

ECOLOGY AND NATURE CONSERVATION

The areas proposed for development are contained entirely within low value habitats in arable fields. No Sites of Special Scientific Interest or Wildlife Heritage Sites would be affected by the proposed MSA development.

The site is partially bordered by Great Wood that consists of valuable ancient woodland habitats. Great Wood would not suffer any direct impact from the proposed MSA development. For the most part, the impacts of the scheme are likely to be restricted to common, widespread species and relatively low value habitats, including arable fields, rough grasslands and highway scrub.

The breeding and feeding habitats of declining farm birds such as skylark and lapwing would be affected by the loss of arable fields.

Intermittently occupied and disused badger setts could potentially be removed by the development proposals. Appropriate mitigation measures are proposed, to ensure that no harm would result to badgers as a result of the proposed MSA development.

Appropriate design and management of new and existing habitats, including the Great Wood outlier and The Cut, presents the opportunity to provide valuable wildlife enhancements as part of the development proposals. New habitats would be used to buffer adjacent habitats of existing value and provide valuable wildlife resources in themselves.

Further surveys are proposed, prior to development, to clarify the interest of the application sites for badgers, reptiles and breeding birds. The likely scale of impacts for these groups is low but appropriate mitigation for any likely impacts would be incorporated into the landscaping scheme for the proposed development

LANDSCAPE AND VISUAL ASSESSMENT

The development is contained from the north by Great Wood and its outlier that has been severed by the Motorway. Woodland further to the east and south provides further containment of the site. The Cut along the south boundary of the MSA development provides a strong vegetation belt containing the development from the south. The east side of the development is contained by a mature hedgerow though more open views of the area generally can be obtained from How Lane to the east. Thus, the development is generally well contained in the wider landscape.

Parts of the site are more visible from the elevated bridge carrying Drift Road over the M4 motorway to the south of the site. The local road system of Drift Road, How Lane and the B3204 are screened from the development by intervening vegetation. No public footpaths would be affected physically. A public footpath off How Lane would have any views filtered by intervening vegetation. No private properties would be physically affected. Some properties in close proximity have views filtered by intervening vegetation.

The land for development is currently used for arable crop production. No important areas of vegetation would be lost or affected. Part of a hedge along the west side of the motorway would be removed for the access roads.

The southern part of the site east of the motorway is derelict grassland and is to be used for balancing ponds, new woodland planting and meadowland.

Extensive mitigation is proposed to screen any residual effects of the development and to integrate the development into its surroundings. Ground modelling is proposed to screen buildings and structures within the development including large areas of woodland type planting. Further planting is proposed off-site on land controlled by the applicant to reinforce and/or replace hedgerows previously removed.

There are significant benefits the scheme would bring in the form of large quantities of new vegetation where in places it has somewhat been depleted in recent years, notwithstanding the generally wooded character of parts of the locality.

LAND USE

Land use on the site is predominantly agricultural and there are woodlands in the general area.

Almost all of the agricultural land is in arable cropping use, growing combinable crops in rotation, with a small area of disturbed ground in the south-western corner under unused permanent grass. At the north on both sides of the M4 there are areas of woodland that are part of Great Wood. There is a watercourse - The Cut - that runs along the south east boundary of the proposal.

So far as the application site is concerned, the land's quality is 1.9ha grade 2, 8.5ha grade 3a, 4.25ha grade 3b and 2.3ha grade 3b/4. All of this land could be lost to the development. However, if proper measures were undertaken this could be offset by the improvement of the 1.1 ha of semi-derelict land at the south end of the adjacent eastern land within the applicants control (which we have graded as 3b/4), by a land improvement scheme which would make use of surplus topsoil generated on the development area. Properly carried out, this land could be upgraded to at least grade 3a standard. In addition, the current landscape proposals do not require all of the land on the eastern boundary to be planted, and some will not even be disturbed by mounding. If the mounded areas that are not required for planting are correctly formed, they can be restored to their current grade 3 a quality. The net effect in this area would be 1.8ha which could return to agricultural use, at grade 3a quality. Thus the total potential offset is 2.9ha of grade 3a.

WATER QUALITY AND DRAINAGE

The site of the proposed MSA is currently in agricultural use and the principal effects of the development would be to increase the rate and volume of the surface water runoff and to create foul discharges of wastewater that did not exist before the development.

It is proposed to discharge the surface water runoff to The Cut. The flow of the water would be passed into a settlement pond, via an interceptor to allow suspended solids to be removed and to attenuate peak flows. The pond would allow accidental pollution incidents to be contained within the site.

Foul water would either be pumped and discharged existing public foul sewer via a new rising main or treated on site and passed through a balancing pond before discharge in to The Cut. The effluent discharged to The Cut would meet the water quality standard stated by the Environment Agency in a consent to discharge.

Protection of the Chalk aquifer is essential due to the proximity of Beenham's Heath Pumping Station. The presence of clays down to 14 metres below ground level should ensure adequate protection of groundwater resources provided construction works are not taken below the clay layer.

AIR QUALITY

The Air Quality in the region of the MSA is principally determined by the proximity of the M4 motorway, the additional effects of emissions from vehicles using the MSA will be small.

No residential properties would be affected by vehicle refuelling, or by emissions from combustion gases associated with the amenity and lodge buildings.

Two residential properties could potentially experience dust levels sufficient to cause a small level of nuisance during the construction phase.

NOISE

The existing noise levels have been measured and evaluated, and the potential impacts from the construction and operational use of the MSA investigated.

The M4 dominates the ambient noise climate at all the locations measured, though overflying aircraft contribute a great deal to the ambient levels during the daytime period.

It is anticipated that the road traffic noise associated with the development would not cause a perceptible change in the overall noise climate at any of the surrounding properties.

The operational sources within the proposed site, such as building services, mobile chiller units and car door slams, are not anticipated to cause any impacts at the surrounding properties.

COMMUNITY EFFECTS, PEDESTRIANS, CYCLISTS, & EQUESTRIANS

The site has only one public footpath in medium proximity. The greatest effect would be experienced westbound for a few yards approaching How Lane. The remainder of the path is well protected by existing vegetation.

The site has two C class roads in medium proximity that pass the site offering partially filtered views from infrequent vehicles. Where possible mounding and planting is intended to eliminate any adverse effects and new hedgerows are proposed along roadsides to contain views.

1.0 INTRODUCTION

1.1 PROPOSED DEVELOPMENT

1.1.1 The proposed development of a westbound Motorway Service Area (MSA) is intended to serve the needs of the travelling public on the M4/M25 motorway network. It would be constructed on land in close proximity to Great Wood that is located approximately 2 ½ miles south of Maidenhead. The proposed site is situated between Junctions 8/9 and 10 of the M4 and is the subject of an outline planning application. The Great Wood MSA would increase the frequency, availability and choice of service facilities on the M4/M25 network. Its location is shown on Plan 1 (See Volume 3 of the EIA).

1.1.2 The provision of such a facility is entirely commensurate with Central Government advice, in particular that of PPG13 (March 1994), which describes the role to be adopted by the private sector in seeking to improve the level of service facilities on the country's motorway network. The guidance given by PPG13 had followed the original encouragement given to the private sector in the Secretary of State for Transport's Press Announcement on 6th August 1992. That guidance remains in place and is to be read in conjunction with the July 1998 MSA Policy Statement, now referred to as HA269. A consolidation circular on MSA policy, which will draw together the advice of PPG13, Circular 1/94 and this latest policy statement will be published in due course.

1.1.3 The July 1998 MSA Policy Statement takes precedence over previous guidance where it differs from that previous advice. However, the broader and more detailed advice of PPG13 and indeed DOT Circular 1/94, which expresses the Government's commitment to improving the service offered to motorway users remains extant. The 1998 MSA Policy Statement provides additional advice on 'retail and other development' given the concern that, in the absence of any clear guidelines, there may be a greater danger of such developments becoming destinations in their own right. The level of facilities which are considered acceptable, over and above the compulsory, are set out at paragraph 9 of this guidance and include an overnight lodge.

1.1.4 Spacing advice that had been given by PPG13 (Annex A paragraph 10) has been revised with priority being given to ensuring that MSAs are available at roughly 30 mile intervals throughout the motorway network. Additional MSAs at 15 mile intervals will still be allowed but a more precise 'test' has been defined with the emphasis on the issue of road safety.

1.1.5 A study of the M4/M25 Motorway network has been undertaken between the existing MSA sites at Reading, South Mimms, and Clackets Lane. Reading MSA is situated between Junctions 11 and 12 of the M4 to the south west of Reading. South Mimms, is situated at Junction 23 - M25(northern section), 53 miles from Reading. Clacket Lane, is situated between Junctions 5 and 6 - M25(southern section), 65 miles from Reading.

1.1.6 At a local public inquiry held in September /October 1997 into MSA provision at this location the Inspector in his report concluded (page 89 para. 12.50) that *'the traffic flows between the M4 and the M25 are such that there would be considerable road safety benefits in reducing the existing gap between MSAs on the M25 and the MSA at Reading. I conclude this represents a compelling need for additional facilities'.*

1.1.7 Although the Inspector recommended that the appeal for the granting of planning permission at the Great Wood MSA be dismissed. He added the proviso that should the Secretary of State decide that no additional MSAs be built on the M25 to the north

of the M4/M25 interchange, or on the M25 to the south of the M4/M25 interchange, then in the event of either of these situations

'I recommend that the appeal should be allowed subject to the exclusion of the proposed lodge'.

Planning Policy Context

1.1.8 There is a general presumption against what is deemed inappropriate development within Green Belts. In line within PPG2 The Royal Borough of Windsor and Local Plan Policy GB11 states that:

'The Borough Council will not approve proposals for a motorway service area within the boundaries of any excluded settlement and will not approve such proposals elsewhere within the Borough unless very special circumstances can be demonstrated'.

1.1.9 Exceptions can be made and Paragraph 13 of Annex A in PPG13 gives advise on the circumstances where this may arise:

'One of the material considerations which could justify such an exception could be the lack of any signed MSA's. The greater the interval between the proposed site and any existing facility the more weight should be placed on the needs of motorway users'.

1.1.10 Paragraph 13 of PPG13 Annex A, continues; accepting that although Green Belt sites should be avoided where possible, this is not always practical and advises.

'Where no alternatives are readily available, developers will be expected to take great care to mitigate the likely impact of the development'.

1.2 LEGAL BASIS FOR THE ENVIRONMENTAL IMPACT ASSESSMENT

1.2.1 The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999, SI 1999 No 293, came into force on 14th March 1999. It revokes and supersedes the original 1988 regulations. Circular 2/99, Environmental Impact Assessment, gives guidance on the Regulations.

1.2.2 This Circular gives policy guidance on the implementation in England of the amendments made to the original EC directive on Environmental Impact Assessment (Council Directive 85/337), which was adopted on 27th June 1985, and cancels and supersedes DOE Circular 15/88.

1.2.3 Annex A of Circular 2/99 provides indicative Thresholds and Criteria for identification of Schedule 2 Development requiring EIA. Criteria A21 relates specifically to Motorway Service Areas and states that:

'Impacts likely to be significant are traffic, noise, air quality, ecology and visual impact. EIT is more likely to be required for new motorway service areas which are proposed for previously undeveloped sites and if the proposed development would cover an area of more than five hectares.'

Therefore, because the proposed MSA development represents an area of 19.5ha of previously undeveloped land, an Environmental Impact Assessment is required to accompany the planning application.

1.3 PURPOSE AND FORMAT OF THE ENVIRONMENTAL IMPACT STATEMENT

1.3.1 The purpose of this EIA is to determine the likely environmental effects of the proposed MSA on the area within which the development would be sited.

1.3.2 Schedule 4 of the Regulations sets out the information for inclusion in Environmental Statements It must contain the information specified in Part II, and such of the relevant information in Part I of Schedule 4 of the Regulations as reasonably required to assess the effects of the development. Part II of the regulations specifies that the following information is to be included in an ES:

'1. A description of the development comprising information on the site, design and size of the development.

2. A description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects.

3. The data required to identify and assess the main effects which the development is likely to have on the environment.

4. An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice, taking into account the environmental effects.

5. A non-technical summary of the information provided under paragraphs 1 to 4 of this Part.'

1.3.3 The information specified in Part 1 of the regulations is:

'1. Description of the development, including in particular –

(a) a description of the physical characteristics of the whole development and the land-use requirements during the construction and operational phases;

(b) a description of the main characteristics of the production processes, for instance, nature and quantity of the materials used;

(c) an estimate, by type and quantity, of expected residues and emissions (water, air and Soil pollution, noise, vibration, light, heat, rādiation, etc) resulting from the operation of the proposed development.

2. An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice, taking into account the environmental effects.

3. A description of the aspects of the environment likely to be significantly affected by the development, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors.

4. A description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development, resulting from:

(a) the existence of the development;

(b) the use of natural resources;

(c) the emission of pollutants, the creation of nuisances and the description by the applicant of the forecasting methods used to assess the effects on the environment.

5. A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.

6. A non-technical summary of the information provided under paragraphs I to 5.

7. An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the applicant in compiling the required information.'

1.3.4 The EIA considers the environmental effects of the development specified in Part II (items 1 to 5) and Part I (items 1a, 1c, 3, 4a, 4c, 5, 6 and 7).

1.3.5 The format of the EIA is as follows:

Chapter 1.0 Introduction - which briefly describes the site location, government policy and planning history of the proposed MSA and sets out the environmental impact assessment regulations.

Chapter 2.0 The Proposed Motorway Service Area - which describes the existing use of land within which the MSA would be located including a summary description of the proposed development.

Chapter 3.0 Assessments of Impacts - which identifies the likely environmental impacts of the proposed MSA under the environmental impact assessment category headings, describing both positive and negative aspects, in terms of Baseline Conditions, Predicted Impacts and Mitigation Measures.

Chapter 4.0 Summary of Key Issues - which identifies the main environmental consequences of constructing the MSA and highlights those positive and negative aspects most pertinent to the assessment of impact.

Chapter 5.0 Environmental Impacts Tables - tables which summarise the direct and indirect impacts resulting from the construction of the proposed development.

Chapter 6.0 Plans and Plates - Maps, Plans and Drawings.

Appendices - Lists, Tables and Technical Reports.

1.4 CONSULTATIONS AND THE SCOPE OF THE ASSESSMENT

1.4.1 During the process of compiling the Environmental Impact Assessment a number of bodies have been consulted about the information to be included in the document. A list of consultees with whom informal consultations have taken place, including those that are on-going are included at Appendix A.

1.4.2 Following the publication of the EIA, in association with the Outline Planning Application, formal consultations will be undertaken with the Local Authority, the Countryside Commission and English Nature, and any other bodies or organisations as directed by the Planning Authority.

1.4.3 Determining the scope of the EIA is a fundamental stage in the process of compiling an environmental assessment and assists in identifying the range of environmental effects of a proposed development. The contents of the Maidenhead EIA has been determined by undertaking a scoping exercise with the local planning authority, and in conjunction with guidelines given in Appendix 4 of the publication 'Environmental Assessment - A Guide To The Procedures' (published by HMSO for the Department of the Environment/Welsh Office) and Schedule 3 of the 'Regulations'. The condition and value of the existing environment, the collection of information relevant to the location of the development and the engineering proposals have all been taken into account. The particular environmental assessment issues that have been identified during the scoping exercise were:

- Cultural Heritage
- Topography and Geology
- Ecology and Nature Conservation
- Landscape and Visual Assessment
- Land Use and Agricultural Land Quality
- Water Quality and Drainage
- Air Quality
- Noise
- Community Effects and Pedestrians

These environmental issues form the assessment categories that are considered in detail in Chapter 3.0 of this EIA.

1.5 ALTERNATIVE SITES

1.5.1 Along the section of motorway affected by the proposal there are three existing MSAs are currently serving the needs of vehicle travellers on the M4/M25 motorway network. These are:

- M4 Reading;(14 miles from proposed Great Wood MSA)
- M4 Heston;(17 miles from proposed Great Wood MSA)
- M25 South Mimms; (39 miles from proposed Great Wood MSA)
- M25 Clackett Lane; (51 miles from proposed Great Wood MSA)

1.5.2 In the vicinity of the proposed development, three alternative MSA sites have been brought forward for consideration by the planning process. The site locations are shown on Figure 2 these are:

- MSA at Great Hazes, Beenham Heath, Binfield. Promoted by Hallam Land -This proposal consists of an on-line site to the north western side of the M4 serving east bound traffic only. This proposal was refused planning consent by the Secretary of State following a joint local inquiry for MSA provision in the Bracknell Forest Borough District. The decision was subsequently challenged in the High Court and quashed.
- MSA at Junction 8/9, Holyport. Promoted by Boulevard Land - This proposal consists of a site in the south and south-west quadrant of the junction and would potentially serve both east and westbound traffic, accessed from the motorway via the interchange. This proposal was refused planning consent by the Secretary of State following a joint local inquiry for MSA provision in the Royal Borough of Windsor and Maidenhead District.

1.5.3 Similarly, there are five proposals for MSA's currently the subject to outstanding outline planning applications on the M25 between Clackett Lane and South Mimms. These are:

- MSA at Downside, Cobham, between junctions 9 and 10. Promoted by Swayfields - The site is 31 miles from Great Wood MSA. This proposal was the subject of a Local public inquiry in September 1996, and was granted planning permission by the Secretary of State following a local inquiry for MSA provision in the south-western sector of the M25. The decision was subsequently challenged in the High Court and quashed.

- MSA at Simplemarsh Farm, Chertsey, adjacent junction 11.Promoted by Lawlor Land - The site is 22 miles from Great Wood MSA. This proposal was refused planning consent by the Secretary of State following a local inquiry for MSA provision in the south-western sector of the M25. The decision was subsequently challenged in the High Court and quashed.

- MSA at Palmers Moor Lane, Iver, between junctions 15 and 16. Promoted by Cape Plc and Corporate Land - The site is 16 miles from Great Wood MSA. This proposal was the subject of a Local public inquiry in November/ December 1994. The Inquiry was subsequently re-opened in November 1996, due to Highway Agency proposals to widen this section of the motorway to dual five lane standard. This proposal was refused planning consent by the Secretary of State following a local inquiry for MSA provision in the western sector of the M25. The decision was subsequently challenged in the High Court and quashed.

- MSA at Palmers Moor Lane, Iver, between junctions 15 and 16. Promoted by Caswell Contracting - The site is 16 miles from Great Wood MSA. This proposal is the subject of an outline planning application and is currently awaiting determination by the local planning authority. This proposal was refused planning consent by the Secretary of State following a local inquiry for MSA provision in the western sector of the M25. The decision was subsequently challenged in the High Court and quashed.

- MSA at Warren Farm and Denham Park Farm, Chalfont St Peter. Promoted by Lawlor Land - The site is 22 miles from. Great Wood MSA. This proposal was refused planning consent by the Secretary of State following a local inquiry for MSA provision in the western sector of the M25. The decision was subsequently challenged in the High Court and quashed.

- MSA at Burtley Wood, Beaconsfield, Adjacent Junction 2 of the M40. Promoted by Swayfields Ltd. The site is 23 miles from. Great Wood MSA. This proposal is currently awaiting the outcome of the public enquiry.

- MSA at Hedgeley Lane, Beaconsfield, between Junctions 1 and 2 of the M40. Promoted by Hallam Land. The site is 22 miles from. Great Wood MSA. This proposal is currently awaiting Secretary of State, determination.

1.6 CHANGES TO THE EXISTING SITUATION

1.6.1 In terms of the Development Plan for the area under consideration there are no known proposals for the area within which the MSA would be located.

1.6.2 The site is an area of land bounded by the M4 to the west, a C class road to the south. The Cut together with a mature hedgerow to the east encloses the area by abutting with Great Wood at the northern boundary. This part would contain the developed areas of the motorway services.

1.6.3 The proposed MSA would be located on agricultural land.

1.6.4 If the development were not to go ahead the area of land concerned would almost certainly remain in agriculture for the foreseeable future.

2.0 THE PROPOSED MOTORWAY SERVICE AREA

2.1 INTRODUCTION

2.1.1 The proposed Great Wood MSA development consists of a parcel of land lying on the eastern side adjacent to M4 motorway totalling 19.5ha lying between Great Wood and the Drift Road overbridge. Its location is shown on Plan 1 (See Volume 3 of the EIA).

2.2 EXISTING LAND USE

2.2.1 The site for the proposed Motorway Service Area (MSA) is located to the south of Maidenhead, Berkshire, approximately 2½ miles south west of Junction 8/9 of the M4/A404(M)/A308(M) motorways.

2.2.2 The eastern triangle of land to the east of the Motorway required for the construction of the MSA is bounded by the M4 to the west, 'The Cut' to the south and an undefined boundary from 'The Cut' near How Lane in the south to the northern tip of Great Wood. As can be seen from Plan 1, a portion of Great Wood has already been severed by the M4 and is included within the site boundary. The main built development of the MSA would lie to the west of the hedgerow linking Great Wood with 'The Cut'. However, the Applicant controls land up to How Lane in the East and the C' class road (Drift Road) in the south as well as a smaller portion of Great Wood west of the motorway.

2.3 DESCRIPTION OF PROPOSED DEVELOPMENT

2.3.1 The publication of the Government Circular 23/92 placed the onus for the identification and development of MSA's with the private sector rather than as previously with the Department of Transport. The publication of PPG13 in March 1994 updates the advice in Circular 23/92, thereby cancelling it, and in Annex A puts forward the Government's basic standards for service provisions at a proposed MSA; these are:

'adequate quantities of free short term parking for all types of vehicle; free toilets; fuel; and a picnic area; all available 24 hours a day every day of the year;

all facilities to be accessible to disabled people; and

no sale or consumption of alcohol on the site.

Beyond that, it will be for operators to decide what services to offer in the light of demand.'

2.3.2 HA269 (MSA Policy Statement) sets out the Governments commitment to the principle of preventing MSAs from becoming destinations in their own right by providing clear guidelines for establishing the level of appropriate development within MSAs.

2.3.3 The Maidenhead MSA would include all the basic provisions and would provide the following additional facilities:

- a family restaurant and shop or shops and a modest meeting room for up to fifteen people catering for those using the motorway, with a total floor area not exceeding 2116 sq.m;
- a motor hotel (60 bed lodge) providing overnight accommodation, but not a bar, restaurant, function room or more extensive conference facilities;

2.3.4 The masterplan (Plan 7) provided in Volume 3 - Drawing No. 12-1030.03.01A shows the proposed site layout for the MSA.

2.3.5 The MSA would be accessed via conventional slip roads, designed to the appropriate Department of the Environment Transport and the Regions (DETR) standards. These provide the minimum practical 'detour' off the motorway mainline. The entry and exit sliproads meet at a roundabout, which also provides the focus for the on-site road layout. This is in the form of a series of loops, with the one to be used being on the purpose of the visit. The access arrangements are shown on Plan 13 provided in Volume 3 - Drawing No HSL00062/1.

2.3.6 The MSA would contain the following provision at Opening Year:

- free parking for 316 cars (16 staff), 8 caravans, 11 coaches and 28 heavy goods vehicles;
- An amenity building containing a family restaurant and shop, free toilets and washroom facilities, tourist information and service yard. The building with a roof height generally 7.2 metres high, (2.7metres to eaves) would be centrally located to serve the surrounding parking areas, by locating the amenity building as low as possible in the lowest part of the site, in conjunction with perimeter mounding and planting, the apparent reduction of size and scale would immediately reduce the visual impact from close viewpoints and in the wider countryside. Full mitigation can be achieved virtually at the outset with mounding of sufficient height to screen out most impacts from sensitive viewpoints.
- A motor hotel (lodge) providing budget accommodation. The two storey hotel at 7.4 metres high (4.8 metres to eaves) is located against the background of Great Wood;
- A picnic area located in a landscaped area adjacent to the eastern boundary;
- Comprehensive refuelling facilities and kiosk. The HGV fuel canopy would be a maximum of 5.4 metres high and the fuel forecourt canopy 5.8 metres high. These would be located as the last facility before leaving the site and would be set against the background of the tall, thick, mature vegetation of The Cut so that the dark edges of the canopies would recede into the background. The facilities would be flanked by substantial areas of indigenous planting with semi-mature trees fronting the surrounding access roads. The PFS would be dug approximately 0.7 m into the ground.

2.3.7 The site layout has been designed in order to accommodate the parking requirements as set out in the Roads Circular 1/94 of 450 cars, 15 coaches, and 40 heavy goods vehicles. This requirement would be phased in order to meet the predicted traffic flows over a 15 year design period.

2.3.8 To assess the visual impact of the development in its countryside setting, it is deemed appropriate to provide information regarding the heights to eaves and ridgelines of the buildings, and photographs showing the scale and appearance typical of the buildings proposed for this MSA (See Plan 11B - Volume 3).

2.3.9 The building types shown on plan 11B may be viewed at MSAs recently constructed adjacent to the M1 Chesterfield. These Services are operated by RoadChef MSAs and Goldstar MSA Fourcourts. Whilst the materials and room layout etc; may vary from site to site the basic design parameters remain similar.

2.3.10 Similar building types to those listed above may be viewed at MSAs recently constructed at Cambridge A14, Peterborough A1(M) and Baldock A1(M). The above Services are operated by 'Extra' MSAs within a joint venture agreement of which Swayfields Ltd is a partner.

2.3.11 To reduce as far as possible the perceived height, scale and mass of the development, buildings and structures have been placed against the backgrounds of existing site features or at levels as low as possible on the site. The perceived scale and mass of the development could be further reduced by the appropriately selection of colours and materials. Brick could be the predominant elevation and paving material in earth-related colours, strongly detailed and textured to absorb light and to tone down vertical walls so that they recede into the background as far as possible.

2.3.12 The site excavation would generate spoil which would be used for mounding around the built-up areas for screening purposes. A preliminary examination of the cut and fill of the site has been undertaken and there would be no need to import or export material or to transport excavations along local roads. The screen-mounding proposed on the site would be sculptured into ground-modelling reflecting natural landforms rather than 'engineered' earthworks, especially as perceived on the outward-facing slopes. The inner slopes may be steeper to maximise height for screening purposes. The most important areas for ground-modelling would be outside the east boundary hedge where the MSA development would be screened by ground-modelling up to 5 metres high. The outer slopes of the mound would be gently sloping between 1:8.5 and 1:14 and returned to agriculture where practicable (1.5ha). The inner slopes would be steeper (say, 1:4 max) to contain the development. A land budget of areas of mounding, planting, cut and fill, heights and gradients of mounds is tabulated on the Masterplan.

2.3.13 The combination of tree and shrub planting would provide a natural environment, visual screening throughout the year and the integration of the proposals into the surrounding landscape and vegetation. There is persuasive argument for the planting of new trees, and in particular for the planting of native species, appropriate to the locality. The objective here has been to create new plantations that would significantly augment the existing local landscape character as well as providing an effective screen for the proposals from the east, west and south. The intensification of the existing woodland matrix would strengthen and enrich the existing rural landscape character. The added value of additional woodland outside the highway corridor as proposed would satisfactorily integrate the motorway and its linear planting into the wider landscape.

2.3.14 This type of woodland structure planting would contain a wide range of plant size from extra-heavy standard trees planted at a height of 4.5 - 5.25 metres to a dense range of forestry transplants and 'whips' 415 mm - 750 mm high plus a distribution of 'feathers' and 'standards' ranging in height from 1.5 - 3.5 metres. Within this planting mix would be a variety of indigenous shrubs that would contribute to the screening effect and to the species range on the site. The forest transplants would be planted at 1- metre centres to maximise growth rates. It is anticipated that the majority of the forest transplants would, with proper care and encouragement, reach a height of 4-6 metres after 7 years. In this way, the eastern and western parts of the development areas would benefit from planting provisions of considerable widths.

2.3.15 The extra-heavy standard trees would be provided for immediate effect to reduce the scale of the development generally. Retained existing hedgerows, woodland and vegetation along The Cut would be reinforced with new edge planting and semi mature trees. Semi-mature trees and other ornamental planting would be placed within the car parking areas for amenity purposes as well as for screening and to reduce the scale of hard standings, especially as perceived from the motorway. East of the boundary hedge would be located a quiet picnic area secluded from the parking areas by the intervening and reinforced hedge. The whole of the east boundary and the MSA development would be screened with new planting of extra-heavy standard trees, woodland planting and wild-flower meadows over the surface of the ground-modelled areas. The extra-heavy standard trees would create a measure of instant screening of most of the tallest buildings and structures.

2.3.16 In addition to the mitigation measures within the site and immediately outside the development area there are a number of off-site proposals which would go some way to restoring the previous landscape pattern of the area where many of the existing hedgerows have been removed. or become weak features in the landscape. This would be implemented by means of a Section 106 Agreement. New hedgerows or blocks of woodland are proposed to reinforce the existing vegetation and restore the landscape character generally. This would be particularly effective along the existing country roads and The Cut. Existing hedgerows would be strengthened or new ones created as shown on Plan 9 – Off-site Planting and Cross Sections Locations Plan.

2.3.17 The landscape proposals have been designed to provide a high degree of visual screening during the winter months. Winter screening can, in part, be achieved by evergreen indigenous species such as holly and privet but is primarily secured by planting deciduous species at a sufficient density, depth and variety of species and size such that the coalescence of twigs and branches achieves a dense visual barrier. The planting would therefore contribute to visual containment initially in much the same way as the existing hedgerows in the countryside fulfil this function in the winter. Ultimately, the planting would take on the role of existing woodlands in this respect. From the outset, the scheme has been designed in a robust manner.

2.3.18 The implementation of the planted areas would be designed. along sound horticultural principles using the best of current techniques. These techniques will include the use of polymer additives to the soil to assist in water retention, the application of Alginure to the roots of bare root transplants and whips to assist in the transfer of nutrients from the soil, the uses of mulches to suppress to potential weed growth and the addition of soil ameliorants to promote growth. These principles would apply to areas of woodland planting where maximum growth rates would be required for screening purposes. However, where this is not so critical, remaining areas of woodland planting, typically at the south-westem part of the site, would be established using ecological techniques such as low-fertility substrates, pit planting and appropriate field layers.

2.3.19 Due consideration would be given to any existing wildlife habitats and the necessity to introduce programming constraints and safeguards during the development implementation stage to ensure their protection and enhancement.

2.3.20 The principles of Sustainable Urban Drainage Systems (SUDS) as encouraged by the Environment Agency would be implemented as far as possible without compromising the ability for prevention of pollution. Only sustainable drainage systems for particular areas of potential surface water run-off generation that are approved by the Environment Agency would be proposed at this site.

2.3.21 The area to the south and west of the MSA development would be excavated to create a balancing pond for the development which could also be developed further for habitat creation. Extensive planting and wild flower grasslands around these ponds and into the extremities of the site would significantly augment the wildlife interest of the surrounding areas as well as reinforcing the existing amenity of the vegetation pattern.

2.3.22 The soakaway system above would be designed to have sufficient storage capacity to maximise the disposal of surface water to the underground strata. If sufficient storage were impractical, then the system would be provided with an overflow to the piped surface water system discharging to the balancing pond. The balancing pond would be designed to attenuate the run-off from the areas connected directly by pipework and the overflows from the soakaways systems. Adopting this approach embraces the principles of SUDS by increasing the time for flows to reach the balancing pond, allowing the maximum amount of rainfall to pass naturally into the ground and reduce the volume flowing to the balancing pond and the downstream watercourse.

2.3.23 Foul sewage generated by the development would be treated on site and either discharged to the watercourse via the balancing pond to the satisfaction of the Environment Agency.

2.3.24 In adopting a lighting policy for the MSA site best-practice principles for reducing light spillage in rural areas recommended by the DoT (Road Lighting and Environment) would be followed using high-pressure sodium lamps and special light-control lanterns. Within the site, a mixture of column and mounted full cut-off lanterns and low-level bollard lighting is proposed to give a 'wash' effect at round level, principally to guide pedestrians and to comply with visibility and safety standards. The slip roads and access roundabout would be lit with 8 metre high columns. The lorry park and internal circulation roads would also be illuminated with 8-metre columns but for the car park these would be reduced to 6 metres high. Wherever possible twin lanterns would be used to restrict the number of columns.

2.3.25 Examples of these provisions are contained within Plan 8A- Lighting Units and a lighting layout is provided for the development as Plan 8B – Drawing No. 11710B Lighting Layout. The plan shows the normal requirement to light the surface of the parking area to a value of 10 Lux but owing to the position of the lanterns this level of lighting falls off rapidly around the perimeter of the development. Illuminance contours of 10, 5 and 1 Lux respectively are drawn, the outer contour being the 1-Lux value. The surface outside this contour would therefore be dark. Thus all the surfaces that would be lit are contained well within the site and there would be no 'leakages' beyond the site boundaries.

2.3.26 For additional security and safety, the fuel filling station area would be designed to provide 300 lux maintained illuminance. The luminaires within the canopy would be designed to ensure that light above the horizontal plane would not spill directly outside of the canopy area.

3.0 ASSESSMENT OF IMPACTS

INTRODUCTION

3.1.1 The relative environmental effects of the proposed development of the MSA, in terms of both positive and negative aspects, have been assessed with regard to the factors itemised in paragraph 1.4.3 of this Environmental Statement. Each of the categories is summarised below under the headings of Introduction, Baseline Conditions, Environmental Effects of the Proposed Development, Mitigation Measures and Key Issues.

3.2 CULTURAL HERITAGE

INTRODUCTION

3.2.1 An assessment of the archaeology and heritage implications of the proposed Motorway Service Area has been undertaken within a radius of approximately 1km around the development site and forms part of this Environmental Statement. The scope of this study comprises a survey of the known archaeological and historic remains and sites, the location of which are shown on Plan 4, together with an assessment of the risk of further undocumented remains existing on the site.

3.2.2 Cultural heritage resources fall into three main groups:

- Archaeological sites
- Historic buildings
- Historic landscapes.

3.2.3 The sources consulted for this assessment include:

- Information held on the Berkshire Sites and Monuments Record
- Information held by the Local Studies Collection of Berkshire County Council
- Printed and manuscript maps
- Published and unpublished documentary sources
- Aerial photograph evidence.

3.2.4 A site visit has been made.

3.2.5 The views of Archaeologists of the Babtie Group (who act as Planning and Transportation consultant on behalf of Berkshire County Council) were sought to determine the particular issues arising from development in the area and the likely curatorial requirements related to any archaeological issues.

BASELINE CONDITIONS

Archaeological and Historical Background

The Prehistoric Period (up to 55 BC)

3.2.6 The Middle Thames Region is well known for the density of Palaeolithic and Mesolithic finds. Within Berkshire, the Thames gravels area is a rich source of flint tools and quantities of these have been found from the terraces between Maidenhead and Slough. A very large axehead of this era has been found at Canon Court Farm at Maidenhead. There are over 50 Mesolithic sites in Berkshire. Many of these are located in the Kennet Valley between Thatcham and Hungerford, in the Abingdon area of the Upper Thames Valley and on the chalk slopes overlooking the River Kennet.

3.2.7 Around the fifth millennium BC, as the economy began to include the cultivation of certain crops and the domestication of some animals, settlements became more permanent. In Berkshire, the light well-drained soils, which were the easiest to clear of trees, were favoured for settlement. Most occupation sites are found in the valley river gravels, notably those of the Kennet, Loddon , Blackwater and Ock. A single pit containing fragments of pottery, charcoal and human bone has been found to the north of Great Wood, which may be the remains of a cremation rite.

3.2.8 There are no known sites of the Bronze Age within the environs of the proposed development site.

3.2.9 Iron tools and weapons appear in the archaeological record in Britain early in the first millennium BC. The development of coinage at this times indicates that society was becoming more complex. It was a tribal society and Berkshire lay within the area controlled by the *Catevellauni,* the *Dobunii* and the *Atrebates* (the capital of which was *Calleva Atrebatum* (later to become Silchester). There are no known Iron Age sites within the environs of the proposed development, although a complex of features visible on air photographs may belong to the Late Iron Age (see below, section).

Roman Period (55 BC - AD 410)

3.2.10 *Calleva* became one of two administrative centres for the region. and an important route centre, with roads radiating from it in five directions. Outside the towns, the countryside was divided into large agricultural estates. One of the most fully excavated of these villa estates was at Cox Green near Maidenhead. This was built in the second century AD and was enlarged to such an extent that by the late fourth century it consisted of eighteen rooms. The gravel terraces of the Middle Thames valley has been the subject of twenty-five years of aerial survey work (Gates, 1975). Many cropmark features indicating the buried remains of Roman settlements and occupation have been identified , bounding the clay slopes in the region of the proposed site, north of White Waltham and Maidenhead. Investigations on some of these, particularly north of Maidenhead have revealed Romano-British occupation from the 1st to the 4th century AD. While the gravel areas are clearly of higher archaeological potential and were intensively occupied during the Roman period, recent work, such as at Cox Green suggests that the higher belt of the London Clay, which includes the proposed site, was also settled and formed part of the well established Roman agricultural hinterland. These were associated with the network of roads leading to the Thames crossings, one of which lies at Cookham. The London Clay areas have been less well investigated than the gravel areas but the Cox Green investigations indicate that these areas are of greater archaeological potential than has been hitherto supposed.

Anglo-Saxon period to the present day (AD 410 - to present)

3.2.11 Archaeological evidence in the Upper Thames Valley has been found of Germanic or Saxon occupation even before the Roman army left Britain. For much of the fifth century, southern Berkshire was still occupied mainly by Britons and *Calleva Atrebatum* functioned as a town.

3.2.12 At the time of the Domesday Survey in 1086, White Waltham lay with the land of the Bishop of Durham and was held by Waltham Abbey. The Domesday Survey records for White Waltham:

3.2.13 3 hides; land for 6 ploughs, in Lordship 2; 8 villages and 3 cottagers with 4 ploughs; 3 slaves; meadow - 4 acres; woodland - 6 pigs. Value before 1066 - 60s, later 70s, now 100s.

3.2.14 The church of St Mary the Virgin although heavily restored, retains traces of the twelfth century structure. The parish was enclosed with Shottesbrook in 1801. Shottesbrook Manor is mentioned in the Domesday Survey and was held by Alward the Goldsmith in 1086. Roque's Map of 1752 (not accessed during this survey but mentioned in the SMR) shows a nucleated settlement of eight buildings but is now a deserted village. A scatter of medieval pottery, dating from the twelfth to the fifteenth centuries has been found in a field to the south of the village nucleus This is probably the result of manuring in the fields but it may indicate the extent of the agricultural holdings attached to Shottesbrook. Also within Shottesbrooke is Smewin's Farm which comprises a well-preserved moated enclosure dating to the Medieval Period which is now a Scheduled Ancient Monument. The moat indicates that many of the holdings in the area were of relatively high status and perhaps therefore that the resources, the farmland and woodland, in the area supported a well-established population. Great Wood, which bounds the north side the proposed development site is classed as ancient woodland, which means that it is known to have been in existence since 1600 AD. It almost certainly covered an area much greater than its present extent and its shape suggests that the fields around its edge (including the proposed site) were formed by the expansion of routes leading into the wood, from the roads which skirt around it. The proposed site throughout the medieval period will have formed part of the well-exploited rural resources which consisted of cultivated land as well as woodland resources.

3.2.15 The cartographic evidence indicates that the character and landuse of the site and its environs had been subjected to very little change until the construction of the M4.

The Archaeological Evidence in the Area of the Proposed Development Site

3.2.16 The County Sites and Monuments Record

3.2.17 Sites of archaeological significance are entered onto county-based Sites and Monuments Records under the *Town and Country Planning Act (1990)*. These are summarised below, but see Appendix B for a full list of SMR records relating to approximately 1 km radius of the proposed development site.

3.2.18 Three sites of archaeological finds and features have been recorded on the proposed development site (see also Appendix B for a full list of SMR records relating to 1km radius of the proposed development site):

3.2.19 On the eastern portion, a Prehistoric flint tool, pot-boiler and a scatter of Roman pottery was found during fieldwalking and archaeological watching brief on the excavation of a pipeline (SMR Nos 703, 2583, 668). The scatter of pottery may well indicate that the remains of a Roman villa exist on the proposed development site, although no associated buried features were noted in the watching brief.

3.2.20 In addition, the lines of linear features on the proposed development site, have been traced on to the SMR map. These appear to be the remains of Medieval ridge and furrow and a possible settlement site but see below 3.2.32 for a full discussion.

3.2.21 Within a radius of 1km around the proposed development site there are nine recorded sites of archaeological significance.

3.2.22 A Neolithic possible cremation pit and a scatter of Late Mesolithic/Early Neolithic flint were found during fieldwalking north of Great Wood (SMR Nos 457, 702). A circular cropmark 1km to the south of the proposed site has been noted (SMR No 3453).

3.2.23 An additional scatter of Roman pottery was found during fieldwalking on the route of a pipeline 1km south-east of the proposed site (SMR No 704).

3.2.24 Pottery and occupation debris, dating from the twelfth and thirteenth centuries was found 1.1km north-west of the proposed site (SMR No 666). Smewins Farm to the west of the proposed site, consists of a well preserved moat and sixteenth century timber-framed buildings. (SMR No 431) and Medieval to Post-Medieval brick kiln has been found near to Smewins Farm (SMR No 2579). In Great Haze Wood, to the south of the proposed site, previously unknown features, relating to woodland management and exploitation, such as borrow-pits, trackways and a bank have recently been identified (SMR No 6043).

The Cartographic Evidence

3.2.25 Cartographic evidence allows the landuse history of the proposed development site to be traced. This helps to identify the potential and type of archaeological remains likely to occur on the site as well as to determine the impact landuse activities may have had on any archaeological resource, which in turn helps to assess the likely state of preservation.

Inclosure Map for White Waltham 1810

3.2.26 The proposed site lies within the parish of Shottesbrooke but features on the historic maps for the parish of White Waltham. It was not possible to reproduce the Inclosure Map owing to the fragility of the original. On the map much the area of study is taken up by land designated as "old enclosures" which include Great Wood. Landuse is not mentioned. In the accompanying text, fields 21, 26, 27 lie within the proposed development site. These are listed as being in the ownership of Arthur Vansittart and lie within "The Common". The Cut, which is a straightened waterway between New England Wood and Old Farm, and which lies within the eastern portion of the proposed site, is not visible on this map.

3.2.27 Tithe Map and Award for White Waltham 1881
Ordnance Survey 1st ed 6in Sheet XXXI 1870-75
2nd ed 6in Sheet XXXI 1900
3rd ed 6in 1913 Sheet XXI 1913
1:10560 SU 87 NE 1961
1:10 000 SU 87 NE 1975

3.2.28 These depict the area from the late nineteenth century to after the construction of the M4. All depict the topographic features (including "The Cut") and field boundaries and the series illustrates the continuity of these boundaries and the landuse. Until the construction of the M4, the area had remained unchanged for at least a century and there is nothing to suggest that this arrangement had not continued from at least the Medieval period.

Photographic Evidence

3.2.29 An air photo search was undertaken of the area by Air Photo Services Ltd. The SMR map shows features on the proposed development site. Linear features are centred on SU 854 756 and there are parallel lines which may represent ridge and furrow, partially overlying them to the west, north and east. The lines are visible on photo sets CPE/UK/1936 taken in January 1947. Although the date of the features cannot be determined by air photographs alone, their shape and size suggest they may be Iron Age or Romano-British in date. The ditches were badly degraded in 1970 and were not visible during the recent site visit.

3.2.30 A series of narrow linear ditches were visible on air photos, at SU 861 756, which are probably post-enclosure boundaries.

3.2.31 It was not possible to confirm the presence of medieval ridge and furrow on the development site by air photographs. No firm traces of these could be interpreted from the air photographs and it is even possible that they have been incorrectly located on the Sites and Monuments Map.

Site Inspection

3.2.32 The proposed site was visited prior to the Public Inquiry held in September/October 1997 into MSA provision at this location. At this time the site was under crops on both portions of the site, therefore the surface could not be inspected, save for the extreme south end of the eastern portion. This is currently a disused open area which was occupied by travellers. The ground surface here was seen to be undulating. No pattern could be discerned but this may well be part of the remains of ridge and furrow, which have been recorded in this area. A brief inspection was made of that part of Great Wood which is adjacent to the north end of the site. The woodland appears to be of ancient origin. The ditch system, which presumably related to woodland management in the medieval and post-medieval period is well preserved. No other archaeological features were noted but the ground was covered in undergrowth and bluebells, making slighter earthworks difficult to discern. The wood will not be affected by the proposals but it may well repay further archaeological investigation at a future date.

Historic Landscape Features

3.2.33 There area number of landscape features on and around the proposed development site which are depicted on historic maps and which currently contribute to the historic character of the site. These are:

- Great Wood, at the northern end of the site, which is believed to have been in existence since 1600 AD.
- Established hedge and field boundary at the western boundary
- A stretch of The Cut within the eastern portion of the site, which is a canalised stretch of the watercourse between Paley Street to the north and Buck Farm to the south and which appears on the Tithe Map.
- Drift Road and How Lane on the southern and eastern boundaries of the site, and a portion of the relict road from Pond Wood to Drift Road at the southern end.
- The field boundaries within both the eastern and western portions of the proposed site.

Listed Buildings

3.2.34 There area no listed buildings on the proposed development site Buildings of historical interest are classified in grades to show their relative importance as follows:

Grade I	These are buildings of exceptional interest.
Grade II*	These are particularly important buildings of more than special interest.
Grade II	These are buildings of special interest, which warrant every effort being made to preserve them.

There is also a Grade III category which is a non-statutory and now obsolete grade.

3.2.35 Listed buildings within an approximate 1.5km radius of thesite are described below:

SMR	Site Name	Grid Reference	Description	Grade
	Buck Farmhouse	SU 85700 74650	1829 brick farmhouse	II
	Buck Farm barn	SU 85700 746680	Late C17 / C18 barn	II
	Buck Farm animal shelter	SU 85690 74640	C18 animal shelter	II
	28 and 28A Smewins Road Shottesbroke	SU 84500 76800	Pair of late C18 brick cottages	II
431.00 SAM 12028	Smewins Farm 1 & 2 Smewins Cottages	SU 84660 76130	C15 Timber framed hall house (now two cottages	II
431	Smewins Farm barn	SU 84700 76130	C18 Timber framed hay barn	II
431.02	Smewins Farm barn	SU 84700 76150	Late C16 Timber framed threshing barn	II
432.07	29 Shottesbrooke	SU 84560 76760	C16 Timber framed cottage	II
4043.02	Rose Cottage	SU 86900 76650	C14 Hall house	II
4043.03	Rosemary Cottage	SU 86910 76620	Late C16 Timber frame cottage	II
4043.04	Corner Cottage	SU 86940 76270	Late C16 Timber frame cottage	II
4043.05	The Bridge House Pub	SU 86980 76230	Late C16 Timber frame cottage	II
4043.07	Beam End	SU 86800 76880	Late C15 Hall house	II
4043.05.1	Barn at the Bridge House Pup	SU 86980 76230	Small late C16 barn	II
4045	Littlefield Farm House	SU 86000 76120	Mid C16 Hall house	II

The listing details of Littlefield Farm are included in Plan 4A (see Volume 3 of the EIA).

Limitations of the Assessment

3.2.36 The major limitation on the study is that many of the conclusions must rely on information about known archaeological remains. This knowledge in turn, reflects only the extent of archaeological observation and reporting in the area, rather than the true extent of the archaeological remains themselves. The tracing of past landuse on and around the site is also limited by the maps, the earliest of which date to 1810.

Archaeological Potential of the Proposed Development Site

3.2.37 There are known archaeological remains on the proposed development site. However, circumstantial evidence must also be examined to assess the likelihood of the existence of additional unrecorded remains on the site. This can be broken down by period:

3.2.38 **Prehistoric**: The evidence for this period between the earliest human activity and the end of the Iron Age is very sparse. The proposed development site lies within an area rich in woodland resources and the Thames Valley is known to hold considerable evidence of Prehistoric activity. However on present evidence, there is nothing to suggest anything but a low probability that settlement evidence of the period before the Iron Age remains within the proposed development site.

3.2.39 **Iron Age:** There is no evidence for Iron Age occupation or activity within the immediate environs of the proposed development site. However, the farming activity which this region supported in the Roman period may well have begun, if on a much smaller scale, in the preceding Iron Age. Moreover the cropmarks on the western side of the M4 Motorway opposite the site may well relate to this period. There is a medium to high probability that remains of this period exist on the proposed development site.

3.2.40 **Roman**: As discussed above, a scatter of Roman pottery, which may indicate the existence of a villa, has been found immediately to the south of The Cut in the eastern part of the field. Cropmarks which may relate to settlement remains are visible on the western portion of the site . The site lies within an area which is known to have been occupied and farmed at this time. There is a high probability that remains of this period exist on this site.

3.2.41 **Anglo-Saxon and Medieval**: Apart from the possible cropmarks of ridge and furrow on the western side of the Motorway immediately opposite the development site there are no known Saxon or Medieval remains on or in the immediate vicinity of the proposed site. The cartographic evidence, together with the existence of Great Wood and sites such as the moat at Smewins Farm, to the west, indicate that the agricultural and woodland resources were well established and managed in the Medieval and possibly in the Saxon periods. It is possible that the cropmarks on the western portion of the site are the remains of a farmstead of this period but this is believed to be unlikely and there is nothing to suggest that the proposed development site was anything but part of an agricultural holding which was perhaps formed by the clearance of part of Great Wood. The probability of remains of the Anglo-Saxon period existing on the proposed development site is low.

Likely Importance or Significance

3.2.42 As so little evidence has been recovered so far, from the proposed development site it is difficult to assess its value in local, regional or international terms. However, as has been demonstrated, any remains on the site are likely to relate to the well-document agricultural and settlement activity of the Roman and possibly Iron Age periods. The significance therefore may be derived from their local value because they would contribute to a larger picture of the changing pattern of settlement and use of the area.

Archaeological Risk

3.2.43 The following table summarises the known evidence on the site and the risk of encountering archaeological remains.

Table of Archaeological Risk

PERIOD	SUMMARY OF EVIDENCE	RISK
Palaeolithic Mesolithic Neolithic	Stray finds of flint tools on eastern portion of site. Neolithic possible cremation pit to north of Great Wood. Otherwise little circumstantial evidence for these periods	Low
Bronze Age	No evidence on site or environs	Low
Iron Age	No evidence on site or environs. Cropmarks on western side of the M4 opposite the site may relate to settlement of this period. Otherwise little circumstantial evidence	Medium to Low
Roman	Finds scatter of Romano-British pottery on eastern portion of site which may suggest a Villa. Cropmarks on western side of the Motorway may relate to this period. Environs known to be occupied and farmed at this time.	High
Anglo-Saxon/Medieval	No evidence on site or immediate environs. There may be remains of ridge and furrow on the site there is small possibility that cropmarks relate to farmstead but no other evidence.	Low
Post-Medieval	The Cut is post-Medieval but no other evidence on or in the environs of the proposed site.	Low
Type Historic Buildings Organic Remains Masking Deposits	None Not a wet site, but evidence may exist at base of any cut features. No alluvium or colluvium.	The settings of buildings in the environs of the proposed site will not be affected. Low Low
Apparent Archaeological Potential	**Medium**	**High**

ENVIRONMENTAL EFFECTS OF THE PROPOSED DEVELOPMENT

3.2.44 In summary, there are two records of archaeological finds within the proposed development site. In view of this and the known and Roman occupation and agricultural activity in the area, the proposed development site is of high archaeological potential However the site has not been subjected to systematic survey and no features were found associated with the recovered artefacts. It is therefore not possible to identify any part of the development site as particularly archaeologically sensitive.

3.2.45 In general terms it is possible to say that should any remains occur on the proposed position of the service and amenity buildings, they may be disturbed by the foundations which would be excavated to a depth of between 1 - 1.5 metres below present ground level. Plantation of new trees for landscaping would also disturb any buried archaeological remains.

3.2.46 The listed buildings and their settings, in the environs of the proposed development site will not be affected by the development.

THE VIEWS OF THE ARCHAEOLOGY SECTION OF BERKSHIRE COUNTY COUNCIL

3.2.47 A database of all archaeological sites, findspots and monuments in the County is held by the Babtie Group (who act as planning and transportation consultant on behalf of Berkshire County Council) and it is an important source of local information and material about the archaeological character of the region. Rob Bourne was consulted in person on 7 May 1997 prior to the public enquiry, to determine the particular issues arising from development in this area. In his view, the proposed site is known to lie within an area of high archaeological potential, owing to the Roman artefacts found on the site and its contexts within an area of extensive Roman agricultural activity. A staged programme of archaeological investigation is required in order to further define the presence and state of preservation of any archaeological remains on the site. Mr Bourne stated that ideally, the evaluation should occur prior to the determination of planning permission and this may take the form of field-walking and geophysical survey prior to the excavation of sample trenches.

MITIGATION MEASURES

3.2.48 Measures to mitigate the effect of development on archaeological remains fall into two types of strategy.

3.2.49 Mitigation by design - in which disturbance to the archaeology is avoided by either re-siting the proposed structures or damage to it is avoided by appropriate design and construction.

3.2.50 Preservation by record - in which the archaeological remains are accurately recorded before or during construction so that a record survives in archive form.

3.2.51 The key to minimising the unexpected discovery of archaeological remains is to assess and evaluate the likelihood of their occurrence prior to construction. Typically this involves a staged approach of progressively gaining and refining archaeological information about those areas which will be to subject to ground disturbance. This Statement, resulting from an archaeological desk-top assessment, forms the first stage. Further stages, including fieldwork, may be implemented in order to verify the results of the desk-top assessment and to further evaluate the likelihood, presence and nature of archaeological remains.

3.2.52 The following staged investigation is proposed for the site if planning permission is granted.

3.2.53 A non-destructive intensive and systematic walkover survey of the proposed site will be carried out to locate any previously unrecorded remains in both cultivated and open areas of the proposed development site.

3.2.54 This should be followed up by geophysical survey to locate buried features and this in turn will inform the siting of sample trenches to confirm the presence or absence of any archaeological remains and determine their nature and state of preservation.

3.2.55 If archaeological evidence is discovered during this evaluation programme, an appropriate scheme of mitigation would be designed, in consultation with Berkshire County Council, and implemented prior to development.

KEY ISSUES

3.2.56 Archaeological records and cartographic, topographic and aerial photographic records have been examined to form an assessment of the archaeological resource on the proposed development site and to determine the likely impact on it posed by the construction of the Motorway Service Area.

3.2.57 This study has shown that three archaeological finds and features, visible on aerial photographs, exist on the proposed development site. In view of this and the known evidence of Roman activity in the region, the potential for remains being encountered on the proposed site is believed to be high. Without a suitable scheme of archaeological mitigation, such remains, if they exist, may well be encountered and disturbed by the proposed development.

3.2.58 It is fully accepted that the potential archaeological remains form a significant material consideration in the proposals for the development on this site. Therefore to enhance the information set out by this statement and following the guidelines set out in Planning Policy Guidance Note 16 (Archaeology and Development) it is proposed that an intensive archaeological walkover survey, fieldwalking, geophysical survey and trial trenching is carried out on the development site prior to construction.

3.2.59 In addition, and in accordance with the construction programme, it is proposed to discuss these results and conclusions with Berkshire County Council and if necessary to design and implement an appropriate and approved scheme of archaeological mitigation prior to and if necessary during construction.

GEOPHYSICAL SURVEY

3.2.60 During November 1997 Swayfields Ltd commissioned Gifford and Partners Ltd to organise a geophysical survey. This was in response to questions raised at the Public Inquiry of two competing motorway service areas. The work was carried out by Oxford Archaeotechnics Ltd and the *'Results of the Geophysical Investigation' were* compiled in a report by Gifford and Partners Ltd summary (Report No. B 1053A.R01).

3.2.61 The geophysical survey took the form of magnetic susceptibility and gridded magnetometer survey over a 16.25 hectare area. This area covers the land expected to be disturbed by structural ground works. The survey located two recently removed hedgerows, two weak lines at the south of the site (which do not appear archaeological) and an area of burnt flint. It is possible that the area of burnt flint may merit further recording. However, no other archaeological features have been found.

3.2.62 The Report complete with Geophysical Survey were submitted to the Consultants (Babtie Group) acting for the Royal Borough of Windsor and Maidenhead who confirmed by letter dated 16 April 1998 that

'the archaeological potential was less than that suggested by the desk based assessment The presence of a possible burnt mound does still imply that further remains may not have been detected by the geophysical survey. As a consequence limited trenching would still be required in order to elucidate the nature of the burnt mound, the survival of any related features, to check the results of the geophysical survey and to provide the basis for full mitigation / recording strategy should it be required. As it is unlikely that remains warranting preservation-in-situ survive on the site, the evaluation need not be undertaken prior to the public inquiry'.'

PUBLIC INQUIRY REPORT

3.2.63 Inspector M P Hill in his public inquiry report on page 95 para. 12.86 concluded that

'The council has not raised any objection to the scheme on archaeological grounds and merely seek the imposition of a condition which accords with the advice in PPG16'.

The Impact on the Listed Building at Littlefield Farm

3.2.64 An Assessor, K D Barton was appointed to advise at the local public inquiry primarily on the effect of the development could have on the setting of a grade 11 listed building known as Littlefield Farm. On page 91 para. 12.63 the inspector concluded that

'The report of the Assessor concludes that the setting of the Listed Building at Littlefield Farm would be preserved, both by day and night. I agree with this conclusion. The majority of the built development would be screened from the Listed Building by substantial mounding and areas of planting. The eastern slopes of these mounds, which would face in the direction of Littlefield Farm, would have gentle gradients and could be returned to agricultural use. I am satisfied that the distance between the proposed built development and the Listed Building, and the proposals for planting and landscaping, would ensure that the rural setting of the Listed Building would be preserved'.

3.3 TOPOGRAPHY AND GEOLOGY

INTRODUCTION

3.3.1 The information for this section has been derived mainly from Ordnance Survey Mapping, the topography is shown on Plan 3.

BASELINE CONDITIONS

3.3.2 The Study Area is generally flat or gently undulating, with the landform in the immediate vicinity of the site ranging between 38m AOD and 43m. Between Great Wood in the north and the overbridge carrying the minor road (Drift Road) across the motorway in the south, the M4 is on embankment some 1.5-2.0m high. Both the west and east parts of the MSA lie in a shallow depression, with the lowest area located next to 'The Cut' - a tributary of the River Thames. The 40m contour crosses both parts of the site with the lowest land, at about 39 metres AOD, being in the southern most corner.

3.3.3 To the east, How Lane runs in a north - south direction at an almost level gradient between 41m-42m AOD. The land then begins to rise towards the east to form a low ridge about 45m AOD which effectively contains the site from wider views from the east. The land also rises to the west and north with the 45m contour passing through Great Wood. There are no prominent landmarks in the vicinity.

3.3.4 The Cut is a significant watercourse locally though, as its name suggests, it has a rather unnatural channel having a relatively straight alignment. The Cut is deeply incised with its water level, at the time of the survey, lying some metres below the level of the surrounding fields. However, the natural drainage in the area appears to be impeded generally, as is certainly the case further south in the plantations.

3.3.5 The site and surrounding area is underlain by London Clay. The London Clay overlies clays and sands of the Reading Formation beneath which Chalk is present at a depth of around 24 metres below ground level.

ENVIRONMENTAL EFFECTS OF THE PROPOSED DEVELOPMENT

3.3.6 There would be no significant changes to topography that would have widescale implications. Topographical changes would be localised and restricted to the excavation of the balancing ponds and new ground - modelling to screen the development.

3.3.7 Excavated material would be used to form mounds up to 3m high to screen views of the development from Pondwood Lane and Cottages.

3.3.8 The balancing pond would be excavated to depths sufficient to accommodate storm water runoff from the hard surfaces of the development. They are anticipated to be approx. 1m deep but not exceeding 2m deep. Ponds would have shallow edge profiles and would contain plants of ecological interest.

3.3.9 The ground modelling to the east of the development up to 5m high would be formed from material derived from the balancing ponds and reduced levels from the MSA development site. The outer slopes of all mounding would be graded out gently into the surrounding land.

MITIGATION MEASURES

3.3.10 Changes to topography would be sensitively married into the surrounding landform. There are no specific mitigation measures with regard to the geology of the area.

KEY ISSUES

3.3.11 There are no key issues to be addressed at this stage.

MINERAL DEPOSITS

3.3.12 In August 1998 Swayfields commissioned a Report by D K Symes Associates to assess the nature of underlying mineral deposits and their economic value. The report came to the following conclusions:

- Analysis of the geological maps for the area indicate that the site is underlain by London Clay which has no significant economic value.
- Beneath the London Clay lies the Reading Beds which are known to contain deposits of sand in the locality. A resistivity survey carried out for a mineral company in 1986 did not indicate the presence of sand beneath a substantial thickness of London Clay.
- In the southern part of the site the geological map shows a narrow outcrop of sand and gravel associated with the minor drainage ditches in the locality. The resistivity survey did not indicate any thickness of granular material, there is no history of evidence of past workings and no interest was shown in this deposit by the contractors who built the M4. It is therefore considered that there is no economic deposit of gravel on the site.
- Based on the assessment made it is considered that the site does not contain any deposits of economic minerals.

PUBLIC INQUIRY REPORT

3.3.13 Inspector M P Hill in his public inquiry report on page 95 para. 12.85 concluded that

> *'I am satisfied that the proposal would not cause an unacceptable sterilisation of mineral deposits underlying the site. After receiving a report giving an assessment of the mineral deposits at the site, the LPA has confirmed that this matter does not justify grounds for refusal of the development'.*

3.4 ECOLOGY AND NATURE AND CONSERVATION

INTRODUCTION

3.4.1 This chapter of the Environmental Impact assessment (EIA) sets out the findings of ecological investigations in relation to the proposed Motorway Service Area (MSA). The methods of ecological assessment are described, including scoping consultations, data collection, site surveys and evaluation. The ecological baseline conditions are described. The potential ecological implications of the MSA proposals are outlined and their significance are assessed. Appropriate mitigation and enhancement measures are formulated to avoid or off-set the potential negative impacts of the proposals.

SCOPING AND DATA COLLECTION

3.4.2 An initial site visit was undertaken on 14 January 1997, to assess the character and potential ecological interests of the application sites and their immediate surroundings. Information on the existing ecology and nature conservation interests of the application sites and the surrounding land was sought through consultation with English Nature, the Environment Agency (EA), the County Ecologist, the Berkshire, Buckinghamshire and Oxfordshire Naturalists' Trust (BBONT), the Royal Society for the Protection of Birds (RSPB) and the Reading Bat Group. The same consultees were also invited to comment on the appropriate scope of the EIA.

3.4.3 This EIA includes information on the habitats and species interests recorded within 100m of the M4 highway boundary during surveys conducted between 1992 and 1994.

3.4.4 English Nature supplied information on the location of statutorily protected sites - Sites of Special Scientific Interest (SSSIs) - and an extract from the Ancient Woodland Inventory for Berkshire. They recommended that the ES should assess the following areas of concern, as a minimum:

- Impact upon SSSIs;
- Impact upon County Wildlife Sites;
- Impact upon protected species (badgers, bats, reptiles etc.);
- Scale of impact;
- Mitigation (if any of the above)

3.4.5 The County Ecologist (Babtie Group) provided information on the location and interests of county wildlife sites - known in Berkshire as Wildlife Heritage Sites (WHS). She also provided some detailed species information for Great Wood, a woodland WHS which lies adjacent to the application sites, together with information on existing records for badgers and for protected birds in the vicinity of the proposed MSA site. In relation to scoping matters, the County Ecologist drew attention to the presence of ancient woodland WHSs adjacent and near to the application sites and expressed concern over the potential presence of badger setts.

3.4.6 The EA provided information relating to the habitats of The Cut, a watercourse which flows along the eastern boundary of the westbound application site. In response to the Planning Application, the EA raised no objection to the proposals in principle but recommended that standard conditions be imposed for the prevention of water pollution. In addition, they recommended the imposition of conditions to maintain the character and conservation value of The Cut.

3.4.7 No response has been received from BBONT, RSPB and the Reading Bat Group.

SITE SURVEYS

3.4.8 The site of the proposed MSA was surveyed initially on 14th January 1997. Further site visits were undertaken on 27 January and on 16th April 1997 prior to the public enquiry.

Phase 2 Surveys

3.4.9 On each survey visit, the whole of the proposed development site was inspected, habitat by habitat. The habitats and vegetation types present on the site were recorded and mapped onto a field map at 1:2500 scale. All higher plant species encountered were recorded, together with an indication of their relative abundance. The timing of the January surveys did not permit the recording of detailed species information. However, the most prominent species of plants were recorded, to assist in characterising the main habitat types and more detailed species-recording was undertaken on subsequent visits. The motorway verges within the highway boundary were inspected only from the edges, outside the boundary fence.

Animal Surveys

3.4.10 All animal species or groups encountered during the survey visits were also recorded. The structure and quality of the habitats present were assessed for their suitability to support animal groups, paying particular attention to detecting signs of occupation or suitability for protected species.

Breeding Birds

3.4.11 During April 1997, a breeding bird assessment was undertaken. The survey consisted of two single visits undertaken separately from other site visits, during the latter part of April. The visits were two weeks apart and were undertaken between the hours of 06.00 and 12.00 hours and covered the whole of both application sites and the adjacent habitats of Great Wood and The Cut. A simplified territory mapping exercise was undertaken with the location, sex (where identifiable) and behaviour of each species being noted onto a large scale field map. This allowed for the breeding status of species encountered to be ascertained. The two visits were intended to provide a preliminary assessment of the sites for breeding birds. It is not possible to assess the detailed character of the site's avifauna from two visits in early spring. To assist in the assessment, notes were taken on the habitat character of the sites, and their suitability and potential value as breeding bird habitats was assessed. On this basis, it is considered that a reliable assessment of the potential breeding bird interest of the sites has been obtained.

Badgers

3.4.12 The scoping study had revealed a potential interest for protected species, since records suggested the possible presence of badgers on or near the application sites. Detailed searching was undertaken during site surveys to clarify the status of badgers within and adjacent to the application sites.

3.4.13 A survey was carried out to detect badger setts and to determine the potential range and direction of badger movements within and adjacent to the application sites. Potential badger trails were followed, to detect any evidence of footprints and foraging marks, latrines or sett holes. Additional badger evidence was searched for, including scratching posts and hairs caught on fences, brambles, etc.

3.4.14 The results of surveys for badgers were presented in a separate confidential annex to prevent their use in the illegal persecution of badgers.

Reptiles

3.4.15 In addition, existing survey information in the M4 widening study suggested the possible presence of protected reptile species on the site. The survey visits were all too early to provide reliable evidence on the presence of these species but the sites were assessed for suitable habitats for this group and preliminary searches were made during the April survey.

3.4.16 Efforts were made to obtain permission from the Highways Agency to undertake reptile surveys along the motorway verges where previous studies had been undertaken. Permission was refused on the grounds of undue safety risks. In addition, it was planned to undertake further reptile surveys in suitable habitats within the site, particularly at the southern end of the westbound site. These plans were disrupted by the occupation of the site by Travellers in early April.

ASSESSMENT OF NATURE CONSERVATION VALUE

General Criteria for Evaluation

3.3.17 The evaluation of the site's habitats was based broadly on the criteria established by the Nature Conservancy Council (now English Nature) in the evaluation of biological habitats. They are based on the criteria described by Ratcliffe (1977) and include:

Rarity:
whether the habitat, community or species is nationally or locally rare or uncommon, or is suffering serious reduction.

Diversity:
the diversity and richness of the habitat in terms of species, communities and structure.
Size:
the size of the site or any of its habitat components (and thus the robustness and viability of its communities and populations).

Ecological Position:
the location of the site and its context, the characteristics of the surrounding land (the site may form a link in a 'wildlife corridor' between isolated natural habitats or alternatively may be too isolated to be of significant value).

Naturalness:
the 'naturalness' of the habitat, which depends on the extent of man-made modifications; in general the more natural and longer established an ecosystem the greater the difficulty of re-creating its richness and complexity.

Typicalness:
the 'typicalness' of the habitat, the degree to which the habitat has characteristics in common with other habitats of its kind.

Fragility:
the fragility and sensitivity of the communities and populations to damage and disturbance and their ability to recover from such disturbance;

Intrinsic Appeal:
the intrinsic, amenity, educational and recreational importance of habitats and species to local people;

Potential Value:
the potential of a habitat given appropriate management;

Recorded History:
the extent of recorded history of a site and its features, providing information on the development and ecological history of the landscape and its habitats.

Habitat-Specific Features

3.4.18 The criteria listed above are rather general and are normally expanded in an evaluation in relation to the nature of each habitat type. Woodlands supporting a mixture of native trees and shrubs, and herbaceous communities reflecting variations in soils and geology, and which are long-established with associated ancient woodland indicator species, are especially valued. The presence of non-native species and signs of disturbance are usually detracting features.

3.4.19 Grasslands of ecological value will support a species-rich assemblage of plants and animals (especially invertebrates), variations in these communities are likely to reflect the soil wetness, alkalinity and nutrient levels of the habitat. Long-established grasslands are generally highly valued.

3.4.20 Hedgerows of value tend to have dense, continuous woody cover of locally native trees and shrubs. Long established hedges (ie. for say 300 or more years) tend to exhibit a high diversity of woody species. In contrast, recently established hedges (usually of the Enclosure period 150-200 years ago, or later) tend to be poor in species and, when fragmented, short and thin, constitute a poor quality habitat. Hedges of particular value have a high species-diversity of woody or herbaceous woodland plants and support mature hedgerow trees. The presence of banks with ditches in association with a hedge, a diverse woodland herbaceous layer, the proximity of other areas of semi-natural habitat, and linkage to other hedges in a complex network are all features which tend to increase the nature conservation value of hedgerow features.

3.4.21 Streams, rivers and water-filled ditches which are characterised by low levels of pollutants tend to be of high value for their flora and/or fauna, especially where the natural sinuous channel of a watercourse has remained free from artificial disturbance. High levels of pollutants will seriously undermine their value, for example where they are subject to high levels of agricultural or urban run-off. Even in such circumstances, however, an open water channel with well developed vegetation will provide additional habitat diversity and value.

RARE AND DECLINING SPECIES

3.4.22 The legal status of habitats and species has been assessed according to the EC Birds Directive (EC 1979), the EC Habitats Directive (EC 1992), The Wildlife and Countryside Act 1981 and the Protection of Badgers Act 1992. The presence of rare species was determined by reference to various Red Data Books and their recent updates and from national recording schemes and reviews.

THE EVALUATION OF IMPACTS

3.4.23 There is no clearly defined published methodology for assessing the impacts of a development upon natural resources. Impacts are considered in relation to the likely severity and extent of their effects upon features of value.

3.4.24 The assessment also relates to the criteria for evaluation. Impacts upon features that are of value under several criteria are likely to be considered more significant than those affecting features of value under only a single criterion. In addition, the scale of impact is related to the value of the features affected under each of the criteria. Impacts upon features of especially high value under a given criterion represent effects of greater severity and are therefore considered more significant than similar effects upon lower value features.

3.4.25 The greatest impacts, therefore, are those where high value features are totally lost. Minor impacts would include the loss of small parts of low quality features that may be readily replaced. Significant effects are those which are severe and cannot be adequately mitigated.

3.4.26 The impact assessment pays special attention to natural features of recognised high value, especially those protected under statute, or given protection through provisions of policy and planning. Animals and plants that are individually protected under various Acts of Parliament or EC Directives also receive special attention.

BASELINE CONDITIONS

SITES OF IMPORTANCE FOR NATURE CONSERVATION

3.4.27 The nearest Site of Special Scientific Interest is Great Thrift Wood SSSI, approximately 2.5km to the north-east of the application sites, on the north-western side of the motorway.

3.4.28 A number of sites recognised for their nature conservation importance have been designated as non-statutory wildlife sites, protected under the policy provisions of the local development plan. In Berkshire, these sites are known as Wildlife Heritage Sites (WHSs). The WHSs in the vicinity of the application sites are depicted on Plan 6. They are mostly woodland sites and those within 1-2km of the application sites are listed in the following table.

Table of Wildlife Heritage sites within 2km of the Application Sites

Site No.	Name	Grid Ref	Brief Description
SU 87M01	Buck Farm Copse	SU 858 745	Broadleaved, semi-natural woodland
SU 87M02	New England Wood	SU 853 751	Mixed woodland, coniferous plantation
SU 87M03	Gardners Copse & Wood to the north	SU 848 739 SU 847 741	Broadleaved woodland. Scheduled species
SU 87M04	Benhams Copse	SU 874 742	Broadleaved woodland. Scheduled species.
SU 87M05	Furze Ground	SU 854 745	Woodland
SU 87M06	Great and Little Hazes	SU 850 747	Broadleaved woodland, coniferous plantation
SU 87M08	Long Wood, Little and Great Round Woods	SU 848 754	Broadleaved woodland
SU 87M09	Pond Wood	SU 849 755	Broadleaved semi-natural woodland
SU 87N01	Great Wood	SU 853 764	Broadleaved semi-natural woodland
SU 87N05	Marsh Wood	SU 847 768	Broadleaved semi-natural woodland and neutral unimproved grassland
SU 87S01	Strattons Copse	SU 860 742	Broadleaved semi-natural woodland

THE APPLICATION SITE

3.4.29 The area in which development is proposed, the application site consists entirely of actively farmed arable land under forage or cereal crops. A limited number of hedgerows fringe parts of the proposed development area and others are included within the application site but outside the areas proposed for development. The development area is partially bordered by ancient woodland. The application site includes a small area of ancient woodland. The woodland itself falls outside the areas to be developed. The motorway verges support a mixture of rough grassland, scrub and tall herb habitats. The habitats present on and adjacent to the application sites are depicted in Plan 4B. Species lists of all species recorded in the habitats on or adjacent to the application sites are presented in Appendix C

Arable Farmland (Compartments A1 and A2)

3.4.30 The arable fields which form the bulk of the site is of little ecological value. They are intensively managed for crop production. Plant life apart from the crop is intensively controlled by the use of agricultural herbicides. The crop is also likely to be sprayed with pesticides and is likely to be of little value for its faunal interest. Common woodland and hedgerow birds, such as blackbird, song thrush and chaffinch, were recorded feeding in these fields. Rabbits, deer, badgers and other small mammals are also likely to feed in these arable fields whilst breeding and sheltering in other nearby habitats.

Grasslands

3.4.31 To the south of the proposed westbound development area, a former arable field **(G1)** is now occupied by species-poor rough grassland. The M4 widening ES recorded this area as derelict pasture and its current condition is consistent with development from arable land or improved pasture. It is now mostly dominated by coarse grasses - couch grass and cock's-foot - with a limited number of common grassland herbs and areas of nettle and creeping thistle. This is a recently developed habitat of low ecological interest.

3.4.32 Towards the south of G1, the sward is shorter and areas of disturbed, bare ground occur, including areas of rubble. Together with the rough grassland and scrub of the adjacent road banks, and the habitats of The Cut, these areas have a high potential value for protected reptile species, including grass snake, slow worm, and adder. The M4 widening study recorded all three of these species along this stretch of the motorway.

Hedgerows and Scrub

3.4.33 The hedges which fringe the proposed development area **(H1-H4)** are mostly well developed, tall and fairly dense. They are mostly characterised by mixtures of hawthorn, suckering elm, field maple, hazel and smaller amounts of other species. The field layer is impoverished and dominated by typical field-edge species, including nettle, cleavers, false oat grass and couch grass. The survey did not find them to be especially species-rich but they provide dense, more-or-less continuous cover of potential value to common farmland birds and small mammals and as a corridor along which such species might move. They also support a number of mature oak trees - especially in H1 and H2 - which may be of value for woodland invertebrates and may provide roosting opportunities for bats. The hedges are all extensively used by rabbits whose diggings and trampling have resulted in extensive bare ground beneath the hedges. These hedges are of ecological value in a local context.

3.4.34 All the hedges also have ditches associated with them. A further ditch runs alongside the southern edge of Great Wood, on both sides of the motorway. At the time of survey, these were all dry, supporting a species-poor grassland vegetation with an abundance of competitive, nutrient-demanding species of field edges, including false oat-grass, cleavers, nettle and ground ivy. A ditch on the eastern side of the motorway, within the highway boundary, contained some water and a sparse wetland flora of soft rush and great bulrush. The ditch is mostly overgrown by extensive bramble cover, however, and is mostly dry. These ditches are not especially rich habitats in themselves and they do not provide marked additional habitat diversity in the site as a whole. In a number of places, the hedge and ditch fringing the westbound development area **(H1)** showed signs of crossing points which may have been made by the regular passage of badgers.

3.4.35 At the southern end of the westbound application site, the embankment of a minor road crossing the motorway is occupied by mixed scrub **(S2)** of pedunculate oak, grey willow, hawthorn, blackthorn and bramble. These are interspersed with areas of grassy vegetation or tall herbs, including cock's-foot, red fescue, ground ivy, creeping cinquefoil, and areas of bare ground. Together with the rough grassland of G1 and the M4 verges, and the nearby habitats of The Cut, S2 contributes to a complex of common habitats of limited diversity but which are capable of supporting uncommon species including protected reptiles.

The Motorway Verges

3.4.36 The verges of the motorway are occupied by a mixture of rough grassland, scrub and tall herb habitats. These are all habitats of recent origin, of some value to breeding birds of scrub and woodland edge habitats but otherwise of relatively low value. The M4 widening study recorded slow worm and adder in suitable areas of habitat along the verges of this stretch of the motorway. It is unclear to what extent the habitats are still suitable, although suitable basking areas are likely to have become overgrown with rough grassland, tall herbs and scrub.

3.4.37 The scrub cover is variable in density. In some areas, trees and shrubs are limited to the occasional occurrence of pedunculate oak, hawthorn and ash. Elsewhere, along the westbound verge, dense tall suckering elm scrub has developed. An intermittent ditch-line along the westbound verge also supports occasional goat willow. Large areas of the verge are occupied by dense bramble scrub, interspersed with patches of tall herbs such as mugwort, creeping thistle and bracken, or areas of rough grassland dominated by false oat-grass, couch and cock's-foot. Small areas of shorter turf also occur which may be of value for basking reptiles. A short stretch of the ditch contained standing water in January, with areas of soft rush and bulrush. Additional common wetland plants were recorded along this ditch-line in the ecological surveys for the M4 widening ES.

The Cut

3.4.38 To the south-east of the proposed westbound development area - within the application site but outside the area proposed for development - a large watercourse known as The Cut flows in a north-easterly direction, exiting the site at its eastern edge at Howlane Bridge. The watercourse flows in a straight, steep-sided cut, approximately 3-8m deep. The north-western bank of the cut is occupied by well developed woodland cover of mixed broadleaves, including alder, oak, hawthorn, ash, field maple, suckering elm and others. The shrub layer is well developed with saplings of a similar range of species, together with occasional field rose and abundant climbing ivy. The field layer is fairly heavily shaded by this tree cover and is mostly characterised by a carpet of ivy, with localised dense patches of nettle, cleavers and bramble. Occasional areas with a more diverse field layer include common violet, lesser celandine and scattered ferns. The south-eastern bank supports more restricted scrub growth of young alder, hawthorn and ash. These scrub patches are interspersed with extensive areas of tall herbs such as creeping thistle, hemlock and great willowherb, rough grassland of cock's-foot, couch and false oat-grass and drifts of bramble.

3.4.40 These wooded habitats are relatively well-structured, with a range of canopy heights, areas of scrub and associated tall herb habitats. They provide ample opportunities for breeding birds, including blackbird, bullfinch, blackcap, chiffchaff, blue tit, great tit and long-tailed tit. Kingfisher, a protected species under Schedule 1 of the Wildlife and Countryside Act 1981, was recorded on this reach, and ample suitable nesting sites exist.

3.4.41 The water channel is 3-5m wide and up to 1m or so deep, with a moderate-to-slow flow. The channel bed is mostly silty and lacks habitat variety. To the west of Howlane Bridge, the channel supports no aquatic or marginal vegetation as a consequence of its steep sides and dense shade from adjacent vegetation. Further upstream, where shade is less dense, extensive beds of filamentous algae grow on the channel bed.

Locally frequent patches of a fine-leaved pondweed are also prominent. In general, however, the channel itself lacks habitat diversity and is currently of poor ecological quality but has considerable potential for ecological enhancement. The dense vegetation of the high banks provides extensive cover and a potential wildlife corridor of value to birds and small mammals.

Great Wood

3.4.42 Great Wood, a recognised Wildlife Heritage Site, lies adjacent to the MSA application site. The whole of the wood, on both sides of the highway, is recognised as ancient woodland. Adjacent to the proposed development areas, the woody vegetation is dominated by a coppice layer of hazel with occasional canopy trees of oak, silver birch and ash. Occasional elder and aspen also contribute to the shrub layer and, to the east of the motorway, in parts of the outlier, the coppice layer contains concentrations of sweet chestnut. Field maple also occurs in places. Close to the western edge of the motorway, open glades of dense bracken occur in which tree cover is sparse or absent. Birch is particularly prominent around the regenerating edges of these clearings.

4.3.43 The field layer is very well developed adjacent to the application site. The spring flora is heavily dominated by bluebell immediately adjacent to the proposed development areas, with areas of bramble, honeysuckle, occasional ferns and other typical ancient woodland species such as primrose, wood spurge and yellow pimpernel. To the north of the application site, the field layer becomes dominated by bracken.

4.3.44 The M4 widening study recorded white admiral butterfly in Great Wood, to the north of the motorway. Appendix C2 provides a list of previous species records from Great Wood, provided by the County Ecologist.

4.3.45 The ancient woodland habitats of Great Wood are the most valuable nature conservation features on or adjacent to the proposed MSA application site. They support well-developed habitats of considerable antiquity and continuity. The wood supports vegetation communities typical of ancient woodlands in southern England on similar, mildly acidic soils. Areas of the wood are disturbed and replanted with non-native tree species but large areas of semi-natural woodland also occur. These habitats have the potential to support a rich and varied range of plant and animal species, including scarce and protected species, including protected birds, reptiles and mammals.

Fauna

Badgers

3.4.46 Badgers and their setts are fully protected under the Badgers Act 1992. No badgers or active setts were recorded within the area proposed for development. However, active and disused setts were recorded on or adjacent to the application site. Extensive badger foraging activity was recorded outside the application site. The detailed findings of badger surveys are reported in a confidential annex to this ES, to prevent the mis-use of the information for the illegal persecution of badgers.

3.4.47 An active sett, together with extensive signs of foraging, were recorded on the westbound side of the motorway, outside the area proposed for development. Additional, intermittently used setts and further signs of foraging were also recorded outside the application sites on both sides of the motorway.

3.4.48 Ecological studies for the M4 widening proposals (HA Sept., 1994) recorded considerable badger activity along this stretch of the M4, including setts within and outside the application sites. Those within the application sites were recorded, in 1992-94, as disused or partially used, with few signs of recent badger usage. The 1997 surveys confirmed the earlier findings of the M4 study. Setts within the application sites in the M4 study were still present in 1997. Most were disused, with many showing signs of occupation by rabbits. A number of these intermittently used outlying setts showed signs of recent digging in April 1997.

3.4.49 Further setts may exist outside the application sites and badgers are likely to forage over both MSA application sites and pass across the proposed MSA sites between other areas of habitat. It is also possible that disused setts identified during the survey might become occupied prior to any development. Further survey should be undertaken prior to development, to determine the nature and level of usage of the sites by badgers at that time.

Bats

3.4.50 All species of bats are fully protected under the Wildlife and Countryside Act 1981 (WCA 1981). No direct evidence of bats has been recorded on or adjacent to the MSA site. However, no specialist surveys have been undertaken for this group of mammals. The mature trees of Great Wood and of the hedgerows which fringe the site may contain potential sites for summer roosts and bats are likely to feed widely over the area of the application sites. The buildings of nearby farms may also include potential roost sites, including possible nursery roosts and hibernation sites. These all lie outside the MSA application sites.

Herpetofauna (Reptiles and Amphibians)

3.4.51 A single juvenile toad was recorded within the MSA application site to the south in G1. No suitable amphibian breeding sites (ponds or other areas of still water) occur within or adjacent to the application site, and the proposals for development are unlikely to have implications for this group. The main concentration of terrestrial amphibian habitats occurs in nearby woodlands, however, and amphibians are unlikely to be affected by development within the arable fields of the application sites.

3.4.52 Reptiles may inhabit areas of woodland or other rough vegetation, including rough grassland and scrub along the motorway verges. Ecological studies for proposals to widen the M4 (HA Sept. 1994) recorded evidence of slow worm and adder along this part of the M4 corridor. Both these species are protected from intentional killing, injury or sale, under the WCA 1981.

3.4.53 The roadside habitats alongside the proposed MSA site and elsewhere along the M4 corridor have the potential to support these species. Records from the M4 widening ES were all from within the highway boundary. The open fields of the application site is likely to be of little value to species of this group, although the hedges may provide some cover from which to forage into field margins. The rough grassland and scrub of G1 and the adjacent road verges and embankments also provide suitable habitats, as do the woodland habitats adjacent to the application site.

3.4.54 Further surveys of suitable reptile habitats should be undertaken prior to development, to ensure that these species would not be affected by the proposed MSA.

Birds

3.4.55 The bird fauna of the application sites themselves is likely to be poor. A number of common birds are likely to feed on the arable fields at various times of year, whilst sheltering or breeding within nearby hedgerows and woodlands.

3.4.56 Barn owl, hobby and kingfisher - all of which are protected under schedule I of the WCA 1981 - were all recorded within the vicinity of the proposed MSA site in the M4 widening study. However, only kingfisher was recorded from within the MSA application sites during the April 1997 surveys, and none of the habitats affected by the proposed MSA development are suitable for nesting by any of these protected bird species. Further breeding bird surveys should be undertaken prior to development, to confirm that these species interests would not be affected.

3.4.57 Grey partridge and corn bunting, both species whose severe decline in recent decades have been recognised by their inclusion in a recent revision of the Red Data List for birds (RSPB 1996; JNCC 1996), have also been recorded within the vicinity of the application sites. These are both species of open farmland and the arable and agricultural grassland habitats of the application sites provide suitable habitats for these species. They have not been recorded on or adjacent to the application sites during the preliminary bird assessment of April 1997. Skylark was recorded singing to the north of the application site during the April 1997 surveys. This species has suffered significant reduction in population size in the last few decades, and has been added to the revised red list. Lapwing, which was observed displaying territorial behaviour on the first visit in A1, also appears on the new red list. The arable fields provide suitable breeding and feeding habitats for these two species. Further breeding bird assessments should be undertaken prior to development to obtain a fuller description of potential bird interests on or near the application site.

Other Animals

3.4.58 Other animals recorded during surveys in 1997 include rabbits which are numerous, particularly along the site's hedgerows and the margins of woodland and scrub habitats. A single female Roe Deer was seen crossing the application site during the April 1997 bird survey. These animals are likely to occupy areas of nearby woodland, venturing into open countryside to feed.

3.4.59 An uncommon spider *Zilla diodia* was reported in the M4 widening study (HA 1994) from the eastern edge of the Great Wood outlier, within the application site. This species is recognised as nationally scarce (Nb)[1] and its distribution is largely restricted to southern England (Merrett 1990).

3.4.60 Although not specifically recorded within the application site, other noteworthy species recorded along the M4 corridor for which the application site supports suitable habitats include white-letter hairstreak and the locally distributed Essex skipper and Roesel's bush cricket.

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[1] These are species which have been recorded in 16 to 100 of the 10 x 10km recording squares into which the country is divided using the ordnance survey grid. Species occurring in 1 to 15 squares are Red Data book species, whilst those found in 101-500 squares are local.

NATURE CONSERVATION EVALUATION

Rarity

3.4.61 The habitats and species of the application site are mostly common and widespread. The ancient woodland of Great Wood, and the habitats of The Cut, both adjacent to the proposed development areas, contain habitats of greater scarcity. Berkshire has a relatively extensive coverage of ancient woodland, compared to some counties. However, nationally, some 7.76% of ancient woodland is thought to have been destroyed since the 1930s, and a further 39.6% has suffered significant reductions in nature conservation value as a result of replanting and commercial forestry management (Spencer & Kirby 1992). In Berkshire, the overall ancient woodland resource has diminished by 9.0% since the 1930s, with a further 32.8% replanted (Spencer & Kirby 1992).

3.4.62 Hedgerows have also suffered severe reductions. A recent Countryside Commission study of New Agricultural Landscapes suggested that hedgerows have been reduced by approximately 23% since 1945 (Peterken & Allison 1989). Figures for parts of Berkshire suggest that the area of the application site is likely to be fairly typical of this national figure. Recent Ordnance Survey maps of the application site show field boundaries which no longer exist. It is likely that most of these were previously marked by hedgerows.

3.4.63 These features, the motorway verges and less intensively managed areas of the agricultural land on the westbound application site, have the potential to support rare and protected species, including birds protected under Schedule 1 of the Wildlife and Countryside Act 1981 (WCA 1981) and reptiles protected under Schedule 5 of the same act.

Diversity

3.4.64 The agricultural habitats which occupy the bulk of the application site are species-poor and low in diversity. The habitats of the adjacent ancient woodlands and of The Cut are inherently richer in species and support habitats of high structural diversity. The motorway verges are generally likely to be fairly species-poor. They contain a relatively complex mixture of common habitats which contribute to the ecological resources available for a number of mostly common species.

Size

3.4.65 The agricultural habitats of the proposed development area are extensive but of generally low value. They are also very common in the vicinity of the application site. Great Wood, which lies largely outside the application site, is an extensive area of high quality habitat. The Great Wood outlier, within the application site, is small and divided from the main body of the wood by the motorway. The nature and degree of any effects of this isolation and fragmentation on the ecology of the outlier are unclear.

Ecological Position

3.4.66 Although generally of low ecological value itself, the application site is fringed by a range of semi-natural habitats of varying quality. Existing ecological habitat links are well developed, around the margins of the application site. Of particular importance in

this respect are Great Wood, the wooded habitats and watercourse of The Cut and the mature hedgerows fringing the site. These all contribute to a network of habitats which is capable of allowing species movement and colonisation throughout the wider countryside in which the application site is set. In addition, the habitats of the existing motorway verges provide habitat linkage within the extensive habitat corridor of the M4 motorway. The agricultural habitats of the application site contribute relatively little to this network of ecological links, although they are likely to provide foraging for a limited number of common farmland species of birds and small mammals.

Naturalness

3.4.67 The habitats of the proposed development area consist of highly artificial, man-made habitats, intensively managed for cereals and forage crops. These are fringed by habitats with a greater degree of naturalness. Of particular note in this respect are the wooded habitats of Great Wood and The Cut. Parts of Great Wood have been replanted, reducing their degree of naturalness, but few signs of intensive management are evident. The channel of The Cut itself is artificial but is capable of supporting a range of aquatic and semi-aquatic organisms. The motorway verges and the mature hedgerows fringing the application site are man-made but display semi-natural characteristics of value to a range of common species.

Typicalness

3.4.68 Whilst typical of intensively managed agricultural land, the cereal and grassland areas of the application site are of very low value. Similarly, the hedgerows and road verges of the application site are typical of widespread, common habitats of value to common species and communities. Great Wood contains woodland communities typical of the ancient woodlands of the area and of similar areas of lowland countryside in southern England. Partial replanting and areas of disturbance have diminished the quality and extent of these typical communities. The habitats of The Cut are well developed and of higher quality and value than many artificial watercourses, particularly its well-developed woodland habitats. The watercourse itself, however, is highly artificial and in its ecology and geomorphology, does not typify a naturalistic lowland river system.

Fragility

3.4.69 Of the habitats on and adjacent to the application site, ancient woodlands are the most sensitive to disturbance. Parts of Great Wood show signs of past disturbance, especially on edges abutting the M4 highway boundaries. This, together with continuing disturbance from road traffic noise and air pollution are likely to have affected the quality and value of the wood's habitats.

3.4.70 The aquatic ecology of The Cut is likely to be sensitive to reductions in water quality resulting from sediment run-off or other pollution.

3.4.71 The agricultural habitats of the application site, the motorway verges and the site's hedgerows are subject to relatively high levels of continuing disturbance resulting from agricultural management or from their proximity to the noise and air pollution of the motorway. Under these conditions, the species and communities present in these habitats are likely to be restricted to those capable of withstanding such levels of chronic disturbance.

Intrinsic Appeal

3.4.72 The character of the ancient woodland and features such as The Cut and the site's network of hedgerows, provide a resource of intrinsic appeal for the wildlife they harbour. However, both application sites are currently in private ownership with no public access and, consequently, their value for amenity, recreation or education is very limited.

Potential Value

3.4.73 Appropriate management of the ancient woodland and other semi-natural habitats for nature conservation would yield considerable wildlife benefits. The low value agricultural habitats have little potential for nature conservation without a radical shift in land use or farming practices.

Recorded History

3.4.74 The extent and character of the ancient woodlands, the development of The Cut and the general field pattern of the application site is likely to be relatively well documented in historic maps and Parish or Estate records. In this respect, however, they are unlikely to be of greater significance or value to historical research than the habitats of the surrounding countryside of which they are more or less typical.

ENVIRONMENTAL EFFECTS OF THE PROPOSED DEVELOPMENT

IMPACTS UPON DESIGNATED SITES OF NATURE CONSERVATION IMPORTANCE

3.4.75 No designated sites of nature conservation value would be directly affected by the proposals. The nearest Site of Special Scientific Interest - Great Thrift Wood SSSI - is 2.5km to the north of the application site and would be unaffected. Part of Great Wood Wildlife Heritage Site is included within the application area. However, this area of valuable ancient woodland falls outside the areas proposed for development.

HABITAT IMPACTS

3.4.76 The proposed MSA is contained entirely within the areas of the arable fields. These areas are of very low ecological value. No features of particular nature conservation value would be directly affected. No areas of woodland or hedgerows would be lost to the proposed development.

3.4.77 The proposed access arrangements for the MSA application site would affect habitats of scrub, tall herbs and rough grassland on and adjacent to the motorway verges. These are habitats of generally low value, of common and widespread occurrence along the M4 and other motorways.

3.4.78 Ample resources of woodland and hedgerow exist outside the development site to cater for species requiring these habitats. No areas of woodland would be lost under the development proposals and the provision of new woodland and scrub habitats within the development site would provide additional areas with potential for use by breeding and foraging birds.

3.4.79 New landscaping and habitat creation associated with the proposed MSA would buffer and protect existing habitats of value and re-inforce the wildlife corridor functions of existing hedgerows and other features such as The Cut.

SPECIES IMPACTS

3.4.80 Previous records of protected species interests associated with the proposed MSA sites include badgers, Schedule 5 reptiles and Schedule 1 birds. These records for reptiles and birds, with the exception of kingfisher, remain unconfirmed for the application site itself, despite preliminary surveys in Spring 1997. The assessment of baseline conditions suggests that the habitats of the application site and adjacent countryside include areas suitable for occupation by these species but that these areas are almost all outside the areas proposed for development. Similarly, all species of bats are protected and suitable potential roost sites are likely to occur in mature trees within and adjacent to the application site and in nearby buildings.

Badgers

3.4.81 No badgers or active badger setts have been recorded within the main proposed development area. Other, disused setts occur within areas that would be affected by development.

3.4.82 It is possible that badgers may re-occupy disused setts before development occurs and, for this reason, a re-survey should take place prior to development. However, it seems likely that badger use of this area is confined to passage and occasional occupation of old setts. The setts are not main setts and, as disused, subsidiary or outlying setts, their loss to the proposed MSA is likely to have only a limited affect upon the badger population of the area.

3.4.83 The MSA application site is likely to be used by badgers for feeding and in passage between areas outside the application site. Similar, equally accessible foraging habitats occur in abundance outside the application site and the proposed MSA landscaping would provide additional habitats of potential value for feeding. The abundance of disused, outlying setts in and around the application site suggests that the local badger population is active but considerably reduced from former levels. Unless new surveys indicate that population levels are high and that competition for feeding resources between clans is marked, these changes in the habitats of badger foraging territories are unlikely to have any noticeable impact upon feeding patterns in the area.

3.4.84 The presence of the proposed MSA would deter badgers passing across the areas occupied by built development. However, a substantial part of the proposed MSA would be occupied by new landscaping, through which the badgers would be able to pass. The hedges and other farmland habitats which surround the application site would also be suitable to provide passage around the site to other areas of habitat. Whilst the existing routes of badgers may be disrupted, therefore, it is likely that the badgers would establish new routes around the proposed development.

Reptiles

3.4.85 Reptile sites recorded during the M4 widening studies were all within the highway boundary. These sites and any reptiles in them could be affected by access arrangements for the proposed MSA. Additional suitable habitats occur within the application site but in areas which would be unaffected by the MSA proposals or in areas subject to landscaping and habitat creation.

Birds

3.4.86 The M4 widening study (HA 1994) recorded bird species protected under schedule I of the WCA - barn owl, hobby and kingfisher - outside the MSA application site. Only kingfisher was recorded within the application site during the April 1997 survey. The areas proposed for development do not provide suitable habitats for nesting by these protected bird species. The Cut, outside the development area but within the application site, provides suitable breeding habitat for kingfisher and barn owl. Hobby and barn owl may feed more widely over the application site. The habitats of the application site is unlikely to be critical feeding territory, however, since these species will feed extensively over similar habitats throughout the surrounding countryside.

3.4.87 With the possible exception of kingfisher, no evidence currently exists of breeding on or adjacent to the application site for any of these species and development impacts are considered unlikely.

3.4.88 Scarce species of open farmland bird, including grey partridge and corn bunting, have also been recorded within the vicinity of the application site. They have not been recorded on or adjacent to the application site during the preliminary bird assessment of April 1997. Further breeding bird assessments are proposed prior to development to obtain a fuller description of potential bird interests on or near the application site. If these and other species dependent upon open farmland habitats are found to be breeding on the application site, the loss of arable and agricultural grassland habitats would result in the removal of suitable breeding and feeding habitats.

3.4.89 These species have declined by over 50% over the last 25 years and, in the case of corn bunting, this has exacerbated a longer-term historical decline in numbers. The loss of the open farm habitats of the application site reduces the overall area available to these species for breeding. However, similar habitats to those of the application site are commonplace in this area of southern England. The population decline amongst birds of farmland is thought to be related primarily to changes in farming practices and the proposed MSA is unlikely to be a significant contributory factor.

3.4.90 Other birds occurring on the application site are species of woodland, hedgerow and scrub habitats. The breeding habitats of these species would suffer no direct effects from the proposed MSA development. The creation of new habitats as part of the scheme's landscaping proposals would be capable of providing additional breeding and feeding opportunities for these species.

Bats

3.4.91 No bats or bat roosts have been recorded on or adjacent to the application site. However, bats are likely to forage widely over the site and the surrounding countryside. Bats are likely to roost nearby, therefore, for at least part of the year. No buildings or mature trees - which might house potential bat roosts - would be removed by the MSA proposals. Any impacts upon bats are, therefore, likely to be indirect and of limited significance. The effects of the MSA proposals would be restricted to areas probably used by bats for foraging.

3.4.92 The proposed MSA would require night-time lighting. Evidence exists (Blake et al 1994) that street-lighting provides an enhanced feeding resource for some bats, by attracting insect prey. This is particularly true of mercury lamps which emit high levels of ultra-violet radiation. Some species, by contrast, are thought not to take advantage of this feeding resource and may be deterred by such lighting. High pressure sodium lamps are thought to attract fewer insects and be less used by bats whilst low pressure sodium lamps seem to have little or no effect upon bats or their prey.

3.4.93 The use of high pressure sodium lamps within the proposed MSA can be expected to have some influence upon local insects, therefore, and the bats feeding upon them. Concentrations of insects around lit areas may benefit those bat species which are able to take advantage of the locally enriched prey resources. It may also draw prey away from areas in which other, less opportunistic species of bats are accustomed to feeding.

3.4.94 The new habitats of the proposed MSA would provide additional feeding resources of potential value for bats. They would increase the overall area of habitats suitable for feeding amongst bat species such as pipistrelles, brown long-eared and other bats which feed in areas of mixed, more or less sheltered habitats. Species which feed over open fields, such as serotine and noctule are unlikely to be seriously affected by the loss of the fields of the application site since they feed over wide areas of open countryside.

Other Animals

3.4.95 Other common animal species are likely to feed on the application site. These species, such as deer, rabbit and other common small mammals and birds, are widespread species in the area of the application site and, whilst the proposed MSA would remove a small area of their feeding resource, their numbers and breeding success in the local vicinity are unlikely to be affected.

3.4.96 Other notable species reported from the vicinity of the application site in the M4 widening studies (HA 1994) include the uncommon spider *Zilla dioida* and the white-letter hairstreak butterfly. The habitats of these species would be unaffected by the proposed MSA development. Essex skipper butterflies and Roesel's bush cricket are recorded from the grassy verges of the motorway. Similar habitats for these species are widespread along the motorway and the removal of small areas of motorway grassland for the creation of new slip roads for the proposed MSA would be more than compensated for by the creation of new habitats of a similar character along the new slip roads and elsewhere with the proposed MSA landscaping scheme.

DISTURBANCE TO RETAINED HABITATS

Direct Disturbance

3.4.97 There is a potential for disturbance to affect habitats neighbouring the development. Ancient woodland and its sensitive ground flora can be particularly sensitive to this kind of disturbance, through incursion by MSA users and their dogs. Similarly, nesting birds may be susceptible to reduced breeding success as a result of disturbance pressures.

Noise

3.4.98 Research on the effects of roads on breeding birds in woodlands (Reijnen *et al*, 1995) suggests that the density of breeding populations may be adversely affected within a broad zone adjacent to the road. Across areas of open farmland such as those of the application site, the effects are likely to be still greater than in the woodlands of Reijnen's study. The greatest existing noise effects on breeding birds are likely to be felt on the wooded margins of the motorway. However, the woodland margins fringing parts of the application site are also well within the likely zone of high noise disturbance and any possible effects on breeding are already likely to be at work.

3.4.99 The evidence on noise, presented in chapter 3.9 of this ES, suggests that the noise effects of the proposed MSA are likely to be imperceptible against the background of the existing motorway.

Air Pollution

3.4.100 There is some potential for a deterioration of air quality on the margins of the woodland habitats adjacent to the application site. Of particular concern are the levels of particulate emissions generated by the high turnover of vehicles in the proposed MSA. Dust and particulate deposition from exhaust fumes can have a localised impact upon vegetation by coating leaves which will reduce photosynthesis and raise leaf temperatures, rendering plants more prone to drought stress. In addition, the particulate emissions of exhaust fumes contain heavy metals which can be toxic to plants and animals.

3.4.101 Air pollution assessments undertaken for the ES - including assessment of CO, NOx, NO_2 and HC - indicate that air quality in the vicinity of the proposed MSA is expected to be very good. However, levels of particulate matter - especially from diesel vehicles - are expected to increase, particularly close to the HGV parking areas.

Construction Impacts

3.4.102 Construction activities would be temporary, but there is the potential for disturbance and loss in adjacent habitats during construction activities. By adopting best practice methods, maintaining tight control of contractors and carefully protecting adjacent habitats, these impacts would be avoided wherever possible.

MITIGATION MEASURES

HABITAT LOSS

3.4.103 The habitats which would be lost to the development are generally of low nature conservation value. In particular, the arable fields, which form the bulk of the areas in which development is proposed, are of very low value as wildlife habitats.

3.4.104 The arable fields have the potential to support breeding birds of conservation concern, such as corn bunting and skylark. In more general terms, however, the newly created habitats of the proposed landscaping scheme would be capable of supporting a richer wildlife community than those currently present on the great majority of the application sites.

SPECIES IMPACTS

Badgers

3.4.105 The overall impact of the MSA proposals upon badgers are unlikely to be severe. Nevertheless, the following measures are proposed, to offset any potential adverse impacts upon badgers or their setts:

- a re-survey for badger setts prior to development;
- the design and implementation of a humane exclusion programme to exclude badgers from any affected occupied setts (if found during re-survey);
- the provision of alternative areas in which badgers are able to establish new setts if necessary and the provision of alternative foraging areas;
- the provision of structures (underpasses, badger fencing) to prevent road casualties and, where possible, to allow movement across the site to continue along established routes, or provide alternative movement corridors.

3.4.106 The scheme proposed already provides areas which would be suitable for badgers to dig new setts and feed, including areas of new embankment and new habitats of grassland, scrub and woodland. It will also provide ample alternatives for badger movement through landscaped areas outside the MSA itself.

3.4.107 All activities likely to affect badgers or their setts would be subject to agreement and licensing by English Nature.

Reptiles

3.4.108 To accommodate the needs of reptiles, the proposed MSA scheme would include:

- re-survey of motorway verges and other suitable habitats prior to development;
- removal and exclusion of reptiles found in areas which would be affected by development;
- provision of additional/alternative habitats for reptiles.

3.4.109 Appropriate design of the proposed landscaping and habitat creation would provide additional suitable reptile habitats. All activities which would involve disturbance to protected reptiles would be subject to agreement and licensing by English Nature.

Birds

3.4.110 The creation of new habitats as part of the scheme's landscaping proposals would provide additional breeding and feeding opportunities for bird species requiring woody habitats and mosaics of scrub and grassland.

3.4.111 Species requiring agricultural habitats, such as skylark, corn bunting and partridge, could not be accommodated within the proposed MSA or its landscaping. However, further surveys are planned to determine the extent of the site's interest for these species. If significant interest is found, areas of agricultural land adjacent to the proposed development area would be set aside for appropriate management for these species. Such management might include the retention of uncropped headlands, the cultivation of spring-sown cereal crops and the retention of winter stubble.

3.4.112 Landscaping and enhancement works along The Cut would provide enhanced breeding and feeding habitats for kingfisher and barn owl.

Bats

3.4.113 Lighting designs for the proposed MSA would seek to reduce light spillage to a minimum, to minimise any potential impact upon bats and their insect prey. The new habitats of the proposed MSA would provide additional feeding resources of potential value for bats, especially those species such as pipistrelles, brown long-eared and other bats which feed in areas of mixed, more or less sheltered habitats.

DISTURBANCE

3.4.114 New planting would be designed to provide a buffer against potential disturbance to retained habitats, along the edge of the development, especially where it abuts the wooded habitats of Great Wood and The Cut. In addition, adjacent habitats would be fenced to prevent access from the proposed MSA.

3.4.115 The predicted impact of noise upon ecological interests is low. Nevertheless, the provision of new planting adjacent to sensitive wooded margins would reduce the penetration of noise into the woodlands, both from the proposed MSA and from the motorway. Along the boundary of the Great Wood outlier, the effects of noise would be further reduced by the layout of the proposed MSA, with the hotel and associated landscaping providing partial noise protection from the rest of the MSA.

3.4.116 In a review of the effects of dust on vegetation, Farmer (1993) suggests that the establishment of a buffer strip beside a wood would intercept a high proportion of these pollutants and significantly reduce or eliminate their impacts on the wood itself. The new planting which forms part of the proposed MSA landscaping, would also provide buffering against air pollution from vehicle emissions, especially along the margins of the important woodland habitats of Great Wood and The Cut and along existing hedgerows.

3.4.117 The potential for ecological disturbance during construction would be minimised by adopting best practice methods, maintaining tight control of contractors and carefully protecting adjacent habitats. In particular, areas of existing valuable habitats which are to be retained - including all areas of woodland, hedgerows and trees to be retained, ditches and areas of rough grassland - would all be fenced to prevent ingress by construction traffic, both pedestrian and vehicular. Protective fencing would be provided to appropriate British Standards. Best working practices would be adopted for the protection of all existing and new features of ecological value. These would be enforced by appropriate contract documentation, including detailed method statements and fencing schedules, in consultation with the local authority.

NATURE CONSERVATION ENHANCEMENTS

3.4.118 There is considerable scope for nature conservation enhancements to be incorporated into the proposed scheme, through appropriate management of existing features, including the Great Wood outlier and The Cut. In addition, the appropriate ecological design and management of new habitats adjacent to the ancient woodland could provide wildlife benefits which would improve the quality of existing woodland-edge habitats and provide areas into which woodland species may colonise.

3.4.119 Enhancements to the channel form and habitat structures of The Cut have the potential to provide significant ecological benefits to a riverine habitat which is of poor quality in this reach but which is of higher quality elsewhere. Management proposals for new and existing habitats would take the form of a nature conservation and landscape management plan which integrates the requirements of landscaping with those of ecology.

3.4.120 The nature and detailed design of the final development proposals would have regard to the potential for enhancing existing wildlife habitats and for providing new features of wildlife value within the local area. Matters for consideration would include:-

- the provision of protective buffers around existing habitats and features of value;
- the creation of new habitats of wildlife value, including new woodlands and scrub, based on the locally native species and communities found in nearby semi-natural woods; new wildflower grasslands, sown with mixes of locally native species; and new wetland habitats associated with the creation of balancing ponds;
- the management of existing features to enhance their wildlife interest;
- the use of appropriate substrates of low fertility in landscaping schemes - to provide new habitats of greater wildlife value;
- the use of locally native species in seeding and planting schemes - to provide naturalistic communities characteristic of the area in which development takes place.

3.4.121 The development proposals would provide adequate buffers to protect the watercourses and the adjacent woodlands and to minimise any possible indirect impacts upon the flora and fauna of high value areas through the loss of adjacent open habitats. Development would ensure that the water supply of the ditches is maintained and that no water bodies are adversely affected by run-off or pollution.

KEY ISSUES

3.4.122 The proposed MSA development would be contained entirely within arable fields of very low ecological value. It would not affect any SSSIs, Wildlife Heritage Sites or species protected under the Wildlife and Countryside Act 1981. No features of particular nature conservation value would be directly affected. No areas of woodland or hedgerows would be lost to the proposed development.

3.4.123 The proposed access arrangements for the MSA application site would affect habitats of scrub, tall herbs and rough grassland on and adjacent to the motorway verges. These are common, widespread habitats of low value.

3.4.124 Great Wood is a Wildlife Heritage Site and falls partly within the application site but outside the proposed development area. Areas of Great Wood within the application site would be managed to maintain and enhance their nature conservation value. New landscaping and habitat creation associated with the proposed MSA would buffer and protect existing habitats of value such as Great Wood, existing hedgerows and The Cut.

3.4.125 A number of measures are proposed to offset potential adverse impacts upon badgers or their setts as a consequence of the development of the proposed MSA.

3.4.126 Skylark, a bird species of conservation concern, probably breeds within the arable fields of the application site. Other scarce species of open farmland, include grey partridge and corn bunting, also occur nearby. Further surveys are proposed prior to development. If these species open farmland habitats are likely to be affected by the proposed MSA, suitable mitigation measures would be proposed on adjacent farmland.

3.4.127 Protected reptile species have been recorded on the nearby motorway verges. Further surveys for reptiles would also be undertaken prior to development, to ensure that these species would not be affected by the proposed MSA.

3.4.128 Potential nature conservation enhancements could form part of the landscaping scheme, including;

- the creation of new habitats of wildlife value;
- the provision of protective buffers around existing habitats and features of value;
- enhancements to the channel form and habitat structures of The Cut;
- the management of existing features to enhance their wildlife interest;
- the provision of a nature conservation and landscape management plan;

PUBLIC INQUIRY REPORT

3.4.129 Inspector M P Hill in his public inquiry report on pages 91,92 and 93 paras. 12.64 – 12.73 commented on the ecological value of the site and its surroundings in the context of South East England. At paragraph 12.74 he concludes that

> *'I consider that the proposal would cause some material harm to the ecology of the area. However, the mitigation measures in the form of planting, fencing and mounding, and the creation of new habitats, would offset this harm to a considerable extent. It has not been shown that the development would have an unacceptable impact on any particular species, or that the appeal site is critical to the feeding or breeding needs of species such as barn owl, hobby or kingfisher. I conclude that the harm to the ecology of the area is not so great that it represents a significant objection to the proposal. In reaching this conclusion, I am mindful that English Nature do not object to the scheme in principle'.*

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3.5 LANDSCAPE AND VISUAL EFFECTS

INTRODUCTION

3.5.1 The survey and analysis has concentrated upon an area approximately 1km from the proposed MSA which, for the purposes of this assessment, will be termed the Study Area.

3.5.2 The scope of work will consist of a Landscape and Visual Assessment of the Study Area for the proposed MSA.

3.5.3 This assessment will describe the existing landscape and visual characteristics of the area, as well as establishing the main planning designations relevant to the location. Following this, potential changes, either impacts or benefits, to the landscape due to the construction of the MSA will be identified along with the visual impacts associated with this change.

3.5.4 The assessment has been based upon guidance published in the 'Guidelines for Landscape and Visual Impact Assessment' (Landscape Institute/Institute of Environmental Assessment, 1995), the 'Design Manual for Roads and Bridges, Volume 11, Environmental Assessment' (Department of Transport, June 1993, updated August 1994), and the 'Landscape Assessment Guidance' (Countryside Commission, 1993). The landscape and visual assessment was undertaken by means of site surveys and desktop studies which took place between December 1996 and May 1997.

3.5.5 The assessment process will provide the following:

- a description and analysis of the existing landscape characteristics in and around the Study Area
- descriptions of the proposed development, including design principles, layout and mitigation techniques
- identification of the potential impacts of the proposed MSA
- an assessment in terms of changes to the landscape and the visual impact associated with those changes
- a description of the measures to be taken to mitigate any impacts which are incorporated in the Landscape Proposals for the scheme

BASELINE CONDITIONS

3.5.6 The character of the surrounding area is generally of a flat, open landscape comprising fields with hedgerow boundaries of variable stature interspersed with blocks of woodland and coniferous plantations.

3.5.7 To the south of Drift Road where it crosses over the motorway in the south, there is a significant block of woodland made up of Great Hazes, Little Hazes and New England Wood. These are large rectangular plantations of mainly coniferous woodland. To the north of this road, the area is characterised by large irregular blocks of native deciduous woodland.

3.5.8 The combination of Great Wood, Pond Wood, Long Wood, Great Round Wood and New England Wood enclose the site of the MSA from wider views from the north west, west and south west.

3.5.10 The area around the MSA is open where it is evident that of the field boundaries have been removed in the locality leaving larger, open field units. Along the western boundary of the MSA there is no significant vegetation separating it from the motorway. To the east, the north bank of The Cut, which limits the MSA development site, has a particularly strong and continuous belt of mature vegetation comprising mainly oak, ash, alder, willow and holly, some of which are good specimens. The south bank also supports similar vegetation but of a lesser stature.

3.5.11 Another strong hedgerow some 4 - 5 metres high with occasional large mature oak and ash trees links The Cut with the south east corner of Great Wood. This hedge, together with The Cut vegetation and Great Wood, effectively encloses the MSA development site. Between this hedge and How Lane there is a further east - west aligned trimmed hedge with some good mature oak and ash trees. Further north a similar east - west field boundary has been removed as has also the hedge along the west side of How Lane.

3.5.12 Except along the motorway itself to make way for the slip roads no existing lengths of hedgerow field boundaries would be removed and nowhere would watercourses be lost or altered.

3.5.13 The site is given over to arable crops as are several of the surrounding fields.

3.5.14 Thus, it can be seen that the combination of vegetation and landform contain the development site from the wider landscape, even when parts of the locality seem quite open in contrast to the generally wooded landscape.

ENVIRONMENTAL EFFECTS OF THE PROPOSED DEVELOPMENT

3.5.15 A visual analysis was undertaken to assess the visibility of the site from the surrounding area. Obviously the screening ability of vegetation would increase substantially in the summer as is demonstrated by the site photographs see Photographs 1 to 9. The aim was to assess the degree of visibility from roads, public footpaths and properties, taking into account distances from the site, topography and the filtering and screening effect of vegetation and buildings. The analysis identified a visual envelope within which key viewpoints were identified and where views of the site could be obtained to varying degrees.

3.5.16 In describing these impacts the methodology contained within the Highway Agency's *Design Manual for Roads and Bridges, Vol 11, Environmental Assessments; Part 5,* Landscape Effects has been used. Whilst this document is primarily concerned with the effect of new road schemes on the landscape, it nevertheless follows the principles of visual impact assessment and is appropriate for use in these circumstances. The categories of impact, viz 'Substantial', 'Moderate' and 'Slight' views are further classified as to whether views are 'filtered' where there is a degree of intervening vegetation and buildings as shown on Plan 6A,6B & 6C Visual Assessment of the Development. The influence of distance from the centre of the development is apparent from the diagram.

3.5.17 The assessment determines the degree of visibility of the site with its proposed development. The impact is translated into a visual envelope extending across an area up to less than 1 km from the site, with varying degrees of impact in the form of buildings, structures, lighting columns and high sided vehicles. The likely degree of intrusion that any part of the built development on completion would have on the surrounding areas can be appreciated.

3.5.18 Mitigation would have the effect of reducing the impact of smaller scale features within the proposed development, but the taller features may remain visible for some years until planting had established some growth and had softened the development. These residual impacts are considered to be acceptable in this rural area.

3.5.19 It is clear from the plan that the site is well enclosed from the north west and south west by woodland planting and vegetation. The site is more open to the east, north east and south east, but is still well contained in the wider landscape by rising ground and local vegetation. The Cut is a significant landscape feature of vegetation that encloses or, at worst, filters views from the south and south east. Cross sections in this document demonstrate the effectiveness of the mitigation measures. See Plan 9 – (Drawing No. 12/1030.03.03A) and Plan 12 – (Drawing No. 12/1030.03.02).

Views from Local Roads

3.5.20 The B3204 and a C class road crosses the M4 north and south of the site respectively. The former would gain little view of the site being screened by Great Wood as shown on Plan 10A- **Photograph 1**. The eastern descent from this overbridge is well screened by existing vegetation on the embankments and by intervening vegetation.

3.5.21 The most substantial views of the site are fleetingly from the overbridge to the south of the site which is a minor and infrequently used local highway.

3.5.22 From the bridge structure views may be gained into the development site both sides of the motorway, see Plan 10A - **Photograph 2** .The impact, albeit at some 480 metres, is not possible to screen on the short open section of the bridge. However, further east the existing vegetation on the embankment filters the views from this road. Continuing eastwards the road returns to ground level where it is contained by a hedgerow.

3.5.23 Filtered views of the development would be gained as far as the crossroads through this hedge and The Cut, but when leaves are present on the trees such views would effectively be blocked, see Plan 10B- **Photograph 3**.

3.5.24 The approach from the south along How Lane would also be similarly modified by The Cut and roadside vegetation until How Lane Bridge when the views become open towards the development site, see Plan 10B - **Photograph 4**. Views of the development from this short section of the road as far as How Lane Farm would be filtered by the hedge and the trees in the middle distance enclosing the east edge of the development.

Views from Public Footpaths

3.5.25 There is only one public footpath in the area which passes down Green Lane to turn south west towards How Lane. Only a short 100 metre length of this path would gain filtered views of the development site, see Plan 10C - **Photograph 5**, Elsewhere the path is screened by intervening vegetation and/or agricultural buildings.

Views from Private Property

3.5.26 Nearby Littlefield Green would not gain views of the development. Three properties lie in Green Lane but are well screened by intervening vegetation. Braywoodside lies over the ridge to the east. The nearest property with direct views to the east hedgerow is Littlefield Farm at 280 metres from the development. A property nearby known as Meadowside is located further north and is orientated east - west. How Lane Farm is given over to various small agriculture related units, see Plan 10C - **Photograph 6**. Parsonage Farm at 320 metres is enclosed by high evergreen cypress trees, see Plates 10C - **Photographs 6** Plan 10D - **Photograph 7**, though views may be gained from bedroom windows.

3.5.27 A bungalow Anne Cherry Cottage, south of the crossroads to the south of the site some 470 metres from the development, might gain some filtered views of the development as might the bedroom windows of Pope's Farm and Buck Farm further to the south. In summer such views would be blocked by existing vegetation along The Cut, see Plan 10D- **Photograph 8**. Two cottages and the new Pondwood Farmhouse on Pondwood Lane gain filtered views except at gateways, see Plan 10E - **Photograph 9**, of the west part of the site through surrounding and intervening vegetation. No other property in the area would gain views of the site. There are no listed buildings or conservation areas in close proximity.

3.5.28 The general enclosure of the site is best appreciated from within the heart of the development site itself. The site where the MSA would be located feels surprisingly secluded, except for the motorway and local overbridge. The surrounding vegetation along The Cut and east hedgerow is remarkably dense and one is hardly aware of any local human habitation or movement. For this reason many of the low level parts of the development would be effectively screened by existing vegetation.

Beneficial Effects

3.5.29 The proposed development would bring about a number of beneficial effects many of which have been described in greater detail elsewhere in this document. In assessing the landscape and visual impacts of the development it is important to consider also any beneficial effects to the landscape and visual amenity of the area that the development would bring and which should be taken into the balance in offsetting some of the detrimental effects.

3.5.30 The existing motorway is very intrusive, especially in winter, to local travellers along How Lane and Drift Road. The constant movement of vehicles, and high sided vehicles in particular, on the elevated motorway embankment is noticeable through the hedgerow on the east boundary of the MSA site, particularly when driving along How Lane north of How Lane Bridge where there is no roadside hedge to contain it. The proposed ground modelling to the east of existing hedge would screen out views of the motorway from this direction as would the new hedge proposed along How Lane.

3.5.31 The new woodland planting proposed in the southern corner of the site and the new hedgerow planting along Drift Road west of the roundabout would also help to screen views of the motorway from the local roads. The planting reinforcement and thickening of vegetation proposed along the north bank of The Cut would have a similar effect.

3.5.32 Extensive areas of woodland planting and open grassland areas are proposed as an extension of Great Wood west of the motorway. This would again increase the visual and ecological diversity as well as enrich the local wildlife habitats.

3.5.33 As well as extensive lengths of new hedgerow planting proposed around the local roads and other field boundaries there are further off-site planting proposed on the severed waste ground left after the motorway overbridge was built. All this planting would replace hedgerows lost as a result of agricultural "improvements" and more than compensate for the overall reduction of vegetation that has taken place in recent years.

MITIGATION MEASURES

3.5.34 East of the Motorway the Lodge is set against the background of Great Wood to achieve maximum screening and to reduce its prominence against the woodland backdrop. Similarly, the PFS would be set against the background of the tall, thick and mature vegetation of The Cut so that the dark edges of the canopies would recede into the background.

3.5.35 The area to the south west of this would be developed further for habitat creation. Extensive planting and wildflower grasslands around the ponds and into the extremities of the site would significantly augment the wildlife interest of the surrounding areas as well as reinforcing the existing amenity of the vegetation pattern.

3.5.36 Within the developed areas of the MSA, ground modelling and woodland type planting, especially between the motorway and the development, including extra heavy standard trees for immediate effect would be undertaken to reduce the scale of the development internally. Retained existing hedgerows, woodland and vegetation along The Cut would be reinforced with new edge planting. Semi-mature trees and other ornamental planting would be placed within the car parking areas for amenity purposes and to reduce the scale of hard standing, especially as perceived from the motorway.

3.5.37 The whole of the east boundary and the MSA development would be screened by ground modelling up to 5 metres high which would be planted with extra heavy standard trees, woodland planting and wildflower meadows. The extra heavy standard trees would create a measure of instant screening of most of the tallest buildings and structures.

3.5.38 The outer slopes of the mounds would be gently sloping (say, 1:12) and returned to agriculture where practicable. The inner slopes would be steeper (say, 1:3) to contain the development.

3.5.39 All lighting units would be flat glass full cut-off lanterns to prevent the unnecessary spread of light beyond the limits of the development itself.

3.5.40 Several cross sections shown on Plan 12 – (Drawing no. 12 / 1030.03.02) have been prepared from key locations to demonstrate the effectiveness of screening by the existing vegetation and the proposed mitigating measures.

3.5.41 Section AA demonstrates that eye-level on the motorway bridge would overlook the development from this short section of exposed road. The proposed mounding west of the Amenity Building would reduce the apparent scale of the building but the planting at Year 7 would provide extensive filtering if not obscure it to the ridge line. The 8m high columns on the roundabout would also be virtually obscured. Section BB shows that from the bedrooms of Littlefield Farm the proposed ground modelling alone to the east

of the development effectively screens out the oblique views of the PFS canopies before the planting establishes. The tops of lighting columns in the car park would be screened.

3.5.42 Similarly, in Section CC a traveller on How Lane would benefit from the ground modelling which at the outset would screen the full height of the Amenity Building and all columns on the site except for the tops of those few on the perimeter circulation road along the east side of the development. Planting would mitigate any residual effects.

3.5.43 Section DD shows that views from bedroom windows of Pondwood Cottages would be screened by the existing garden hedge and trees and by the existing vegetation to the west of the motorway. Traffic on the motorway itself is already substantially screened.

3.5.44 The significant advantages the scheme would bring would include the planting of extensive areas of woodland which would augment the general amenity and existing wooded landscape character of the area as well as enriching the existing local biological resource within intensively managed farmland. The ecological approach to the landscape proposals would bring diversity of flora and fauna to an area which in parts has been depleted by farming practices, notably in the removal of hedgerows and improved grass and arable land. Further, the woodland within the site boundary would be enhanced as part of a management programme to ensure its continued long life and diversity.

3.5.45 In addition to the mitigation measures in and around the site there are a number of offsite planting proposals (see Plan 9) that are intended to restore the previous landscape pattern by planting new hedges or strengthening existing ones. This would be particularly valuable along the country lanes that are currently open. Thus, views from Littlefield Farm and along Howe Lane would be intersected at close quarters to screen any residual impacts of the development. Similarly, views on the approach to the motorway overbridge would be screened by the new roadside hedge. The severed areas of land north of the bridge embankment could also reinforce the existing filtering effect of embankment vegetation.

3.5.46 The net effect of all of this is that 6.7ha of new woodland planting and 1.5ha of wildflower meadow would be created together with 1600 metres of new hedgerows together with off-site belts of woodland, improving the amenity and ecological value of the area. None of this would occur without the MSA proposal

KEY ISSUES

3.5.47 The key landscape issues relate to the extent of physical loss and value of landscape quality in that area, the visibility of the development from public, and to a lesser extent private, places in the surrounding landscape that would cause unacceptable detrimental effect upon the character of the area. Such effects need to be balanced against the mitigation measures proposed and other landscape benefits the scheme would bring.

3.5.48 The development site is comparatively secluded by landform and vegetation. Areas that are more exposed to development can be screened satisfactorily by proposed mounding and planting.

3.5.49 A few farm properties in the vicinity would experience some residual effects until planting had established adequate screening.

3.5.50 The site has only one public footpath in medium proximity. The greatest effect would be experienced westbound for a few yards approaching How Lane. The remainder of the path is well protected by existing vegetation.

3.5.51 The site has two C class roads in medium proximity that pass the site offering partially filtered views from infrequent vehicles. Mounding and planting is intended to eliminate any adverse effects and new hedgerows are proposed along roadsides to contain views.

3.5.52 There is an elevated view of the site from the motorway overbridge at close proximity. This is considered to be the worst impact for a distance of a few metres.

3.5.53 The proposal provides the opportunity for extensive areas of new woodland, wetland and other habitat creation on a very large scale.

3.5.54 The proposal has the opportunity to provide extensive ground modelling to screen built features and tall vehicles from important viewpoints.

3.5.55 The proposal has the opportunity to restructure and restore the landscape fabric of the surrounding area by way of off-site planting.

3.5.56 The proposal provides a development to meet the overall needs without unacceptable damage to the landscape and environment.

PUBLIC INQUIRY REPORT

The Impact on the Landscape and the countryside in General

3.5.57 Inspector M P Hill in his public inquiry report on pages 89, 90 and 91 paras. 12.53 – 12.62 commented on the landscape character of the area, visual impact and the lighting scheme detailed for the proposed MSA. At paragraphs 12.57,12.58, 12.59 and 12.60 he concluded that

> *'I consider that the proposed buildings, hardstandings, lighting and access roads would harm the open, undeveloped character of the area. Although the landscaping would screen the majority of the development from most viewpoints, the presence of the built development would be readily apparent from a number of locations. Until the new planting matured, it seems likely that glimpses of the top of lighting columns would be seen from How Lane, Littlefield Farm and the bridge carrying the B3024 road over the motorway. Moreover, a large part of the development would be visible from the motorway and from the bridge carrying Drift Road over the motorway. However, in my opinion, the visual impact of the development in long distance views from the area around Jealott's Hill would be small, bearing in mind the distance of about 2.5km, the partial screening provided by existing and proposed vegetation and the presence of the motorway. Moreover, other than Littlefield Farm, most dwellings are already reasonably well screened from the site'.*

'During my site visit in December 1998, when the majority of deciduous trees had lost their leaves, I saw that the screening effect of vegetation at The Cut was limited; traffic on the motorway was readily visible from the southern section of How lane. Unless a large number of evergreen plants were used to reinforce the planting along The Cut, it is unlikely that the development would be well screened during the winter when viewed from the southern end of How Lane. In my opinion, a large swathe of evergreen green trees would be out of character with existing vegetation in the area'.

'Nevertheless, the impact of the motorway must be taken into account. I do not agree with the LPA that the motorway does not weaken the quality of landscape. In my opinion, it has a significant impact on the site and its surroundings. Many of the viewpoints from which the MSA would be seen are already dominated, or at least affected, by the motorway; particularly those views from the bridges carrying Drift Road and the B3024 over the motorway, and from the motorway itself. As indicated above, traffic on the motorway is readily apparent in views from How Lane, particularly in the wintertime. The MSA would be seen as a development closely associated with the motorway and would therefore not have the same impact as an isolated development in open countryside'.

'However, despite the presence of the motorway, I conclude that the MSA would have a significant and harmful visual impact on the countryside. The development would also be obtrusive at night, bearing in mind the unlit nature of the surrounding countryside and the fact that the motorway is also unlit at this location'.

3.6 LAND USE AND AGRICULTURAL LAND QUALITY

INTRODUCTION

3.6.1 An appraisal of the probable agricultural land quality along a fairly broad corridor containing the M4 corridor, including the proposed MSA, was carried out mainly by interpretation of published soils and agroclimatic information. The full report and plans are included at Appendix D1.

3.6.2 A detailed soil survey of the proposed development site was carried out to determine the extent and distribution of land in each of the different ALC grades and sub-grades, using MAFF's revised guidelines and criteria for grading the quality of agricultural land. A full report and plans are included at Appendix D2.

BASELINE CONDITIONS

3.6.3 The land use is predominantly agricultural in arable cultivation. The remaining land comprises woodland and a watercourse

3.6.4 The soils across the site mainly consist of varying thicknesses of fine loamy drift over clay, although locally there are soils which are predominantly fine loamy or clayey throughout.

Agriculture

Land Quality

3.6.5 The area surveyed extends to about 29ha; 9.8ha to the west of the M4 and about 19.2ha to the east. Most, about 25.8ha, is agricultural land mainly in arable cultivation with 2.5ha of permanent grass in the south-west. The remaining non-agricultural land (3.2ha) comprises woodland and a watercourse.

3.6.6 *So far as the application site is concerned, the land's quality is 1.9ha grade 2, 8.5ha* grade 3a, 4.25ha grade 3b and 2.3ha grade 3b/4. All of this land could be lost to the development. However, if proper measures were undertaken this could be offset by the improvement of the 1.1 ha of semi-derelict land at the south end of the adjacent eastern land within my client's control (which we have graded as 3b/4), by a land improvement scheme which would make use of surplus topsoil generated on the development area. Properly carried out, this land could be upgraded to at least grade 3a standard. In addition, the current landscape proposals do not require all of the land on the eastern boundary to be planted, and some will not even be disturbed by mounding. If the mounded areas that are not required for planting are correctly formed, they can be restored to their current grade 3 a quality. The net effect in this area would be 1.8ha which could return to agricultural use, at grade 3a quality. Thus the total potential offset is 2.9ha of grade 3a.

Land Use and Tenure

3.6.7 The land is wholly owned by the Shottesbrook Estate. Part is farmed by the Estate and part let to a tenant farmer.

3.6.8 Almost all of it is in arable cropping use growing combinable crops in rotation. The land at the south-western corner is in permanent grass, unused except for occasional clay-pigeon shooting, and part has been recently trespassed upon by travellers. This land is in a state of under-use on account of its poor quality following disturbance at the time of motorway construction.

3.6.9 The land farmed in-hand by the Estate is part of an all-arable unit of some 650ha based at Shottesbrook farm Almost all is owned, with just 35ha rented. The tenanted land is part of a 120ha unit based at Paley Street. About 40ha of this unit are rented, the remainder being owned.

Woodland

3.6.10 The proposed development site includes an area of Great Wood and a watercourse in the east.

Footpaths and Tracks

3.6.11 There are no public rights of way or tracks across the site.

ENVIRONMENTAL EFFECTS OF THE PROPOSED DEVELOPMENT

Agriculture

Land Loss

3.6.12 The proposed development would result in the irreversible loss of about 10.4ha of best and most versatile land and the loss of about 6.5ha of lower quality land.

Land Use and Tenure

3.6.13 The main effect of the proposed development on the Estate farming business would be the permanent loss of 10.4ha of agricultural land and 2.2ha of non-agricultural land. The loss would have negligible consequences for the unit. The remaining land would continue to be farmed as at present.

3.6.14 On the tenanted land the proposed development would result in the loss of 12.6ha of agricultural land and 1ha of non-agricultural land.

3.6.15 There would be an increased risk of wind-blown litter onto the adjacent farm land.

Woodland

3.6.16 There would be some slight impacts to the edges of the woodland surrounding the proposed development and these are also discussed in sections 3.4 and 3.5 of this statement.

Footpaths and tracks

3.6.17 There are no public rights of way or tracks across the site, and thus no impacts of development on them.

MITIGATION MEASURES

Agriculture

Land Quality

3.6.18 Mitigation of the loss of best and most versatile land can be achieved by limiting the extent of the impact to the smallest size possible, consistent with operational requirements, and by retaining the maximum area of land in continuing agricultural use.

3.6.19 Further mitigation could be achieved by utilising soils stripped from the development area - especially topsoils - in order to upgrade areas remaining in agricultural use. The area of 3b/4 land in the south-west corner, poorly restored following previous disturbance, could easily be improved to sub-grade 3a if the work was appropriately planned and executed. Other land in sub-grade 3b, to the south of The Cut, could be upgraded by careful placement of additional topsoil. The net effect of such measures would depend on the availability of soils for the purpose and cannot currently be quantified. Such use of soil would be both logical and comply with the concept of sustainable use of soil.

Land Use and Tenure

3.6.20 Mitigation of the impact on the tenanted unit can be achieved by reducing the area required for the MSA to the minimum. It can be further reduced if the Estate was to grant a tenancy of equivalent land by way of replacement.

3.6.21 Mitigation of the risks associated with litter can be achieved by adequate boundary treatment and site design.

Woodland

3.6.22 Mitigation measures for the woodland areas are discussed in sections 3.4 and 3.5 of this statement.

KEY ISSUES

Agriculture

3.6.23 The proposed MSA would result in the irreversible loss of about 12.6ha of best and most versatile agricultural land. Such land is given considerable weight for its protection when seeking to reach a balance of the planning issues.

3.6.24 Potential impacts include trespass and wind-blown litter, but these would be mitigated by the construction of fencing around the perimeter of each site.

3.6.25 Key issues regarding effects on woodlands are described in sections 3.4 and 3.5 of this statement.

PUBLIC INQUIRY REPORT

3.6.26 Inspector M P Hill in his public inquiry report on pages 93 para. 12.75 commented on the loss of best and most versatile land. At paragraph 12.74 he stated that

> *'The proposed development would result in a net loss of 7.5ha of the best and most versatile agricultural land. This is a significant disbenefit, even though the amount of such land which would be lost lies below the level that would normally trigger an objection from the Farming and Rural Conservation Agency. The loss of best and most versatile land conflicts with the objectives of sustainability and in particular with the aims of SP Policy C10. Nevertheless, I am mindful that the appeal site does not have a large uniform tract of best and most versatile land, and the use and versatility of the small areas of Grade 2 land on the site are limited'.*

3.7 WATER QUALITY AND DRAINAGE

INTRODUCTION

3.7.1 The section deals with the impact that the proposed development would have on:

- surface water drainage
- foul water
- water quality

3.7.2 The development of a motorway service area can affect the quality and volume of surface water drainage from the site. In addition, new discharges can be generated from a previously greenfield site.

3.7.3 In considering the impact on water quality and drainage of a motorway service area, it is necessary to determine how the impact of development will affect the environment and how mitigation of impacts can alleviate the effects of development.

3.7.4 The site and surrounding area is underlain by London Clay. The London Clay overlies clays and sands of the Reading Formation beneath which Chalk is present at a depth of around 24 metres below ground level.

BASELINE CONDITIONS

3.7.5 The site of the proposed motorway service area is located east of the M4, between J8/9 and J10. The area is currently in agricultural use.

3.7.6 The area is relatively flat, although the site slopes gradually toward the south. To the south east of the site is a river known as 'The Cut'. The Cut crosses the south of the site and flows from west to east. The river flows to the north east and discharges into the Thames approximately 7km towards the north east of the site, at Bray.

3.7.7 The site lies within a groundwater source protection zone 1 of the Mid Southern Water Company's Beenham's Heath Pumping Station. The pumping station is situated approximately 300 metres at its closest point to the south west of the proposed MSA. Water is abstracted from the Chalk aquifer that lies at approximately 24m below ground level.

ENVIRONMENTAL EFFECTS OF THE PROPOSED DEVELOPMENT

3.7.8 The proposals would generate wastewater from toilets and washing facilities. The foul water, combined with any runoff from fuelling areas would amount to a peak discharge of approximately 7l/s.

3.7.9 The substitution of agricultural land with the hard standing and building roofs of the proposed development, would increase the volume of water running off the site during storms because of the reduced capacity for percolation through the soil. This surface water runoff would reach the low points of the site, at the points of discharge, much more quickly than the existing condition.

3.7.10 The Reading formation overlaying the chalk is approximately 15m in depth. The Reading formation encountered at 9m below ground level consists of clay and sand which act as protection to the chalk aquifer. Excavation and construction at depth could contaminate the chalk aquifer.

3.7.11 Fuel storage located on the site has a potential impact on the water quality of the underlying aquifer should any leakage occur.

MITIGATION MEASURES

3.7.12 There is no foul water drainage facility present at the site. Foul water from the site would be collected in sealed manholes and discharged under gravity to a Pumping Station on-site. The foul water would either then be pumped to a public foul sewer or treated on-site and discharged to The Cut.

3.7.13 Off site treatment could be made via a public foul sewer present in Broadmoor Lane. The connection would be subject to a flow survey to be carried out by Thames Water on behalf of the Client. The foul sewage would be pumped to the existing sewer via a new section of main.

3.7.14 On-site treatment would be carried out by pumping the untreated sewage into a treatment plant located within the site. The sewage treatment plant would be designed to a standard specified by the Environment Agency, but the final effluent would have a minimum quality standard of 45:30 milligrams/litre of suspended solids and biochemical oxygen demand respectively. The treated effluent would be discharged to The Cut.

3.7.15 The principles of Sustainable Urban Drainage Systems (SUDS) as encouraged by the Environment Agency will be implemented as far as practical and without compromising the ability for prevention of pollution. Only sustainable drainage systems for particular areas of potential surface water run-off generation that are approved by the Environment Agency will be proposed at this site.

- Uncontaminated roof water may be discharged to the on-site balancing ponds without passing through an interceptor.
- The car-parking areas and site roads should be discharged to the on-site balancing pond and pass through an interceptor. The run-off. may be transferred using a system of swales and as such the flow would not be required to pass through an interceptor. The swales should have some means of isolating the flow i.e. facility to install temporary stop boards, should an accidental spillage occur.
- The HGV and coach parking areas should be served by deep sealed gullies and be piped to a balancing pond via an bypass interceptor.
- Any surface water flows generated from the site and discharged to the watercourse shall be attenuated to the equivalent run-off from a green field site for storm frequencies up to a 1 in 30 year event. Acceptable green field run-off rates would be between 3.0 and 5.0 litres/second/hectare.
- The balancing pond shall be lined and equipped with a cut-off valve on the outlet, to contain any potential spillage's or water generated from fire fighting.

3.7.16 Taking into account the requirements of the Environment Agency the following disposal routes for the various areas that will generate surface water run–off are proposed.

- Petrol Forecourt Roof - direct to a balancing pond via adjacent swales
- Site Roads - via open jointed kerbs to adjacent swales to a balancing pond
- Amenity Building and Lodge Roofs - direct to a balancing pond.

- HGV and Coach Parking - via trapped gullies and a bypass interceptor to the balancing pond. Note: the bypass interceptor shall be sized to retain the spillage from a full tanker.
- Car Parking – either via open jointed kerbs or via channel drains to adjacent swales that transfer flow to a balancing pond.

3.7.17 There is also an opportunity to capture some of the uncontaminated roof water for either irrigation of the landscaped areas or re-use for flushing of toilets. These SUDS concepts will be further considered at the detailed design stage.

3.7.18 The balancing pond shall be "wet ponds" with the outlet from the pond set above the bottom of the pond so that some rainwater is always retained.

3.7.19 The balancing ponds will be lined with an impermeable membrane to facilitate the retention of water in the wet area and also to contain any potential pollutants that may enter the piped site drainage system.

3.7.20 The balancing ponds shall also be equipped with isolating valves on the outlets.

3.7.21 The outflows from the balancing ponds shall be controlled by the use of flow control devices designed to restrict the outflows to predetermined limits.

3.7.22 The risk of contamination of the aquifer from fuel storage would be mitigated by the use of twin walled tanks with sensors and alarm systems in accordance with the requirements of Health and Safety Executive Guidance Note HS(G)41.

3.7.23 The nature and thickness of the underground strata down to the top of the Chalk have been obtained from a Site Investigation undertaken for the project in May 1997. The results indicate that the depth of significant clay (including surface drift sand and gravel) extends down to around 14 metres below ground level and that there is a 'perched' aquifer in the sands of the Reading Formation in addition to the main water table in the Chalk below. Depth of excavation to formation level would be strictly limited below existing ground level, in order to ensure that the clay cap remains over the Chalk aquifer for protection.

KEY ISSUES

3.7.24 During the construction of the proposed MSA the runoff from the sites would potentially contain suspended solids and oil/petrol. The construction of the balancing reservoir and interceptors shall be phased to allow their use during the construction period.

3.7.25 The MSA development would create an increase in surface water runoff of the site. The surface water would be passed to a balancing pond and discharged at a controlled rate to The Cut.

3.7.26 The development would create wastewater from various sources. Wastewater would either be pumped off-site to a public foul sewer or treated on-site prior to discharge to the Cut.

3.7.27 The potential for contamination of groundwater supplies is not an issue at this site as it is not in a groundwater protection zone. However, the risk of contamination would be mitigated by the use of twin walled tanks with sensors and alarm systems in accordance with the requirements of Health and Safety Executive Guidance Note HS(G)41.

3.8 AIR QUALITY

INTRODUCTION

3.8.1 This section of the Environmental Impact Assessment identifies and assesses the impacts on air quality of the proposed MSA serving the westbound carriageway only would have upon the area surrounding the MSA *(See Appendix E for a full technical report)*.

3.8.2 The report at Appendix E was prepared for an Environmental Statement submitted in July 1997 in support of a Planning Application for an MSA designed to serve both carriageways of the M4 motorway, and can best be described as representing a 'worst case' in terms of environmental impact.

3.8.3 Baseline air quality data recorded in the region of the proposed development have been discussed, and the potential impacts of the construction and operation of the proposed MSA have been addressed.

3.8.4 The potential impacts include: dust associated with construction; exhaust gases emitted from vehicles; volatile organic compounds emitted from the refuelling facility; gases produced upon combustion of fuel in boilers and odours associated with the catering facility.

3.8.5 These potential air quality impacts are considered in the context of the existing air quality in the region, which is primarily influenced by the proximity of the M4 motorway.

3.8.6 The properties close to the MSA which have the potential to experience air quality impacts from the MSA facilities are Pondwood Cottage and Magpie Cottage, on the western side of the M4; Pondwood Farm, some 200 m from the western section of the application site boundary for the MSA; and How Lane Farm and How Lane Farm Units, approximately 200 m to the east of the application site boundary.

BASELINE CONDITIONS

3.8.7 The existing concentrations of pollutants in the region of the proposed development are reported from surveys conducted by local authorities and from monitoring programmes managed by AEA Technology on behalf of the Department of the Environment.

3.8.8 Where data are available, they indicate that pollutant concentrations in the region do not exceed statutory EU standards. Occasional exceedances of the EPAQS and NAQS guidelines have been observed for nitrogen dioxide and ozone. Measured concentrations of other pollutants did not exceed EPAQS and NAQS guidelines.

3.8.9 The existing air quality in the region of the proposed MSA is principally defined by the proximity of the M4 motorway.

ENVIRONMENTAL EFFECTS OF THE PROPOSED DEVELOPMENT

Construction Impacts on Air Quality

3.8.10 The potential for dust to be emitted during the construction phase is strongly dependent on the type of construction activities taking place, the prevalence of hot, dry weather during the construction period, the prevailing wind speed and whether winds carry emitted particles toward potentially sensitive receptors.

3.8.11 The types of construction activities most likely to generate dust are grading and levelling of ground prior to construction of the underpass, link roads and buildings; removal of spoil; site stripping; and earthworks.

3.8.12 Other construction activities with a lesser potential for dust emissions are site excavations; concreting operations; site reinstatement and road construction.

3.8.13 The magnitude of dust emissions, and hence deposition rates, are very dependent on the suppression measures employed during the construction activities.

3.8.14 Pondwood Cottage and Magpie Cottage lie 200m from the application site boundary and could potentially experience a small level of nuisance as a result of dust emissions during construction of the proposed link road. Such nuisance would be exacerbated by dry weather, wind blowing towards the property and fairly high wind speeds.

3.8.15 The impacts of dust emissions would be significantly reduced by careful management of the site during the construction phase.

Operational Impacts on Air Quality

3.8.16 The MSA is not expected to generate traffic upon the M4 motorway and it is estimated that only 7.5% of the traffic using the M4 would make use of the MSA. Vehicles using the MSA are therefore *relocated* with respect to nearby properties. All nearby properties are closer to the M4 than they are to slip roads, the car parks and the HGV parks associated with the MSA. Therefore, ii all cases, vehicles using the MSA would be further from properties than when they were travelling on the motorway.

3.8.17 Vehicles travelling along the M4 are the dominant pollution sources with respect to these properties, and the additional effect of emissions from vehicles using the MSA would be small.

3.8.18 The influence of emissions of benzene due to refuelling would not have a significant effect on users of the facility, owing to the short time periods for refuelling. The refuelling area would be 400 m from the nearest residential receptors (Pondwood Cottage and Magpie Cottage) and would be therefore too far away to exert an influence on benzene levels experienced at these receptors.

3.8.19 The combustion of fuels within boilers associated with on-site heating and catering facilities at the amenity building, together with heating associated with the lodge, would result in emissions of combustion gases to the environment. Compared to the emissions of the same pollutants from vehicles using the nearby motorway, the boiler emissions are not likely to be significant.

3.8.20 The main potential source of odours from the site would be the catering facilities associated with the amenity building. In order to comply with the Environmental Protection Act (1990) the control of odours from this facility should be achieved.

MITIGATION MEASURES

3.8.21 To minimise the nuisance caused by construction dust, particularly to nearby receptors such as Pondwood Cottage and Magpie Cottage, a series of *good site practices* for management of the construction site should be adopted, including, but not limited to: careful management of soils and stockpiles; sealing and/or re-vegetation of completed earthworks; site speed limits; sheeting of lorries; minimising drop heights for material transfer activities; cleaning of surfaced roads and stabilisation of unsurfaced roads; wheel washing facilities; and routing of vehicles away from sensitive receptors where possible.

3.8.22 With regards to emissions of benzene at the refuelling facility, the proposed MSA will be required to comply with EU directives on vapour recovery equipment, which would ensure that emissions of volatile organic compounds are successfully mitigated.

3.8.23 The use of extraction fans and carbon filters should be adopted to minimise the potential for odour nuisance from the amenity building.

KEY ISSUES

3.8.24 Pondwood Cottage and Magpie Cottage lie closest to the site application boundary. These properties could potentially experience dust levels sufficient to cause a small level of nuisance, as a result of the construction of the proposed development, unless careful mitigation measures are employed and adhered too.

3.8.25 Vehicles using the M4 motorway represent the dominant source of emissions to air in the area. The additional pollutant emissions from operation of the MSA would be small compared to the motorway emissions, and are unlikely to result in a noticeable effect on air quality at the properties in the area. Nevertheless, mitigation measures which reduce as far as possible emissions from the MSA would be adopted.

PUBLIC INQUIRY REPORT

3.8.26 Inspector M P Hill in his public inquiry report on pages 94 para. 12.79 commented on the issues related to air pollution. He stated that

> *'Similarly, there is little detailed evidence that air pollution would be a signfficant problem at this location. I have no doubt that slow moving vehicles and the stopping and starting of engines at the MSA would add to pollution which must already be created by the motorway. However, there is no suggestion that air quality is presently unacceptable in the locality or that it would rise beyond acceptable limits as a result of the development'.*

3.9 NOISE

INTRODUCTION

3.9.1 This section of the EIA identifies and assesses the noise effects which the proposed development serving the westbound carriageway only would have upon the area surrounding the MSA *(See Appendix F for a full technical report)*.

3.9.2 The noise report at Appendix F was prepared for an Environmental Statement submitted in July 1997 in support of a Planning Application for an MSA designed to serve both carriageways of the M4 motorway, and can best be described as representing a 'worst case' in terms of environmental impact.

3.9.3 The existing noise levels have been measured and evaluated, and the potential impacts from the construction and operational use of the MSA investigated.

3.9.4 There are a limited number of properties within 1km the proposed site.

- To the east of the M4 lie How Lane Farm and How Lane Farm Units, approximately 150m and 300m from the centre of the carriageway respectively. Further south, also to the east of the M4, lies Pope's Farm, approximately 475m from the centre of the carriageway.
- West of the M4 lie a number of dwellings on Mare Street, 100m from the centre of the carriageway, Smewins Farm, 1025m from the M4, Pondwood Farm, 450m from the M4, Pondwood Cottage and Magpie Cottage, 150m from the M4 and to the north, a number of dwellings in an area known as Littlefield Green, an average of 100m from the M4.

BASELINE CONDITIONS

3.9.5 Noise surveys were carried out by ERM between 21st and 26th May 1997. The surveys covered daytime, evening and night-time periods and the measurement locations were chosen to be representative of the sensitive receptors.

3.9.6 Daytime noise measurements were made between the hours of 0830 and 1600, evening measurements between 2200 and 2300, and night-time measurements between 2315 and 0130. Figure 10 shows the measurement locations at which the noise levels quoted in *Tables 2.2* and *2.3* in *Section F* of the *Appendix* were recorded.

3.9.7 The measurements, all of which were attended, were conducted over 15 minute periods, and repeated until a consistent level was recorded.

3.9.8 The M4 motorway dominated the ambient noise climate at all the measurement locations irrespective of the time of day. During the day, aircraft approaching Heathrow airport overflew the proposed site at regular intervals (at the peak these were approximately one per minute).

3.9.9 Traffic on local roads also contributed to the noise climate, but the volume of the traffic was not sufficient to influence the L_{A90} measured.

3.9.10 The levels recorded are contained in *Tables 2.2* and *2.3* in *Section F* of the *Appendix*.

3.9.11 In summary, the M4 dominates the ambient noise climate at all the locations measured, though overflying aircraft contribute a great deal to the ambient levels during the daytime period.

ENVIRONMENTAL EFFECTS OF THE PROPOSED DEVELOPMENT

Construction Noise Predictions and Assessment

3.9.12 The level of noise from construction operations tends to be variable and of limited duration. In order to assess the potential for impact, two scenarios have been assumed, each may be considered a typical worst case. The first is the site clearance and preparation phase, which is typically the noisiest phase that can be expected to last for a reasonably long period (typically 8-12 weeks). The second phase under consideration is the piling phase, which is typically the noisiest phase, but often the shortest in duration.

3.9.13 In order to represent the worst case for each phase, the plant assumed to be operating has been assumed to be operating at the closest realistic distance to the sensitive receptors. For the site clearance phase this has been assumed to be at a position approximately at the site boundary, and for the piling phase this has been assumed to be at the locations proposed for the main buildings.

3.9.14 The construction activities assumed to be needed during the site clearance and preparation phase include: stripping of top soil; regrading parts of the site; drainage installation; construction of haul roads for construction traffic; and preparations for the piling/foundation placement. The construction plant assumed to be operating is listed in an inventory contained in *Annex B* of *Section F*.

3.9.15 It has been assumed that there will be no construction activity outside of the hours 0700-1900.

3.9.16 *Tables 4.1* and *4.2* in *Section F* indicate the level predicted to occur at the facades of the sensitive receptors for the site clearance/preparation phase and the piling phase respectively.

3.9.17 Criteria against which the construction noise is assessed are derived in *Section F*. Comparing these criteria with the predicted levels indicates that at Pondwood Cottage and Magpie Cottage, the assessment criterion will be exceeded by a significant amount (17dB). This is a gross overestimation of the noise levels since it was assumed that all the construction plant would be operating at a nominal distance of 20 metres from the properties, that with the removal of the eastbound access roads would now become a nominal distance of 200m.

3.9.18 At Pondwood Cottage, Magpie Cottage and How Lane Farm (taken as representative of How Lane Farm and How Lane Farm Units) the criterion is slightly exceeded for the piling phase. Given that the predictions are a worst case, that the duration of the noise at this worst case distance is expected to be short, and that the existing L_{Aeq} at How Lane Farm is already 71 dB(A), these are not considered significant impacts.

3.9.19 The construction activities are predicted to be below the criterion for the daytime period at all other receptors.

Traffic Noise Predictions and Assessment

3.9.20 ERM undertook traffic noise predictions in accordance with the DTp/Welsh Office publication *Calculation of Road Traffic Noise*.

3.9.21 There was predicted to be no change in traffic noise levels as a result of the operation of the MSA at any of the sensitive receptors.

3.9.22 The overall noise levels are predicted to decrease in the year 2014 (compared to 1999) since the traffic flows are predicted to reach the congestion capacity of the motorway so the speeds are expected to drop.

3.9.23 The existing traffic noise levels result from the domination of the noise climate by the M4. The relatively small number of vehicles predicted to use the MSA will contribute a significantly lower noise level and will not therefore make a noticeable contribution to the overall level.

3.9.24 *Table 4.3* of *Section F* presents the full predictions for the $L_{A10,\ 18\ hour}$ noise levels.

Operational Noise Predictions and Assessment

3.9.25 The activities that can be expected to occur at a MSA include, but are not limited to: car doors slamming; engines revving; vocal noise; and engines starting. It is difficult to accurately predict noise from these sources since they are not readily quantifiable. ERM considered taking measurements at current MSAs in order to provide indicative data, but it was considered that the proximity of a large source of constant noise (*ie* the motorway) would unduly influence the results and thus invalidate them.

3.9.26 If a worst case car door slam were to be assumed to be a maximum of 80 dB(A) at 10m, and was assumed to occur at the closest reasonable point to the closest receptor (How Lane Farm 250m away), then this would translate to a free-field level of approximately 52 dB(A). This maximum level is substantially below the existing average level (*ie* L_{Aeq}) in the daytime and evening and marginally lower than the night-time level.

3.9.27 Pondwood Cottage and Magpie Cottage are similar distances from the closest possible car parking/stopping area, so the level at How Lane farm is considered representative of these locations.

3.9.28 This estimation has not included any correction for ground attenuation and so can be assumed to overestimate the level at the receptor.

3.9.29 Mobile chiller units may be expected to be parked at the MSA for various periods of time, and may thus provide a source of noise. An octave band spectrum for a 'Petter' type of chiller unit is given in *Table 4.4* in *Section F*. This type of unit is generally noisier than more common, modern units, typically by 10 dB, so this may be considered a worst case.

3.9.30 The attenuation expected to be gained from the distance between the proposed designated HGV park and the closest receptor (How Lane Farm) as well as the air and ground absorption (calculated using the method contained in the Engineering Equipment and Materials Users Association publication number 140 *Noise Procedure Specification*) are all included in *Table 4.4*.

3.9.31 It has been predicted that a level of 41 dB(A) would occur at the nearest/most sensitive location (Pondwood Cottage and Magpie Cottage) below the criterion derived for operational noise sources for this location of 43 dB(A) (see *Section F*).

MITIGATION MEASURES

3.9.32 There are predicted to be exceedances of the assessment criteria from the two worst case construction phases at Pondwood Cottage and Magpie Cottage and for the piling phase at How Lane Farm. However, the predictions contain an element of over-prediction and the predicted levels at How Lane Farm do not greatly exceed the existing values of L_{Aeq}, so the impacts from the piling phase are not considered significant.

3.9.33 Best practicable means should be implemented throughout the construction process, including, but not limited to: siting of any noisy plant towards the M4 side of the site (as far as possible); not operating outside of the stated hours; and screening noisy plant, where possible.

3.9.34 The exact nature of the mitigation measures and site management plan should be developed once the construction process has been defined.

3.9.35 It is not expected that operational elements of the MSA, including building services noise, mobile chiller noise and miscellaneous MSA noise such as car door slamming, will cause any adverse impact. Orienting the layout of the MSA such that the HGV park, and main car parking areas are as far as possible from the sensitive receptors and, where possible, locating intervening structures between these sources and the receptors, should ensure that any potential to cause impacts is minimised.

KEY ISSUES

3.9.36 There are three sensitive receptors within two hundred metres of the proposed site boundary (Pondwood Cottage, Magpie Cottage and How Lane Farm), and one other is two hundred metres away (Pondwood Farm).

3.9.37 The noise surveys of the area have established that the M4 is the dominant source of noise in the area, with aircraft approaching Heathrow airport during the day over-flying the proposed site at a peak rate of one per minute.

3.9.38 It is anticipated that the road traffic noise associated with the development will not cause a perceptible change in the overall noise climate at any of the surrounding properties.

3.9.39 The operational sources within the proposed site, such as building services, mobile chiller units and car door slams, are not anticipated to cause any impacts at the surrounding properties.

PUBLIC INQUIRY REORT

3.9.40 Inspector M P Hill in his public inquiry report on pages 94 para. 12.78 commented on the issues related to noise pollution. He stated that

> *'The LPA considers that noise associated with the MSA would lead to a loss of tranquillity in the area and be detrimental to the character of the countryside, although it is argued that it is not possible to accurately determine the impact of the various noises which would arise. Bearing in mind firstly, the existing background noise of the motorway, secondly, the barriers to noise which would be provided by the proposed mounding and planting and, thirdly, the lack of any detailed evidence which demonstrates that noise associated with the MSA would be significant, I conclude that this aspect of the development is unlikely to cause serious harm'.*

3.10 COMMUNITY EFFECTS, PEDESTRIANS, CYCLISTS, & EQUESTRIANS

INTRODUCTION

3.10.1 The use of Ordnance Survey Mapping together with a site survey, has established the presence of facilities within, and surrounding the proposed development site. These are shown on Plan 2 (See Volume 3).

BASELINE CONDITIONS

3.10.2 Whilst largely falling in the parish of White Waltham, which lies well to the north of the site, there are no major settlements nearby. Several communities in Waltham St Lawrence including Shurlock Row and Beenham's Heath lie well to the west. Binfield lies well to the south. Other settlements appear to be linear in nature along the local roads such as Paley Street and Braywoodside to the east. Littlefield Green is the nearest hamlet to the north. The site, therefore, lies in a rural area with only occasional agricultural properties in the immediate surrounding landscape. The nearest properties are Pondwood Farm Cottage (2No), How Lane Farm, Littlefield Farm, Ann Cherry Cottage and Parsonage Farm.

Public Rights of Way/Access

3.10.3 The locality is well networked with minor roads and country lanes. The A330 between Maidenhead and Bracknell lies well to the east. The quiet B3204 links Paley Street with White Waltham. The C class How Lane, connects Binfield to the south and supports occasional use. A further C class road, Drift Road, linking Braywoodside with Beenham's Heath is an infrequently used lane. There is only one public footpath in the area to the east of How Lane.

ENVIRONMENTAL EFFECTS OF THE PROPOSED DEVELOPMENT

3.10.4 The fields on both sides of the motorway to be occupied by the MSA development are currently in arable use. Part of this land not required by development west of the motorway is to be returned to agriculture or converted to woodland or meadowland to be sown with wild flowers. The change from arable, to more diverse habitats is considered advantageous both ecologically and visually.

3.10.5 The waste ground to the south of the MSA and to the east of the motorway is to be converted into a diverse habitat of woodland plants, wild flowers, balancing ponds and aquatic plants. The land would be improved ecologically and visually. A small corner of derelict field south of The Cut is to be top-soiled and returned to agriculture.

3.10.6 The most significant change in the long term would be from an appearance of open arable fields to a more vegetated and wooded land use enclosing development.

3.10.7 There would be no direct physical effects on pedestrians or the community as a whole. No public footpaths exist across the site or in its immediate vicinity. No properties would be lost and no settlements are directly affected. There would be some visual effects on one footpath, some local roads, and properties around the wider area of the site and these are described in section 3.5 of this statement.

4.0 SUMMARY OF KEY ISSUES

4.1 MAIN EFFECTS OF THE DEVELOPMENT

4.1.1 The likely environmental impacts resulting from the development of the proposed MSA are described in Section 3 of the Environmental Impact Assessment. Listed below is a summary of key issues that are identified:

- It is recognised that there is a need for MSA development to serve the westbound travellers on this section of the M4 motorway.
- The proposed MSA at Great Wood would meet the needs of the motorway user and is entirely consistent with Government advice and Planning Policy Guidance.
- The development would not impact directly on any known statutorily designated sites of heritage and historical interest.
- The development would not impact directly on any known statutorily designated sites of nature conservation importance, however there would be some minor effects on Ancient Woodland.
- There would be a loss of agricultural land, including land in the best and most versatile grades. The area of loss of such land would be smaller than the 20ha that is a trigger for MAFF objection.
- The loss of agricultural land would have no significance for one of the farms using it, but could have an adverse impact on the sustainability of the other, if not mitigated.
- The development can be accommodated on the site without unacceptable harm to surrounding areas and can be largely mitigated for in terms of environmental effects.
- Access and egress slip roads would be designed to meet Highway Agency Standards.
- Vehicles using the M4 represent the dominant source of air pollution in the area. The additional pollutant emissions arising from the use of the MSA would be small compared to the motorway emissions, and are unlikely to result in a noticeable effect on air quality at the properties in the area. Likewise, noise levels in the area around the MSA are already dominated by noise from the motorway traffic. The traffic using the MSA will not give rise to any significant change in overall noise levels at any of the noise sensitive receptors in the area.

5.0 ENVIRONMENTAL IMPACTS TABLES

5.1 In the following Environmental Impacts Table (EITs) the area identified for the proposed MSA, and the surrounding area where applicable, are assessed in terms of direct and indirect effects that would result from the construction of the proposed development. A comments section is provided in the tables to allow for the discussion of the various environmental effects in terms of their mitigation and explanation in a summary form.

5.2 The categories for assessment are those discussed in Section 3 of this assessment.

Table 1	Cultural Heritage / Topography and Geology
Table 2A	Ecology and Nature Conservation
Table 2B	Ecology and Nature Conservation - Continued
Table 3	Landscape and Visual Assessment
Table 4	Water Quality and Drainage
Table 5	Air Quality and Noise
Table 6	Traffic and Highways / Community Effects

M4 GREAT WOOD MAIDENHEAD: MAIDENHEAD MOTORWAY SERVICE AREA

ENVIRONMENTAL IMPACTS TABLE

CATEGORY FOR ASSESSMENT	DIRECT EFFECTS	INDIRECT EFFECTS	COMMENTS
CULTURAL HERITAGE **Archaeology**	None identified	None	This does not preclude the possible existence of archaeological deposits within the development area A geophysical survey located two recently removed hedgerows, two weak lines at the south of the site and an area of burnt flint
Listed Buildings	None		None within proposed site. The setting of the Listed Building at Littlefield Farm would be preserved, both by day and by night
Registered Parks and Gardens	None		
TOPOGRAPHY AND GEOLOGY **Topography**	There would be no significant changes to topography that would have widescale implications Topographical changes would be localised and restricted to the excavation of the balancing ponds and new ground - modelling to screen the development		Changes to topography would be sensitively married into the surrounding landform Top soil would be relocated to neighbouring fields to improve their agricultural land quality
Geology	On-site works would result in the disturbance of surface geological deposits	None	There are no specific mitigation measures with regard to the geology of the area

M4 GREAT WOOD MAIDENHEAD : MAIDENHEAD MOTORWAY SERVICE AREA

ENVIRONMENTAL IMPACTS TABLE

CATEGORY FOR ASSESSMENT	DIRECT EFFECTS	INDIRECT EFFECTS	COMMENTS
ECOLOGY AND NATURE CONSERVATION			
Habitat Impacts			
	Loss of arable fields		Low value habitats
	Loss of small areas of rough grassland and scrub within the highway boundary		Low value habitats. New habitats of nature conservation value are proposed as part of landscaping scheme
Species impacts			
Badgers	Loss of disused and intermittently active setts	Loss of potential foraging habitats	Further surveys proposed prior to development to ensure setts not in use at commencement. Landscaping scheme would provide new habitats of higher value for foraging than existing farmland habitats
Bats	None known	Loss of potential foraging habitats	Landscaping scheme would provide new habitats of higher value for foraging than existing farmland habitats.
		Unknown potential for lighting to affect feeding patterns of certain species	Some bat species would be deterred from feeding in the area of the MSA by lighting; others would feed on insects attracted to the light; design would incorporate low-spillage lighting
Reptiles	None known	Loss of potential habitats for protected reptile species	Further surveys proposed to determine likely impacts
			Landscaping scheme would provide new habitats of value to reptiles

M4 GREAT WOOD MAIDENHEAD : MAIDENHEAD MOTORWAY SERVICE AREA

ENVIRONMENTAL IMPACTS TABLE

CATEGORY FOR ASSESSMENT	DIRECT EFFECTS	INDIRECT EFFECTS	COMMENTS
ECOLOGY AND NATURE CONSERVATION **Species impacts - continued** **Birds**	Loss of breeding habitat for skylark and other potential breeding farmland species of conservation concern		Only skylark is recorded as a probable breeder within the application site. Further surveys are proposed to determine the potential breeding bird interest of the site
Disturbance	Potential noise disturbance to retained woodland and hedgerow habitats	Potential reduction in breeding success in songbirds	Increases unlikely to be significant over effects of existing noise levels of motorway on woodland margins Proposed layout maximizes distance of noise sources from edges of Great Wood
	Potential air pollution in retained woodland and hedgerow habitats	Potential effects to plant growth through phyto-toxic exhaust emissions	Adjacent woodlands and hedgerows would be buffered from air pollution by new planting Proposed layout maximizes distance of worst pollution sources from edges of Great Wood
	Potential damage to retained habitats through incursion by MSA users	Potential damage to vegetation and disturbance to resident fauna	All retained habitats would be securely fenced from the proposed development and screened by appropriate new planting
Construction	Potential damage to retained habitats through incursion by contractors or construction traffic	Potential damage to vegetation and disturbance to resident fauna	All retained habitats would be securely fenced from the proposed development and screened by appropriate new planting

M4 GREAT WOOD MAIDENHEAD : MAIDENHEAD MOTORWAY SERVICE AREA

ENVIRONMENTAL IMPACTS TABLE

CATEGORY FOR ASSESSMENT	DIRECT EFFECTS	INDIRECT EFFECTS	COMMENTS
LANDSCAPE AND VISUAL ASSESSMENT **Landscape Assessment**	Agricultural land would be given over to a fuel court, amenity building and lodge, car, coach and lorry parks and associated circulation routes and landscape/ planting The site would be gently regraded to accommodate the above facilities	The development would be illuminated at night and thereby introduce light into the landscape after normal daylight hours	A lighting policy for the MSA site best-practice principles for reducing light spillage in rural areas recommended by the DoT (Road Lighting and Environment) would be followed using high-pressure sodium lamps and special light-control lanterns A picnic area would be established as an amenity feature for travellers A balancing pond/amenity lake would be an attractive feature and additional wildlife resource New planting/woodland habitats would complement those of the nearby woodland
Visual Assessment	The landscape has been assessed to determine the degree of visibility of the site with its proposed development. The impact is translated into a visual envelope extending across an area up to less than 1 km from the site, with varying degrees of impact in the form of buildings, structures, lighting columns and high sided vehicles The proposed site can be viewed from Littlefield Farm and other local properties		The development site is comparatively secluded by landform and vegetation. Areas that are more exposed to development can be screened satisfactorily by proposed mounding and planting. The proposal has the opportunity to restructure and restore the landscape fabric of the surrounding area by way of off-site planting Views of the MSA from Littlefield Farm and other properties would be well screened by the landscaping proposals

M4 GREAT WOOD MAIDENHEAD : MAIDENHEAD MOTORWAY SERVICE AREA

ENVIRONMENTAL IMPACTS TABLE

CATEGORY FOR ASSESSMENT	DIRECT EFFECTS	INDIRECT EFFECTS	COMMENTS
WATER QUALITY AND DRAINAGE **Surface Water Quality**	During construction there would be potentially high suspended solids in runoff water	None	The increase in potential for the discharge of suspended solids during construction would be mitigated by passing surface water through a balancing reservoir to provide treatment by settlement
	Surface water discharged from the site following completion of the project may have high suspended solids and may also contain oil based pollutants	None	All surface water run-off which could be polluted by oil or petrol waste would be passed through interceptors or treated by passing through granular media Provision would be made in the balancing pond to contain any major pollution spillage that enter the balancing pond
Groundwater Quality	There is a possibility that a leak from the on-site fuel storage would percolate through the strata and contaminate the underlying aquifer	None	Fuel would be stored in approved double skin tanks with leak detection sensors in the intermediate layer
Surface Water Drainage	The increase in hard surfacing and roofs associated with the development would cause surface water to be discharged at a greater rate than at present with the potential for downstream flooding	None	The discharge from the site would be attenuated to its current rate by the use of a combination of soakaways, underground storage and balancing ponds
Foul Water Drainage	The development would create wastewater from toilets, washing facilities, food preparation areas and other ancillary uses	None	Foul water discharges would be collected and treated on site to a standard acceptable to the Environment Agency before discharge to the watercourse, or pumped to a public foul sewer via a new rising main

Table 4

M4 GREAT WOOD MAIDENHEAD : MAIDENHEAD MOTORWAY SERVICE AREA

ENVIRONMENTAL IMPACTS TABLE

CATEGORY FOR ASSESSMENT	DIRECT EFFECTS	INDIRECT EFFECTS	COMMENTS
AIR QUALITY **Operational Effects**	The proposed MSA includes several facilities which result in pollutant emissions to air		Vehicles travelling along the M4are the dominant pollutants in the area. Operational effects are unlikely to result in a noticeable reduction in air quality
Construction Effects	The construction of the proposed MSA has the potential to lead to the generation of dust particles		All properties likely to be affected by the construction of the MSA are over 100m from the site, therefore no construction impacts are predicted. Careful management of the site during the construction phase should be adopted to reduce any potential nuisance
NOISE **Traffic Noise**	Traffic using the MSA is unlikely to give rise to a significant change in the overall noise levels		Noise resulting from traffic movements in the service area would be substantially less than the noise from the motorway traffic and would result in no perceptible increase in noise levels
Operational Noise	Noise arising from the operation of the MSA includes patron noise (i.e. door slams), noise from HGV chillers, reversing alarms and building services plant (i.e. refrigeration and air conditioning units)		No significant noise impacts are expected to arise from the operation of the MSA
Construction Noise	Local properties could potentially experience noise pollution during the construction of the MSA		The nearest properties are not likely to experience a significant impact during the construction of the MSA Mitigation measures and site management plans would be instigated once the details of the construction process are finalised

Table 5

M4 GREAT WOOD MAIDENHEAD : MAIDENHEAD MOTORWAY SERVICE AREA

ENVIRONMENTAL IMPACTS TABLE

CATEGORY FOR ASSESSMENT	DIRECT EFFECTS	INDIRECT EFFECTS	COMMENTS
TRAFFIC AND HIGHWAYS **Highways Issues**	Additional slip roads would be required between the M4 motorway and the proposed development		Slip roads have been designed in full accordance with design standards and would accommodate design traffic flows safely and efficiently. Weaving lengths would be in excess of 3km
Effects during Construction	Some direct impacts would arise during construction of the MSA and associated improvements to the highway		Mitigation of impacts would be by means of appropriate traffic management arrangements and other measures which would be in agreement with the Highway Authority
COMMUNITY EFFECTS, PEDESTRIANS, CYCLISTS, AND EQUESTRIANS **Effects on Public Footpaths**	There would be no direct effects on property, communities or public rights of way	The development would be seen from one public footpath	A short 100 metre length of this footpath would obtain only filtered views of the development
Effects on the Community and Pedestrians	None	There would be an indirect lighting impact on a few local properties	No properties would be lost and no settlement directly affected

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HSL

SWAYFIELDS LIMITED
PROPOSED WESTBOUND-ONLY
MOTORWAY SERVICE AREA (MSA),
M4 JUNCTIONS 8/9 TO 10, MAIDENHEAD

HIGHWAYS ASSESSMENT
JUNE 2001

HSL

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HIGHWAYS ASSESSMENT
JUNE 2001

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SWAYFIELDS LIMITED

PROPOSED WESTBOUND-ONLY MOTORWAY SERVICE AREA (MSA), M4 JUNCTIONS 8/9 TO 10, MAIDENHEAD

HIGHWAYS ASSESSMENT

1. INTRODUCTION AND BACKGROUND

Introduction

1.1 Swayfields Limited have made a planning application for a proposed motorway service area (MSA) to serve westbound traffic on the M4 between junctions 8/9 and 10 at Maidenhead.

1.2 HSL are appointed to advise on highway engineering issues associated with this scheme.

Background

1.3 This proposal has previously been the subject of a planning application. Full agreement was reached on highways matters with the Highways Agency (HA) in late-1997.

1.4 This note reviews the traffic assessment work which lead to agreement with the HA.

Scope of the Report

1.5 The scope of this note is as follows:-

i) The study area is described.

ii) The HA's previous highway requirements are summarised and reviewed in the context of the current planning application.

iii) The traffic assessment work undertaken for the previous planning application is reviewed and found to be acceptable for the current proposal. A description of the key findings from such work is presented.

iv) The site access scheme is described.

v) The HA's agreement to the previous planning application is reviewed, particularly with regard to the direction of conditions.

vi) The Circular 1/94 parking requirements for the proposed MSA are updated.

vii) The options for construction and roadworks traffic management are described and the impact assessed.

Conclusion

1.6 This note concludes that highway matters associated with the proposed MSA can all be satisfactorily addressed.

1.7 The proposed MSA is therefore commended to the Highways Agency for approval.

2. STUDY AREA

2.1 The site lies on the southern side of the M4 about 6km to the east of M4J10 and about 3.5km to the west of M4J8/9.

2.2 The study area is confined to the westbound M4 motorway itself since there is no proposal to provide access to the MSA from the local road network.

2.3 This section of the M4 is a dual three lane carriageway which complies substantially with modern motorway design standards.

3. HIGHWAYS AGENCY'S REQUIREMENTS

3.1 The HA's key highway requirements for the assessment and design of the MSA access were originally set out in their letter dated 5 December 1996 (see Appendix A).

Traffic Assessments

3.2 The 1997 traffic assessment was based on traffic flows which represented the capacity of this section of the M4. Consequently, the assessment flows which should be used in this current assessment can be no higher than those adopted in the previous assessment as the capacity of the M4, established by the HA's estimated year 2002 flows, cannot be exceeded.

3.3 The HA's 5 December 1996 letter set out their proposed methodology for estimating MSA traffic. This was based on a twelfth of 7.5% of the 12 hour annual average weekday traffic flow (AAWF).

3.4 HSL's previous assessment did not follow this methodology but, without prejudice, estimated MSA flows as 7.5% of the HA's estimated M4 capacity value (6129 vehicles per hour). The estimated MSA flows were higher than those which would have been obtained by using the HA's methodlogy (about 6% of peak M4 flows). HSL's methodology was accepted by the HA on this basis.

3.5 Accordingly, the 1997 traffic assessments are considered to remain appropriate for establishing the design of the MSA access scheme whilst recognising that the adopted turn-in rate of 7.5% of the M4 capacity value is likely to be more than robust.

Geometric Design

3.6 Geometric design standards for motorway junctions have not changed since agreement was reached with the HA in late-1997.

3.7 The geometric design requirements associated with the proposed MSA access, as set out in the HA's 5 December 1996 letter, therefore remain appropriate.

4. TRAFFIC ASSESSMENTS

4.1 As explained in section 3 above, the traffic assessment work which formed the basis for the 1997 agreement with the HA remains current given that it was based on M4 capacity threshold traffic flows and a robust MSA turn-in rate.

Merge and Diverge Facilities

4.2 The relevant TD22/92 merge and diverge assessments are presented in Appendix B. These demonstrate that Type A merge and diverge tapers are appropriate.

Roundabout Capacity

4.3 The relevant ARCADY roundabout capacity calculations are presented in Appendix C. These demonstrate that the proposed on-site roundabout will have adequate capacity.

Weaving

4.4 There is no requirement to undertake a weaving assessment for the scheme as the proposed MSA access is further than 3km from both M4J8/9 and M4J10. There will therefore be no interaction between the MSA access and adjacent junctions on the M4.

5. ACCESS DESIGN

5.1 The proposed MSA site access scheme is presented in Appendix D. This is the same scheme as agreed with the HA in late-1997. It incorporates Type A merge and diverge facilities, to the relevant design standard, and the key features as required by the HA in their letter of 5 December 1996.

5.2 On the above bases, the proposed site access scheme illustrated in Appendix D is considered to be acceptable in highway terms.

6. HIGHWAYS AGENCY APPROVAL

6.1 Appendices E and F include copies of the HA's letters of 14 August 1997 and 22 December 1997, respectively.

6.2 The HA's 14 August 1997 letter (Appendix E) includes confirmation that a satisfactory westbound-only single-sided MSA access scheme (as per the drawing in Appendix D) can be achieved. Accordingly, the HA proposed to direct relevant planning conditions which remain acceptable.

6.3 The HA's letter of 22 December 1997 (Appendix F) included the formal direction of planning conditions for the westbound-only MSA scheme, repeating the draft conditions as proposed in the 14 August 1997 letter (Appendix E).

6.4 Given that the proposed MSA access scheme remains acceptable, having regard to the earlier sections of this note, it is considered that highway approval should be forthcoming from the HA. Planning conditions similar to those previously proposed by the HA would be acceptable.

7. PARKING REQUIREMENTS

7.1 MSA parking requirements, in accordance with Roads Circular 1/94 (C1/94), are estimated on the basis of annual average daily traffic (AADT). The 1997 C1/94 assessments were based on an AADT of 106,000 vehicles with 11% HGVs.

7.2 The HA have advised that the year 2000 AADT was 113719 (with 11% HGVs from an earlier source), with an almost 50/50 eastbound/westbound split.

7.3 Application of the 1997 National Road Traffic Forecasts (NRTF) for rural motorways to the year 2000 AADT over a 15 year design horizon would result in a forecast AADT of in excess of 180,000 vehicles. Such levels of traffic flow are not, in practice, attainable on dual three lane motorways. It is HSL's experience, on MSA schemes elsewhere on the motorway network, that C1/94 requirements have been based on congestion reference flow (CRF) values estimated in accordance with Advice Note TA46/97 (Annex D) with allowances for peak spreading and the future likelihood that AADT values will become closer to annual average weekday traffic (AAWT) levels.

7.4 Appendix G presents the updated C1/94 assessment based on methodology agreed with the HA for other MSA sites.

7.5 The current C1/94 parking requirements for the westbound-only MSA scheme are as follows:-

- Cars = 351
- HGVs = 31
- Coaches = 9

7.6 The proposed MSA internal layout confirms that such levels of parking can be accommodated within the site and, subject to compliance with other requirements in C1/94, the MSA will qualify for signage from the M4.

8. CONSTRUCTION

8.1 Dialogue was undertaken with the HA in late-1997 on the issue of construction access. It was accepted that the MSA stub slip roads should be constructed from within the site, over a period of 8 to 12 weeks. Following this all MSA construction access could be taken from the M4.

8.2 Dual 3 lanes would be maintained on the M4 at all but the least trafficked times ((eg) overnight) in order to minimise disruption due to construction. The options available to achieve this include the use of either three narrow lanes on the westbound M4 or contra-flow working to provide sufficient working space for construction of the slip roads.

8.3 Both methods of working would be accompanied by the introduction of a temporary 50mph speed limit and roadworks traffic management, to Chapter 8 of the Traffic Signs Manual, to ensure road safety.

8.4 The maintenance of dual 3 lanes with the 50mph speed limit is unlikely to have any perceptible impact on traffic flows on the M4.

9. SUMMARY AND CONCLUSIONS

Summary

9.1 Swayfields Limited have made a planning application for a MSA on the westbound M4 between M4J8/9 and M4J10, Maidenhead.

9.2 This scheme was subject to a previous planning application, for which full agreement was achieved with the HA in late-1997.

9.3 Conditions and standards have not changed since 1997. Only the C1/94 parking requirements need to be reassessed to bring the former highway approval up to date.

9.4 All of the HA's key requirements remain valid and can be met in the current access scheme. The previously agreed MSA access scheme, and its associated and robust capacity calculations, therefore remain acceptable.

9.5 The MSA will have no weaving interaction with adjacent junctions on the M4.

9.6 The C1/94 parking requirements have been updated. Swayfields' site layout plan confirms that these requirements can be met on site. Subject to meeting other requirements of C1/94 the proposed MSA will therefore qualify for signage from the M4.

Conclusion

9.7 This note concludes that highway matters associated with the proposed MSA can all be satisfactorily addressed.

9.8 The proposed MSA is therefore commended to the Highways Agency for approval.

Enc

Highway Solutions Limited
29 June 2001

APPENDIX A

HA LETTER DATED 5 DECEMBER 1996

HIGHWAYS AGENCY

Southern Network Management Division

Federated House
London Road
DORKING RH4 1SZ

Direct Line: 01306 878313
Fax: 01306 878299
Switchboard: 01306 742025

Our ref: SU845/745
Your ref:

Alan Boreham Associates ltd
1 Argent Court
Sylvian Way
BASILDON Essex
SS15 6TH

5 December 1996

K Dudhill

For The Attention Of Mr M Bedwell

2 pages

Dear Sirs

MOTORWAY SERVICE AREA APPLICATIONS M4 J8/9 TO 1

The appeal Inspector has asked us to agree on traffic figures and the like. I therefore put forward my proposals, copying to the main parties, and ask all the applicants/appellants to give me their view in writing. As I have had informal discussions on the main points and found that agreement is likely, I will only contact parties again if there is disagreement and a change.

Total flows past the Granada and Stansford Holdings sites at J8/9 are the September 1995 weekday 0800-0900 and 1700-1800 peak hour approach videoed turning counts previously agreed between them and HA. These have been growthed to 2002 using NRTF high growth [say +21%]. From these for J8/9 to 10 I calculate a peak eastbound flow of 6129 veh [am] and peak westbound of 5816 [pm]. There is no widening now planned for 8/9 to 10, and it appears that the 2002 peak flows at J8/9 are broadly at the maximum permitted by the current road widths and junctions, so no significant growth is likely without widening. I therefore propose that these peak flows are used as the hourly design flows [as TD22 3.1] for the MSA applications between 8/9 and 10; widening of 4b to 8/9 is assumed to make no difference to 8/9 to 10 flows.

I propose that opening year is now taken as 1999, and so design year is 2014. After re-examining the figures, Berkshire as our agent now advises an AADF in 1995 for 8/9 to 10 of 102600; this is abnormal due to major roadworks to the east in the last quarter [but for that it would have been about 106000]. The AAWF was 111400. OGV1+2 [colloquially HGVs] was 10.9% of AADF. As explained above, calculating an AADF at 2014 by using even NRTF low is unrealistically high. Peak spreading is difficult to calculate so I simply propose an AADF of 130000 for 2014. I think we already have an agreed minimum turn in formula for junction design of 7.5% of 12hrs AAWF [from TAM factors] divided by 12.

For the MSAs between J8/9 and 10 in addition to TD22 we ask for at least 215m visibility along the internal road from the back of the exit slip nose, so that drivers do not have to slow down on the motorway itself, thereby affecting motorway traffic. There should also be at least

100m of straight or large radius curve beyond the back of the exit nose before encountering sharp [sub 360m] radii, as vehicles will be leaving the motorway at 50-60 mph. At least 215m from back of nose to any give way line across the entry, to allow some queuing without approaching vehicles having to brake severely on the motorway. For entry slips there should be at least 100m of straight or large radius curve immediately before the back of nose, to allow HGVs and the like to get up to motorway speeds before having to join the motorway. These additional requirements have been derived from our experience.

Yours faithfully

D. Rounthwaite

Douglas Rounthwaite
Development Control Team

Highway Solutions for Great Wood/Smyfields 0115 941 5754
P Tevelyan for BFDC
SP Johns, Thorburn-C for granada 0171 - 455 7456
P Mew for RBWM
D Brodie BCC
S Brook HA
D Avery, M Roberts, D Sarkar HA
C Calvert; T Sol.
R Chaplin/M Garnham

01268 - 541672

APPENDIX B

TD22/92 ASSESSMENTS

Mr D Rounthwaite
Highways Agency
Southern Network Management Division
Federated House
London Road
Dorking
RH4 1SZ

Our ref: HSL00062/SPD/NM/05

17 February 1997

Dear Douglas,

PROPOSED MOTORWAY SERVICE AREA (MSA)
M4 GREAT WOOD, MAIDENHEAD

I refer to our recent telephone conversation and look forward to meeting you again on Thursday 20 February 1997 regarding the above project.

As discussed, please find enclosed a copy of our calculations which substantiate the choice of Type A merge and diverge facilities to TD22/92 for the proposed site access.

I trust you will find the enclosed satisfactory.

As explained, in order that our Client's proposals can be presented in the best possible light to the current M4 MSAs inquiry we seek to achieve early release of your suitably conditioned Direction, in advance of the environmental statement process for our Clients' scheme.

We look forward to discussing this matter with you on Thursday.

Yours sincerely

Steve Dudhill
Director
for Highway Solutions Limited

Enc

cc A Finch

HIGHWAY SOLUTIONS LIMITED

Consultants in Transportation Planning & Traffic Engineering

Client : SHAMFIELDS LIMITED.

Project : M4 MAIDENHEAD.

Prepared		Checked		Passed		Project No.	00062.
Date	14/1/97	Date		Date		Sheet No.	TIA 1.

ACCESS MERGE & DIVERGE TYPES

1). Design Flows.

i) HA letter of 5/12/96 proposes eastbound design flows of 6129 vph (AM) and 5816 vph (PM)

ii) Assume that the above can be reversed for the westbound direction.

iii) Thus, M4 design flows are :-

	AM	PM
Eastbound	6129.	5816.
Westbound	5816	6129.

(e.g. Design flow (max) is at practical capacity of around 2050 vph/lane ⇒ 6150 vph for D3M.

iv) Assumed MSA turn-in = 7.5%. Thus MSA turn-in flows are :-

	AM	PM
Eastbound	460	436
Westbound	436	460

v) Thus, M4 passing flows are ; for use in TD 22/92 checks :-

	AM	PM
Eastbound	5669	5380.
Westbound	5380	5669.

HSL

HIGHWAY SOLUTIONS LIMITED

Consultants in Transportation Planning & Traffic Engineering

Client :	SWANNELDS LIMITED.						
Project :	M4 MAIDENHEAD						
Prepared	SJ	Checked		Passed		Project No.	00062.
Date	14/1/97	Date		Date		Sheet No.	TIA 2.

Access Merge and Diverge Types (Continued)

2) TD22/92 Assessment

i) Attached TD22 plots confirm that, with D3 M4 operating at capacity, Type A types onto the D3 M4 are acceptable.

ii) Connector road cross-sections, based on an MSA design flow of 460 vph, are :-

TD22/92 Table 3/1 ⇒ 1 Lane @ 3.7m.

Hardshoulder = 2.3m.

iii) Drg Nos HS00062/1 and /2 comply with the above and the additional requirements of the HA as stated in their 5/12/96 letter.

HSL

Eastbound AM } Type A (4,4).
Westbound PM }

Eastbound PM } Type C (4,3)
Westbound AM }

But, allow for M4 operating at D3 capacity, MSA flows @ 436 to 460 vph ⇒ bias Type A types are satisfactory

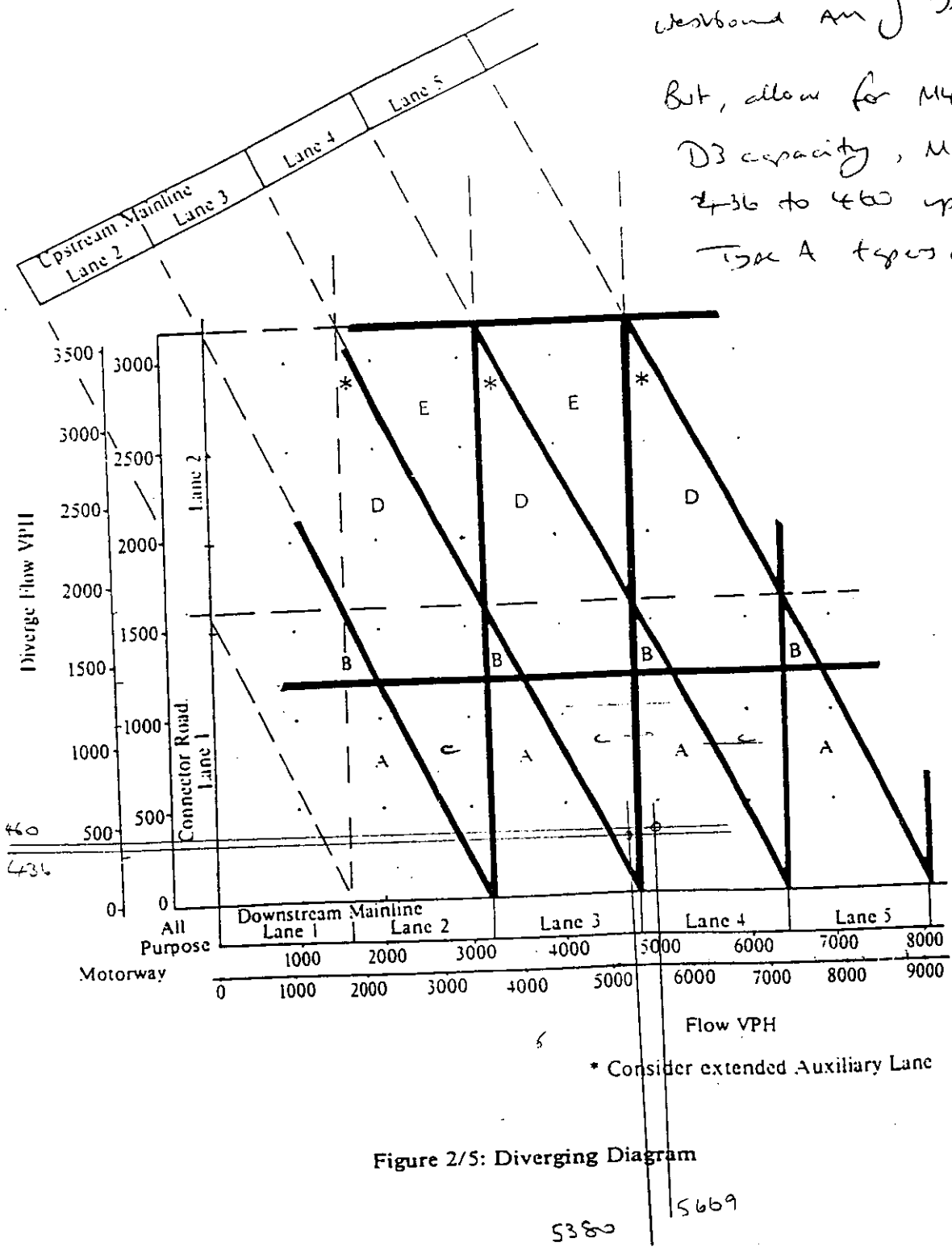


Figure 2/5: Diverging Diagram

5380
5669

Eastbound AM, Westbound PM } Type D (3.4).

Eastbound PM, Westbound AM } Type A (4.4).

But, allow for M4 operating at capacity, MSA flows @ 430 to 460 vph ⇒ basic Type A taper is satisfactory.

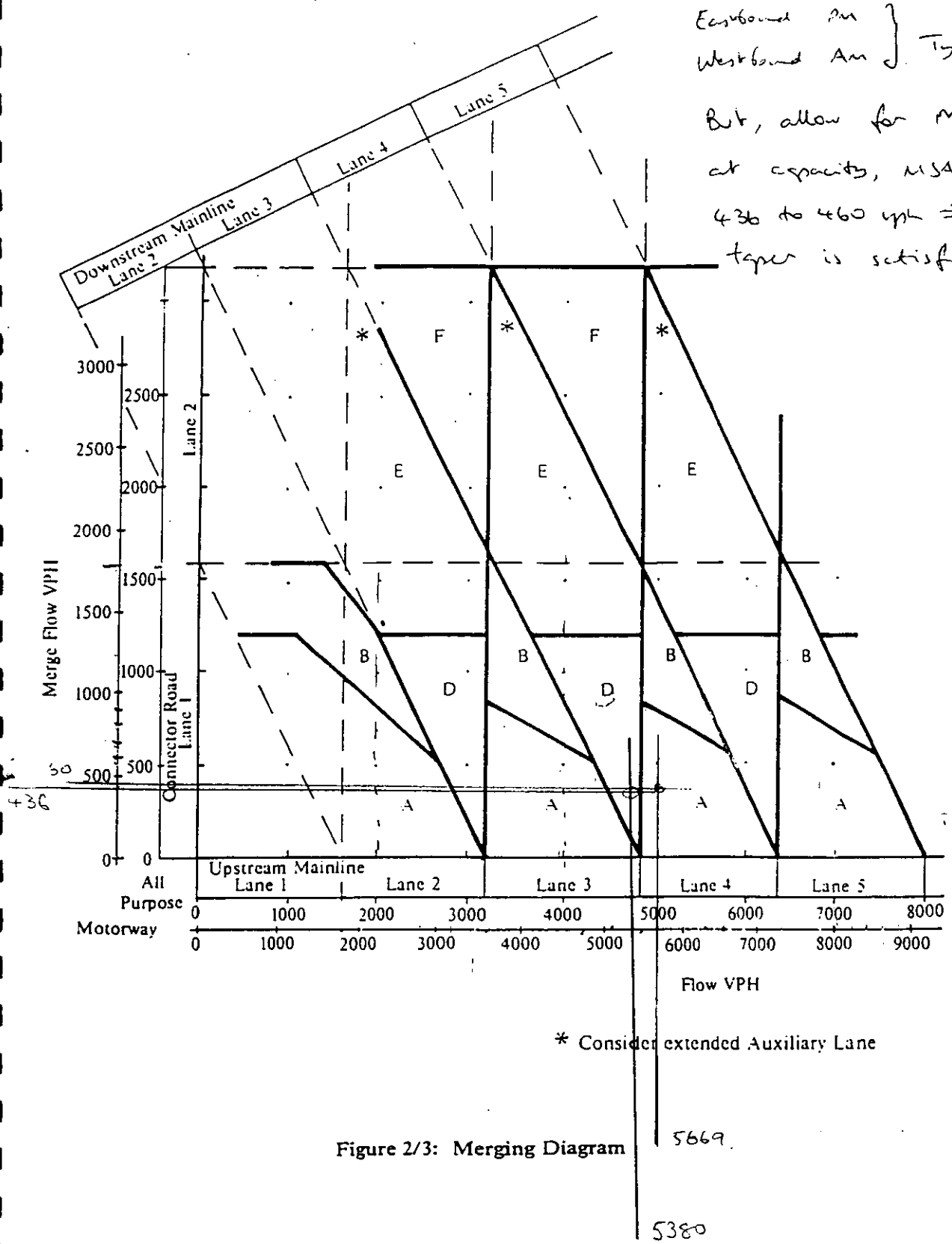


Figure 2/3: Merging Diagram

APPENDIX C

ARCADY ASSESSMENTS

Mr D Rounthwaite
Highways Agency
Southern Network Management Division
Federated House
London Road
Dorking
RH4 1SZ

Our ref: HSL00062/SPD/NM/009

11 April 1997

Dear Douglas,

PROPOSED MOTORWAY SERVICE AREA (MSA)
M4 GREAT WOOD, MAIDENHEAD

I refer to your letter dated 10 April 1997 regarding the above.

As requested, please find enclosed copies of our ARCADY calculations for each of the MSA access scheme proposals, as follows:-

i) Drawing No. HSL00062/1 - westbound only access

ii) Drawing No. HSL00062/2 - all-moves access

You will note that each roundabout has more than adequate capacity.

The above drawings will be given to the local planning authority and I assume that, as you already have copies of these, we need not provide you with any more.

We look forward to receipt of the draft conditions at your earliest convenience.

Yours sincerely

Steve Dudhill
Director
for Highway Solutions Limited

Enc

cc A Finch

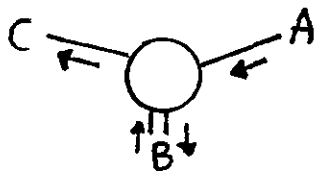
HSL

SWAYFIELDS LIMITED

PROPOSED MOTORWAY SERVICE AREA, M4 MAIDENHEAD

MSA INTERNAL ROUNDABOUT CAPACITY CALCULATIONS

i) **Westbound Only Scheme**



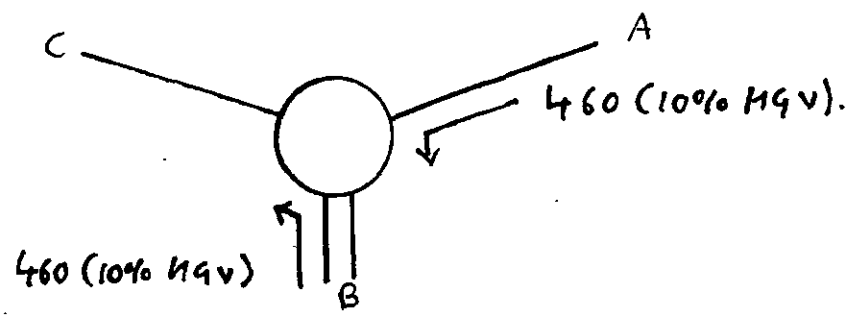
A = M4 westbound off-slip
B = MSA access/egress
C = M4 westbound on-slip

ARM	v	e	l	r	Ø	D	Max RFC	Max Q
A	3.7m	6.5m	6.5m	25m	60°	50m	0.425	1
B	6.6m	7.0m	2.0m	18m	40°	50m	0.286	0
C	*	*	*	*	*	*	-	-

(Geometric inputs measured from drawing number HSL00062/1)

* Exit only, therefore dummy values used.

Traffic Data : Apply worst case hourly flow to all arms, ie:-



D E P A R T M E N T O F T R A N S P O R T

TRANSPORT RESEARCH LABORATORY

(C) CROWN COPYRIGHT 1991

CAPACITIES, QUEUES, AND DELAYS AT ROUNDABOUTS

PROGRAM ARCADY/3

RELEASE 1.3 (NOVEMBER 1993)

FOR PROGRAM ADVICE AND MAINTENANCE CONTACT:-
MAINTENANCE CONTRACTOR LISTED IN USER GUIDE

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CONTACT TRL, Tel: CROWTHORNE (0344) 770176

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HSL00062: M4 MAIDENHEAD WESTBOUND ONLY MSA ROUNDABOUT (File:M4WB)

ROUNDABOUT CAPACITY AND DELAY

INPUT DATA

ARM A - M4 WESTBOUND OFF SLIP
ARM B - MSA ACCESS/EGRESS
ARM C - M4 WESTBOUND ON SLIP

0GEOMETRIC DATA

I ARM	V (M)	E (M)	L (M)	R (M)	D (M)	PHI (DEG)	SLOPE	INTERCEPT (PCU/MIN)
I ARM A	3.70	6.50	6.50	25.00	50.00	60.0	0.513	22.307
I ARM B	6.60	7.00	2.00	18.00	50.00	40.0	0.652	33.175
I ARM C	3.00	6.00	6.00	20.00	50.00	30.0	0.525	20.977

HSL00062: M4 MAIDENHEAD WESTBOUND ONLY MSA ROUNDABOUT (File:M4WB)

0TRAFFIC DEMAND DATA

0TIME PERIOD BEGINS 07.45 AND ENDS 09.15
0LENGTH OF TIME PERIOD - 90 MINUTES.
LENGTH OF TIME SEGMENT - 10 MINUTES.

0
DEMAND FLOW PROFILES ARE SYNTHESISED FROM TURNING COUNT DATA

ARM	NUMBER OF MINUTES FROM START WHEN FLOW STARTS TO RISE	TOP OF PEAK IS REACHED	FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	AT TOP OF PEAK	AFTER PEAK
ARM A	15.00	45.00	75.00	5.75	8.63	5.75
ARM B	15.00	45.00	75.00	5.75	8.63	5.75
ARM C	15.00	45.00	75.00	0.00	0.00	0.00

HSL00062: *M4 MAIDENHEAD WESTBOUND ONLY MSA ROUNDABOUT (File:M4WB)*

TURNING PROPORTIONS

TURNING COUNTS (VEH/HR)

(PERCENTAGE OF H.V.S)

TIME	FROM/TO	ARM A	ARM B	ARM C
07.45 - 09.15	ARM A	0.000	1.000	0.000
		0.0	460.0	0.0
		(0.0)	(10.0)	(0.0)
	ARM B	0.000	0.000	1.000
		0.0	0.0	460.0
		(0.0)	(0.0)	(10.0)
	ARM C	0.000	0.000	0.000
		0.0	0.0	0.0
		(0.0)	(0.0)	(0.0)

0TURNING PROPORTIONS ARE CALCULATED FROM TURNING COUNT DATA

0*THE PERCENTAGE OF HEAVY VEHICLES VARIES OVER TURNING MOVEMENTS*

HSL00062: M4 MAIDENHEAD WESTBOUND ONLY MSA ROUNDABOUT (File:M4WB)

QUEUE AND DELAY INFORMATION FOR EACH 10 MIN TIME SEGMENT

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
07.45-07.55								
ARM A	5.75	20.28	0.284		0.0	0.4	3.8	
ARM B	5.75	30.16	0.191		0.0	0.2	2.3	
ARM C	0.00	20.98	0.000		0.0	0.0	0.0	
07.55-08.05								
ARM A	5.75	20.28	0.284		0.4	0.4	3.9	
ARM B	5.75	30.16	0.191		0.2	0.2	2.3	
ARM C	0.00	20.98	0.000		0.0	0.0	0.0	

08.05-08.15							
ARM A	7.20	20.28	0.355	0.4	0.5	5.3	
ARM B	7.20	30.16	0.239	0.2	0.3	3.1	
ARM C	0.00	20.98	0.000	0.0	0.0	0.0	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.15-08.25								
ARM A	8.25	20.28	0.407		0.5	0.7	6.6	
ARM B	8.25	30.16	0.273		0.3	0.4	3.7	
ARM C	0.00	20.98	0.000		0.0	0.0	0.0	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.25-08.35								
ARM A	8.63	20.28	0.425		0.7	0.7	7.2	
ARM B	8.63	30.16	0.286		0.4	0.4	3.9	
ARM C	0.00	20.98	0.000		0.0	0.0	0.0	

HSL00062: M4 MAIDENHEAD WESTBOUND ONLY MSA ROUNDABOUT (File:M4WB)

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.35-08.45								
ARM A	8.25	20.28	0.407		0.7	0.7	7.0	
ARM B	8.25	30.16	0.273		0.4	0.4	3.8	
ARM C	0.00	20.98	0.000		0.0	0.0	0.0	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.45-08.55								
ARM A	7.20	20.28	0.355		0.7	0.6	5.7	
ARM B	7.20	30.16	0.239		0.4	0.3	3.2	
ARM C	0.00	20.98	0.000		0.0	0.0	0.0	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.55-09.05								
ARM A	5.75	20.28	0.284		0.6	0.4	4.1	
ARM B	5.75	30.16	0.191		0.3	0.2	2.4	
ARM C	0.00	20.98	0.000		0.0	0.0	0.0	

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
09.05-09.15								
ARM A	5.75	20.28	0.284		0.4	0.4	4.0	
ARM B	5.75	30.16	0.191		0.2	0.2	2.4	
ARM C	0.00	20.98	0.000		0.0	0.0	0.0	

HSL00062: M4 MAIDENHEAD WESTBOUND ONLY MSA ROUNDABOUT (File:M4WB)

QUEUE AT ARM A

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE	
07.55	0.4	
08.05	0.4	
08.15	0.5	*
08.25	0.7	*
08.35	0.7	*
08.45	0.7	*
08.55	0.6	*
09.05	0.4	
09.15	0.4	

HSL00062: M4 MAIDENHEAD WESTBOUND ONLY MSA ROUNDABOUT (File:M4WB)

QUEUE AT ARM B

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
07.55	0.2
08.05	0.2
08.15	0.3
08.25	0.4
08.35	0.4
08.45	0.4
08.55	0.3
09.05	0.2
09.15	0.2

HSL00062: M4 MAIDENHEAD WESTBOUND ONLY MSA ROUNDABOUT (File:M4WB)

QUEUE AT ARM C

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
07.55	0.0
08.05	0.0
08.15	0.0
08.25	0.0
08.35	0.0
08.45	0.0
08.55	0.0
09.05	0.0
09.15	0.0

HSL00062: M4 MAIDENHEAD WESTBOUND ONLY MSA ROUNDABOUT (File:M4WB)

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

ARM	TOTAL DEMAND		* QUEUEING * DELAY *		* INCLUSIVE QUEUEING * DELAY *	
	(VEH)	(VEH/H)	(MIN)	(MIN/VEH)	(MIN)	(MIN/VEH)
A	625.2	416.8	47.6	0.08	47.6	0.08
B	625.2	416.8	27.1	0.04	27.1	0.04
C	0.0	0.0	0.0	0.00	0.0	0.00
ALL	1250.4	833.6	74.7	0.06	74.7	0.06

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD.
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL ONLY BE SIGNIFICANTLY DIFFERENT IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

END OF JOB

HSL

APPENDIX D

SITE ACCESS SCHEME
DRAWING NUMBER HSL00062/1

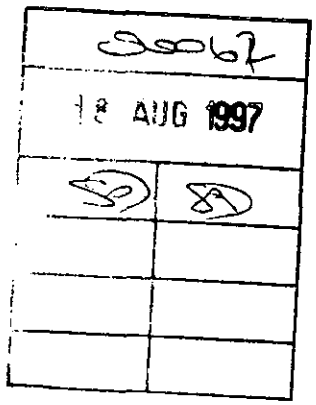
APPENDIX E

HA LETTER DATED 14 AUGUST 1997

HIGHWAYS AGENCY

wing 2a
Federated House
London Road
Dorking RH4 1SZ

Our ref: MSE858/757
Your ref:



Mr S Dudhill
Highway Solutions Ltd
44 High Pavement
The Lace Market
NOTTINGHAM
NG1 1HW

Direct Line: 01306 878313
Fax: 01306 878299
Switchboard: 0645 55 65 75

14 August 1997

Dear Mr Dudhill

MSA APPLICATIONS AT GREAT WOOD M4 J 8/9-10

Thank you for your fax of 12 August following our telephone conversation. I was concerned that some applicants tend to offer a layout well below standards without the reasoning to justify its safety. Also, no two sites are the same. As well as my responsibility for the safety of users leaving our network at high speed to go into the MSA, you understood the need to justify the layout on private land to the planning authority and third parties. I confirm that your explanation is acceptable and accept that a satisfactory underpass connection to the M4 could be achieved within your red line area [appl'n 30836], as of course can a single sided layout [appl'n 30837]. Further, I visited the area and accept that, due to various weight restrictions on local roads, and the nature of the area, the great majority of construction access can be by the Motorway, assuming adequate mud control.

Thereafter, it is my understanding [our meeting notes are not clear] that you want emergency services access only from the local roads, only if that is requested by the emergency services [They may well do so eventually].

Thus the conditions that I propose to direct would seem to be

1. No building operations shall commence until the access has been constructed in accordance with the approved drawing and in compliance with the requirements of the Secretary of State for transport for work carried out in the highway. [This is essentially identical to the agreed condition for Great hazes at appeal]

2. No rear or onward vehicular access shall be provided other than in accordance with approved plans for use by personnel of the emergency services on duty.

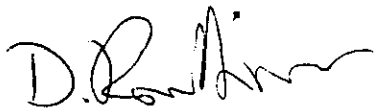
3. No part of the development shall be open for use unless traffic signs to it are in place on the motorway.

The reasons for all would be safety and free flow of traffic. Comments please

POSITIVE ABOUT DISABLED PEOPLE
An Executive Agency of THE DEPARTMENT OF TRANSPORT

I have not yet seen the transport aspects of the environmental statement [assuming there are some] and remind Mrs Snell by copy of this letter. I would prefer to do so before issuing the direction of conditions. I also need confirmation that the planning authority is certain you are only proceeding with the underpass solution.

Yours sincerely



Douglas Rounthwaite
Area 5 team

cc Rust M KIllin S Snell RBWM

APPENDIX F

HA LETTER DATED 22 DECEMBER 1997

HIGHWAYS AGENCY

wing 2a
Federated House
London Road
Dorking RH4 1SZ

Our ref: MSE/SU/858/757
Your ref: 30836, 30837

Mrs S Snell
Directorate of Planning
Royal Borough of Maidenhead and Windsor Council
Aston House York Road
MAIDENHEAD
Berks SL6 1PS

Direct Line: 01306 878313
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22 December 1997

Dear Mrs Snell

2 OUTLINE APPLICATIONS FOR MSAs, GREAT WOOD, WHITE WALTHAM M4 J8/9-10

The copy of my letter of 14 August to Highway Solutions ltd should have answered much of your letter of 26 August, concerning Swayfields' of 13 August. The only additional point that need be made concerns 4.1. I have proposed to all applicants that the peak hour "turn in" proportion to the MSA is calculated as my letter of 5 December 1996, which gives a little less than 7.5% of a weekday peak hour; no applicant has disagreed, and of course Great Hazes and Holyport sites were judged on this. Highway Solutions has not commented in writing on my letter of 14 August, and orally I understand they are content.

I have a copy of Swayfields traffic statement [their letter to us of 12 November], which presumably is part of the applications. Para 1.4 is a curious mis-statement of the position. As TPK would be aware, the M4 was built in the early 1970s and our design standards have changed since, so it might be that it does not conform to all current standards. TPK have not asked us if we have checked it to current standards, and we do not have that information. In any event, this seems of little consequence. On 1.5, it should be borne in mind that the emergency services might well ask for a connection of local roads, and it would be worth considering pedestrian and cycle access for workers, given PPG13.

For much of the year it was unclear if Swayfields was proposing in the application an underbridge, or overbridge, or either, to serve the 2 sided MSA [30836]. I understand that the application is now clearly for an underbridge only. I can therefore give you the HA's conclusive response, namely the directions of conditions attached; you saw these in my letter of 14 August, and as noted there, the access condition is as collectively put to the Inspector for the Great Hazes site. In addition we would recommend you apply a condition requiring adequate measures to prevent mud and dust being deposited on highways by vehicles leaving the site, the reason being road safety.

As I will now hand over any further HA involvement to my colleague Muriel Killin, Stuart Brook and I thank you for your co-operation and help. We thank the council for accommodating the Appeal Inquiry so well.

An Executive Agency of THE DEPARTMENT OF TRANSPORT

I confirm your advice that Swayfields have now appealed against non-determination. Please let us know your decisions on the applications. Please let us know the date for any appeal Inquiry. We might want to make a representation to the Inspector on conditions, but of course we would discuss them with you first.

Yours sincerely



Douglas Rounthwaite
Area 5 team

cc Kennedy and Donkin
TPK
HSL

Highways Agency

TR 110
(SNCS Rev Apr 1997)

Form of Notification by the Secretary of State for Transport Relating to an Application for Permission For

Development Affecting Trunk (including Special) Roads

To the Director of Planning

Royal Borough of Windsor and Maidenhead Council

Council's Ref: 96/30836

SNMD Ref: MSE/SU/858/757

With reference to the notification of an application on Form TR 108 dated 20/1/96 relating to the following proposed development:

1 a **National Grid Reference of a central point on site:**

	Horizontal			Vertical		
SU	8	5	8	7	5	7

b **Address or location:**
land adjacent Great Wood and M4 Motorway, Maidenhead Berkshire

2 **Name and classification number of affected road(s):** M4 London - South Wales

3 **Applicant's or agent's name and address:** Swayfields Ltd
1 Castle Hill LINCOLN LN1 3AA

4 **Date of receipt of application:** 28 November 1996

5 **Particulars of development and/or change of use as shown on plan number:** 133m/1 **dated:** October 1996.
motorway service area to serve both carriageways of M4

6 Outline Application.

Notice is hereby given under Article 14 of The Town and Country Planning (General Development Procedure) Order 1995 (SI 1995/419) that the Secretary of State for Transport directs that any permission which the Planning Authority may give shall include the conditions shown overleaf, for the reasons shown.

Signed by authority of the Secretary of State

Date: 22 December 1997

Signed: D. Rounthwaite

Douglas Rounthwaite
Engineer
HIGHWAYS AGENCY

c:\data\user-wp\tr110gro.txt

CONDITION(S) to be attached to any permission the Council may give

1. No building operations to commence until the access has been constructed in accordance with the approved drawing and in compliance with the requirements of the Secretary of state for Transport for work carried out in the highway.

2. No rear or onward vehicular access shall be provided other than in accordance with approved plans for use by personnel of the mergency services on duty.

3. No part of the development shall be open for use unless traffic signs to it are in place on the motorway.

REASON(S) for the direction overleaf

The safety and free flow of highway traffic.

Highways Agency

TR 110
(SNCS Rev Apr 1997)

Form of Notification by the Secretary of State for Transport Relating to an Application for Permission For

Development Affecting Trunk (including Special) Roads

To the Director of Planning

Council's Ref: 96/30837

Royal Borough of Windsor and Maidenhead Council

SNMD Ref: MSE/SU/858/757

With reference to the notification of an application on Form TR 108 dated 20/1/96 **relating to the following proposed development:**

		Horizontal			Vertical		
1 a **National Grid Reference of a central point on site:**	SU	8	5	8	7	5	7

b **Address or location:**
land adjacent Great Wood and M4 Motorway, Maidenhead Berkshire

2 **Name and classification number of affected road(s):** M4 London - South Wales

3 **Applicant's or agent's name and address:** Swayfields Ltd
1 Castle Hill LINCOLN LN1 3AA

4 **Date of receipt of application:** 28 November 1996

5 **Particulars of development and/or change of use as shown on plan number:** 133m/3 **dated:** October 1996.
motorway service area to serve westbound carriageway of M4

6 Outline Application.

Notice is hereby given under Article 14 of The Town and Country Planning (General Development Procedure) Order 1995 (SI 1995/419) that the Secretary of State for Transport directs that any permission which the Planning Authority may give shall include the conditions shown overleaf, for the reasons shown.

Signed by authority of the Secretary of State

Date: 22 December 1997

Signed: D Rounthwaite

Douglas Rounthwaite
Engineer
HIGHWAYS AGENCY

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REASON(S) for the direction overleaf

The safety and free flow of highway traffic.

APPENDIX G

CIRCULAR 1/94 REQUIREMENTS

SWAYFIELDS LIMITED

HSL

PROPOSED MOTORWAY SERVICE AREA (MSA), M4J8/9-10, MAIDENHEAD

CIRCULAR 1/94 ASSESSMENT

Based on methodology agreed with the HA elsewhere, the Circular 1/94 requirements can be determined using the congestion reference flow (CRF).

The CRF for M4J8/9-10, Maidenhead is as follows:-

Capacity = 2300 – (25 x 11) = 2025 vph (based on AADT HGV%)

NL = 3

Wf = 1.0

PkF = 7.4 (allowing for peak spreading)

PkD = 50%

AADT/AAWT = 0.96 (allowing for peak spreading)

(CRF estimation methodology as agreed at M42J5 and M6J22)

Thus,

$$CRF = 2025 \times 3 \times 1.0 \times \frac{100}{7.4} \times \frac{100}{50} \times 0.96$$

= 157622 AADT

Hence, the Circular 1/94 requirements based on the CRF value are:-

i)	Cars	= 157622 x 0.89 x 0.005	= 701 spaces
ii)	HGVs	= 157622 x 0.11 x 0.0035	= 61 spaces
iii)	Coaches	= 157622 x 0.11 x 0.001	= 17 spaces

Thus, for the westbound-only MSA scheme, the C1/94 requirements are half of the above calculation (ie):-

i)	Cars	= 351
ii)	HGVs	= 31
iii)	Coaches	= 9