

LIVERPOOL

GREEN INFRASTRUCTURE STRATEGY

TECHNICAL DOCUMENT

VERSION 1.0



CONTENTS

1. INTRODUCTION AND BACKGROUND	14
1.1. Introduction	14
1.2. Project Outcomes.....	16
1.3. Project Outputs.....	17
2. WHAT IS GREEN INFRASTRUCTURE?	18
2.1. Introduction to Green Infrastructure	18
2.2. Describing Green Infrastructure.....	19
2.3. Related Projects	22
3. DEVELOPING THE STRATEGY	25
3.1. Methodology.....	25
4. STEP 1 – PRIORITIES, STAKEHOLDERS, POLICY & EVIDENCE	26
4.1. Priorities	26
4.2. Stakeholder Engagement.....	26
4.3. Policy Context	27
4.4. Northwest England and Sub-Regional Evidence, Policy and Strategies	33
5. KEY ISSUES RELATED TO THE GREEN INFRASTRUCTURE PRIORITIES FOR LIVERPOOL	41
5.1. Introduction	41
6. SUPPORTING SUSTAINABLE HOUSING GROWTH AND REGENERATION	42
6.1. Economy	42
6.2. Culture and Tourism	43
6.3. Quality of Place	43
6.4. Transport and Accessibility	46
6.5. Housing	46
6.6. Wider Regeneration	51
7. IMPROVING HEALTH ACROSS THE CITY	53
7.1. Health Inequality	53
7.2. Mental Health.....	54
7.3. Quality of Life.....	56
8. TACKLING CLIMATE CHANGE.....	58
8.1. Climate Change Impacts	58
8.2. Climate Change Adaptation	62
9. IMPROVING BIODIVERSITY	64
9.1. Current Biodiversity	64
10. DESIGN AND MANAGEMENT QUALITY	66
10.1. Sustainable Development	66
11. THE EVIDENCE TO SUPPORT GREEN INFRASTRUCTURE ACTIONS FOR EACH OF THE PRIORITIES AND ISSUES	72
11.1. Introduction	72
11.2. A Sustainable City.....	72
11.3. A City Providing Natural Choices for Health.....	75
11.4. A Cool City.....	79
11.5. A Green and Biodiverse City.....	84
12. LINKING ISSUES, EVIDENCE & POLICY	87

12.1. Key linkages	87
12.2. Information Gathering on Liverpool's Green Infrastructure - Steps 2-4	96
12.3. Historical Context	96
12.4. Identifying Typology	98
12.5. Identifying Function	113
12.6. Identifying Need	120
12.7. Identifying Assets.....	123
13. STEP 5 – IMPLEMENTATION PLAN	126
13.1. Introduction.....	126
13.2. Analysis and Action Development.....	129
13.3. Developing Actions	138
13.4. Locating Issues and Actions	141
13.5. PRIORITY 1: A Sustainable City	149
13.6. PRIORITY 2: A City Providing Natural Choices for Health.....	161
13.7. PRIORITY 3: A Cool City.....	178
13.8. PRIORITY 4: A Green and Biodiverse City	190
13.9. PRIORITY 5: A City where Green Infrastructure is Well-Planned and Designed	198
13.10. Recommendations	201
14. APPENDIX 1 – METHODOLOGY FOR STEPS 2 – 4	206
14.1. Mapping Methodology	206
14.2. Typology	206
14.3. Functionality	212
14.4. Benefits	220
14.5. Needs.....	223
14.6. Targeting	225
14.7. Mapping.....	227
14.8. Functions Maps	230
14.9. Needs Maps	258
14.10. Assets Maps	286
15. APPENDIX 2 LIVERPOOL KNOWLEDGE QUARTER PROJECT SUMMARY	314
15.1. Introduction.....	314
15.2. Assessment of Typology.....	314
15.3. Climax Plan.....	314
15.4. Functionality	315
16. APPENDIX 3 GREEN INFRASTRUCTURE INDEX	317
16.1. What is the Green Infrastructure Index?.....	317
16.2. Green Infrastructure Score	317
17. APPENDIX 4 POLICY SUPPORT	325
17.1. Policy Review	325
17.2. Support for Green Infrastructure	327
17.3. Support for Green Infrastructure Functions	328
17.4. Support for Green Infrastructure Benefits.....	330
18. APPENDIX 5 ANALYSIS & ACTIONS	331
18.1. Introduction	331
18.2. PRIORITY 1: A Sustainable City.....	332
18.3. PRIORITY 2: A City Providing Natural Choices for Health.....	347
18.4. PRIORITY 3: A Cool City	370
18.5. PRIORITY 4: A Green and Biodiverse City	388
19. APPENDIX 6 LOGIC CHAIN	395
19.1. Logic Chain Development	395

20. APPENDIX 7 GREEN ROOFS STUDY FOR LIVERPOOL	396
20.1. Green Roof Study Overview.....	396
21. APPENDIX 8 HOUSING GROWTH AND GROWTH POINTS	397
21.1. Introduction.....	397
21.2. Population Growth in the Growth Point Areas	399
21.3. Current Green Infrastructure of the Growth Point area and SHLAA sites	401
21.4. Existing Green Infrastructure Assets	408
21.5. The Need for Additional Functionality Around the SHLAA Sites.....	410
21.6. Actions in the Growth Point Wards	412
21.7. Conclusion	414
22. APPENDIX 9 STORYLINES FOR THE CORE STRATEGY SUB AREAS AND THE NEIGHBOURHOOD MANAGEMENT AREAS	415
22.1. Introduction	415
22.2. City Centre Core Strategy Sub Area	416
22.3. Inner Area Core Strategy Sub Area.....	417
22.4. Outer Area Core Strategy Sub Area	418
22.5. Alt Valley Neighbourhood Management Area	419
22.6. City and North Neighbourhood Management Area	420
22.7. Liverpool East Neighbourhood Management Area	421
22.8. South Central Neighbourhood Management Area	422
22.9. South Liverpool Neighbourhood Management Area	423

TABLE OF FIGURES

Figure 1 Targets to influence.....	15
Figure 2 The eleven economic benefits of green infrastructure.....	20
Figure 3 Type to benefit	20
Figure 4 Simple example of the green infrastructure web from type to value	21
Figure 5 Five Step process for strategy development	25
Figure 6 Sustainability framework.....	37
Figure 7 Employment, deprivation and worklessness in Liverpool.....	43
Figure 8 Elements that make up quality of place (World Class Places document)	44
Figure 9 Transport and access statistics for Liverpool	46
Figure 10 Selected health data for Liverpool	53
Figure 11 Liverpool health indicators.....	54
Figure 12 Proportion of respondents with low, moderate and high mental wellbeing, Northwest PCT areas.....	54
Figure 13 Socio-economic stress and its impacts on health - taken from the Joint Strategic Framework for Public Mental Health 2009-2012.....	56
Figure 14 Projected change in mean temperature	59
Figure 15 projected change in maximum temperature.....	59
Figure 16 Projected change in precipitation on the wettest day	60
Figure 17 Distribution of value categories by Neighbourhood Management Area	69
Figure 18 Distribution of proportional value categories by Core Strategy Sub Area.....	70
Figure 19 Proportion of open space in Liverpool in each of the value categories.	71
Figure 20 Model for Lifestyle change - from “Lightening the Load”	76
Figure 21 Climate change mitigation and adaptation services provided by green infrastructure.....	79
Figure 22 Relationship between green infrastructure and maximum surface temperature	81
Figure 23 Effect of natural and impervious surfaces on the hydrological cycle.....	83
Figure 24 Assessment of policy support for green infrastructure.....	87
Figure 25 The percentage cover of green infrastructure types by neighbourhood management area (Legend on page 101)	104
Figure 26 Typology by Core Strategy Sub Area	110
Figure 27 Typology by Strategic Investment Area	111
Figure 28 Typology by fringe housing areas.....	112
Figure 29 Function by neighbourhood management area – percentage of land in each neighbourhood management area delivering each of the 28 functions	116
Figure 30 Function by Core Strategy Sub Areas	118
Figure 31 Logic chain showing the process of developing the recommendations and actions	128
Figure 32 Proportion (%) of issues identified by Neighbourhood Management Area	146
Figure 33 Total number of issues by ward.....	147
Figure 34 Hospitalised prevalence of mental health conditions and percentage green infrastructure cover in Liverpool.....	169
Figure 35 Coronary heart disease and accessible green infrastructure in Liverpool.....	170
Figure 36 Nitrous oxides air pollution and percentage green infrastructure cover	173
Figure 37 Air quality score and green infrastructure cover	173
Figure 38 Total targeting score for health in the main Core Strategy areas	175
Figure 39 Examples of green infrastructure for city cooling in the City Centre	186
Figure 40 The achievability and impact of the actions	204

Figure 41 The opportunity and availability of funding for each of the actions (annotations are action numbers)	205
Figure 42 Potential lead agencies for actions	205
Figure 43 Supportive documents	328
Figure 44 Documents per green infrastructure function.....	329
Figure 45 Number of documents supportive of each green infrastructure benefit	330
Figure 46 Logic chain	395
Figure 47 Typology of the growth point wards.....	401
Figure 48 Typology of the SHLAA sites in the growth point wards (percentage of total area of SHLAA sites)	405
Figure 49 Typology of the SHLAA sites in the growth point wards (percentage of total area of the SHLAA sites) with not GI removed	406

TABLE OF TABLES

Table 1 Green infrastructure strategy documents	17
Table 2 Regional support for green infrastructure	19
Table 3 Relates green infrastructure frameworks, strategies and plans	23
Table 4 Extract from Healthy Weight Healthy Liverpool – Actions	31
Table 5 Population density levels by ward based on estimated population growth from 2008 through to 2024	47
Table 6 Climate change impacts	58
Table 7 Susceptibility to reduced evaporative cooling	62
Table 8 Area (ha) of the open space value categories across the city Neighbourhood Management Areas	68
Table 9 Proportional area of the open space value categories across the city Neighbourhood Management Areas (percentage)	68
Table 10 Area (ha) of open space value categories across the city Core Strategy Sub Areas	69
Table 11 Proportional area of the open space value categories across the city Core Strategy Sub Areas (percentage)	70
Table 12 Linking issues to evidence	89
Table 13 Typology, area and percentage	98
Table 14 Percentage typology cover by neighbourhood and ward	103
Table 15 Green infrastructure percentages in Core Strategy Sub Areas	107
Table 16 Percentage typology distribution across the Core Strategy Sub Areas	108
Table 17 Derelict land typology	113
Table 18 Functions most relevant for the four priorities identified	114
Table 19 Function by neighbourhood (percentages)	115
Table 20 Function by Core Strategy Sub Area (percentage)	116
Table 21 Priorities and alternative titles	127
Table 22 Sustainable development and the Liverpool Green Infrastructure Strategy	128
Table 23 Summary of findings in Steps 2 to 4 for the Liverpool Green Infrastructure Strategy by Neighbourhood Management Area	130
Table 24 Summary of findings in Steps 2 to 4 for the Liverpool Green Infrastructure Strategy by Core Strategy Sub Area	133
Table 25 Appropriate interventions for each neighbourhood management area	140
Table 26 Green Infrastructure functions to address issues by Core Strategy Sub Area	142
Table 27 Green infrastructure functions to address issues by Neighbourhood Management Area	144
Table 28 Priority 1: Targeting score for each action by Core Strategy Sub Area	158
Table 29 Priority 2: Targeting score for each action by Core Strategy Sub Area	175
Table 30 Mitigation and adaptation services of green infrastructure	184
Table 31 Priority 3: Targeting score for each action by Core Strategy Sub Area	187
Table 32 Priority 4: Targeting score for each action by Core Strategy Sub Areas	195
Table 33 Linking typology and function	216
Table 34 Function and benefit matrix	221
Table 35 Function and objective matrix	222
Table 36 Thresholds for identification of need	223
Table 37 Targeting criteria by MSOA	226
Table 38 Data sources	227
Table 39 Surface type scores	317
Table 40 Green infrastructure interventions and their associated benefits	318

Table 41 Growth point challenges and opportunities and potential green infrastructure contributions.....	398
Table 42 Growth point ward population projections.....	401
Table 43 Green Infrastructure typology of the SHLAA sites in the growth point wards	402
Table 44 Targeting actions in the growth point wards	412

TABLE OF MAPS

Map 1 Gateways and strategic road network for Liverpool	45
Map 2 Core Strategy areas and sub-areas.....	49
Map 3 Liverpool population density 2008	50
Map 4 Liverpool projected population density 2014	50
Map 5 Liverpool projected population density 2024.....	50
Map 6 Assessment of site value collated as part of the Open Space Study for the city.	67
Map 7 The distribution and type of green infrastructure across the city.	99
Map 8 Green infrastructure resource in Liverpool excluding private gardens	100
Map 9 Location of Neighbourhood management areas	102
Map 10 Liverpool's multifunctional green infrastructure	119
Map 11 Greatest need for water interception.....	121
Map 12 Water interception need and function.....	122
Map 13 Green Infrastructure assets – green infrastructure that fulfils identified greatest needs.....	124
Map 14 Number of needs unfulfilled at present	125
Map 15 Targeting for all priorities.....	143
Map 16 Multifunctionality: A Sustainable City	151
Map 17 Targeting of actions for Priority 1 issues across Super Output Areas.....	152
Map 18 Total targeting score for Priority 1 by Core Strategy Sub Area	159
Map 19 Needs unfulfilled at present for Priority 1	160
Map 20 Multifunctionality: A City Providing Natural Choices for Health.....	163
Map 21 Targeting of actions for Priority 2 issues across Super Output Areas	164
Map 22 Links between health and well being multifunctionality and poor health	168
Map 23 Tree Density in relation to PM10 data	171
Map 24 Total targeting score for Priority 2 by Core Strategy Sub Area	176
Map 25 Number of needs unfulfilled at present for Priority 2.....	177
Map 26 Multifunctionality: A Cool City.....	180
Map 27 Targeting of actions for Priority 3 issues across Super Output Areas.....	181
Map 28 Total targeting score for Priority 3 by Core Strategy Sub Area	188
Map 29 Number of needs unfulfilled at present for Priority 3.....	189
Map 30 Multifunctionality: A Green and Biodiverse City	191
Map 31 Targeting of actions for Priority 4 issues across Super Output Areas	192
Map 32 Total targeting score for Priority 4 by Core Strategy Sub Area	196
Map 33 Number of needs unfulfilled at present	197
Map 34 Typology of green infrastructure in Liverpool.....	211
Map 35 Accessible Water Storage Function	230
Map 36 Aesthetic Function.....	231
Map 37 Biofuels Production Function	232
Map 38 Carbon Storage Function	233
Map 39 Coastal Storm Protection Function	234
Map 40 Corridor for Wildlife Function.....	235
Map 41 Cultural Asset Function	236
Map 42 Evaporative Cooling Function	237
Map 43 Flow Reduction Through Surface Roughness Function	238
Map 44 Food Production Function	239
Map 45 Green Travel Route Function.....	240
Map 46 Habitat for Wildlife Function	241
Map 47 Heritage Function	242
Map 48 Inaccessible Water Storage Function.....	243

Map 49 Learning Function	244
Map 50 Noise Absorption Function	245
Map 51 Pollutant Removal From Soil/Water Function	246
Map 52 Recreation – Private Function	247
Map 53 Recreation – Public Function	248
Map 54 Recreation – Public with Restrictions Function.....	249
Map 55 Shading from the Sun Function	250
Map 56 Soil Stabilisation Function	251
Map 57 Timber Production Function.....	252
Map 58 Trapping Air Pollutants Function.....	253
Map 59 Water Conveyance Function	254
Map 60 Water Infiltration Function	255
Map 61 Water Interception Function.....	256
Map 62 Wind Shelter Function	257
Map 63 Greatest Need for Accessible Water Storage.....	258
Map 64 Greatest Need for Aesthetic	259
Map 65 Greatest Need for Biofuels Production.....	260
Map 66 Greatest Need for Carbon Storage.....	261
Map 67 Greatest Need for Coastal Storm Protection.....	262
Map 68 Greatest Need for Corridor for Wildlife	263
Map 69 Greatest Need for Cultural Asset	264
Map 70 Greatest Need for Evaporative Cooling.....	265
Map 71 Greatest Need for Flow Reduction Through Surface Roughness.....	266
Map 72 Greatest Need for Food Production	267
Map 73 Greatest Need for Green Travel Route	268
Map 74 Greatest Need for Habitat for Wildlife	269
Map 75 Greatest Need for Heritage.....	270
Map 76 Greatest Need for Inaccessible Water Storage.....	271
Map 77 Greatest Need for Learning	272
Map 78 Greatest Need for Noise Absorption.....	273
Map 79 Greatest Need for Pollutant Removal from Soil/Water	274
Map 80 Greatest Need for Recreation - Private	275
Map 81 Greatest Need for Recreation - Public	276
Map 82 Greatest Need for Recreation – Public with Restrictions.....	277
Map 83 Greatest Need for Shading from the Sun	278
Map 84 Greatest Need for Soil Stabilisation	279
Map 85 Greatest Need for Timber Production.....	280
Map 86 Greatest Need for Trapping Air Pollutants.....	281
Map 87 Greatest Need for Water Conveyance.....	282
Map 88 Greatest Need for Water Infiltration.....	283
Map 89 Greatest Need for Water Interception	284
Map 90 Greatest Need for Wind Shelter	285
Map 91 Accessible Water Storage Assets	286
Map 92 Aesthetic Assets	287
Map 93 Biofuels Production Assets.....	288
Map 94 Carbon Storage Assets	289
Map 95 Coastal Storm Protection Assets.....	290
Map 96 Corridor for Wildlife Assets	291
Map 97 Cultural Assets	292
Map 98 Evaporative Cooling Assets.....	293
Map 99 Flow Reduction Through Surface Roughness Assets.....	294

Map 100 Food Production Assets.....	295
Map 101 Green Travel Route Assets.....	296
Map 102 Habitat for Wildlife Assets	297
Map 103 Heritage Assets.....	298
Map 104 Inaccessible Water Storage Assets.....	299
Map 105 Learning Assets	300
Map 106 Noise Absorption Assets.....	301
Map 107 Pollutant Removal from Soil/Water Assets	302
Map 108 Recreation – Private Assets	303
Map 109 Recreation – Public Assets.....	304
Map 110 Recreation – Public with Restrictions Assets.....	305
Map 111 Shading from the Sun Assets.....	306
Map 112 Soil Stabilisation Assets	307
Map 113 Timber Production Assets.....	308
Map 114 Trapping Air Pollutants Assets	309
Map 115 Water Conveyance Assets.....	310
Map 116 Water Infiltration Assets.....	311
Map 117 Water Interception Assets.....	312
Map 118 Wind Shelter Assets	313
Map 119 Liverpool Knowledge Quarter current and climax plan typology	315
Map 120 Liverpool Knowledge Quarter change in Multifunctionality	315
Map 121 Liverpool Knowledge Quarter change in Multifunctionality comparing the old climax plan and revised climax plan	316
Map 122 Priority 1 Overview Map	332
Map 123 Green Infrastructure in development and investment areas	334
Map 124 Action 1.1 Targeting	335
Map 125 Gateways and routes	337
Map 126 Need and function for the Aesthetic function related to the environmental improvement corridors and key gateways in Liverpool.....	338
Map 127 Action 1.2 Targeting	339
Map 128 Green travel route functionality.....	341
Map 129 Action 1.3 Targeting	342
Map 130 ANGSt provision	344
Map 131 Space for People provision.....	345
Map 132 Action 1.4 Targeting	346
Map 133 Priority 2 Overview Map.....	347
Map 134 Vacant and derelict land which could be targeted for productive uses	349
Map 135 Action 2.1 Targeting	350
Map 136 Mental health and green infrastructure	352
Map 137 Action 2.2 Targeting.....	353
Map 138 Trapping air pollutant functionality	355
Map 139 Tree density in main road corridors	356
Map 140 Action 2.3 Targeting	357
Map 141 Green infrastructure provision and incidence of Coronary Heart Disease	359
Map 142 Action 2.4 Targeting in relation to Coronary Heart Disease.....	360
Map 143 Green infrastructure provision and incidence of Obesity	361
Map 144 Action 2.4 Targeting in relation to Obesity.....	362
Map 145 Green infrastructure provision and incidence of Diabetes	363
Map 146 Action 2.4 Targeting in relation to Diabetes	364
Map 147 Hospital and health centre locations	366
Map 148 Action 2.5 Targeting	367

Map 149 Action 2.7 Targeting.....	369
Map 150 Priority 3 Overview Map.....	370
Map 151 Location of older people in relation to green infrastructure	372
Map 152 Action 3.1 Targeting in relation to older people.....	373
Map 153 Urban heat island effect and people with limiting long term illness in relation to green infrastructure.....	374
Map 154 Action 3.1 Targeting in relation to limiting long term illness	375
Map 155 Location of young children in relation to green infrastructure.....	376
Map 156 Action 3.1 Targeting in relation to young children	377
Map 157 Action 3.2 Targeting	379
Map 158 Tree density	381
Map 159 Action 3.4 Targeting.....	382
Map 160 Action 3.5 Targeting	384
Map 161 Culverted watercourses and functional floodplain	386
Map 162 Action 3.10 Targeting.....	387
Map 163 Priority 4 Overview Map.....	388
Map 164 Core biodiversity areas	390
Map 165 Action 4.1 Targeting	391
Map 166 Connectivity of parks and urban trees.....	393
Map 167 Action 4.2 Targeting.....	394
Map 168 Four growth point wards - taken from Mersey Heartlands Programme of Development.....	397
Map 169 Growth point population density 2008.....	400
Map 170 Growth point population density 2014.....	400
Map 171 Growth point population density 2024	400
Map 172 Green Infrastructure typology of the SHLAA sites in the growth point wards	404
Map 173 Multifunctionality of SHLAA sites in growth point wards	407
Map 174 Number of needs fulfilled in SHLAA sites in the growth point wards	409
Map 175 Number of needs unfulfilled in SHLAA sites in growth point wards	411
Map 176 Targeting all priorities across the growth point wards.....	413

GREEN INFRASTRUCTURE GLOSSARY

Green Infrastructure - the city's life support system – the network of natural environmental components and green and blue spaces that lies within and around Liverpool and provides multiple social, economic and environmental benefits”.

Type – A description of the elements that make up Liverpool’s green infrastructure. In developing a **typology** PPG 17 has been used as a starting point, with the addition of a range of different **types** so that all land cover is included.

Functions – Describes what the green infrastructure type does; it could range from intercepting water to reducing noise.

Benefits – Green infrastructure planning is set firmly in the context of public benefit. There are many ways of identifying and categorising benefits. The Natural Economy Northwest¹ project developed a model of eleven benefits that has now been taken up by a range of organisations in the region and across the country. This is used in this strategy

Asset - Green infrastructure that is delivering a function or functions in an area of identified need. For example, woodland that is intercepting and storing water in an area of flood risk is a water management asset; it is providing functions that help to reduce the risk of flooding.

Multi-functionality – one of the strengths of a green infrastructure approach is that it can be used to deliver several functions from a single intervention. For example, the opportunity to expand a key habitat may also provide an opportunity to improve water management, improve image and capture air borne pollution. Often, because the wider functions are not considered, the opportunities to get more value from an intervention are not taken.

¹ Ecotec & NENW (2008) The Economic Benefits of Green Infrastructure

1. INTRODUCTION AND BACKGROUND

1.1. Introduction

1.1.1. This document provides the background information, evidence and analysis to support recommendations and actions that can deliver Liverpool's Green Infrastructure Strategy.

1.1.2. The work has been commissioned by Liverpool City Council Planning Department, funded through an Area Based Grant that was applied for by Liverpool City Council in partnership with Liverpool Primary Care Trust (PCT) to Liverpool First.

1.1.3. The principle purposes of this strategy are to identify specific actions that can assist the Liverpool health sector and Liverpool City Council improve health outcomes in the city, while creating a high quality environment for business and people. The strategy also looks at how green infrastructure can help Liverpool to adapt to projected climate change and support biodiversity in the city.

1.1.4. Whilst there is a focus on these principal purposes, the strategy also looks to make the best possible use of the inherent capability of the natural environment to carry out several functions in any one place, to be multifunctional and therefore deliver a wider range of benefits.

1.1.5. These benefits, whether they are related to quality of place, health and wellbeing, productivity or economic development, can help as part of a coordinated programme to tackle some of the major socio-economic issues for Liverpool. It will support other strategic documents for the city, including the Local Development Framework.

1.1.6. Some examples of the types of organisations that have a role to play in delivering the actions in this strategy are shown in Figure 1. Influencing and coordinating action will be important for the successful delivery of this strategy.

Figure 1 Targets to influence



1.1.7. This strategy for Liverpool builds on work that has developed in the Northwest of England over the last five years. In particular, it utilises research published by the Natural Economy Northwest Programme². Since 2007 this programme has greatly accelerated the development of green infrastructure policy and strategy in the region and supported a wide range of projects, delivering a wealth of evidence and guidance.

1.1.8. This strategy also builds on the work of the Green Infrastructure Unit, work elsewhere in the country and the current parallel, strategic work creating a sub regional green infrastructure framework³.

1.1.9. Planning green infrastructure is analogous to planning any of the other infrastructures, such as transport or energy, which are necessary for the city to function effectively. A holistic approach to planning green infrastructure provides an opportunity to meet key objectives for the city, co-ordinate actions and maximise value for money. The statement below from the US website www.greeninfrastructure.net sets out a case for this type of approach.

² www.natureconomyNorthwest.org.uk

³ The Mersey Forest (2010) Liverpool Sub Region Green Infrastructure Framework

“Just as we must address haphazard development, we must also address haphazard conservation – activities that are reactive, site-specific, narrowly focused, or not well integrated with other efforts. Just as we need smart growth to strategically direct and influence the patterns of land development, we need “smart conservation” to strategically direct our nation’s conservation practices⁴.”

1.1.10. The Green Infrastructure Strategy for Liverpool aims to provide the basis for “smart conservation” to align efforts and target priorities.

1.1.11. CABE have identified the gap that exists nationally in the information base for green infrastructure⁵. They suggest that the lack of good data for green infrastructure means that it is difficult to manage and plan effectively. This strategy for Liverpool helps to address this issue. It provides for the first time a full green infrastructure resource assessment for the city. Developing an approach that for the first time assesses all elements of green infrastructure in a way that can be replicated at any scale.

1.2. Project Outcomes

1.2.1. The strategy focuses on three key outcomes:

- Joint working between Liverpool City Council and the health sector in the development of healthy urban planning policies for green infrastructure.
- Development of a robust evidence base for the Local Development Framework and other strategic plans for the city, in particular in the areas identified for housing growth.
- Development of a city-wide Green Infrastructure Strategy identifying interventions that can help tackle key environmental and socio-economic needs and capitalise on opportunities.

⁴ www.greeninfrastructure.net

⁵ <http://www.cabe.org.uk/publications/the-green-information-gap>

1.3. Project Outputs

1.3.1. The strategy consists of the following four documents:

Table 1 Green infrastructure strategy documents

DOCUMENT	DESCRIPTION AND PURPOSE	PRIMARY AUDIENCES
Promotional Leaflet	A wider promotional leaflet seeking to gain support for, and involvement, in the delivery of the strategy.	Health sector, economic development, environment sector, funders and policy makers.
Executive Summary	Written in non technical language to summarise the approach and identify the benefits with conclusion and recommendations for the taking the work forward.	Influencers within key sectors planning, health, economic development and environment.
Key Actions Document	The key actions as agreed with the stakeholders and the commissioning organisations.	All those identified in the strategy as having a role to play.
Technical Document	The full evidence base using the five step approach taken to develop the strategy.	LCC Planning, Health sector, Liverpool First and anyone who wants to see the full story.

1.3.2. In addition the strategy will be supported by an online policy database and a Geographic Information System (GIS) with all of the data layers that have been used to support the development of the strategy.

2. WHAT IS GREEN INFRASTRUCTURE?

2.1. Introduction to Green Infrastructure

2.1.1. The Northwest Green Infrastructure Guide⁶ definition of green infrastructure has been adopted in this strategy and has been adapted so that it is more specific to Liverpool:

The city's life support system – the network of natural environmental components and green and blue spaces that lies within and around Liverpool which provides multiple social, economic and environmental benefits.⁷

2.1.2. The Community Forests along with Natural England (then Countryside Agency) initially advocated and promoted the development of a green infrastructure approach in the Northwest in 2005 as a holistic approach to planning the countryside in and around towns. The approach was at the time being developed and used in southeast England and in particular in Thames Gateway and the growth point areas.

2.1.3. The focus for the development of the idea was to integrate environmental management with development, identifying the socio-economic as well as environmental benefits and seeking to bring together a wide range of stakeholders to develop plans and strategies that could enable sustainable development.

2.1.4. This approach was supported by a range of organisations, and led to development of a wider partnership, to progress the concept and an increasing number of projects, strategies and policies. Table 2 provides information on the current regional support structures.

⁶ Northwest Green Infrastructure Guide (version 1.1). Prepared by the Northwest Green Infrastructure Think Tank. www.greeninfrastructurenw.co.uk

⁷ This is a more comprehensive definition of green infrastructure than that contained in the draft Planning Policy Statement, Planning for a Natural and Healthy Environment.

Table 2 Regional support for green infrastructure

GREEN INFRASTRUCTURE SUPPORT		ROLE
Think Tank		To engage academics and consultants as well as public sector in discussion on key green infrastructure issues, to resolve issues and take the agenda forward on a sound evidence and logic base.
Green Infrastructure Unit		Supports development of the green infrastructure approach in the region through advocacy, development of evidence and methodologies, information sharing, and supporting projects.
Natural Alliance	Economy	Involvement of a wide range of regional agencies to look at green infrastructure programmes and the progress of activity - identify key actions for agencies and individuals, identify opportunities.
Green Infrastructure Forum		Information sharing with anyone in the region who wants to learn more about green infrastructure.
Consultants Panel		Consultants who specialise in green infrastructure work or aspects of it, training provided to this panel and the panel available for public bodies to use.
Website		www.ginw.org.uk - repository for information on green infrastructure and an evidence base for green infrastructure and climate change.

2.1.5. The green infrastructure approach complements other approaches that are taken to planning and managing the natural environment. It is an ecosystems based approach that is guided by landscape considerations and when implemented can lead to biodiversity and ecological framework benefits.

2.2. Describing Green Infrastructure

2.2.1. A standard approach to describing green infrastructure has developed in the Northwest. It is based on a model that describes green infrastructure in terms of:

2.2.2. Types – A description of the elements that make up Liverpool’s green infrastructure. In developing a typology, PPG17 has been used as a starting point, with the addition of a number of additional types so that all land cover is included. For each green infrastructure type a range of functions can be identified.

2.2.3. Functions - Green infrastructure functions describe what the green infrastructure type does; it could range from intercepting water to reducing noise. In all, 28 functions have been identified (see Appendix 1). Functions can exist in parallel and one of the aims of green infrastructure planning is to achieve high levels of multi-functionality where possible. More limited or single functionality is considered appropriate only where there is an overriding function that must be safeguarded due to legislation or strategic significance.

2.2.4. Benefits - Green infrastructure planning is set firmly in a context of public benefit. There are many ways of identifying and categorising benefits. Work by Natural Economy Northwest⁸ used a model of eleven benefits that is now widely used by a range of organisations in the region and across the country and this is the model used for this strategy.

Figure 2 The eleven economic benefits of green infrastructure

2.2.5. For example, the flood alleviation and water management benefit is provided by four functions – water conveyance, water storage, water interception and evapotranspiration. Each of these functions may contribute to several other benefits. A similar relationship exists between all green infrastructure types and function. One function can provide several benefits.

Figure 3 Type to benefit

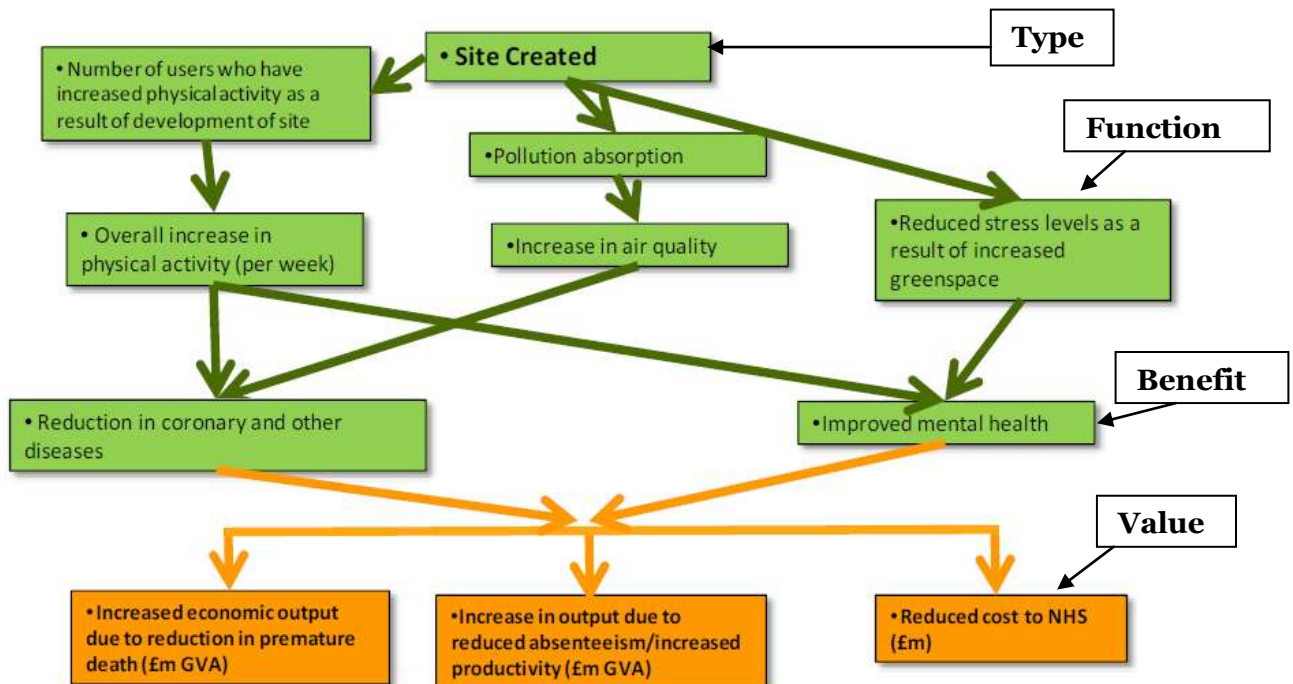


⁸ Ecotec & NENW (2008) The Economic benefits of Green Infrastructure



2.2.6. From these three elements used to describe green infrastructure; type, function and benefit, models can be developed that can assist in identifying where functions and benefits are being delivered by green infrastructure across the city. This creates a complex web, reflecting (but obviously not modelling perfectly) the real life systems that exist in the natural environment. The model does allow us to provide information on the functions that are being provided in a specific area based on the green infrastructure typology mapping. An example is shown below:

Figure 4 Simple example of the green infrastructure web from type to value



2.2.7. Values – In order to consider green infrastructure in the same way as other infrastructure projects the “value” of a proposal needs to be shown. At present this involves having to identify the economic value in order to be able to compare values with other competing opportunities and justify investment. It is important as far as possible to be able to show the value of green infrastructure in the same monetary terms as the target audience uses for decision making on other investments. The UK Treasury Green Book⁹ also recognises that not all environmental benefits can be monetized. Techniques have been developed and are developing to achieve these valuations¹⁰. For example the recent study by Regeneris of The Mersey Forest Objective 1 programme showed that for

⁹ HM Treasury (2010) The Green Book, Appraisal and Evaluation in Central Government
¹⁰ Genecon (2010) Green Infrastructure Valuation toolbox

each £1 invested £2.60 of direct economic benefit was achieved and when other economic values were included the total was £10.20.

2.2.8. Assets – In this strategy, the term “asset” has been used to describe green infrastructure that is delivering a function or functions in an area of identified need. For example, woodland that is intercepting and storing water in an area of flood risk is a water management asset; it is providing functions that help to reduce the risk of flooding.

2.2.9. Full details of the elements that make up these categories and the relationships between them are provided in the methodology in Appendix 1.

2.2.10. Principles - Finally, eight principles of green infrastructure planning, design and implementation have been proposed, based on the original work from the U.S.¹¹

- Identify and protect green infrastructure assets before development
- Engage diverse people and organisations from a range of sectors
- Linkage is key, connecting green infrastructure components with each other and with people
- Design green infrastructure systems that function at different scales and across boundaries
- Green Infrastructure activity must be grounded in good science and planning practice
- Fund green infrastructure up-front as a primary public investment
- Emphasise green infrastructure benefits are afforded to all; to nature and people
- Green infrastructure should be the framework for natural environment projects and programmes.

2.3. Related Projects






2.3.1. The Liverpool Green Infrastructure Strategy is, we understand, the first city-wide green infrastructure strategy in the UK. CABI highlighted the lead taken by Liverpool City Council in the publication “Grey to Green”¹² and in the conference of the same name in March 2010. The work fits with and is complementary to a range of other green infrastructure plans and frameworks at differing spatial scales. Table 3 shows the relationships between these. A major strength of the current green infrastructure work in the Northwest is the relative coherence of plans between the spatial scales and across boundaries, and this still has value despite the removal of “regions”.

2.3.2. This strategy provides a link between the City Region and the more detailed local green infrastructure plans that are emerging.

¹¹ <http://www.greeninfrastructure.net>

¹² CABI (2009) Grey to Green <http://www.cabi.org.uk/grey-to-green>

Table 3 Relates green infrastructure frameworks, strategies and plans

DOCUMENT		RELATIONSHIP
Green Infrastructure Prospectus		Presents green infrastructure as a critical infrastructure for Northwest England, supporting cross boundary working and identifying a framework for assessing benefits and targeting interventions.
Green Infrastructure Guide		Guide produced to support agencies across the region in developing green infrastructure plans of all types.
Liverpool City Region Green Infrastructure Framework		Sets out the key sub regional/cross boundary issues, supporting their consideration in LDF and other local strategic documents.
This Study		Link is between Liverpool City Region and local green infrastructure plans.
Liverpool Knowledge Quarter ¹³		Fits within the overall plan for Liverpool with specific objectives for the area that complement this green infrastructure strategy.

¹³ <http://www.urbedftp.co.uk/kqgreeninfrastructure/>

Alder Hey –
Children’s Health
Park¹⁴

Fits within the overall plan for Liverpool
with specific objectives for the area to
meet the needs for the new hospital.

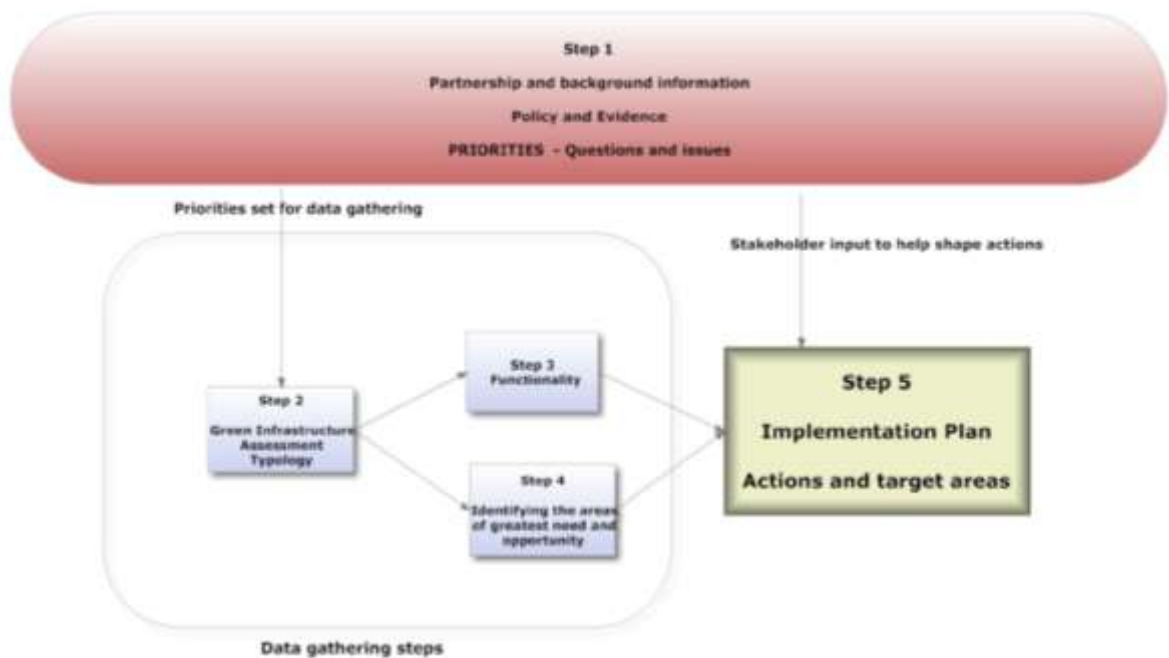
¹⁴ <http://www.ahchp.com/>

3. DEVELOPING THE STRATEGY

3.1. Methodology

3.1.1. This strategy has been developed based on an established methodology involving five steps. The methodology has been used in a number of plans, strategies and frameworks that have been carried out at a range of scales across the Northwest. Figure 5 sets out the five steps.

Figure 5 Five Step process for strategy development



3.1.2. The five steps are iterative. In particular, the feedback and input from stakeholders and the development of the evidence base informs Steps 2 to 4 and the stakeholder input is vital in developing the implementation plan in Step 5.

3.1.3. Step 1 focuses on determining the key priorities, issues, identifying policy support, assembling the evidence base and engaging a range of partners in the development of the strategy.

3.1.4. Steps 2 to 4 of the methodology are mainly concerned with gathering and analysing spatial data to help to understand the issues identified in Step 1 more fully from a green infrastructure perspective. The details of these three steps are provided in Appendix 1.

3.1.5. Finally, **Step 5** develops the recommendations and actions, based on the data, evidence and with stakeholder review.

4. STEP 1 – PRIORITIES, STAKEHOLDERS, POLICY & EVIDENCE

4.1. Priorities

4.1.1. The key priorities have been identified based on the original project brief and discussion with the stakeholders.

- A Sustainable City – supporting business, regeneration and housing growth within environmental limits
- A City providing Natural choices for Health – supporting improved physical and mental health
- A Cool City – adapting to projected climate change and mitigating impacts
- A Green and Biodiverse City – supporting a good quality of life for all
- A City where Green infrastructure is well planned and designed – green infrastructure as a critical infrastructure

4.1.2. Within these priorities the key issues which green infrastructure can help to address are identified through;

- Discussions with stakeholders,
- Assessing the key policies and strategies for the city at local, sub regional, regional and national level,
- Collating the evidence that green infrastructure can play a role in addressing the issues.

4.2. Stakeholder Engagement

4.2.1. Stakeholders from across the city have been involved in meetings and workshops to help to shape the green infrastructure strategy.

4.2.2. In addition to meetings with Liverpool City Council, Liverpool Primary Care Trust, Sports and Physical Activity Alliance, Merseyside Environmental Advisory Service (MEAS), Richmond Fellowship and CABA there have been two stakeholder workshops and one update meeting over the period of the strategy development. The early findings from the strategy were presented at the CABA organised Grey to Green Conference held in Liverpool on 23rd March 2010.

4.3. Policy Context

4.3.1. Introduction

4.3.1.1. The key strategic and policy documents for the city have been assessed, and aspirations for Liverpool City Council and its partners have been identified (for full analyses please see www.ginw.co.uk/liverpool). The following sections provide a brief overview of these documents.

4.3.1.2. A range of sub regional, regional and national documents has been included. Together they set out the major issues, challenges and opportunities for Liverpool.

4.3.2. Liverpool city policies and strategies

4.3.3. *A Thriving International city - Liverpool's Sustainable Community Strategy*

4.3.3.1. This strategy, prepared by Liverpool First, the Local Strategic Partnership sets out a long term vision for the economic, social and environmental well-being of the city to be delivered through five strategic drivers:

- Competitiveness
- Connectivity
- Distinctive sense of place
- Thriving neighbourhoods
- Health and wellbeing

4.3.4. *Liverpool 2024: A Thriving International City - Local Area Agreement 2008/11 (LAA)*

4.3.4.1. The LAA monitors the achievement of the Sustainable Community Strategy with targets for each of its proposed outcomes. Those particularly relevant to the Green Infrastructure Strategy are:

- NI 56 Obesity among primary school age children in Year 6
- NI 120 All-age all cause mortality rate
- NI 175 Access to services and facilities by public transport, walking and cycling
- NI 188 Adapting to climate change

4.3.5. *Liverpool City Region - Multi-area Agreement (MAA)*

4.3.5.1. The MAA covers the Boroughs of Halton, Knowsley, Sefton, St.Helens, Wirral and the City of Liverpool, with the vision “to establish our status as a thriving international City Region by 2030. Based on the Liverpool City Region Development Plan there are five strategic priorities:

- Well connected city region
- Sustainable communities
- Premier destination centre
- Creative and competitive city region
- Talented and able city region

4.3.5.2. The aims of the MAA are to:

- Maximise potential
- Develop the cultural offer
- Tackle deprivation
- Improve housing
- Improve transport
- Maximise connectivity
- Become a low carbon economy

4.3.5.3. With a step change to be delivered through four transformational actions:

- Culture and visitor economy
- Liverpool Superport
- Low carbon economy
- Knowledge economy

4.3.5.4. Opportunities to deliver this transformation include:

- Liverpool City Centre and Southport
- Mersey Waterfront Regional Park
- Mersey Ports and airport
- Mersey Gateway
- Housing and commercial development in Liverpool and Wirral Waters
- Natural resources including tidal energy and environmental technologies to address climate change
- Knowledge economy

4.3.6. *People, Place and Prosperity - An Economic Prospectus*

4.3.6.1. Prepared by Liverpool Vision the prospectus sets out the framework for economic success over the fifteen years to 2024 to achieve the following vision:

Our vision for Liverpool is of a confident and competitive international city, a vibrant knowledge centre and culture capital where dynamic creativity drives a thriving and inclusive economy-simply one of the best places to live, work invest and enjoy life.

4.3.6.2. The vision is built on four pillars of ambition:

- Vibrant economy
- Global connectivity
- Thriving people and
- Quality of place - developing an outstanding quality of place; making the most of Liverpool's distinctive assets and potential as maritime and cultural centre; optimising its role as the economic, transport, knowledge and cultural centre of the city region; developing a premier built environment, public realm and effective transport connectivity for business, residents, workers, tourists and visitors.

4.3.7. *Liverpool Corporate Plan*

4.3.7.1. Liverpool City Council is committed to working in partnership from a basis of sound financial and strategic planning to achieve a thriving international city that can compete on a world stage as a place to live, work and visit.

4.3.7.2. The aims set out in the Corporate Plan are summarised below with elements that refer to issues that green infrastructure planning can help to tackle highlighted.

4.3.7.3. Aim 1: Grow the city's Economy (including)

- Increase business density and gross value added (GVA) beyond national levels for city regions to deliver an environment which provides opportunity, employment and **well-being** for our citizens, business and investors.
- Make Liverpool a first choice for investment and growth by working with the private, not for profit and public sectors quickly and effectively with an emphasis on **quality of infrastructure**.
- Promote enterprise; attract investment through developing the city's co-ordination and offer across the city region to provide scale, connectivity and **sustainability of its economy**.
- Exploit the city's wider cultural advantage to **attract and retain visitors, workers and residents**.

4.3.7.4. Aim 2: Develop our communities

- Provide sustainable communities through access to decent homes and **best practice in environment management** including, recycling, street cleansing and environmental enforcement against dereliction and environmental detractors.

4.3.7.5. Aim 3: Empower our residents

- Ensure safeguarding and **inclusion of the most needy and excluded groups** in the city providing equality and real opportunity for improvement and enhanced quality of life.
- Confront barriers to employment and training through lack of access, deprivation, discrimination and **poor health** to ensure provision of a highly skilled workforce.
- Developing first rate education and training from early years and further position **Liverpool as a prime destination for postgraduate retention**.

4.3.8. *Liverpool Core Strategy*

4.3.8.1. The Core Strategy will set out the strategic planning framework for the city to 2026. It sits alongside the city's other strategies and in particular will give spatial expression to the Sustainable Community Strategy and MAA. The Core Strategy is still being prepared. The revised Preferred Options, published for consultation in January 2010, includes as a key objective high quality green infrastructure:

Protect and enhance Liverpool's green infrastructure to ensure more attractive and cleaner residential neighbourhoods; sustain and promote biodiversity; mitigate against climate change; and provide greater opportunities for sport and recreation to encourage better health and well-being.

4.3.8.2. The Core Strategy makes reference to specific spatial policy issues for which a green infrastructure dimension will need consideration. These include:

- Economic Regeneration
- City Centre (Commercial Quarter, Baltic Triangle, Knowledge Quarter and Waterfront)
- Atlantic Gateway SIA
- Liverpool Waters

- Eastern Approaches SIA
- Speke Halewood SIA
- Approach 580 SIA
- Liverpool Airport
- Ports of Liverpool and Garston
- Housing Market Renewal
- City Centre North Zone
- City Centre South Zone
- Wavertree
- Stanley Park
- Retail (City Centre, District and Local Centres including new district centre at Great Homer Street.)

4.3.9. Health Strategies

4.3.9.1. There are a number of strategies that deal with health across the city. The scale of the challenge in tackling health issues in the city is best summed up in the opening statement of the Liverpool PCT Strategic Commissioning Plan 2009 – 2014:

***“Our city faces some of the greatest health challenges in the Country. It has some of the highest levels of deprivation and lowest levels of life expectancy. It has a high burden of disease and a relatively low take up of healthy lifestyles.*”**

4.3.9.2. The Joint Strategic Framework for Mental Health 2009 – 2012¹⁵, sets out the main mental health issues for the city and how increasing multi-agency working is a key part to tackling the many issues that have an impact on people’s mental health, reflecting many of the national initiatives set out in the national mental health strategy New Horizons¹⁶. It also highlights the fact that whilst there are large numbers of people in Liverpool with identified mental health problems, there is also concern for the segment of the population that can be described as “languishing”, not necessarily with a diagnosed illness, but who for a range of reasons are at high risk of falling into mental and physical poor health.

4.3.9.3. Healthy Weight, Healthy Liverpool¹⁷ seeks to halt the rise in obesity levels in the city, in part by increasing physical activity levels; the strategy includes specific objectives that could be related to this green infrastructure strategy.

¹⁵ The Joint Strategic Framework for Mental Health 2009 – 2012, Liverpool PCT

¹⁶ New Horizons: A shared vision for mental health, 2009, HM Government

¹⁷ Healthy Weight, Healthy Liverpool, Healthy Weight Strategy for Liverpool 2008 – 2011, Liverpool PCT

Table 4 Extract from Healthy Weight Healthy Liverpool – Actions

OBJECTIVE	LEAD ORGANISATION	ACTION IN 2008-2009
11 – Maintain green open spaces and improve the quality of publicly owned facilities to enable an increase in the level of physical activity	Liverpool City Council/ SPAA	Support actions SPAA
12 – Ensure changes to the built environment support the concept of “walkable” neighbourhoods, enabling an increase in physical activity	Liverpool City Council	Prepare Liverpool’s Core Strategy Preferred Options Report

4.3.9.4. The Strategy also highlights the Active City programme which has a series of projects, some of which use the city parks, aimed at increasing physical activity in the city.

4.3.9.5. Liverpool PCT’s draft Sustainability Strategy¹⁸ highlights opportunities to include green infrastructure in refurbishment and rebuilding of health facilities.

4.3.10. *Liverpool Open Space Study*

4.3.10.1. Atkins on behalf of Liverpool City Council carried out a detailed assessment of open space in line with PPG 17, in 2005. The study looks at a more restricted range of typologies than this strategy, but does provide a wealth of information on the quality and quantity of the types that it does assess and sets out a number of policy recommendations.

4.3.10.2. There is a great deal of information in the Open Space Study that both supports and provides additional context to this strategy. In particular, the study provides information on the quality of the recreation areas in the city and importantly some historic context that helps to explain the current distribution of open space within the city.

4.3.10.3. Based on projected population growth of 5% per annum from 2005, the Open Space Study identified the quantity standard and any additional green spaces that Liverpool may have to provide for based on current low provision or provision required due to population growth.

4.3.11. *Liverpool Climate Change Action Plan*

4.3.11.1. Liverpool City Council is currently developing a Climate Change Action Plan that will look at how the city can adapt to projected change and also mitigate its greenhouse gas emissions. The information and evidence gathered in this strategy can help to inform and support the Climate Change Action Plan.

4.3.12. *Liverpool Strategic Flood Risk Assessment*

4.3.12.1. The Strategic Flood Risk Assessment is a tool that plays an important role in delivering sustainable development for the city of Liverpool, taking account of flood risk

¹⁸ Sarah Dewar, personal communication.

issues and climate change. The main objectives of the Strategic Flood Risk Assessment are to:

- Identify land at risk of flooding in Liverpool and the degree of risk from river, sea and other sources
- Reduce flood risk from and to new development through location, design and mitigation measures
- Inform policy formulation and the Sustainability Appraisal for the emerging Local Development Framework concerning land use in flood risk areas
- Provide a framework for development control officers and developers for dealing with the flood risk in development proposals;

4.3.12.2. The Environment Agency considers it beneficial for watercourses to remain open wherever possible for both flood defence and environmental purposes. Although there is a relatively limited area at risk of flooding in Liverpool, development within Liverpool could have a negative impact on the risk of flooding in adjoining authorities and vice versa.

4.3.12.3. Large green spaces, in excess of 1ha in size have been identified within the north and east catchments of Liverpool. Due to their large size, if they were to be developed, they would be more likely to have a significant impact on the surface-water run-off which in turn could affect the level of flood risk in the adjoining authorities.

4.3.12.4. All development proposals in Liverpool should consider incorporating Sustainable Drainage methods, where possible. These issues will be of particular importance for development on large areas of green space, impacting on levels of flood downstream. Amenity issues, such as water resources, community facilities, landscaping potential and the provision of wildlife habitats have largely been ignored in past planning and design of drainage systems.

4.3.12.5. The Green Belt's continued protection may have benefits as a large open area acting as a storage basin, for example Croxteth Park acting as a storage basin for the River Alt and to ensure levels of surface water run-off is not increased. Retention of the Green Belt is not in conflict with the SFRA.

4.3.13. *Liverpool Climate Change Strategic Framework*

4.3.13.1. This document brings together the members of Liverpool First in a commitment to make Liverpool an environmentally responsible, thriving international city for the future. A city that minimises negative environmental and climate change impacts and begins to position itself to adapt to our future changing climate.

4.3.13.2. Competitiveness: By 2024 Liverpool aims to grow jobs in key growth areas such as the knowledge economy and environmental technologies sectors. It aims to develop new skills to take up the opportunities from the growth on jobs from the low carbon sector and support and encourage businesses in the move to a low carbon future.

4.3.13.3. Connectivity: Liverpool will continue to increase the use of public transport and walking and cycling routes. Increasing active travel also contributes to our target to reduce obesity among adults and children from 2010 onwards.

4.3.13.4. Distinctive Sense of Place: Liverpool will improve housing across the city and raise standards of energy efficiency and heating and reducing carbon emissions. Liverpool will work to deliver the highest quality of buildings and green infrastructure, designed to both mitigate carbon emissions and to be well adapted to the known future impacts of climate change.

4.3.13.5. Thriving Neighbourhoods: Liverpool will work with residents and local businesses to assist them in making positive choices to help combat climate change and to create low carbon communities and embed environmental responsibility within our neighbourhood services.

4.3.13.6. Health and Well-being: Liverpool will work closely with healthcare providers in the city to better understand and to address the impacts of a changing climate such as heat, flooding or changes in air quality, on the health of our citizens, particularly the most vulnerable.

4.4. Northwest England and Sub-Regional Evidence, Policy and Strategies

4.4.1. Northwest England

4.4.1.1. Whilst Regional Strategies have been abolished, the evidence base that has been used to develop policy remains and is seen as being a material consideration in developing local policy. Guidance from DCLG¹⁹ is that regional level evidence, such as that gathered for RS2010 should still be used to inform green infrastructure planning. In addition, “Future Northwest²⁰” is a non statutory document that is being prepared by a partnership of organisations and aims to distil the evidence that has been gathered to date at a regional level to support the emerging Local Economic Partnerships and local authorities. There has been a lot of useful information collected at this level and it is important that this is not lost.

4.4.1.2. As part of the Northwest Climate Change Action Plan and the EU Interreg IVC GRaBS (Green and Blue Space Adaptation for Urban Areas and Eco-Towns) project, an action plan is being developed that will focus on green infrastructure solutions to climate change issues in the Northwest²¹.

4.4.1.3. The new Northwest Forestry Framework identifies trees and woodlands as a key component of green infrastructure. It sets out a clear manifesto to double woodland cover by 2050 to achieve a range of green infrastructure benefits. There is a clear focus on public benefit and the role of tree and woodlands in around our towns and cities, in line with the long term plan for The Mersey Forest²².

4.4.1.4. In January 2010 the Northwest Green Infrastructure Prospectus was launched. This advocates that green infrastructure planning should focus on areas that have either need or opportunity.

¹⁹ DCLG (5th July 2010) Letter to Chief Planning Officers: Revocation of Regional Strategies

²⁰ <http://www.communities.gov.uk/documents/planningandbuilding/pdf/1631904.pdf>

²¹ <http://www.nwda.co.uk/media-library/publications/strategy/future-north-west-interim.aspx>

²² www.ginw.co.uk/climatechange and www.grabs-eu.org

²² <http://merseyforest.org.uk/pages/displayDocuments.asp?iDocumentID=251>

4.4.1.5. Areas driven by **opportunity** include:

- Areas that will experience major change by virtue of their economic priority and/or housing growth; in Liverpool this will include the housing growth areas.
- Areas where enhancement could lead to improved economic performance and quality of life gains; for example, Liverpool city centre.

4.4.1.6. Areas driven by **need** include:

- Areas where green infrastructure help to reduce risks, for instance of flooding or poor air quality, so as to enable sustainable growth.
- Areas of known environmental deficit. These areas frequently experience the combined impacts of deprivation, health inequalities and poor environmental quality, all of which are a drag on the economy.

4.4.2. Liverpool City Region

4.4.2.1. The Health is Wealth Commission²³ highlighted the need for greater integration between land use planning and transport to reduce the need for travel and promote sustainable modes of transport. The Commission highlighted the need to place health at the heart of planning, and promoted the idea of greening the physical environment to provide health and wellbeing benefits and in particular emphasised the role that the historic parks can play.

4.4.2.2. A Liverpool City Region Green Infrastructure Framework is currently being developed. The aim of this work, mandated by the City Region Environment and Waste Board, is to look in particular at cross boundary issues for green infrastructure planning. The Framework has identified six key themes for the city region.

4.4.2.3. Setting the Scene for Growth - where can green infrastructure support economic development by providing attractive settings, increasing environmental quality and attracting/retaining people in the city region through excellent image and high quality of life?

4.4.2.4. Adapting to and mitigating climate change – where and how can green infrastructure help to prepare the city region for projected climate change and how can ecosystem services be safeguarded?

4.4.2.5. Providing access to high quality recreation – specifically looking at the provision of strategic routes and also the impacts of cumulative development in areas that cannot provide the levels of open space required.

4.4.2.6. Safeguarding and enhancing the ecological framework of the City Region – how can green infrastructure planning (and in particular its influence on grey infrastructure plans) help to maintain, restore, expand habitats and species populations and increase the movement of wildlife between important biodiversity areas?

4.4.2.7. Supporting the rural economy of the City Region - how will green infrastructure planning help to support the Rural Economy Action Plan, and in particular help to guide diversification, recognising the importance of this sector in

²³ Health is Wealth Commission (2009) Health is Wealth

particular as it covers 50% of the land area and provides many of the green infrastructure benefits?

4.4.2.8. Enabling improved health and well-being – where and how can green infrastructure help to improve our health and wellbeing, particularly linked to addressing the issues of obesity and mental well-being as well as enabling more active lifestyles for all members of society?

4.4.3. Merseyside Local Transport Plan

4.4.3.1. The five-year Merseyside Local Transport plan runs until 2011 and is a long term strategy and delivery programme to give Merseyside a safer, sustainable, efficient and integrated transport network, accessible to all.

4.4.3.2. There is a particular convergence with green infrastructure in relation to the plan's aim to support a healthier community by addressing air and noise problems caused by traffic and promoting cycling and walking.

4.4.3.3. The Local Transport Plan is currently being reviewed. The draft plan has five goals; which show links to green infrastructure.

- GOAL 1 - achieve a sustainable travel culture for the long term across Merseyside
- GOAL 2 - address the growth in traffic associated with regeneration and ensure that accessibility is improved for all, so that the increased demand for travel is managed and is met by sustainable modes.
- GOAL 3 - improve health and reduce health inequalities
- GOAL 4 - create a better environment both now and for the future
- GOAL 5 - ensure that the programme is effectively monitored, evaluated, reviewed and communicated to ensure that it is effective and widely understood, both locally and nationally

4.4.3.4. The Local Transport Plan highlights the need to link transport to the health, environment and climate change agendas and that quality environments support quality of place and life.

4.4.4. Local Enterprise Partnership

4.4.4.1. The Local Enterprise Partnership (LEP) proposal for the Liverpool City Region has been prepared by the six local authorities in the area in consultation with business leaders and business organisations.

4.4.4.2. The proposal states:

“Our priority is to move from a Public Sector dominated economy to a Private Sector based economy. We are committed to establishing the Liverpool City Region as a top international and national investment location, with global trade, knowledge, manufacturing (TATA, Unilever, Pilkington, Getrag) and tourism relationships. We will enhance our status as a thriving International City Region by developing the long-term sustainability of the economy through;”

4.4.4.3. The proposal also recognises the need to work with neighbouring LEAs on green infrastructure planning.

“Enhance our natural environment and resolve emerging pinch points in our critical and green infrastructure.”

4.4.5. Other plans and policies

4.4.5.1. The Mersey Forest Plan²⁴ is an early example of a green infrastructure plan, spatially articulating where environmental change is needed based on an assessment of landscape and socio-economic need. However, it deals primarily with trees and woodlands and not the wider array of types that are assessed in this Green Infrastructure Strategy for Liverpool. The progress to date and targeting achieved can be seen in “The Mersey Forest Comparator Study”²⁵.

4.4.5.2. The North Merseyside Green Infrastructure Habitat Action Plan was produced in 2008, recognising that the existing Biodiversity Action Plan and Habitat Action Plans were lacking in their application to urban areas. The Habitat Action Plan sets out a number of targets that can form part of the targeting for this Green Infrastructure Strategy.

4.4.5.3. Merseyside Environmental Advisory Service (MEAS) are currently developing a Sub Regional Ecological Framework. It will identify key assets and enhancement areas within a sub regional network. This work is complementary to the green infrastructure framework for the region and this strategy for Liverpool.

4.4.5.4. Adapting the Landscape²⁶ is a research document setting out a vision for the landscape between Manchester and Liverpool. It forms the basis for improving the green infrastructure in Atlantic Gateway²⁷, and between the Liverpool and Manchester City Regions.

“This integrated approach to green infrastructure offers a genuine opportunity for the Mersey Basin and its communities to demonstrate a new systems approach to development which;

- Increases the resilience of the area and places it at the forefront of approaches to tackling climate change***
- Gives people and businesses a new and inspirational reason to relocate to the area***
- Creates activities and opportunities to improve health and wellbeing***
- Increases the value and productivity of our land”***

4.4.6. National

4.4.6.1. There is currently a wealth of national policy that supports directly or indirectly a green infrastructure planning approach²⁸. The new government has announced a

²⁴ www.merseyforest.org.uk

²⁵ TEP (2007) The Mersey Forest Comparator Study

²⁶ https://www.yousendit.com/transfer.php?action=batch_download&batch_id=RmNDQ3QzcHZoTWwzZUE9PO

²⁷ NWDA (2010) Atlantic Gateway, Framework for a global Growth Opportunity

²⁸ See www.ginw.org.uk/climatechange for additional information

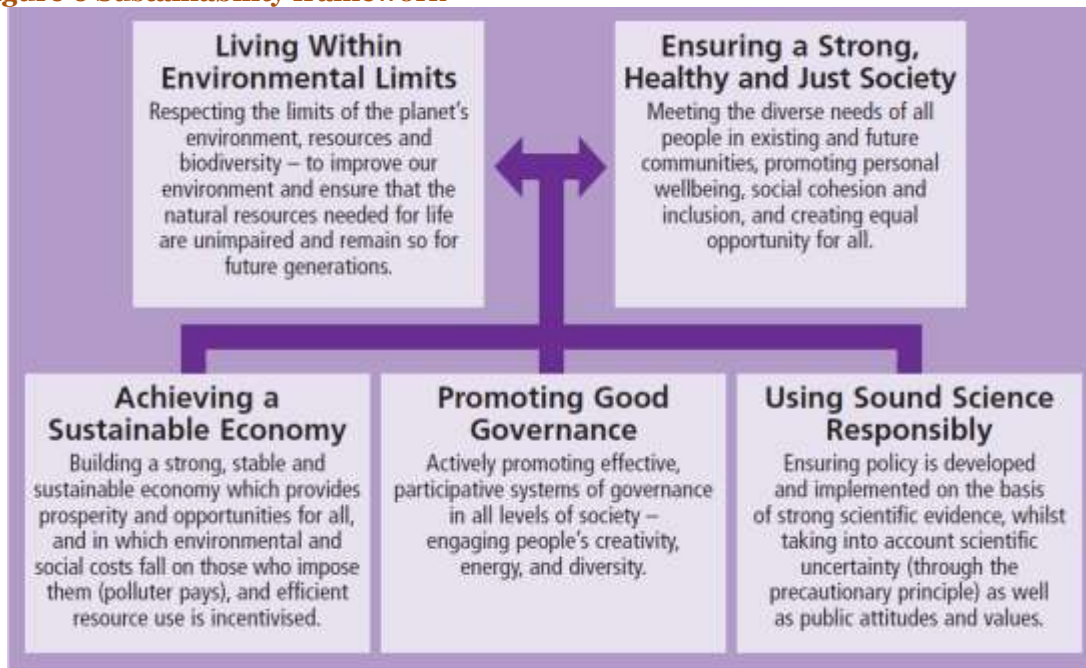
number of initiatives that may produce new guidance and policy. For example the Climate Change Sub Committee report “How well is the UK prepared for climate change?” highlights green infrastructure as a key ‘low regrets’ adaptation measure.

4.4.6.2. The following sections provide an overview of the current key policies. A great deal of this is also available on the Green Infrastructure Northwest website²⁹, gathered as part of the ForeStClim³⁰ and GRaBS³¹ projects. These sites will also continue to be updated to provide information on new policy development and its implications for green infrastructure planning.

4.4.6.3. Sustainability

The UK Government’s Strategy for Sustainable Development was launched in 2005 setting out the guiding principles of sustainable development; social cohesion and inclusion; enhancement of the environment; prudent use of natural resources and sustainable economic development. The role of the planning system was elaborated in PPS1-Delivering Sustainable Development.

Figure 6 Sustainability framework³²



4.4.6.4. The Sustainable Communities Plan³³ sets out a national long term programme of action for delivering sustainable development in both urban and rural areas in England. Two key principles of this plan, which relate to green infrastructure, are Liveability and Protecting the Countryside.

²⁹ <http://www.greeninfrastructurenw.co.uk/climatechange/> - whilst the information has been gathered to look at policy in relation to climate change, much of it has wider relevance and is applicable to this strategy.

³⁰ <http://www.forestclim.eu/>

³¹ <http://www.grabs-eu.org/> and <http://www.ginw.co.uk/climatechange>

³² DEFRA (2005) Securing the future - delivering UK sustainable development strategy

³³ <http://www.communities.gov.uk/publications/communities/sustainablecommunitiesbuilding>

4.4.6.5. Liveability – The plan sets out the Government’s proposals to intensify efforts to improve the local environment of communities which includes cleaner streets, improved parks and better public spaces

4.4.6.6. Protecting the Countryside - The plan outlines how land will be used more efficiently and effectively.

4.4.6.7. The government document “World Class Places” identifies green infrastructure as a key component of developing places that are attractive for investment and people; a key part of any economic growth strategy.

“Cities and towns where most people travel by public transport, foot or cycle, with a good mix of homes, services and amenities and plenty of green space and green infrastructure will not just be more environmentally sustainable, they are also likely to be safer, healthier, more inclusive and enjoyable.”³⁴

4.4.6.8. The Future Land Use³⁵ document from the Government Office for Science highlights the importance of delivery of public benefit through land use planning and supporting multi-functionality through green infrastructure planning – getting maximum benefit from each area of land based on identified needs.

4.4.6.9. Planning

4.4.6.10. The 2007 White Paper “Planning for a Sustainable Future” identified a number of challenges for the planning system:

- Meeting the challenge of climate change
- Supporting sustainable economic development
- Increasing the supply of housing
- Protecting and enhancing the environment and natural resources
- Improving on local and national infrastructure (including green space)
- Maintaining security of energy supply

4.4.6.11. It is likely that a new national planning statement will be produced to set the national framework. However, at present Planning Policy Statements (PPS) and Planning Policy Guidance (PPG) set out the Government’s national policies on different aspects of spatial planning. Of particular relevance to green infrastructure are:

PPS1 – Delivering Sustainable Development and Climate Change Supplement

PPS7 - Sustainable Development in Rural Areas

PPG17 – Planning for Open Space, Sport and Recreation

PPS9 – Biological and Geological Conservation

PPS25 – Development and Flood Risk.

4.4.6.12. In addition, although not yet finalised, two recent Planning Policy Statements consultations will have implications for this strategy³⁶:

³⁴ <http://www.communities.gov.uk/documents/planningandbuilding/pdf/1229344.pdf>

³⁵ Department of Business Innovation & Skills (2010) Land Use Futures, making the most of land in the 21st century, Government office for Science, London

³⁶ However, as a result of a change of government, these draft PPS’s, as well as all the existing PPS’s and PPG’s are subject to review.

- Planning for a Natural and Healthy Environment which reinforces the importance of planning for green infrastructure;
- Planning for a Low Carbon Economy in a Changing Climate states that local planning authorities should plan green infrastructure as part of wider networks so as to optimise its many benefits, including supporting local biodiversity, healthy living environments, urban cooling, local flood risk management and local access to shady outdoor spaces

4.4.6.13. Health

4.4.6.14. The recent Marmot Review³⁷ identified that reducing health inequalities will require action on six policy objectives:

- Give every child the best start in life
- Enable all children young people and adults to maximise their capabilities and have control over their lives
- Create fair employment and good work for all
- Ensure healthy standard of living for all
- Create and develop healthy and sustainable places and communities
- Strengthen the role and impact of ill health prevention

4.4.6.15. The review also supports the idea that green infrastructure improves mental and physical health and has been shown to reduce health inequalities.

4.4.6.16. This is also supported by the government's strategy for mental health, New Horizons, which highlights that access to green spaces is important for mental health. The strategy also identifies the design of neighbourhoods as being a key issue.

4.4.6.17. The National Institute for Health and Clinical Excellence (NICE), have published guidance³⁸ on promoting and creating natural environments that encourage and support physical activity to assist:

- Local authorities to fulfil their remit to promote the economic, social and environmental wellbeing of communities,
- Provide a focus for health and wellbeing partnerships,
- Organisations to benefit from cost savings, disinvestment opportunities or opportunities for re-directing resources.

4.4.6.18. The guidance is therefore extremely relevant to the Liverpool City Green Infrastructure Strategy. The guidance sets out seven recommendations backed up by an extensive evidence base; four recommendations are directly applicable to this study:

Strategies, Policies and Plans

- Ensure planning applications for new developments always prioritise the need for people to be physically active as a routine part of their daily lives.
- Ensure facilities are accessible on foot, by bicycle and other modes of transport that involve physical activity.
- Ensure that children can participate in physically active play.

³⁷ <http://www.nhsconfed.org/OurWork/latestnews/Pages/Marmott-Review.aspx>

³⁸ NICE (2006) Public Health Guidance Note 8 Promoting and creating built or natural environments that encourage and support physical activity

Transport

- Plan and provide walking and cycling routes to schools and other public facilities that are:
- Convenient, safe and attractive
- Accessible by everyone, including those whose mobility is impaired.

Public Open Space

- Ensure that public place can be reached by foot, cycling and using other modes of transport involving physical activity and public transport;
- Ensure public open spaces are maintained to a high standard. They should be safe, welcoming and attractive to everyone.

Buildings

- Ensure workplaces and campus sites are linked to walking and cycling networks. NICE have also produced guidance on improving physical activity for young people³⁹ which complements the guidance discussed above, but highlights the need to provide facilities for outdoor play, the need to provide shade and shelter and ensuring is good linkage to path networks.

4.4.6.19. Other Strategies

4.4.6.20. There are a number of other strategies and initiatives relating to the city. These include the Housing Market Renewal Pathfinder (HMR), Mersey Heartlands New Growth Point, Liverpool Ecological Framework, Climate Change Adaptation and Mitigation Plan and the Open Space Study. These strategies along with a number of others have been assessed and included in the review of policy set out in the online database that has been prepared as part of this study. For further information please see Appendix 4.

5. KEY ISSUES RELATED TO THE GREEN INFRASTRUCTURE PRIORITIES FOR LIVERPOOL

5.1. Introduction

5.1.1. The following sections set out the key issues emerging from the policy section above, supported by other relevant information. Information is provided for each of the four priorities in turn.

- Supporting sustainable housing growth and regeneration
- Improving health across the city
- Tackling climate change
- Increasing biodiversity

5.1.2. In addition to these priorities, issues related to the design and management of high quality multifunctional green infrastructure are assessed, as this has been raised by a number of stakeholders during consultation, and the evidence base highlights this as important in delivery of the other priorities.

6. SUPPORTING SUSTAINABLE HOUSING GROWTH AND REGENERATION

Key Issues Identified from this Section

- Quality of place for projected housing growth and major regeneration programmes
- Increasing productivity
- Attracting investment and people
- Aspirations to significantly increase visitor numbers
- Increasing visitor spend
- Developing a low carbon economy
- Improving walking and cycling routes as part of a low carbon economy
- How the council uses its assets in support of its strategic aims and priorities

6.1. Economy

6.1.1. The main thrust of public policy in Liverpool has been to check and reverse the process of economic and population decline and to tackle associated problems. Over the last 10 to 15 years, there have been clear and encouraging signs of economic recovery. Improvement in economic performance up to 2008 was driven by strong growth of important sectors such as business and professional services, information technology, biological sciences and creative industries. This was supported by new private sector development in economically important locations such as the city centre, the waterfront, Liverpool John Lennon Airport, the Ports of Liverpool and Garston and the Strategic Investment Areas, supported by European and NWDA funds. Continuing a successful programme of regeneration and economic recovery remains a high priority as set out in all of the key policy and strategic documents discussed in the policy section above.

6.1.2. Despite these improvements, the employment rate is still well below the regional and national averages, with many unable to work due to incapacity. The city also has significant areas of deprivation, across all measures (see Figure 7) and over 460 ha of derelict and vacant land⁴⁰. A Liverpool study by SQW, 'Greening the City'⁴¹ strongly advocates using derelict land for 'temporary' uses, particularly where this may bring economic benefits to the area.

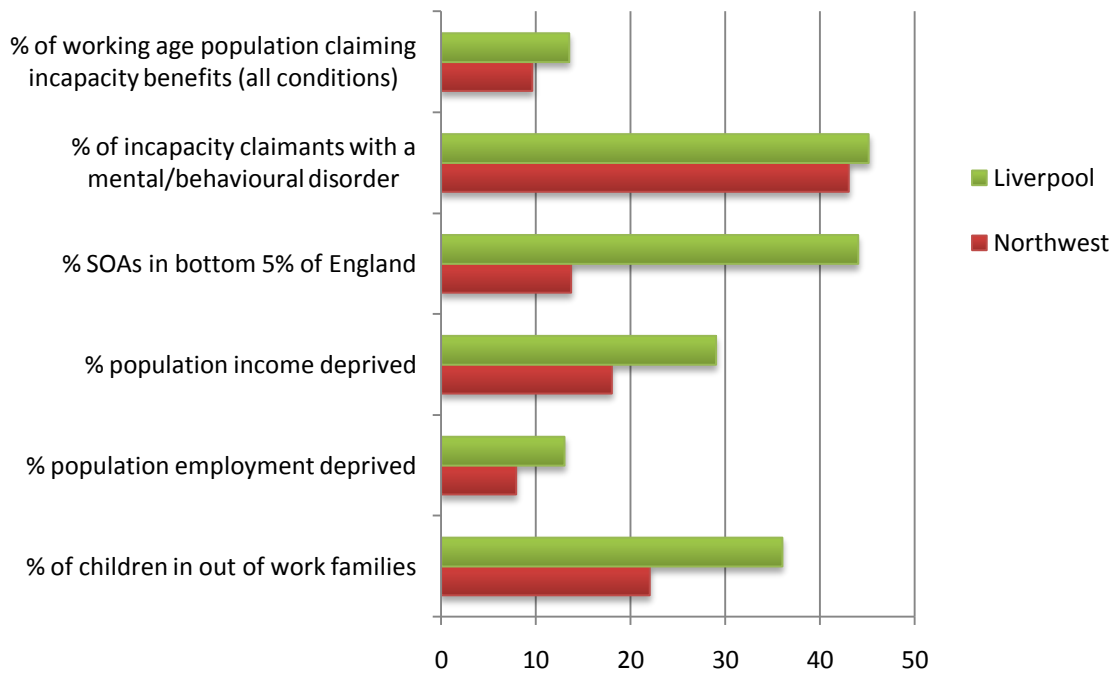
6.1.3. The recession hit the city later than other areas of the country, but it has resulted in an increase in unemployment and a reduction in investment and growth. The public sector accounts for 39% of employment in the city⁴². Reductions in public spending will have implications for the speed of economic recovery in the city. A key issue for all sectors will be how to get back to sustainable growth.

⁴⁰ See section 12.4.8.11 (Some of the derelict land is classified as 'not green infrastructure' or other green infrastructure types in the typology mapping).

⁴¹ SQW (2009) Liverpool Greening the City Report: First Report: Good Practice in Community Led Land Management,

⁴² <http://www.tuc.org.uk/extras/cutsnorthwest.pdf>

Figure 7 Employment, deprivation and worklessness in Liverpool⁴³



6.2. Culture and Tourism

6.2.1. The cultural offer of the city is good, and the Capital of Culture year helped to raise the profile of the city significantly improving its visitor numbers and making it the fifth most visited city in the UK (previously 16th). The parks and open spaces of Liverpool are also part of the culture of the city with 70 parks, 45 playgrounds and four local nature reserves⁴⁴. The city has the second largest area of public parks in the UK.

6.2.2. Visitor numbers are expected to increase significantly as Liverpool is the main destination brand for the city Region Tourism Strategy, with planned increases in both overseas visits and day visitors. There is a target to increase day visitor spend by 55%⁴⁵.

6.3. Quality of Place

6.3.1. Quality of Place is critical to the successful long-term success of the regeneration and development in the city. Figure 8 is taken from the World Class Places document⁴⁶, identifying the four key elements that contribute to Quality of Place. This includes the availability of high quality green infrastructure.

⁴³ NWDA (2009) Places Profile, Liverpool

⁴⁴ SQW (2009) Greening the city - moving towards a strategic approach - A draft final report to Liverpool City Council

⁴⁵ TMP (2009) Liverpool City Region Visitor Economy Strategy to 2020

⁴⁶ <http://www.info4local.gov.uk/documents/publications/1229582>

Figure 8 Elements that make up quality of place (World Class Places document)



6.3.2. Aspirations to be a “world class” city means that Liverpool will need to compete with cities on a broad range of factors, including quality of place and life.

6.3.3. Key gateways and routes to the city are critical to the image of the city for visitors and potential investors⁴⁷. Creating high quality routes into the city and ensuring that key gateways are attractive can help to promote a positive image for Liverpool. The key routes and gateways are shown on Map 1. The Liverpool City Council Unitary Development Plan identifies a number of key Environmental Improvement Corridors, main routes into the city that require improvements in order to support an improved image for Liverpool.

6.3.4. The City Region Green Infrastructure Framework theme “Setting the Scene for Growth” also highlights the key role of transport routes such as the M62, M58, A580 and A561 as being in helping to set the image of the area. These routes are all routes into Liverpool and whilst out of the city’s direct control they do have an impact on the image and perception of Liverpool in terms of quality of place and quality of life.

⁴⁷ TEP & MEAS (2002) New Approaches Study

Map 1 Gateways and strategic road network for Liverpool



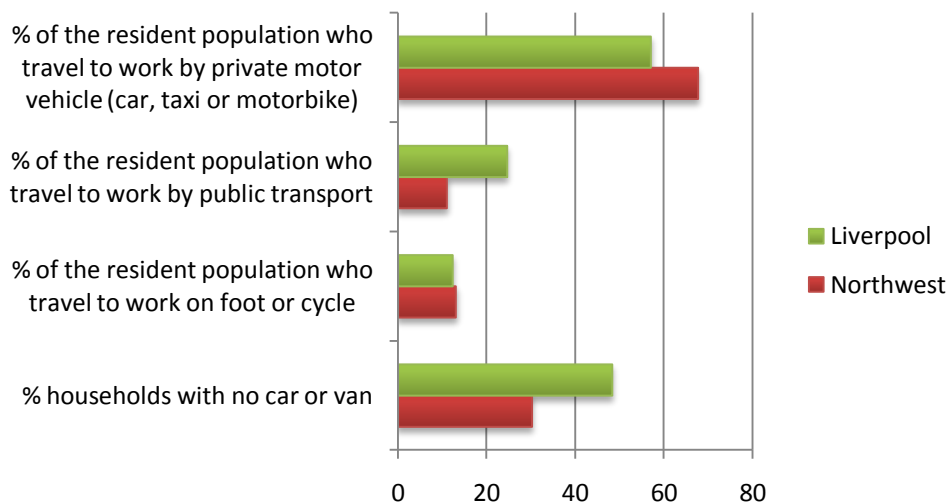
6.3.5. In 2006 Liverpool City Council commissioned Taylor Young to carry out a study looking at environmental detractors and develop an Environmental Detractors Remediation Plan⁴⁸ to look at areas such as the A580 and Edge Lane as well as areas in the city centre, identifying options for improvement including greening.

6.4. Transport and Accessibility

6.4.1. Liverpool has an excellent public transport system, reflected in the high levels of travel to work by public transport. However, there is a lower percentage of people walking or cycling to work in Liverpool than the national average. Developing a low carbon economy will mean improving the levels of walking and cycling for all aspects of daily life. The term “walkable” neighbourhoods is often used to describe areas that are planned and designed to encourage walking and cycling.

6.4.2. The fact that car use in Liverpool is lower than most areas in the Northwest has a significant impact on lowering both the carbon footprint and the greenhouse gas footprint. This is nearly a tonne less per capita than the UK average. In order to develop a low carbon economy it will be necessary to decouple growth in the economy from green house gas emissions further reducing the per capita value of green house gas emissions.

Figure 9 Transport and access statistics for Liverpool⁴⁹



6.5. Housing

6.5.1. Housing has a key role in supporting economic growth and regeneration. The city’s Housing Strategy identifies the key housing regeneration priority as the restructuring of housing markets over a period of 15 years. It highlights the need to improve the quality of housing overall, reduce the polarisation of markets and provide housing growth to accommodate additional households and support economic growth.

⁴⁸ Taylor Young for Liverpool City Council (2006) Environmental Detractors Remediation Plan

⁴⁹ NWDA (2009) Places Profile, Liverpool

6.5.2. The two key initiatives are the Housing Market Renewal (HMR) Pathfinder and Mersey Heartlands Growth Point (See Appendix 8).

6.5.3. Liverpool plans to accommodate 40,480 new dwellings (net of clearance) for the period 2008-2026. This represents the RSS requirements and new Growth Point ambitions. Table 5, Map 3,

6.5.4. Map 4 and

6.5.5.

6.5.6. Map 5 show the population density levels across the city based on estimated population growth from 2008 through to 2024.

Table 5 Population density levels by ward based on estimated population growth from 2008 through to 2024

NMA	WARD	AREA (M ²)	POPULATION 2008	POPULATION 2014	POPULATION 2024
Alt Valley	Clubmoor	2833763	15194	15616	15706
	County	1902909	13165	13044	12796
	Croxteth	5295928	16255	16744	16906
	Fazakerley	6022002	18083	18040	17724
	Norris Green	2637062	13624	13666	13471
	Warbreck	3082505	16102	16046	15775
City and North	Central	3297278	11769	15961	20047
	Everton	3582883	13820	15611	17272
	Kensington and Fairfield	2010833	12277	12614	12751
	Kirkdale	6416306	16033	17659	19893
	Picton	3034034	18429	19619	20562
	Riverside	3869738	13235	18617	25297
Liverpool East	Anfield	2334671	14444	14369	14121
	Knotty Ash	3471702	14185	14219	14461
	Old Swan	2507884	15325	15150	14823
	Tuebrook and Stoneycroft	2575644	16180	16094	15850
	West Derby	3118804	12753	12920	12817
	Yew Tree	3530176	15003	15441	15885
South Central	Childwall	3149337	14034	13880	13554
	Church	3455986	13908	13749	13403
	Greenbank	2111874	12747	12904	12975
	Princes Park	2427512	14317	14523	14616
	St Michael's	3323192	13329	13700	14620
	Wavertree	2923534	15188	15176	14913
South Liverpool	Allerton and Hunts Cross	6345083	14134	14402	14220
	Belle Vale	4725684	15291	15416	15342
	Cressington	3243025	13297	13475	13445
	Mossley Hill	3203146	10882	11282	12191

Speke-Garston	12227326	18572	18977	18984
Woolton	3752657	13176	13066	12738
Total	112412478	434751	451980	467157
Percentage of 2008 population		100.00%	103.96%	107.45%

6.5.7. Accommodating this level of new housing represents a major challenge and the Council's Core Strategy will progress the spatial options and associated delivery mechanisms⁵⁰.

6.5.8. The Core Strategy Revised Preferred Options Report set out three options for the distribution of future housing. The Council's preferred option is:

6.5.9. "In order to meet Liverpool's regeneration needs and priorities, major new development, supported by new and improved social, economic and green infrastructure and accessibility improvements, will be focused on:

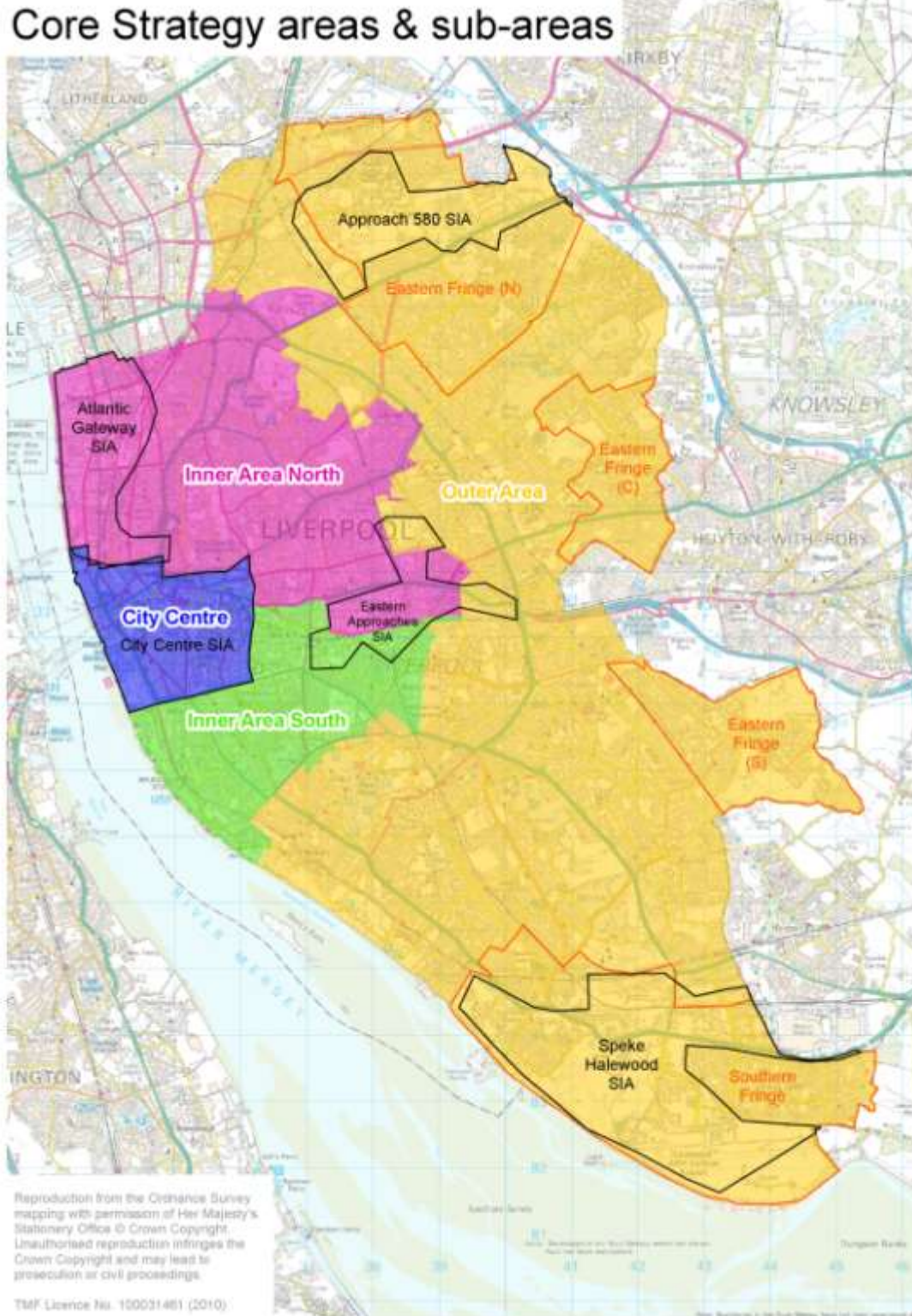
6.5.10. The **City Centre** - capitalising on its capacity to generate economic growth and maximising its role as a key regional economic generator and as a regional retail and commercial centre, and:

6.5.11. The **Inner Areas** (as defined by the HMR Pathfinder boundary), where economic development will be directed to the Atlantic Gateway and Eastern Approaches Strategic Investment Areas and new and refurbished housing will be provided in existing residential neighbourhoods.

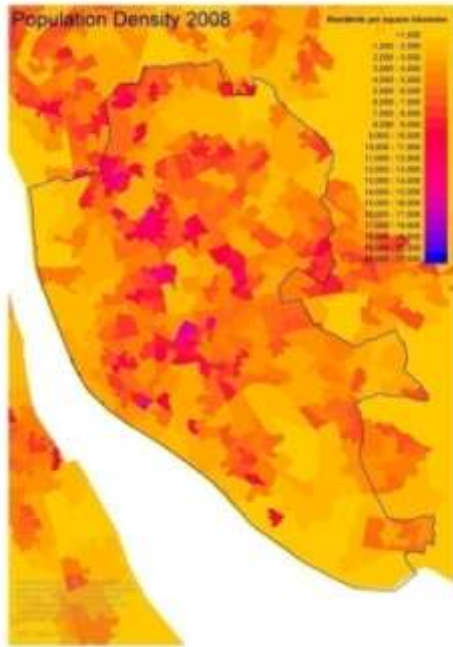
6.5.12. Outside of these areas (i.e. the **Outer Areas**), the scale of new development will be limited. Economic development will be concentrated in the Speke Halewood and Approach 580 Strategic Investment Areas. In the former Council housing estates towards the city's periphery, the emphasis will be on housing renewal and on maintaining and enhancing community infrastructure."

⁵⁰ Liverpool City Council (2010) Core strategy Revised Core Strategy Preferred Options Report
<http://www.liverpool.gov.uk/Images/tcm21-170943.pdf>

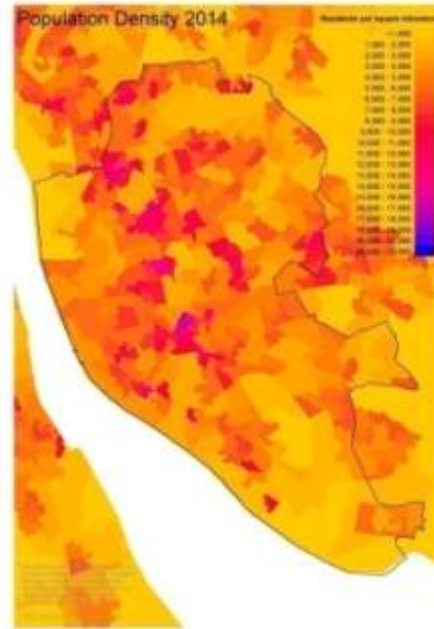
Map 2 Core Strategy areas and sub-areas



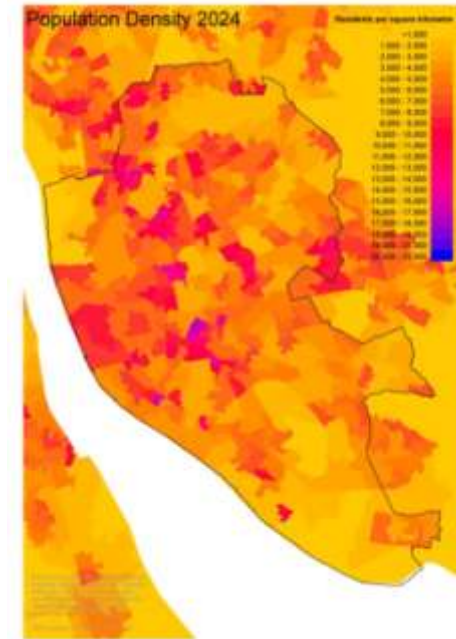
Map 3 Liverpool population density 2008



Map 4 Liverpool projected population density 2014



Map 5 Liverpool projected population density 2024



6.5.13. The maps show that in line with the preferred option, population increases most rapidly in the City Centre and North Liverpool and this can be seen in the three maps. The changes to the inner and outer zones are more subtle and less obvious on these maps.

6.5.14. The Strategic Housing Land Availability Assessment⁵¹ looked at a total of 1,122 sites, of which 10% are Greenfield. These were identified as suitable for development in line with the purpose of the study following an earlier analysis of 2,070 sites. Sites excluded included those where there was a strong case for retaining the site as green space (taking account of the site's classification in the Open Space Study).

6.5.15. The study concludes that against a target of 44,930 dwellings between 2008 - 2026 the potential supply from the 1,122 sites plus outstanding planning permissions is around 48,500. The greenfield contribution is 3,167 dwellings on 64 sites of which 2257 (44 sites) are Category 1 i.e. deliverable in the first five years.

6.5.16. The Core Strategy also indicates the housing mix to be pursued:

6.5.17. City Centre: emphasis on private sector flatted development at high densities

6.5.18. Inner Areas: in existing residential neighbourhoods, particularly the HMRI Zones of Opportunity there should be an emphasis on the delivery of private sector family housing with gardens for owner occupation at densities of 30-50 dwellings per hectare. Where appropriate a proportion of detached properties will be encouraged.

6.5.19. Outer Areas: the emphasis will be on delivering mixed-value, private sector family housing, especially semi-detached and detached houses, at densities of 30-50 dwellings per hectare.

6.5.20. Natural England highlights green infrastructure as a primary consideration in planning, developing and maintaining new development. Their policy statement declares that "necessary housing growth should be accommodated with minimum impact on the natural environment and deliver maximum benefits for the natural environment and people together"⁵². It sets out guidelines for Growth Point areas which outline a 'Green Test' against which all new developments should be measured⁵³.

6.6. Wider Regeneration

6.6.1. In addition to the plans for housing growth there are plans for wider regeneration and investment in the city to develop and strengthen the economy.

6.6.2. Many of these areas have been identified in the policy section above. Below are some examples that will provide opportunities for green infrastructure interventions.

6.6.3. Liverpool Knowledge Quarter – A £600 million programme led by the University of Liverpool, Liverpool John Moores University and the Royal Liverpool University Hospital, to rebuild and reconfigure many of their buildings. A green infrastructure plan has been produced for this area as part of the Natural Economy Northwest programme (see Appendix 2 for a case study on the green infrastructure plan for this programme).

6.6.4. North Liverpool – Work is underway to create a master plan for the North Liverpool Area. Green infrastructure planning is being considered as part of this

⁵¹ Liverpool City council (2009) Draft Strategic Housing Land Availability Assessment

⁵² Natural England (2009) Housing Growth and Green Infrastructure Policy

⁵³ Natural England (2008) Green Infrastructure Strategies: An Introduction for Local Authorities and their Partners

assessment and the Liverpool Green Infrastructure Strategy can provide information to guide the plans in terms of key needs and existing functions of green infrastructure.

6.6.5. The redevelopment of Alder Hey hospital is using a green infrastructure approach looking to maximise the benefits from green infrastructure for the image of the area and for the health and wellbeing of the children and parents who visit the hospital.

6.6.6. Liverpool is currently ranked 11th in the England list of sustainable cities⁵⁴, the aspiration to compete as a world class city not only will require green infrastructure planning and delivery to achieve a higher England ranking, but a need to look at the way in which competitor cities worldwide use their green infrastructure for competitive advantage.

6.6.7. Liverpool is one of a group of cities in the CABI initiative “Sustainable Cities”⁵⁵. This looks at how cities can develop low carbon economies, it includes consideration of green infrastructure. The city is also seen as a leading local authority in delivering another CABI initiative, “Grey to Green”, identifying how planning and management of the green and grey infrastructure can be carried out more effectively so as to maximise the opportunities for green infrastructure to provide the multi-functionality described earlier in this document.

6.6.8. A further major regeneration project in the city is the Liverpool Waters development. The vision involves regenerating a 60 hectare historic dockland site to create a world-class, high-quality, mixed use waterfront quarter in central Liverpool. The Liverpool Waters development is a key part of the Ocean Gateway concept (now renamed Atlantic Gateway). Atlantic Gateway is a “regional vision of Peel Holdings launched in September 2008 to identify and establish the River Mersey and Manchester Ship Canal as an economic powerhouse and environmental assets connecting two City Regions”⁵⁶.

⁵⁴ <http://www.forumforthefuture.org/projects/sustainable-cities09>

⁵⁵ <http://www.sustainablecities.org.uk/>

⁵⁶ <http://www.liverpoolwaters.co.uk/content/home.php>

7. IMPROVING HEALTH ACROSS THE CITY

Key Issues from this Section

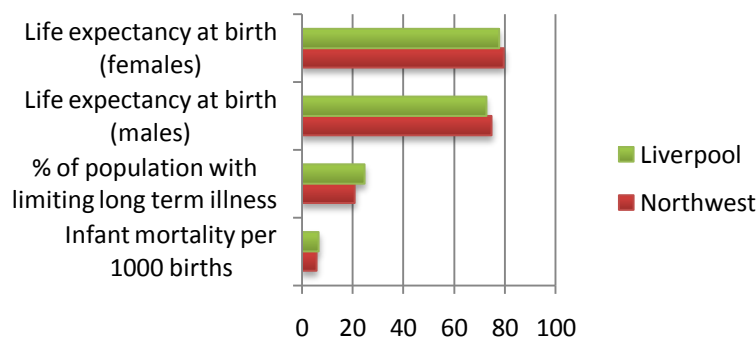
- Health deprivation and inequality
- High levels of coronary heart disease, obesity and diabetes
- High levels of people who feel in poor health and with poor mental health
- Low levels of physical activity
- Hospital rebuilding programmes

7.1. Health Inequality

7.1.1. Of the 32 indicators shown in Liverpool's health profile⁵⁷, only six are better than the England average and 26 are worse. Figure 11 shows the indicators from the Liverpool health profile. Liverpool has amongst the highest mortality rates, lowest life expectancies and greatest health inequalities nationally. Whereas in England the life expectancy rates are 77 years for males and 82 years for females, the life expectancy rates in Liverpool are only 74 years for males and 78 years for females. Health statistics show that 27 of Liverpool's 30 wards are included in the national pentile of wards that have the lowest life expectancy at birth.

7.1.2. Figure 10 shows selected health data for Liverpool compared with the data for the Northwest. It is evident that health inequalities within Liverpool are high. A male born in a disadvantaged ward can expect to live 10.9 years less than males born in the most affluent areas⁵⁸. This inequality across the city almost mirrors the inequality for the whole of the UK.

Figure 10 Selected health data for Liverpool⁵⁹



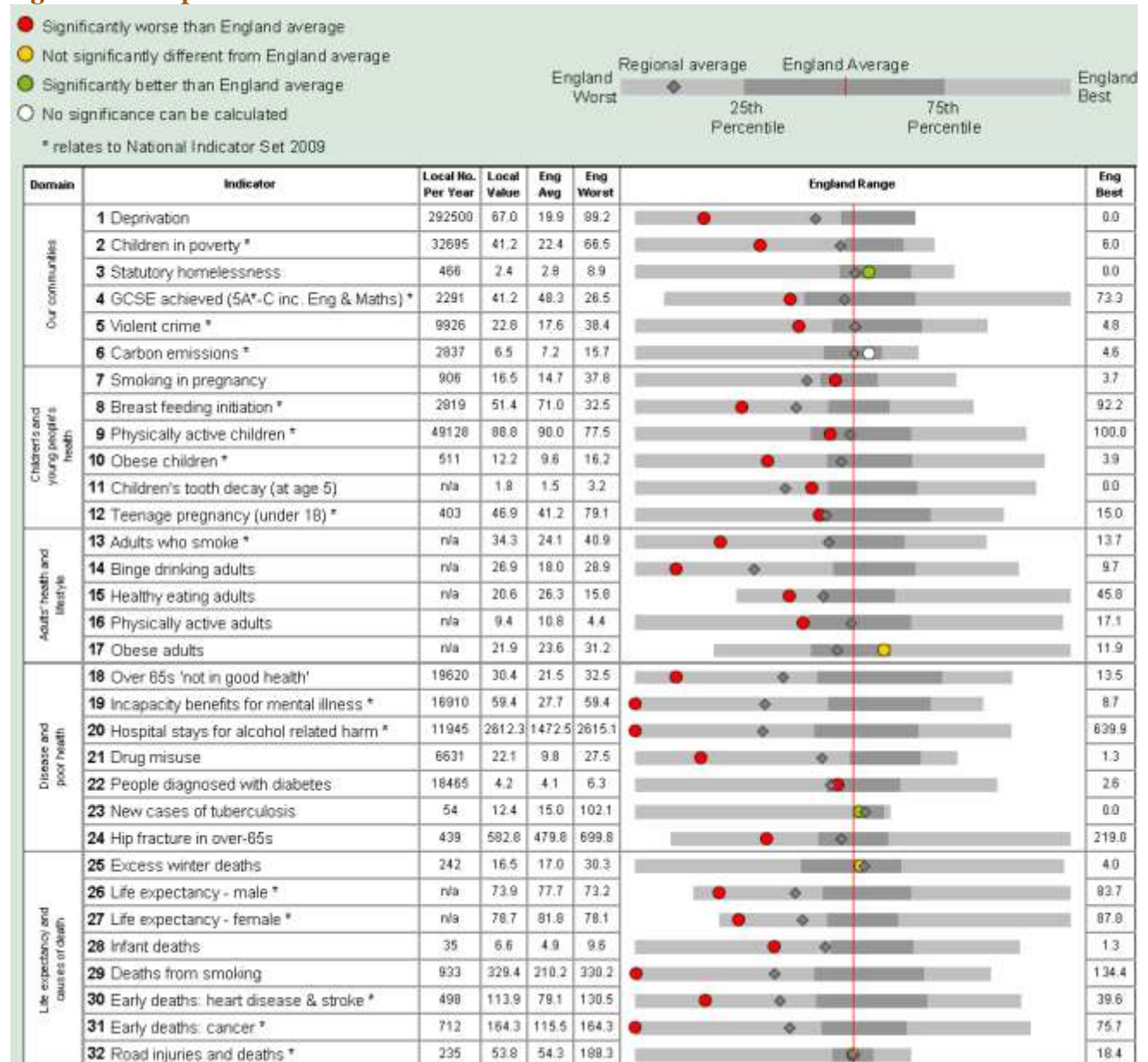
⁵⁷ Association of Public Health Observatories (2009) Liverpool Health Profile

<http://www.apho.org.uk/resource/item.aspx?RID=71192>

⁵⁸http://www.liverpool.gov.uk/Environment/Environmental_health/healthyhomes/programme_intervention/index.asp

⁵⁹ NWDA (2009) Places Profile , Liverpool

Figure 11 Liverpool health indicators



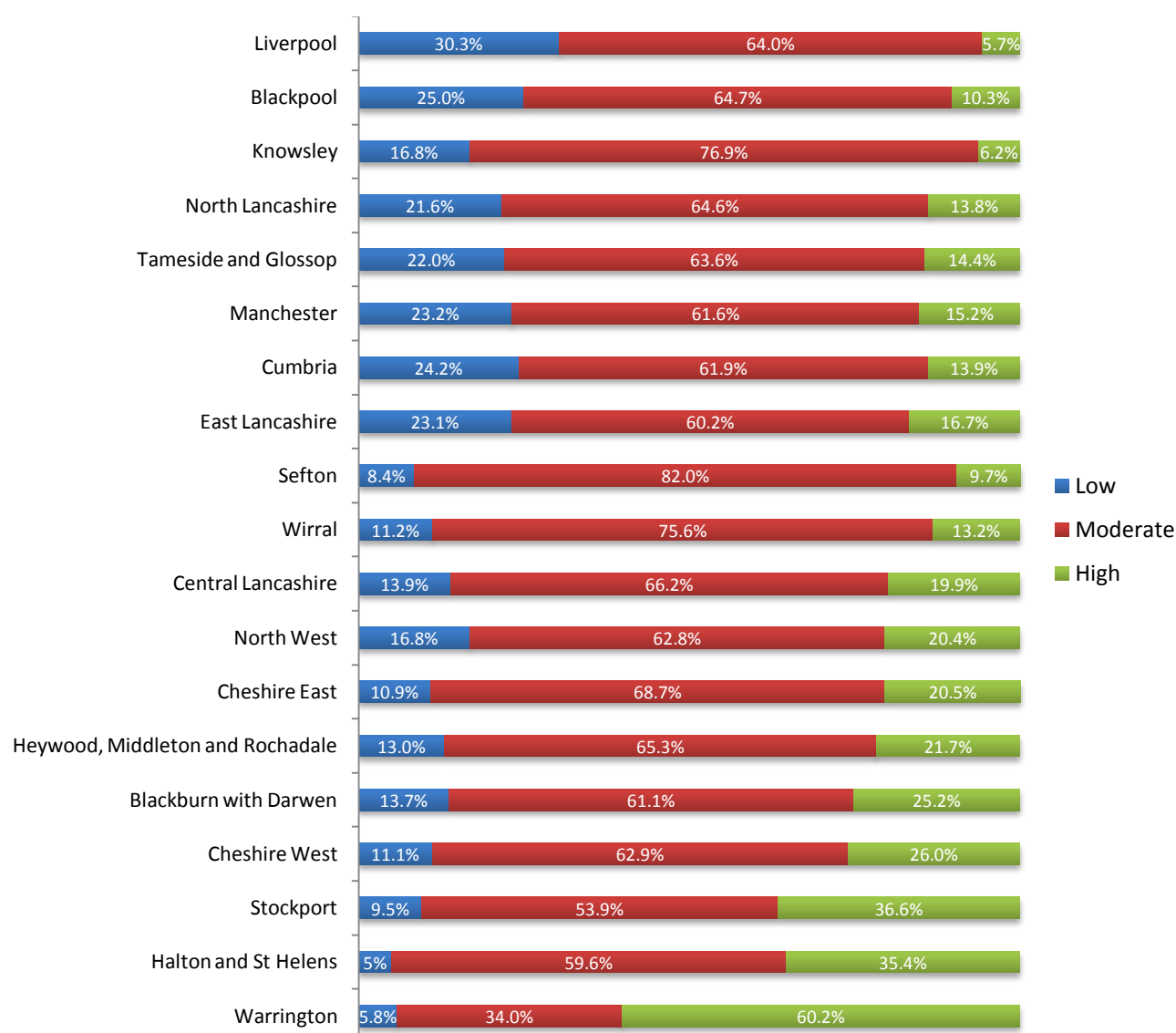
7.2. Mental Health

7.2.1. In terms of mental health, the recent Northwest Mental Health Survey showed that Liverpool had:

- The highest reported levels of poor mental wellbeing
- The lowest level of high mental wellbeing

Figure 12 Proportion of respondents with low, moderate and high mental wellbeing, Northwest PCT areas⁶⁰

60 Northwest Public Health Observatory (2009) Northwest Mental Wellbeing Survey
<http://www.nwph.net/nwpho/NorthWestMentalWellbeingSurvey.pdf>



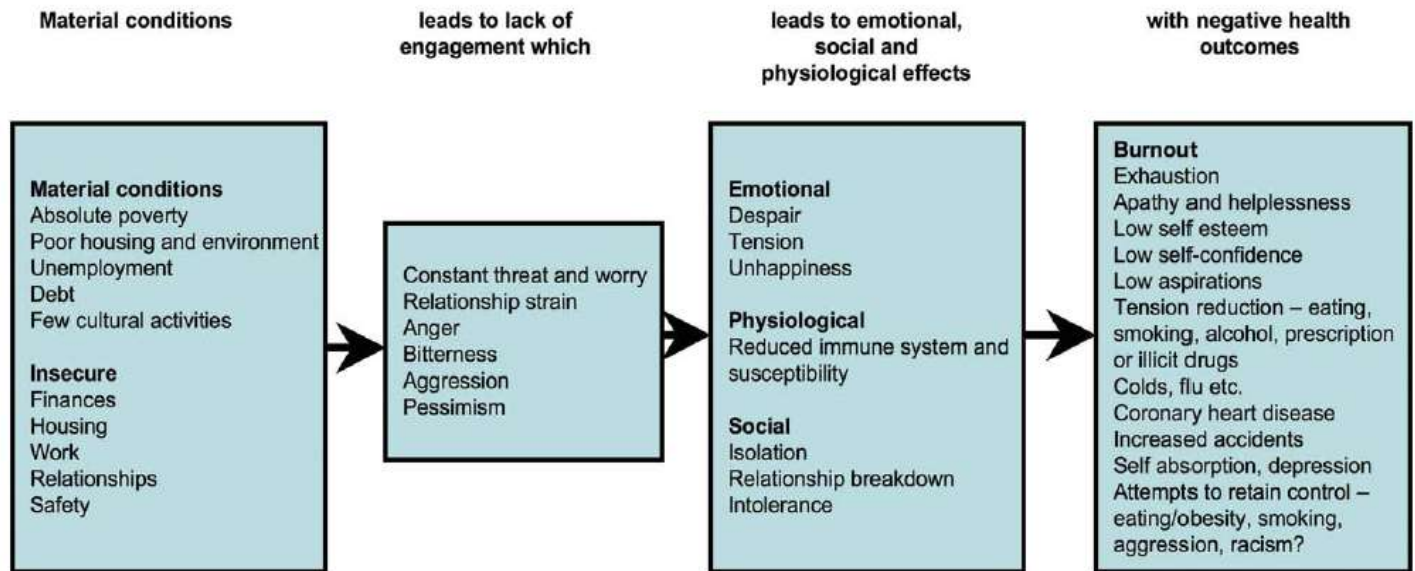
7.2.2. The prevalence of low mental wellbeing is higher in areas of deprivation, amongst black and racial minority groups and in older people. The incidence of poor mental health is not equally distributed across the city⁶¹. As the population of the city ages, an increase in mental health problems are anticipated, for example, Alzheimer’s disease has been projected to rise by 23% by 2030 on current population forecasts⁶².

7.2.3. At the other end of the age spectrum the model that is being used as the basis for developing the mental health action plans for Liverpool highlight the importance of providing a positive start in life. Figure 13 is taken from the Joint Strategic Framework for Public Mental Health 2009–2012 and indicates the complexity of the issues that are being dealt with and that “environment”, including the physical environment, is part of that complexity.

⁶¹ Liverpool PCT (2008) Mental Health Equity Profile for the Mersey Care NHS Trust catchment area

⁶² Liverpool PCT (2009) The Joint Strategic Framework for Public Mental Health 2009–2012

Figure 13 Socio-economic stress and its impacts on health - taken from the Joint Strategic Framework for Public Mental Health 2009-2012



7.3. Quality of Life

7.3.1. Poor health has a human cost in terms of “Quality of Life” (the general well being of individuals and wider society). Poor health and associated low quality of life has an economic cost, directly related to the issues discussed in the previous section Supporting sustainable housing growth and regeneration and the drive to increase productivity in the city. Healthier employees benefit their employers through:

- Reduced absenteeism
- Lower turnover rates
- Improved productivity and employee morale
- Lower health care costs⁶³

7.3.2. Provision of local green infrastructure can assist in maintaining a healthy population, by encouraging exercise and ameliorating mental health. Equally important to provision is the quality of design and safety of accessible green infrastructure, the barriers to choosing healthy lifestyles are not solely about availability but also linked to perception, culture and attitudes. As with many of the key issues for the city it is only through taking action to address all the major factors affecting an issue that will enable a transformation to take place.

7.3.3. There is an increasing emphasis on closer integration of health and planning. In 2007 the Healthy Urban Development Unit produced the Health and Urban Planning Toolkit. The toolkit suggests that close working between the health sector and the Local Planning Authority should be developed and that embedding health into the local planning framework is a key issue to address⁶⁴.

⁶³ Sustrans (2008) Active Travel and healthy workplaces: Sustrans Information Sheet FH06

⁶⁴ NHS Healthy Urban Development Unit (2007) Health and urban planning toolkit

http://www.healthyurbandevelopment.nhs.uk/pages/integrating_health/integrating_health.html

7.3.4. Part of Liverpool is in an Air Quality Management Zone. Poor air quality not only impacts on the “Quality of Place”, but significantly on “Quality of Life”. Poor air quality can exacerbate asthma and other respiratory illnesses. Noise pollution can also be a contributor to poor health by increasing levels of stress. Fortunately good quality landscaped environments can influence air quality and reduce noise pollution.

7.3.5. Liverpool has a long history of leading the public health agenda⁶⁵, and maximising the use of the green infrastructure in the city can provide an additional element to support improving public health in the city. Liverpool is part of the “Healthy Cities” programme⁶⁶ and its “Zagreb Declaration”⁶⁷ highlights the following commitment:

Making health, health equity, social justice and sustainable development key values in our vision for developing our cities and introducing appropriate processes to assess health impact and ensure capacity-building to enable all sectors to maximise their contribution to this goal.

Using our civic leadership to bring together and improve communication between strategic partners and stakeholders and combined organisational resources to improve living, social, economic and environmental circumstances resulting in risk conditions that adversely affect physical and mental health and well-being.

7.3.6. This Green Infrastructure Strategy can assist in helping Liverpool to achieve these commitments.

7.3.7. Two studies⁶⁸ in Liverpool have looked at the opportunities to increase the participation of communities in growing food on a wide range of sites outside of allotments. Health benefits are cited as one outcome.

7.3.8. Public parks originally were planned and developed to provide the green lungs for the city and their roots are in public health improvement⁶⁹. The heritage of historic parks across the city provides a real asset for health and well-being.

7.3.9. The CABI document Future Health - Sustainable places for health and wellbeing, suggests⁷⁰: “Planners can have long-term positive effects on public health, for example through supporting green infrastructure and sustainable transport networks.”

7.3.10. CABI have also recently published a document exploring the nature of green space provision, equality, ethnicity and health⁷¹. The document suggests there is a virtuous circle: where people perceive green space quality to be good, they are also more satisfied with their neighbourhood and have better health and wellbeing. The document highlights the link between quality local green space, improved social cohesion and improved health.

⁶⁵ <http://www.liverpool.gov.uk/Images/tcm21-98273.pdf>

⁶⁶ <http://www.euro.who.int/healthy-cities>

⁶⁷ WHO (2009) Zagreb Declaration for Healthy Cities: Health and health equity in all local policies

⁶⁸ See SQW (2010) Greening the City, and Liverpool City Council (2010) Growing Food in Liverpool: Liverpool Community Network Food for thought urban allotment scheme

⁶⁹ Centre for Public health, Liverpool John Moores University (2007) Returning urban parks to their public health roots

⁷⁰ CABI (2009) Future health: sustainable places for health and well-being

⁷¹ CABI (2010) Community Green: using local spaces to tackle inequality and improve health

8. TACKLING CLIMATE CHANGE

Key issues from this section

- The urban heat island effect will make the city unpleasant for living and working therefore there will be increased need for shading and evaporative cooling
- Vulnerable communities will be particularly affected by increased temperatures
- Climate change will place increasing pressure on water management infrastructure in the city
- Water quality may deteriorate
- Drought and water shortages may affect the functionality of the green infrastructure
- Other species may need assistance in moving into new climate spaces as the climate changes
- Steps to mitigate against further and increased climate change must be taken
- Opportunities which may arise as a result of a changed climate should be exploited – for example increased opportunities for the visitor economy

8.1. Climate Change Impacts

8.1.1. It is clear from the reviewed policies that climate change, and its associated threats and opportunities, is a key issue for Liverpool. This will mean both tackling the negative impacts of climate change, whilst taking advantage of opportunities that it may bring. A Climate Change Adaptation Action Plan is currently being developed by Liverpool City Council; this strategy can help support that document

8.1.2. Projected climate changes for the city include⁷²:

Table 6 Climate change impacts

Hotter, drier summers Average annual temperatures increase by 1.3°C by 2020s and by 2.3-2.5°C by 2050s Average daily maximum temperatures in summer increase by 1.6°C by 2020s and 2.9-3.2°C by 2050s Average summer precipitation is likely to decrease by 2.1mm/yr (nearly 6%) by 2020s and 15% by 2050s
Warmer, wetter, winters Average winter precipitation is likely to increase by 2.4mm (6.2%) by 2020s and nearly 13% by 2050s
Rising sea levels Sea levels are likely to rise by 4-17cm by 2020s and between 15-65cm by 2080s
More extreme weather events heat waves, drought, storms, flood

8.1.3. The following graphs show some of the projected changes for Liverpool under the high emissions scenario. These are over the next century at five probability levels (10, 33, 50, 67 & 90%⁷³); the likely change is between the 10 and 90% probabilities. By the end of

⁷² CAG Consultants (2010). NI 188: Adapting to Climate Change Workshop, Liverpool. Figures come from the UK Climate Projections 2009, and are given for the medium to high emissions scenarios, at the 50% probability level.

⁷³ Where change is 'very likely to be greater than' the 10% level, 'very likely to be less than' the 90% level, and 'as likely as not' to be at the 50% level.

the century, under a high emissions scenario in Liverpool, the likely change in mean temperature is between 2.5 and 6°C (Figure 14), in maximum temperature is between 2 and 6°C (

8.1.4. Figure 15), and in precipitation on the wettest day ranging from little change to a 30% increase (Figure 16).

Figure 14 Projected change in mean temperature

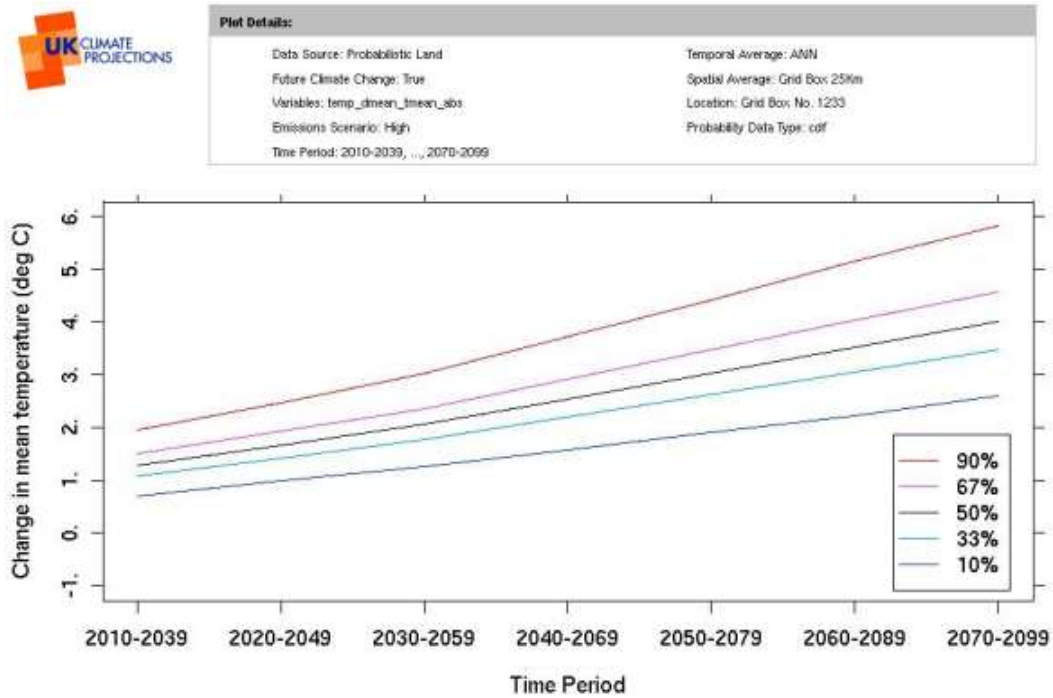


Figure 15 projected change in maximum temperature

Plot Details:	
Data Source: Probabilistic Land	Temporal Average: ANN
Future Climate Change: True	Spatial Average: Grid Box 25km
Variables: temp_dmax_tmean_sbs	Location: Grid Box No. 1233
Emissions Scenario: High	Probability Data Type: cdf
Time Period: 2010-2039, ..., 2070-2099	

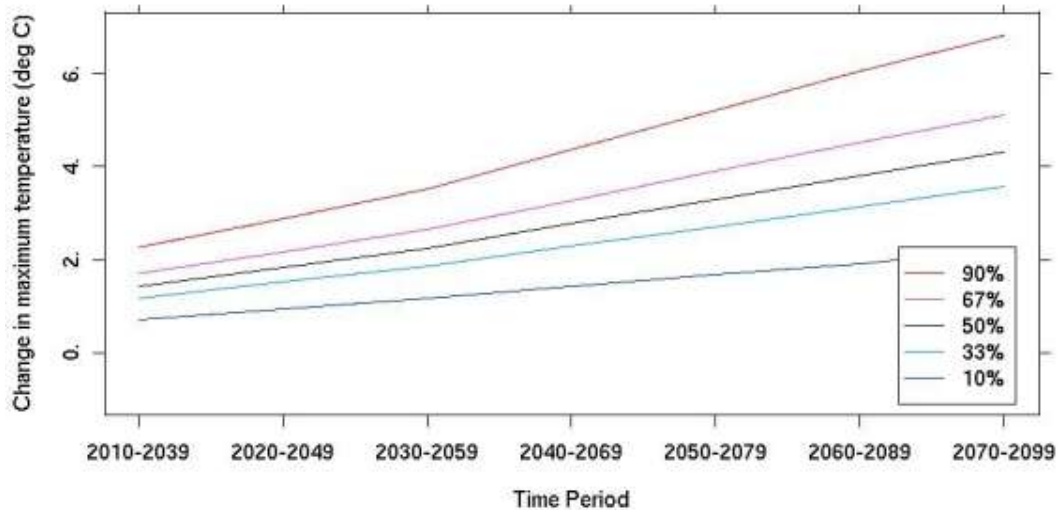
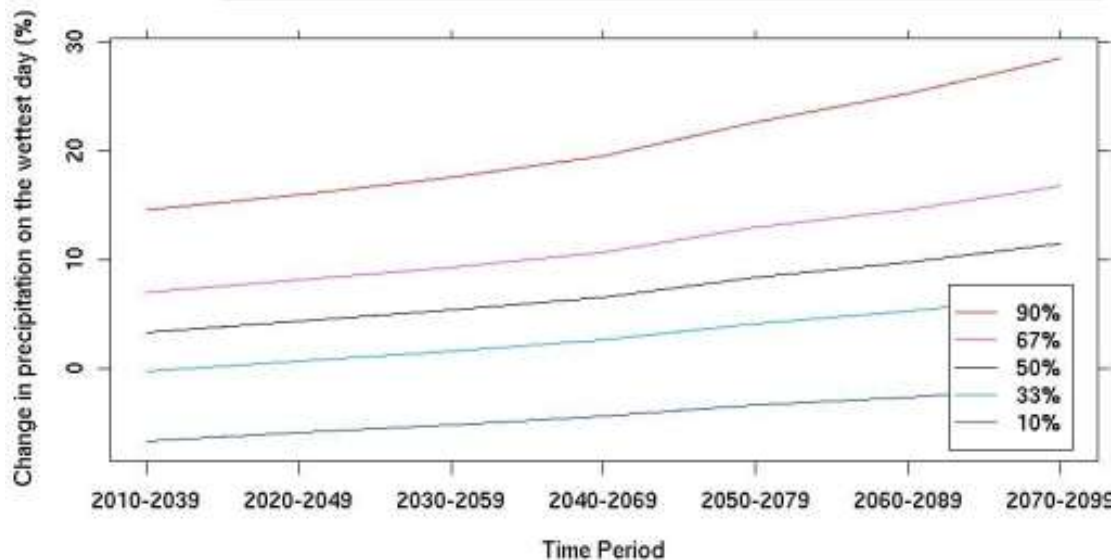


Figure 16 Projected change in precipitation on the wettest day

Plot Details:	
Data Source: Probabilistic Land	Temporal Average: DJF
Future Climate Change: True	Spatial Average: Grid Box 25km
Variables: precip_dmax_t99_perr	Location: Grid Box No. 1233
Emissions Scenario: High	Probability Data Type: cdf
Time Period: 2010-2039, ..., 2070-2099	



8.1.5. Such changes will impact on Liverpool; on people, the economy and the natural environment. They will present a range of risks, but there will also be some opportunities and potential benefits. Potential impacts for Liverpool include⁷⁴:

- Increased extreme precipitation could lead to surface water flooding; this would affect properties, people, and insurance rates
- Increased high temperatures could affect the urban population's health. Many vulnerable people live in urban areas and will be especially susceptible to extreme heat
- Increased tourism and a shift to more outdoor orientated lifestyles, particularly along the Mersey waterfront
- Habitat loss
- Higher summer temperatures could lead to discomfort in buildings and an increased demand for summer cooling
- High winds could cause the cancellation of public events, power cuts, damage to buildings, trees being blown down and closure of parts of the city centre
- In the longer term, there are risks of disruption caused by rising food and fuel prices and by the pressure of inward migration in response to the impacts of climate change elsewhere.

⁷⁴ This list is partly adapted from the impacts identified in Liverpool City Council (2009) Liverpool Climate Change Strategic Framework: A Prospectus for Action

8.2. Climate Change Adaptation

8.2.1. The magnitude of these impacts will depend partly on the outcome of mitigation efforts. However, given that it is now anticipated that there is some inevitable climate change, it is pertinent to begin to adapt to future impacts, especially where adaptation actions will provide other benefits. Green infrastructure has a role to play in addressing some of the impacts and thereby in helping Liverpool to adapt to climate change^{75,76}.

8.2.2. Vegetation and permeable surfaces capture, store and infiltrate rainwater into the ground, thereby reducing both the volume and rate of rainwater runoff and thus the risk of surface water flooding.

8.2.3. Through evaporative cooling, green infrastructure can help to reduce the urban heat island effect. Liverpool is perhaps one of the better positioned UK cities in terms of coping with warmer temperatures. Its extensive waterfront helps in cooling the city. However, it still experiences an urban heat island effect that will become more significant as both the climate changes and with increasing development in the city. Higher temperatures could affect the thermal comfort and health of residents, workers and employees, which may make Liverpool less attractive to visitors and impact on businesses.

8.2.4. Projected climate change could mean that the city faces increasing periods of drought in the summer months. This will mean that some types of green infrastructure, such as grassland, will evapotranspire less and, as a result, will provide less of the cooling function that is so important for the health of communities, and the “comfort” of commercial and business centres, just at the time when it is most needed. Table 7 sets out some thoughts as to which green infrastructure types may be more susceptible to reduced evaporative cooling during dry periods.

Table 7 Susceptibility to reduced evaporative cooling

TYPE	SUSCEPTIBILITY	COMMENTS/SOLUTIONS
Agricultural Land	Medium	Likely to be irrigated
Allotment, community garden or urban farm	Medium	Likely to be irrigated
Cemetery, churchyard or burial ground	High	May be irrigated
Derelict land	High	Normally areas with shallow soil depths
General amenity space	High	Probably not irrigated
Grassland, heathland, moorland or scrubland	Medium	Risk of fire too
Green roof	Medium	Depending on irrigation and species
Institutional grounds	Medium	May be irrigated
Orchard	Low	Unlikely
Outdoor sports facility	Low/medium	May be irrigated
Park or public garden	High	Probably not irrigated
Private domestic garden	Medium	May be irrigated until hosepipe ban

⁷⁵ See CABE's Sustainable Cities website, <http://www.cabe.org.uk/sustainable-cities/green-infrastructure>

⁷⁶ CFNW (2010). Green Infrastructure: How and where can it help the Northwest mitigate and adapt to climate change? www.ginw.co.uk/resources/GI_How_and_where_can_it_help_the_NW_mitigate_and_adapt_to_climate_change.pdf

Street trees	Low	Greater rooting depth provides additional water, except in very extreme cases and for newly planted trees
Water body	Low	N/A
Water course	Low	N/A
Wetland	Low	N/A
Woodland	Low	Cooling may be reduced, but is unlikely to stop

8.2.5. Sustainable sourcing of irrigation would help to ensure that green infrastructure continues to evapotranspire during droughts. The Strategic Flood Risk Assessment identifies that groundwater in the city is rising as less is taken for industrial uses; this potentially offers a source of irrigation water. The storage and re-use of rainwater is another potential source, but would require long term planning to create the infrastructure that is required.

8.2.6. Green infrastructure provides localised shading to help people and buildings cope with high temperatures. Trees with large canopies are especially important as they provide more shade and their deeper roots mean that they can access more water, and will therefore be able to provide evaporative cooling benefits for longer during dry periods compared to shallower rooted vegetation such as grass.

8.2.7. High levels of green infrastructure make for an attractive and comfortable setting for a more outdoors oriented lifestyle anticipated with climate change. Provision of parks and green spaces as cool oases and shade, for example from tree canopies, is particularly important in city centre and district centres and the most built up areas of Liverpool⁷⁷.

8.2.8. The provision of green infrastructure within Liverpool will make the landscape more permeable to other species as they move to find new ‘climate spaces’ in a changing climate.

⁷⁷ Research from the ASCCUE project in Manchester identified that areas of tree shade on hot summer days in a city centre were 13°C cooler than the surrounding areas.

9. IMPROVING BIODIVERSITY

Key Issues from this section

- Other species may have difficulty moving through the landscape in a changed climate
- Development threatens green spaces and habitats in the city
- Habitats may become fragmented - preventing species migration
- Management of green spaces in the city restricts the suitability of the green space as a habitat

9.1. Current Biodiversity

9.1.1. A number of studies have been carried out to assess habitats and biodiversity across the city including the 2006 Phase 1 Habitat Survey⁷⁸. The city has areas of high biodiversity value with 25 Sites of Nature Conservation Value, four Local Nature Reserves, one SSSI, and the Mersey Estuary which also has the highest level of designation as it is both a Special Protection Area and a Ramsar site.

9.1.2. All public bodies are required to consider biodiversity conservation; this is referred to as the “biodiversity duty”⁷⁹. The national target to halt the decline in biodiversity by 2010 has not been achieved and actions will have to continue to meet the target in the future.

9.1.3. The Ecological Framework for Liverpool⁸⁰ sets out many of the key issues for the city that are relevant to this strategy. The framework should influence the Local Development Framework and contribute toward the delivery of biodiversity and green infrastructure plans.

9.1.4. The framework focuses on three areas in its conclusion:

Core biodiversity areas – should be buffered where possible to increase habitat area and reduce impacts of surrounding development on the protected areas of the sites.

Corridors and linkages – can improve the viability of the most important ecological sites, provided that the corridors are well planned and provide an opportunity for species movement through the urban environment. Large areas of green space that are suitable for enhancement to improve the status of the core biodiversity areas are identified.

Deficiency areas – the framework indicates that the city has areas of deficiency which affect social wellbeing and ecological functions

9.1.5. The framework suggests that, in the areas of habitat deficiency, that the most appropriate habitats to create will be those that are targeted by the North Merseyside Biodiversity Action Plan. The Green Infrastructure Habitat Action Plan⁸¹ can be used to guide these improvements across a whole range of green infrastructure types.

⁷⁸ White Young Green & Liverpool City Council (2006) Liverpool Space for Nature – Phase 1 Habitat Survey Report

⁷⁹ The Natural Environment and Rural Communities (NERC) Act, 2006, Section 40 of the Act requires all public bodies to have regard to biodiversity conservation when carrying out their functions.

⁸⁰ White Young Green & Liverpool City Council (2008) Ecological Framework for Liverpool

⁸¹ MEAS (2008) Green infrastructure Habitat Action Plan

9.1.6. Currently MEAS are undertaking work at the city region scale to develop an Ecological Framework, for the Merseyside sub region⁸². This uses a similar approach to the Liverpool Ecological Framework but also includes some specific target areas based on buffers for:

- Search Areas for Potential Habitat Expansion (SAPHE) – around core biodiversity areas, with the search area varying in size depending on the type of habitat.
- Connectivity Zone – This is a standard 100m buffer around all important biodiversity sites.

9.1.7. Liverpool has a national reputation for the good management of urban trees. Planting new urban trees is often a challenge, with issues of ownership, long term management, cost and conflict with underground services. However, in our towns and cities they represent one of the main ways of “retro-fitting” green infrastructure into the public realm, and they are multifunctional. Other towns and cities in the UK are starting to recognise the need to increase urban tree numbers, not least because of the positive impacts for climate change adaptation. Liverpool lost over 70,000 elm trees to Dutch Elm Disease in the 1970’s, mainly in the north part of the city. These trees have not been replaced and represent a significant historic loss for the green infrastructure of the city.

9.1.8. Liverpool is a partner in The Mersey Forest and the delivery of the Forest Plan for the city can assist in adapting to and mitigating climate change as well as supporting many of the other actions. Mab Lane is an example where 20,000 new trees have been planted within the city to provide a range of benefits⁸³.

9.1.9. Biodiversity is in part a measure of the health of a city’s green infrastructure resource. A thriving green infrastructure is likely to have a range of sustainably managed habitats that support a wide range of species. Providing connectivity offers opportunities for species movement, habitat expansion and enables south-north movement of species as climate warms.

9.1.10. Assessing a number of factors, Natural England⁸⁴ has identified the Merseyside Conurbation, and so Liverpool, as an area of the Northwest where the natural environment has high vulnerability to climate change. Climate change will put additional pressure on both the areas that are designated for nature conservation and the wider biodiversity that exists across the city. Actions to buffer and reduce fragmentation of habitat can help species to adapt and move in response to a changing climate.

⁸² MEAS (2010) Liverpool City Region Ecological Framework (draft for consultation)

⁸³ www.mablane.com

⁸⁴ As part of the NW Climate Change Adaptation Plan: Natural England (2010) An Assessment of the vulnerability of the Natural Environment in the Northwest to climate change at the National Character Area scale

10. DESIGN AND MANAGEMENT QUALITY

Key Issues from this Section

- Interventions to support management of green infrastructure to ensure that high quality is provided and maintained.
- Improving design quality of green infrastructure to ensure that the built in potential functionality is realised.
- Securing suitable resources to ensure long term management.
- Need for cross sector cooperation, integration and responsibility with regard to green infrastructure.

10.1. Sustainable Development

10.1.1. Good design and appropriate high quality management are key issues that will affect the ways in which green infrastructure can support sustainable development in Liverpool.

10.1.2. There is an opportunity to link green infrastructure planning with that for grey infrastructure, to gain long term and multiple benefits for the city. CABE have identified the benefits of this joined up approach and launched the Grey to Green campaign in Liverpool in 2010⁸⁵ Good planning will link up the areas of green infrastructure across the city with the public spaces to develop a seamless public realm that will encourage walking and cycling⁸⁶. Natural Economy Northwest provides guidance on integrating green with grey infrastructure planning⁸⁷.

10.1.3. A key issue affecting the ability to deliver many of the functions of green infrastructure for Liverpool is the design and management of the resource.

10.1.4. Poorly managed green infrastructure, whilst still providing a range of green infrastructure functions, some of which may be key for the city, does act as a detractor. There is a temptation to remove this green infrastructure to improve quality of place. In the past this has been done without always considering the implications for the delivery of some key green infrastructure benefits and the role that it plays in providing connectivity within the green infrastructure network.

10.1.5. Quality matters and it is important to seek innovative mechanisms to support high quality management, particularly in areas where the benefits of image, health and wellbeing and property values are most required. Map 6 shows the 'value' of sites across the city, the data was collated as part of the Open Space Study for the City.

⁸⁵ CABE (2010) Grey To Green

⁸⁶ Cabinet Office Strategy Unit (2009) Quality of Place- improving the Planning and design of the built Environment

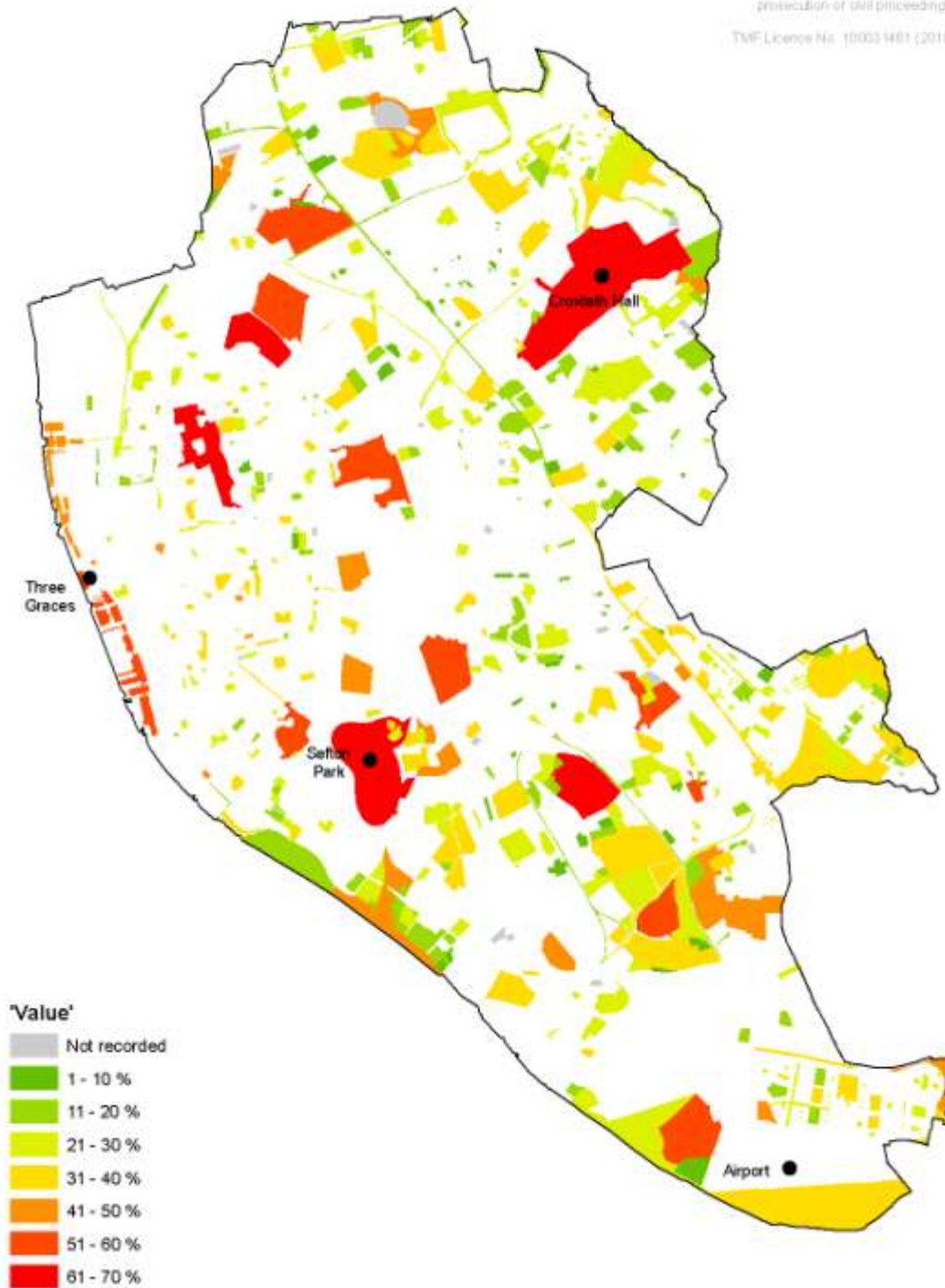
⁸⁷ <http://www.ginw.org.uk/html/index.php?page=resources&NorthwestRegion=true>

Map 6 Assessment of site value collated as part of the Open Space Study for the city.

Open Space Survey

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10.1.6. Map 6 shows the area of open space value categories from the Open Space Study by Neighbourhood management area. This data is also shown in Figure 17; South Liverpool has a large amount of 31-40% 'value'. In comparison to the rest of the city Alt Valley, Liverpool East and South Central have high amounts of 61-70% value land. South Liverpool interestingly has very little of this value land. Table 9 shows these figures by proportion of the area, the largest proportional cover is that of 31-40% value land in South Liverpool.

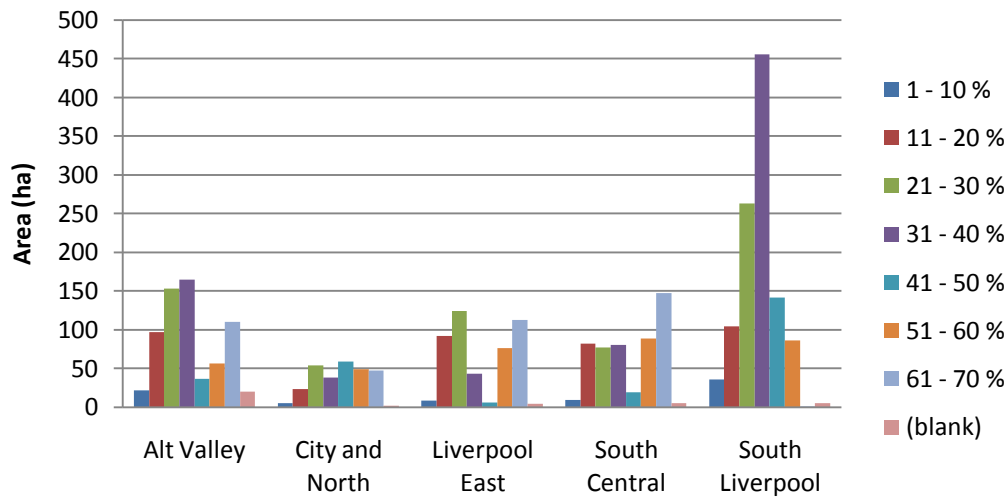
Table 8 Area (ha) of the open space value categories across the city Neighbourhood Management Areas

	1 10 %	- 20 %	11 30 %	- 40 %	21 50 %	- 60 %	31 70 %	- nk)	41 (bla	51 GRAND	61 TOTAL
Alt Valley	22	96	153	165	37	56	110	20		659	
City and North	5	23	53	38	59	49	47	2		276	
Liverpool East	8	92	124	43	6	76	112	4		466	
South Central	9	82	77	80	19	89	147	5		508	
South Liverpool	35	104	263	455	141	86	1	5		1092	
Grand Total	79	397	671	781	261	356	417	37		3000	

Table 9 Proportional area of the open space value categories across the city Neighbourhood Management Areas (percentage)

	1 10 %	- 20 %	11 30 %	- 40 %	21 50 %	- 60 %	31 70 %	- nk)	41 (bla	51 GRAND	61 TOTAL
Alt Valley	1.00	4.43	7.02	7.57	1.68	2.57	5.07	0.93		30.27	
City and North	0.21	1.05	2.41	1.70	2.64	2.20	2.12	0.09		12.42	
Liverpool East	0.48	5.22	7.09	2.44	0.32	4.35	6.40	0.25		26.55	
South Central	0.53	4.70	4.43	4.62	1.09	5.10	8.44	0.30		29.19	
South Liverpool	1.06	3.10	7.86	13.60	4.22	2.56	0.03	0.16		32.59	

Figure 17 Distribution of value categories by Neighbourhood Management Area



10.1.7. Table 10 shows the area of open space value categories by Core Strategy Sub Area. This data is also presented by proportion of the area in Table 11 and Figure 18. It is clear that Eastern fringe (S) has a large proportion of 31-40% value land – much higher than any other Core Strategy Sub Area, however this area has no land of a higher value than this. Eastern fringe (C) has no land of higher quality than 21-30%. The Outer area has the highest proportion of 61-70% value land.

Table 10 Area (ha) of open space value categories across the city Core Strategy Sub Areas

	1 - 10 %	11 - 20 %	21 - 30 %	31 - 40 %	41 - 50 %	51 - 60 %	61 - 70 %	(blank)	GRAND TOTAL
Approach 580 SIA	5	8	40	48	26	0	0	15	142
Atlantic Gateway SIA	1	2	10	0	13	0	0	0	26
City Centre	0	1	7	11	10	19	0	0	48
Eastern Approaches SIA	0	0	3	3	15	4	0	0	24
Eastern Fringe (C)	1	32	34	0	0	0	0	2	70
Eastern Fringe (N)	4	46	101	124	26	0	0	15	315
Eastern Fringe (S)	4	22	39	139	0	0	0	0	204
Inner Area	10	37	67	50	49	199	80	3	496
Inner Area North	10	27	54	28	29	147	80	3	378
Inner Area South	0	10	13	22	19	52	0	1	117
Outer Area	69	359	598	734	202	138	337	34	2470
Southern Fringe	13	18	97	168	31	51	0	1	379
Speke Halewood SIA	9	8	55	50	6	51	0	0	179

Table 11 Proportional area of the open space value categories across the city Core Strategy Sub Areas (percentage)

	1 - 10 %	11 - 20 %	21 - 30 %	31 - 40 %	41 - 50 %	51 - 60 %	61 - 70 %	(blank)	GRAND TOTAL
Approach 580 SIA	1.27	1.95	9.10	11.10	5.90	0.00	0.00	3.47	32.78
Atlantic Gateway SIA	0.26	0.63	2.73	0.00	3.51	0.00	0.00	0.00	7.13
City Centre	0.00	0.18	1.43	2.45	2.21	3.99	0.00	0.01	10.27
Eastern Approaches SIA	0.00	0.18	0.93	0.95	5.25	1.45	0.00	0.00	8.75
Eastern Fringe (C)	0.25	8.96	9.52	0.00	0.00	0.00	0.00	0.65	19.38
Eastern Fringe (N)	0.32	4.01	8.88	10.95	2.25	0.00	0.00	1.32	27.73
Eastern Fringe (S)	0.93	4.88	8.74	30.80	0.00	0.00	0.00	0.00	45.35
Inner Area	0.38	1.34	2.39	1.80	1.76	7.17	2.88	0.12	17.83
Inner Area North	0.54	1.40	2.79	1.44	1.53	7.62	4.15	0.15	19.61
Inner Area South	0.00	1.19	1.50	2.62	2.30	6.18	0.00	0.07	13.86
Outer Area	0.87	4.52	7.53	9.25	2.54	1.74	4.25	0.42	31.12
Southern Fringe	0.93	1.28	6.84	11.88	2.17	3.62	0.00	0.08	26.81
Speke Halewood SIA	0.97	0.88	6.18	5.61	0.67	5.74	0.00	0.00	20.05

Figure 18 Distribution of proportional value categories by Core Strategy Sub Area

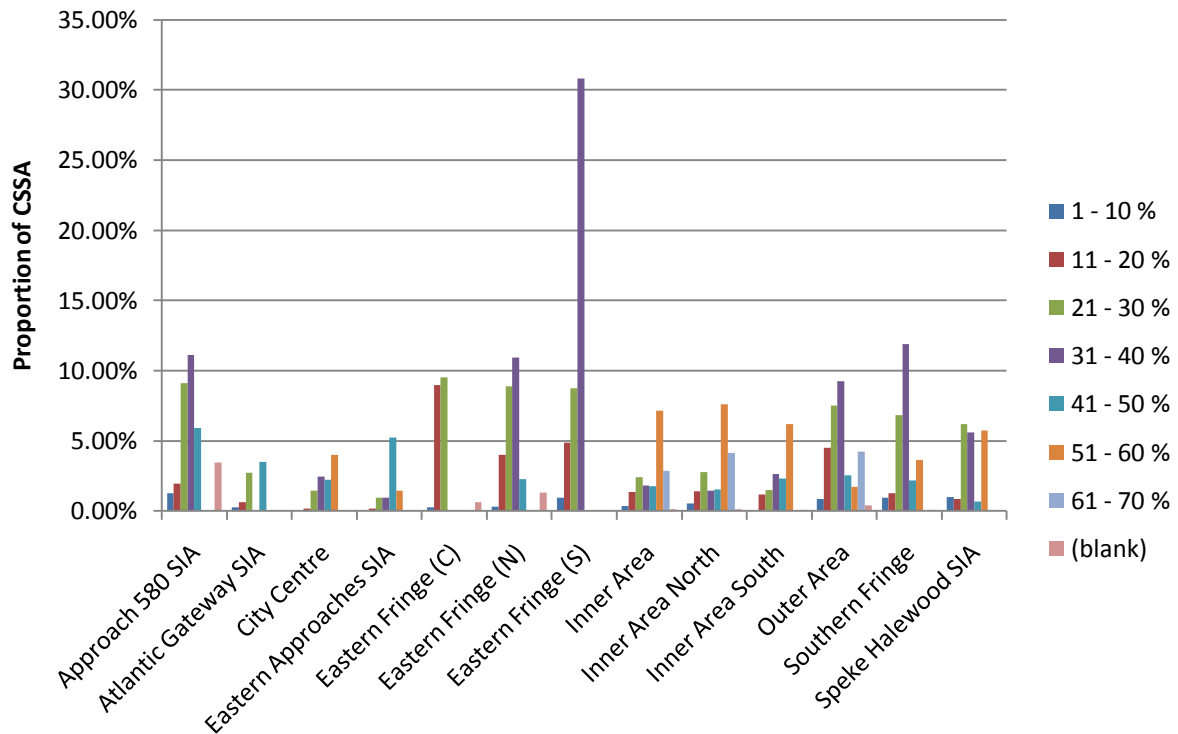
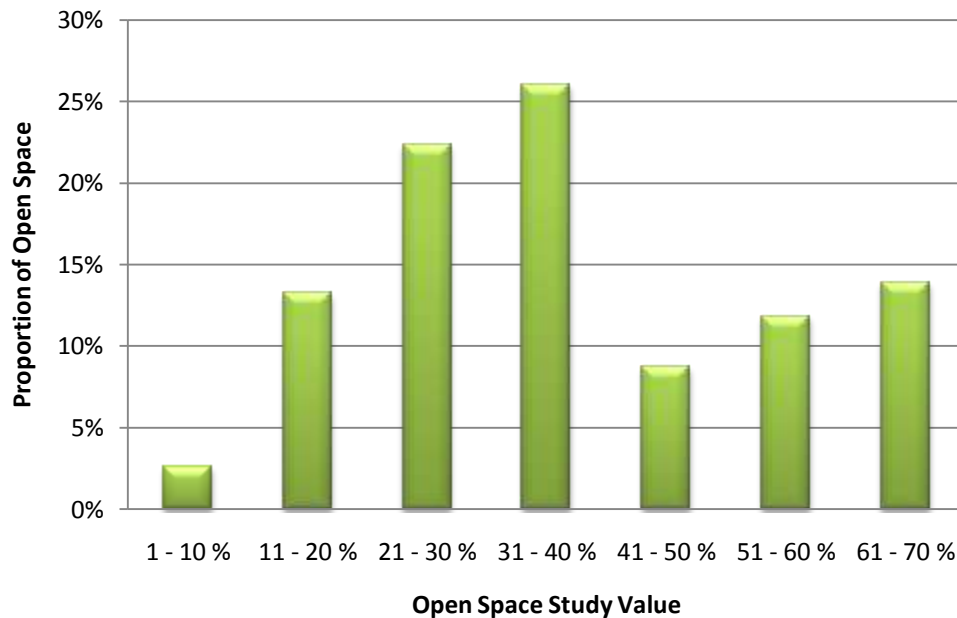


Figure 19 Proportion of open space in Liverpool in each of the value categories.



10.1.8. The values in Figure 19 are taken from the Liverpool Open Space Study. In this document “Value” is described as: “a different and separate concept from quality.” It relates to three things:

- Context: a space which is inaccessible may be of little value, irrespective of its quality. If there is a high level of open space provision in an area some of it may be of relatively little value, conversely if there is very little provision even a space of mediocre quality may be valuable.
- Level and type of use: context should also be interpreted in terms of use by people and wildlife.
- The wider benefits it generates for people, biodiversity and the wider environment.

10.1.9. The benefits and value of open spaces to local communities extends beyond their active recreational role. Both public and private open spaces perform recreational and non-recreational roles contributing to community and quality of life. These roles are examined under the following headings in the Open Space Study:

- Recreational
- Structural
- Amenity
- Historical/Heritage
- Ecological
- Educational
- Cultural and
- Social

11. THE EVIDENCE TO SUPPORT GREEN INFRASTRUCTURE ACTIONS FOR EACH OF THE PRIORITIES AND ISSUES

11.1. Introduction

11.1.1. The following section provides an overview of the evidence that supports green infrastructure interventions to tackle the issues that have been raised in sections 6 – 10.

11.1.2. The evidence has been gathered from a wide range of sources. Recent, but as yet unpublished work by DEFRA⁸⁸ provides the widest range of evidence specifically related to green infrastructure benefits.

11.1.3. The evidence has been set out using the four spatial priorities that have been identified for this strategy. The evidence also supports the fifth priority to ensure quality design and management.

11.2. A Sustainable City

11.2.1. There is now good evidence to show that green infrastructure planning and implementation can help to achieve the objectives set for the major housing and regeneration programmes in Liverpool. Green infrastructure can support these programmes in four ways;

- Direct benefits - by providing or safeguarding jobs
- Indirect – by providing benefits such as improved quality of place
- Reduced Cost – providing functions that would be expensive to replace
- Reduced risk – for example by controlling water flows, storing water or reducing air pollution.

11.2.2. Well planned investments can benefit from using green infrastructure to achieve more than one of these types of support and improve the sustainability of economic investment^{89,90}.

88 DEFRA (2010) Economic benefits of Green infrastructure

89 NENW (2008) Economic Benefits of Green Infrastructure

90 DEFRA. Benefits of Green Infrastructure (unpublished)

11.2.3. Improving quality of place

11.2.3.1. Place making is fundamental to creating attractive and sustainable neighbourhoods. It is a central theme in the work of both the Homes and Communities Agency (Total Place Programme). Work by ECOTEC and Amion⁹¹ highlights the importance of green infrastructure in place making and through an improved living environment, in creating opportunities for leisure and recreation, in improving visual amenity and in enabling empowerment through increased community involvement and action. Quality green space in neighbourhoods and proximity to green spaces have been shown to increase the quality of life of residents and have a positive impact on land and property values⁹². There is a clear link to the health priority in this strategy with guidance issued by the National Institute for Clinical Excellence for planners to ensure that opportunities for increased physical activity are considered in strategies and plans. This has been identified as developing “walkable” neighbourhoods.

11.2.3.2. In the document “How can I find and build a walkable community?”⁹³ twelve key features of walkable communities are identified. Of these twelve, green infrastructure has a role to play in the delivery of four. These are paraphrased below:

- Public Space. There are many places for people to assemble, play and associate with others within their neighbourhood.
- Key Streets Are Speed Controlled. Green Infrastructure plays a part in design to slow down traffic, reducing accidents, the extent of injury caused by accidents and cutting CO2 emissions.
- Streets and paths and public spaces are well linked. Most public rights of way exist within green infrastructure, ensuring good connections can help to increase their use and open up a range of new opportunities to access local facilities.
- Design is Properly Scaled. From most homes, most services are within 400m (actual walked distance).

11.2.3.3. As an element of “Quality of Place” green infrastructure has a role to play in improving the “aesthetics” of the city, and particularly in the areas of planned development and investment. The visual appearance and attractiveness of towns and cities is strongly influenced by the provision of green space⁹⁴.

11.2.3.4. Parks and green space are important components of urban regeneration and neighbourhood renewal schemes and can influence decisions in locating businesses and new homes. In a city context where space is often limited, it is important to consider the fact that whilst some urban green spaces are too small to be of significant recreational value these can provide aesthetic value to housing developments⁹⁵. This supports the holistic approach that has been taken in developing the Green Infrastructure Strategy for Liverpool, including all types and sizes of green infrastructure in the initial assessment of the resource. This allows consideration of the function of these small, but potentially important areas in achieving the aspirations for the city.

⁹¹ NENW (2008) The Economic Value of Green Infrastructure

⁹² CABE (2006) Start with the Park

⁹³ Dan Burden (undated) How can I find and build a walkable community?

⁹⁴ Tibbatts (2002) The benefits of parks and green space. Published by the Urban Parks Forum

⁹⁵ Countryside Agency (2005) Amenity Green space www.cheshireeast.gov.uk/pdf/En-LDF-CongOpSpace07.pdf

11.2.4. Attracting investment and driving up economic growth

11.2.4.1. Talented, creative people in the knowledge economy are attracted to high quality locations with quality environments, and research suggests that the presence of green space is central to these choices on location. Kahn suggests that “green cities” attract skilled workers⁹⁶. Research from CABI⁹⁷ in the UK and from across Europe suggests that the presence of high quality green space can improve the ‘investability’ of an area and its competitiveness as a business location. Creating distinctive and competitive economic business locations that attract high value knowledge based employment to the city is of paramount importance and is an important example of how green infrastructure can make a positive contribution to supporting growth in the city.

11.2.4.2. In city centres, green infrastructure can play a role in creating a pleasant and well-maintained environment that increases the number of people visiting retail areas as well as time and money spent⁹⁸. In the US, studies by Katherine Wolfe⁹⁹ have shown that neighbourhood shopping areas with increased levels of green infrastructure had higher levels of spend (11% more) by customers.

11.2.4.3. Both the business community and consumers were found to favour business districts with good landscaping. The quality of landscaping along approach routes to business districts has also been found to positively influence consumer perceptions¹⁰⁰.

11.2.5. Improved labour productivity

11.2.5.1. As has been described in section 6 above, increasing productivity is a key issue for the city. If the GVA gap between Liverpool and comparator cities is to be closed then productivity will need to increase.

11.2.5.2. Research conducted by ECOTEC¹⁰¹ proposes that ‘high quality accessible green spaces provide opportunities to develop a more productive workforce for employers through improved health, stress alleviation and attracting and retaining motivated people.’ In addition to reducing absence, through ill health, in the work place and creating attractive working environments, the sense of well-being people get from proximity to plants and green spaces enables them to be more productive.

11.2.6. Increased tourism and recreation employment

11.2.6.1. Green infrastructure creates low-cost and healthy leisure and recreation opportunities through the provision of footpaths, cycle paths and bridleways. Green infrastructure also stimulates tourism visits, which tend to last longer and involve more associated spend. Recent work by Regeneris on the Economic Contribution of Mersey Forest’s Objective One Funded Investments points to Tourism and Recreation impacts as the second biggest source of economic value just behind Quality of Place (in gross terms these effects amount to £1.5 million and £2.6 million respectively).

⁹⁶ Kahn (2006) Green Growth, The economics of green cities

⁹⁷ CABI (2004) The Value of Public Open Spaces

⁹⁸ CABI (2005) Does money grow on trees?

⁹⁹ Wolf (1998) Trees in Business Districts - Comparing Values of Consumers and Business, University of Washington College of Forest Resources, Fact sheet #31

¹⁰⁰ Wolf (2000) Community Image - Roadside Settings and Public Perceptions, University of Washington College of Forest Resources, Fact sheet #32.

¹⁰¹ ECOTEC & NENW (2008) Economic Benefits of Green Infrastructure

11.2.6.2. A number of cities have used a green infrastructure “score” or “index” to guide development. Appendix 3 provides an example of how this could be adapted to provide an example of how this could be utilised in Liverpool.

11.3. A City Providing Natural Choices for Health

11.3.1. General health and wellbeing

11.3.1.1. There is an extensive body of evidence to support green infrastructure interventions as a way of helping to improve health and wellbeing.

11.3.1.2. The evidence points to five main areas of health benefit that can be achieved through green infrastructure planning, management and delivery.

- Increased physical activity
- Improving air quality
- Improving mental health
- Reducing health inequalities
- Social cohesion

11.3.2. Increasing physical activity

11.3.2.1. Research by Sport England¹⁰² estimates that the cost of poor health due to lack of exercise could be as high as £6.5bn per year to the national economy. The same report estimates that a 10% reduction in those aged 16+ who are sedentary would benefit the economy by £500 million a year in reduced NHS costs, and increased economic output due to lower ill health and absence from work.

11.3.2.2. Data from the ‘National Travel Survey’ show that the distance people walk and cycle has declined significantly in the last three decades¹⁰³.

11.3.2.3. Various epidemiological studies have demonstrated a positive relationship between green space and population health¹⁰⁴. For example, a study in the UK¹⁰⁵ found ‘A higher proportion of green space in an area was generally associated with better population health.’

11.3.2.4. A recent Natural England study¹⁰⁶ showed that:

- People who live furthest from public parks were 27% more likely to be overweight or obese.
- Children able to play in natural green space gained 2.5 kg less per year than children who did not have such opportunities.
- 1,300 extra deaths occur each year in the UK amongst lower income groups in areas where the provision of green space is poor.

¹⁰² Sport England (2002) A Strategy for Delivering Sport and physical Activity

¹⁰³ Department for Transport (2006) National travel survey 2006

¹⁰⁴ Mitchell & Popham (2007) Green space, urbanity and health: relationships in England

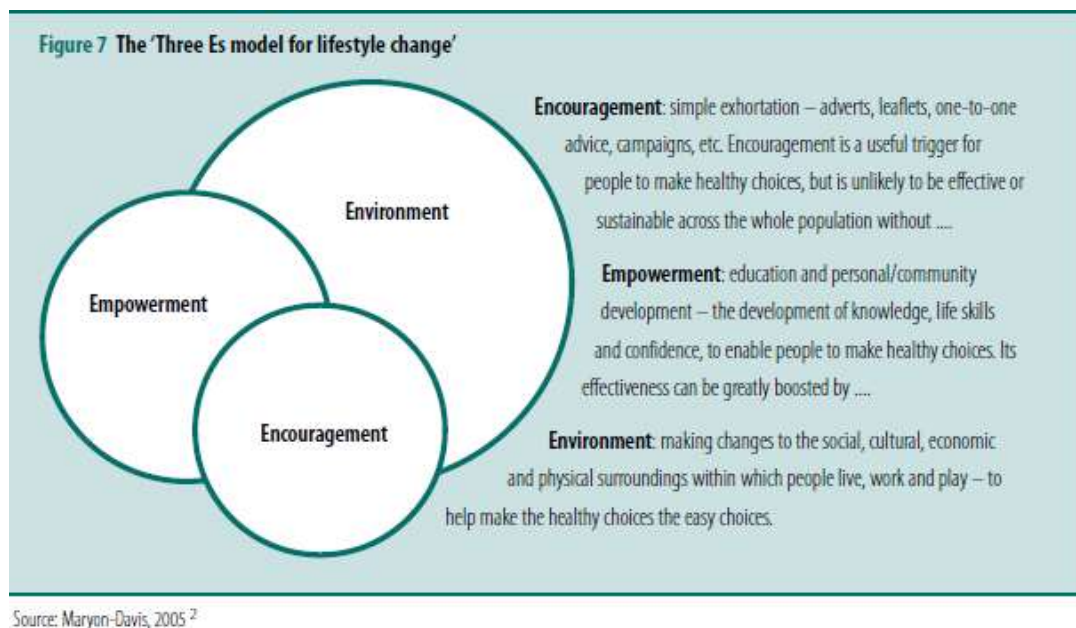
¹⁰⁵ Mitchell & Popham (2007) Green space, urbanity and health: relationships in England

¹⁰⁶ Natural England (2009) Green Space Access, Green Space Use, physical activity and overweight: a research summary.

11.3.2.5. NICE guidance^{107, 108} contains extensive evidence to support their policy recommendations (see section 4.4.6.17). This is an important evidence base as it is used as the basis for guidance to the health service. It suggests that increasing physical activity can help to prevent or manage over 20 conditions and diseases including coronary heart disease, diabetes and obesity. The guidance also emphasises the importance of having environments that encourage healthy lifestyles, creating opportunities to walk or cycle easily and in safety. Increasing physical activity levels in the population will help prevent or manage coronary heart disease¹⁰⁹.

11.3.2.6. One of the issues related to lack of physical activity across the population is increasing levels of obesity. Obesity can be largely overcome by lifestyle changes¹¹⁰. In the document “Lightening the Load” the following diagram is presented:

Figure 20 Model for Lifestyle change - from “Lightening the Load”



11.3.2.7. In terms of the Green Infrastructure Strategy, this strategy is dealing with aspects of the environment and advocates the role green infrastructure can play in encouragement and empowerment.

11.3.2.8. The encouragement of participation in food and other growing projects offers an opportunity to increase physical activity, increase social interaction (see section 11.3.4 on mental health below) and also increase consumption of fresh fruit and vegetables¹¹¹.

107 NICE (2008) Public Health guidance 8: Promoting and creating built or natural environments that encourage and support physical activity,

108 NICE (2009) Public Health guidance 17: Promoting physical activity, active play and sport for pre-school and school-age children and young people in family, pre-school, school and community settings

109 Department of Health (2005) Choosing activity: a physical activity action plan

110 In the document National Heart Forum et al. (2007) Lightening the Load: A toolkit for developing local strategies to tackle overweight and obesity in children and adults tackling overweight and obesity

http://www.heartforum.org.uk/retrievefileinfo.aspx?file=/downloads/Overweight_ObesityToolkit_Full.pdf

111 SQW (2010) Greening the City

11.3.3. Improving air quality

11.3.3.1. Trees and woodlands are particularly effective at removing some elements of pollution from the atmosphere. Work by Lancaster University in the West Midlands identified ozone, nitrogen dioxide and PM¹⁰ particles as being the main pollutants that can be removed. The study estimates that doubling the number of trees in the West Midlands would reduce excess deaths due to particulate pollution by up to 140 per year¹¹².

11.3.3.2. Noise can be an issue that can lead to additional stress and poor health. Trees and other vegetation can play an important role in attenuating noise through reflecting and absorbing sound energy. One estimate suggests that 7 decibel noise reduction is achieved for every 33m width of forest¹¹³ whilst other reported field tests show apparent loudness reduced by 50% by wide belts of trees and soft ground¹¹⁴.

11.3.4. Improving mental health

11.3.4.1. Mental health problems are increasing: one in six adults have mental health problems at any one time, for half these people the problem will last for more than a year, and it is estimated that around one in four people will suffer some form of mental illness at some point in their lives¹¹⁵. Mental health problems are estimated to cost the economy £23 billion¹¹⁶ a year in lost output.

11.3.4.2. Whilst there is good evidence to show that green infrastructure can help to support more active lifestyles, the evidence for positive impact on mental health problems is even stronger¹¹⁷.

11.3.4.3. There is evidence that green spaces can have a positive effect on mental well-being and cognitive function through both physical access and usage¹¹⁸, as well as through access to views of the natural environment¹¹⁹. Work by Ulrich in the US has been influential in hospital design, with a number of hospitals around the world (including Alder Hey in Liverpool) ensuring that wards have views of the natural environment. The aim is to both improve rates of recovery and quality of life of patients as well as reducing time spent in hospital, releasing more beds and improving the “productivity” of the hospital.

11.3.4.4. There is evidence that even the visual presence of green spaces and natural views of elements such as trees and lakes is enough to have a positive effect on stress levels, can promote a reduction in blood pressure and may encourage faster healing in patients following post-surgical intervention¹²⁰.

112 <http://www.es.lancs.ac.uk/people/cnh/docs/UrbanTrees.htm>

113 Coder (1996) Identified Benefits of Community Trees and Forests, University of Georgia Cooperative Extension Service - Forest Resources Publication FOR96-39

114 Dwyer et al. (1992) Assessing the Benefits and Costs of the Urban Forest, [in] Journal of Arboriculture 18(5), pp 227 – 234.

115 Department of Health (2009) The Future Vision Coalition

116 The Sainsbury Centre for Mental Health (2003) Policy Paper 3: The Economic and Social Costs of Mental Illness

117 O'Brien et al. (2010) Urban health and health inequalities and the role of trees, woods and forests in Britain: A review. Forest Research

118 Whitelaw et al. (2008) Physical activity and mental health: the role of physical activity in promoting mental wellbeing and preventing mental health problems: An evidence briefing. Edinburgh: NHS Scotland

119 Ulrich (1984) View through a window may influence recovery from surgery. Science, 224, 420–421

120 DEFRA (2010) Benefits of Green Infrastructure

11.3.4.5. Wilson's 'biophilia hypothesis'¹²¹ seeks to explain the calming and mood enhancing effect of certain green spaces in terms of our evolutionary history. He suggests that our general preference for green environments is “hard wired”, that it comes about because we are genetically predisposed to such environments. Pretty¹²², suggests in a similar vein that humans have evolved through 350,000 generations in contact with nature, our disconnection from nature over the last 200 years (since the industrial revolution) is a short time span to evolve in response to the new way in which we live, we therefore still tend to seek greener areas and feel better in such areas.

11.3.4.6. Direct evidence of the restorative effects of green space and mental health has been found in several studies. Two studies looking at children aged 7-12 found that green space can have a beneficial impact on concentration and on the ability to focus attention.¹²³

11.3.4.7. There is evidence that there are synergistic effects of exercise in “green” environments that improves the positive impact on both physical and mental health.¹²⁴

11.3.5. Reducing health inequalities

11.3.5.1. Recent research at Glasgow University found that:
“Populations exposed to greener environments also enjoy lower levels of income deprivation related health inequality. Physical environments which promote good health may be important in the fight to reduce socio-economic health inequalities.”¹²⁵

11.3.6. Social cohesion

11.3.6.1. There are a range of studies that show that using green space leads to greater social contact and community cohesion. Physical and mental health initiatives utilising green space have been shown to have additional social well-being benefits, for example involvement in “Friends of” groups. Green space can also lead to more day to day experience of greater neighbourliness as people meet in allotments community gardens or simply chat over the garden fence¹²⁶.

11.3.6.2. It has also been shown that greener neighbourhoods create stronger social ties and that there were lower instances of reported crime and domestic violence. Such impacts are more likely if the quality of the green space is high and carefully designed projects are initiated.¹²⁷

11.3.6.3. A study of inner city children in Chicago found that there were significantly higher levels of creative play when the children played in the green spaces around their apartment blocks rather than in the barren areas. Children playing in the green spaces

¹²¹ Wilson (1984) Biophilia: The human bond with other species

¹²² Pretty (2009) Agriculture, Reconnecting people, land and nature

¹²³ DEFRA (2010) Benefits of Green Infrastructure

¹²⁴ Pretty et al. (2003) Green Exercise: complementary Roles of Nature, Exercise and Diet in physical and Emotional Wellbeing and implications for Public Health Policy. CES occasional Paper 2003-1, University of Essex

¹²⁵ Mitchell & Popham (2008) Effect of exposure to natural environment on health inequalities: an observational population study. The Lancet 372(9650):pp. 1655-1660.

¹²⁶ CABI (2007) The Value of Public Space

¹²⁷ DEFRA (2010) Benefits of Green Infrastructure

also had more opportunity to be with adults, a factor that can aid the development of interpersonal skills.¹²⁸

11.3.6.4. More recent work based on Forest Schools¹²⁹ in Sefton has shown that not only did the learning in the natural environment lead to greater levels of physical activity by children involved in the programme, but also that the children involved encouraged parents and siblings to be more active too.

11.4. A Cool City

11.4.1. Mitigation and adaptation

11.4.1.1. The Intergovernmental Panel on Climate Change states that the warming of the global climate system is now unequivocal. Whilst coherent changes can be seen in many aspects of the climate system, the temperature change observed in the last 50 years is very likely (>90% chance) due to increases in man-made greenhouse gas concentrations¹³⁰.

11.4.1.2. There is a recognised international and national need for both climate change mitigation and adaptation. Mitigation involves reducing greenhouse gas emissions and concentrations. It is a vital response as the greater the reduction of emissions and concentrations of greenhouse gases, the less severe the negative impacts of climate change will be. However, some of the changes we will experience over the next 30-40 years are now inevitable as they have already been determined by historic greenhouse gas emissions¹³¹. Alongside mitigation, society must also adapt to the impacts of climate change.

11.4.1.3. There are a number of services provided by green infrastructure which can help with both mitigation and adaptation (Figure 21); the adaptation services provided by green infrastructure may be the more substantial. These services are described and evidence for them presented in a recent report for Northwest England¹³². Additional evidence for some of the services is set out below.

Figure 21 Climate change mitigation and adaptation services provided by green infrastructure

Mitigation	Adaptation
Carbon storage and sequestration	Managing high temperatures
Fossil fuel substitution	Managing water supply
Material substitution	Managing riverine flooding
Food production	Managing coastal flooding
Reducing need to travel by car	Managing surface water
	Reducing soil erosion
	Helping other species to adapt
	Managing visitor pressure

¹²⁸ DEFRA (2010) Benefits of Green Infrastructure

¹²⁹ Ridger & Sayers (2010) Natural Play in the Forest: A Forest School Evaluation

¹³⁰ IPCC (2007) Climate Change 2007: The Physical Science Basis, Summary for Policymakers.

www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf

¹³¹ Hulme et al. (2002) Climate Change Scenarios for the United Kingdom: The UKCIP02 Scientific Report. UK Climate Impacts Programme. www.ukcip.org.uk

¹³² CFNW (2010) Green Infrastructure: How and where can it help the Northwest mitigate and adapt to climate change. <http://www.ginw.co.uk/climatechange>

11.4.2. Managing high temperatures

11.4.2.1. Green infrastructure has the potential to help urban areas cope with increased temperatures, by providing evaporative cooling and shading. Trees with large mature canopies are especially important for their shade provision. Open spaces which allow air to flow through the city could also help to manage high temperatures; Berlin's digital environmental atlas emphasises the importance of air flows through the city, with planning advice for different areas¹³³.

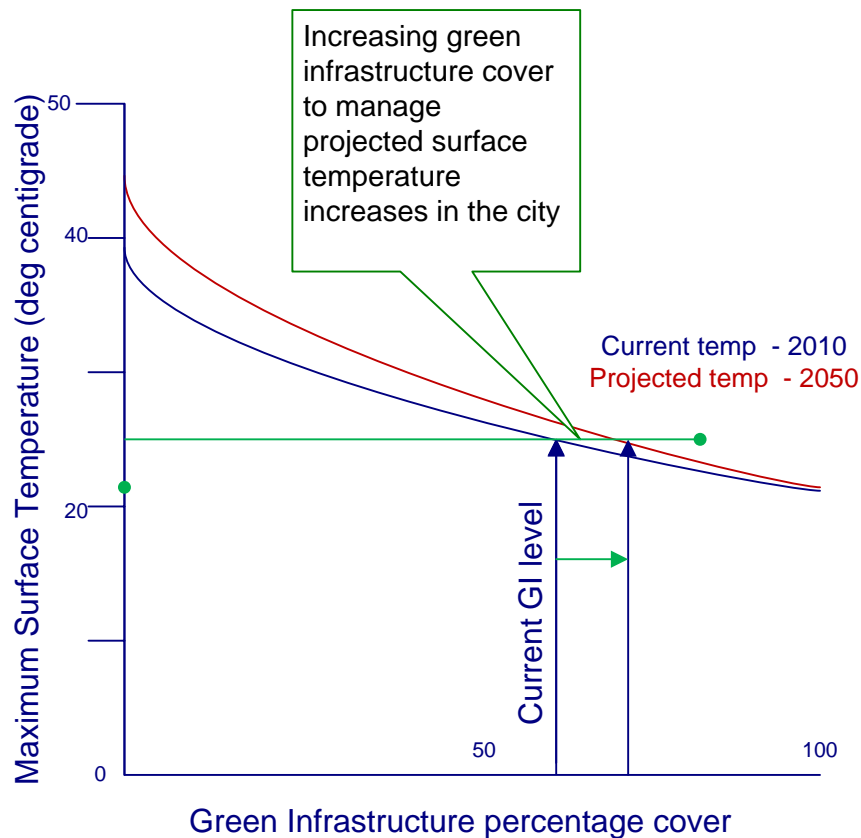
11.4.2.2. Surface temperature has been shown to vary with levels of green infrastructure cover. Figure 22¹³⁴ illustrates the relationship between green infrastructure cover and maximum surface temperature, using both current climate data and climate change projections. Surface temperature, rather than air temperature, is used here as a proxy for the temperature that people sense in a particular area, and so how comfortable they feel. As green infrastructure increases, the maximum surface temperature reduces, providing a mechanism for planners and urban designers to take some control of the impacts of projected climate change on the comfort of the city for residents and visitors. If temperature is to be maintained at a comfortable level, the area of green infrastructure will need to be increased.

11.4.2.3. By increasing the amount of green infrastructure, moderation of increasing temperatures with climate change could be achieved. For example, our mapping suggests that the evaporative cover of Liverpool Knowledge Quarter is 30%, therefore to maintain surface temperatures at levels similar to present day hot periods green infrastructure must be increased by 10%.

¹³³ www.stadtentwicklung.berlin.de/umwelt/umweltatlas/edua_index.shtml

¹³⁴ Adapted from Gill (2006). Climate change and urban green space. PhD thesis completed as part of the ASCCUE project, University of Manchester. http://www.ginw.co.uk/resources/Susannah_PhD_Thesis_full_final.pdf

Figure 22 Relationship between green infrastructure and maximum surface temperature



11.4.2.4. Using green infrastructure to manage high temperatures helps to reduce heat stress and mortality, particularly in vulnerable communities. It also ensures that cities continue to be comfortable places to live, work, visit and invest in the future. It should be noted that green infrastructure responses which help to manage high temperatures, can also help mitigate climate change by reducing energy use for cooling buildings.

11.4.2.5. Urban areas display an ‘urban heat island’ effect, where they are warmer than the surrounding countryside. It is here where green infrastructure can make the biggest impact in terms of helping manage high temperatures. This is especially where vulnerable people live, where green infrastructure levels are currently lowest, and in areas where people congregate.

11.4.2.6. In the Northwest, there were approximately 60 excess deaths in the heatwave of July 2006; this is approximately 15% above the baseline¹³⁵. By the 2080s, it is predicted that a heatwave similar to that experienced in England in 2003 will happen every year. The NHS Heatwave Action Plan¹³⁶ sets out long term planning to increase green infrastructure as a key action to help to reduce the impacts of heat waves. It identifies the factors which make people more vulnerable to increased temperatures as:

¹³⁵ NHS (2010) Heatwave Plan for England
http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/@ps/documents/digitalasset/dh_114423.pdf

¹³⁶ NHS (2010) NHS Heatwave Plan for England

- Older age: especially women over 75 years old, or those living on their own who are socially isolated, or in a care home.
- Chronic and severe illness: including heart conditions, diabetes, respiratory or renal insufficiency, Parkinson's disease or severe mental illness. Medications that potentially affect renal function, the body's ability to sweat, thermoregulation or electrolyte balance can make this group more vulnerable to the effects of heat.
- Inability to adapt behaviour to keep cool: having Alzheimer's, a disability, being bed bound, too much alcohol, babies and the very young.
- Environmental factors and overexposure: living in urban areas and south facing top floor flats, being homeless, activities or jobs that are in hot places or outdoors and include high levels of physical exertion.

11.4.3. Helping other species to adapt

11.4.3.1. As the climate changes, the range of species may shift northwards and upwards to higher altitudes as they seek new 'climate spaces'. A number of factors will limit their ability to do this, including their own dispersal ability and the nature of the landscape through which they are moving (i.e. the fragmentation of existing habitats and the permeability of the landscape between habitats)¹³⁷. The management of linear features and corridors (e.g. river corridors, and road, railway and canal verges) for species movement may become increasingly important. Features oriented north-south may aid species movement, whereas east-west features could act as barriers unless appropriately designed¹³⁸.

11.4.3.2. A recent study assessed and mapped the vulnerability of the Northwest's natural environment to climate change according to character areas. It found that protected landscapes are often the most resilient, whilst areas of highest risk correspond with built up areas and act as a barrier to movement of species through the Northwest¹³⁹.

11.4.3.3. Green infrastructure can help other species to adapt to climate change as it provides existing habitats. In addition, action should be taken in areas deemed to be vulnerable to climate change; this could be by creating new habitat to connect fragmented areas, or by increasing the wider landscape permeability through, for example, the planting of appropriate species and management of linear corridors.

11.4.3.4. The BRANCH project (Biodiversity Requires Adaptation in Northwest Europe under a Changing Climate)¹⁴⁰ found that climate-resilient habitat networks are not yet in place, and recommended that policies and planning systems take climate adaptation into account. BRANCH also recommended that larger areas of green space worked better than smaller or isolated sites when species were under climate stress¹⁴¹.

11.4.3.5. A DEFRA commissioned report¹⁴² on adapting to climate change in England suggested the easiest way to help biodiversity move and survive in urban areas is

¹³⁷ MONARCH (Modelling Natural Resource Responses to Climate Change) was a seven year phased programme to assess impacts of projected climate change on wildlife in Britain and Ireland.

www.ukcip.org.uk/images/stories/Pub_pdfs/Monarch_summary.pdf

¹³⁸ Personal communication with Anna Gilchrist, University of Manchester.

¹³⁹ Natural England (2010). An Assessment of the vulnerability of the Natural Environment in the Northwest to climate change at the National Character Area scale. Final draft version for circulation.

¹⁴⁰ BRANCH Partnership (2007) Planning for biodiversity in a changing climate - BRANCH project Final Report

¹⁴¹ DEFRA (2010) Benefits of Green Infrastructure

¹⁴² Mitchell et al. (2007) England biodiversity strategy - towards adaptation to climate change. Final report to DEFRA

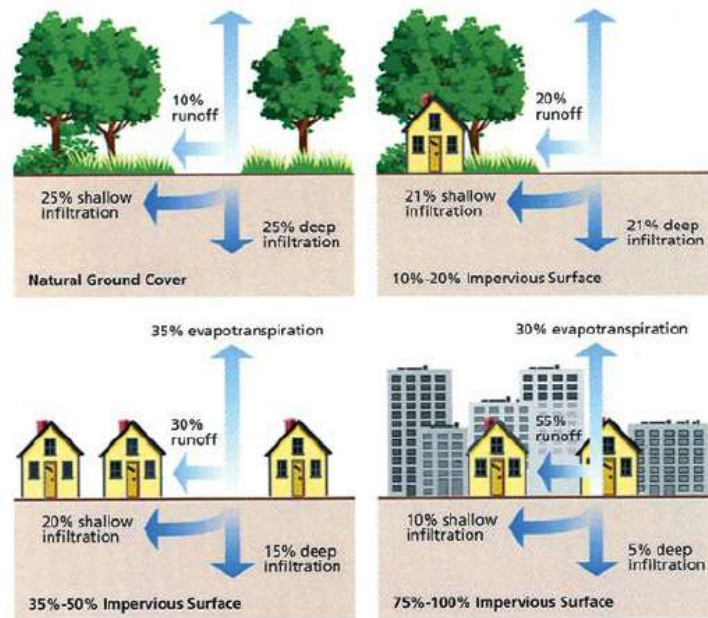
changing the management of close-mown amenity grass and encouraging wildlife-friendly gardening. Adopting a 'light touch' approach helps to improve biodiversity and can significantly reduce the maintenance costs associated with green infrastructure, as this can reduce costs of herbicides, pesticides, fertiliser and labour.

11.4.4. Managing flooding

11.4.4.1. Projected climate change identifies increased winter rainfall with more intense rainfall events. This will lead to increased river and surface water flooding.

11.4.4.2. Ageing water infrastructure and the sealing of natural surfaces through paving (see Figure 23 for the impact of surface sealing on hydrology) combined with the projected changing climate increases the risk of flooding. The Foresight report¹⁴³ suggested that nationally we may be facing an annual cost of management of £1.4 billion to £70 billion by 2080. The Pitt review¹⁴⁴ identified reducing (or restricting) sealed surfaces along with avoiding new building in flood zones as key recommendations to avoid future flood impacts.

Figure 23 Effect of natural and impervious surfaces on the hydrological cycle



11.4.4.3. The Pitt Review advocates working with natural processes to manage flooding¹⁴⁵. Green infrastructure in the wider catchment can reduce the frequency of river floods, but in extreme rainfall events this is less significant. Land use management has a significant effect on runoff at local levels; wetlands and riparian and floodplain woodlands help to reduce peak flood volumes, and provide areas where rivers can flood without causing damage¹⁴⁶.

¹⁴³ Department of Trade & Industry (2004) Foresight Future Flooding report

¹⁴⁴ Pitt (2008) Learning lessons from the 2007 floods

¹⁴⁵ Pitt (2008) Learning lessons from the 2007 floods

http://archive.cabinetoffice.gov.uk/pittreview/thepittreview/final_report.html

¹⁴⁶ Handley & Gill (2009) Woodlands helping society to adapt. In Read et al. (2009) Combating climate change: a role for UK forests. An assessment of the potential of the UK's trees and woodlands to mitigate and adapt to climate change www.tsoshop.co.uk/gempdf/Climate_Change_Main_Report.pdf

11.4.4.4. In London, the importance of gardens for flood control has been highlighted in a report entitled ‘Crazy Paving’. It estimated that 66% of front gardens in London had been paved over and made the following recommendation¹⁴⁷:

Recommendation 3

The Mayor’s revised London Plan should include consideration of the strategic importance of London’s gardens as a crucial environmental resource, wildlife habitat, amenity resources and flood protection system. It should set objectives for the provision and protection of the large area of green space that is made up by front gardens, and should encourage and enable London boroughs to do the same in their own development plans.

11.4.4.5. In more urban areas green infrastructure intercepts (especially trees), infiltrates (especially on permeable soils, where water can percolate underground most easily), stores and evaporates rainwater, thereby reducing both the rate and volume of water entering drains. This reduces the chances of them being overwhelmed during extreme rainfall but also reduces the volume of water that needs to be treated. This means that less pressure is placed on the existing water “grey” infrastructure. Surface water should increasingly be managed through Sustainable Urban Drainage Systems (SUDS). Green infrastructure can incorporate SUDS which mimic natural systems to reduce flooding. Some SUDS components include: swales, infiltration trenches and basins, and detention ponds. Green infrastructure should be safeguarded in areas where the soils are most permeable.

11.4.4.6. Depending on size and species, larger trees have the potential to intercept 80% of precipitation where smaller trees may only have 16% rainfall interception. Generally conifers intercept more water than broadleaved trees with extreme differences during the dormant season when broadleaved trees are leafless. In this time period they intercept only between 10 and 30% of their potential when in leaf.

11.4.4.7. Vegetation also increases the infiltration rate of soils through roots and the turnover of roots. Research has found that root growth by, for example, trees can increase the infiltration rate of soils by a factor of 2-17. Infiltration rates can increase by 90% within two years after converting grassland into woodlands. Besides increasing the infiltration rate of the soil and therefore removing water from the surface and possible runoff from other surfaces vegetation also removes water through water up take.

11.4.4.8. It is obvious that ponds, rivers and wetlands can store water depending on their width and depth. However, areas such as football fields within a floodplain have the potential to temporarily store storm water and therefore prevent flooding of homes and other buildings.

11.5. A Green and Biodiverse City

11.5.1. The emerging City Region Ecological Framework being produced by MEAS will provide an extensive evidence base for this priority and it is not intended to duplicate the evidence that has been gathered for that strategy here.

¹⁴⁷ Greater London Authority (2005) Crazy Paving

11.5.2. The information from the Ecological Framework as it applies to Liverpool has been incorporated into this strategy. In addition, the Green Infrastructure Habitat Action Plan, also developed by MEAS provides an excellent framework for the delivery of biodiversity benefits through green infrastructure planning and delivery.

11.5.3. Key factors influencing the value of green infrastructure for biodiversity are

- The typology - the woodlands, urban forests, ponds, rivers and riverbanks, parks and gardens, allotments and cemeteries - See paragraph 2.2.2.
- The area of habitat available. This is crucial to both the species richness of an area and the size of the individual species populations.
- Proximity of other sites¹⁴⁸.

11.5.4. A study of four urban areas on Merseyside revealed that the greatest influence on their ecology was the proportion of green space, particularly trees¹⁴⁹. The 10-35ha parks will contain all the birds recorded in any urban area of that region¹⁵⁰. Species might have to move between various areas to reach the different resources they need, and the provision of street trees can provide alternative nesting sites and links between parks.

11.5.5. Wildlife corridors are important in helping to overcome habitat fragmentation and to ensure that populations of key species do not become isolated or die out due to inbreeding¹⁵¹. However, this “corridor” role is not a major consideration in the current work on an ecological framework for the city region, where the focus is on habitat expansion areas.

11.5.6. Green infrastructure in built-up areas is potentially a more hospitable environment for flora and fauna than intensively farmed agricultural land in rural areas¹⁵². In particular private gardens are of great importance for biodiversity in urban areas, as they contain a diverse range of habitats. In the section on sustainable Housing Growth and Regeneration (See section 6) the value of small scale green infrastructure in providing aesthetic value was discussed. Such small areas can also be valuable for biodiversity. Well-managed roundabouts and road verges support a wide variety of plants and insects, especially if they are not too intensively mown, not sprayed with herbicides, and have suitable trees planted on them.

11.5.7. Work by Landlife in Liverpool and on major roads leading to the city has highlighted that increasing biodiversity through developing wildflower areas along verges, can also add to the “quality of place” by improving the aesthetic value of an area.

11.5.8. There is evidence that green roofs can provide a range of benefits, particularly in urban areas. A specific review of the opportunities available in Liverpool (see appendix 7 for further information), with a case study on the Toxteth TV building and a detailed

¹⁴⁸ Genecon (2010) Green Infrastructure Valuation toolbox

¹⁴⁹ Whitford et al. (2001) ‘City form and natural process’ – indicators for the ecological performance of urban areas and their application to Merseyside, UK, *Landscape and Urban Planning*, 57 (2), pp91-103

¹⁵⁰ Fernández-Juricic & Jokimäki (2001) A habitat island approach to conserving birds in urban landscapes: case studies from southern and northern Europe. *Biodiversity and Conservation* 10, 2023–2043.

¹⁵¹ O’Brien (2006) Habitat fragmentation due to transport infrastructure: Practical considerations. *Environmental pollution* 10, 191-204.

¹⁵² Loram et al. (2008) Urban domestic gardens XII: the richness and composition of the flora in five U.K. cities. *Journal of Vegetation Science* 19, 321-330

assessment of the Liverpool Knowledge Quarter was carried out in 2009 and provides useful guidance for increasing their implementation across the city including:

- An awareness raising campaign
- Policy guidance
- The establishment of a green roof network that would include champions promoting their use among developers, builders, architects, project managers and in local government.
- Demonstrator funding to help organisations and project managers install green roofs (specifically biodiverse roofs) that can then be used to demonstrate the benefits to others.

11.5.9. Some habitats that are characteristic of urban green infrastructure are of national or international importance. In particular, the new UK Biodiversity Action Plan Priority Habitat ‘Open Mosaic Habitat on Previously Developed Land’ is concentrated in urban and peri-urban areas.

11.5.10. Biodiversity by Design¹⁵³ sets out a range of opportunities to incorporate biodiversity into new development, as part of high quality design. The guide encourages:

- Integrating existing and new elements into large scale planning
- Revising park management to include structurally diverse vegetation¹⁵⁴
- Using the distinct flora of the area as a ‘pattern book’
- Managing linear features to minimise disturbance and consider woodland or wetland linkages
- Planting native species wherever the situation makes them an appropriate choice
- Using higher plot ratios (more people per m² of plot) if the aim is to increase opportunities for a continuous mosaic of doorstep habitats
- Requiring developers to creatively incorporate habitats into buildings and communal spaces, e.g. through green roofs, climbing plants, and artificial bat and bird nest sites.

11.5.11. The Draft Planning Policy Statement: ‘Planning for a Natural and Healthy Environment’¹⁵⁵ states that biodiversity should be included in planning at all levels, based on an understanding of designated sites. Critically, the policy states that local authorities should only permit planning applications that are likely to cause harm to the interests of biodiversity if they are satisfied that there is nowhere else to put the development that would cause less harm.

¹⁵³ TCPA (2004) Biodiversity by Design

¹⁵⁴ It has been suggested that one of the most useful corridors for wildlife movement could be achieved by changing the mowing regime in public parks – though this has to be balanced with a range of other issues related to park use and image.

¹⁵⁵ DCLG (2010) Draft planning policy statement: Planning for a natural and health environment

12. LINKING ISSUES, EVIDENCE & POLICY

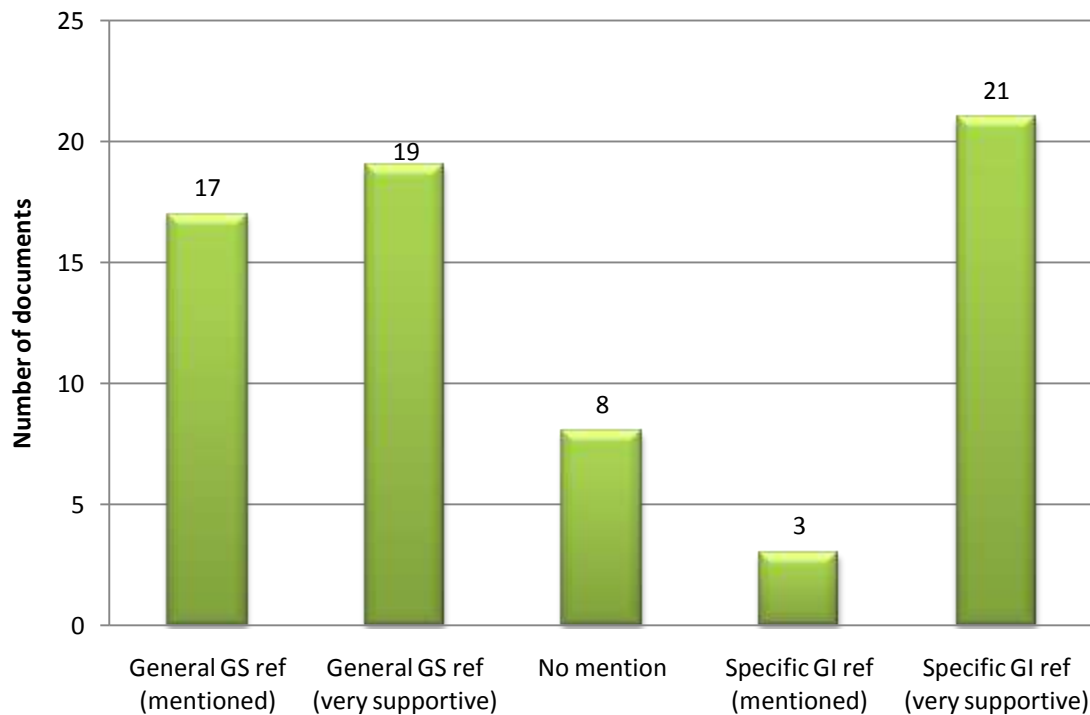
12.1. Key linkages

12.1.1. In the sections above the key policies and issues for each of the priorities have been identified. The evidence of how green infrastructure can play a role in helping to address these issues has also been shown.

12.1.2. Appendix 4 provides an assessment of policy support for green infrastructure from the local, regional and national strategies discussed in this section. This assessment has looked at support for the concept of green infrastructure and the functions and benefits that it can provide. An online evidence base holds all of this information (www.ginw.co.uk/liverpool).

12.1.3. Figure 24 below is an example from this assessment. This sets out the number of documents in the policy evidence base that are supportive of green infrastructure (GI) and green space (GS)

Figure 24 Assessment of policy support for green infrastructure



12.1.4. Table 12 provides a summary of the information that has been gathered in step 1; the table provides a summary of evidence and policy for the issues that were identified under each of the priorities. Where possible potential actions have been informed by information contained in the evidence base.

12.1.5. For Step 1 of our five step process, the evidence that green infrastructure has a role to play in addressing the issues for each priority and the strength of existing policy support has been identified.



Enjoying the tranquillity of Woolton Woods

Table 12 Linking issues to evidence

PRIORITY	ISSUE	SUMMARY OF EVIDENCE	KEY SUPPORTING DOCUMENTS	POTENTIAL TYPES OF GREEN INFRASTRUCTURE ACTIONS – PLANNING OR IMPLEMENTATION
A Sustainable City	Improving quality of place for projected housing growth and major regeneration programmes	Green infrastructure identified as one of the four components of quality of place (World Class Cities), CABE have highlighted the evidence to support high quality design as key to ensuring that the potential value from green infrastructure is maximised. People choose to live in places that are greener when given a choice and house prices have been shown to be higher in areas that are greener and/or close to public parks. Well planned improvements to green infrastructure can boost commercial trading by up to 40% (CABE – grey to green).	DCLG (2009) HM Government World Class Places Liverpool Vision (2000) Liverpool Strategic Regeneration Framework CABE (2006) Does money grow on Trees	Safeguarding areas that are providing these benefits, through their functionality. We have defined these areas as green infrastructure assets Ensure mitigation of loss of green infrastructure assets. Create functions where there is identified need either by managing existing green infrastructure in a different way or by creating new Use vacant and derelict land productively – encourage “meanwhile” use of land Ensure high quality design and management Restructuring and new development should contribute to adding green infrastructure assets to the city. Design guide to support implementation of actions to tackle this and other issues Green Infrastructure Target for new development.
	Increasing levels of productivity across the city	Green infrastructure can contribute to improving productivity by reducing absenteeism, lowering turnover rates, improving employee morale. Green cities are a magnet for the highly educated. Green cities attract and retain skilled workers.	Liverpool City Council(2005) Liverpool: Active city 2005-2010 Department of Health (2003) Investment for health: a plan for the Northwest of England Merseyside EAS (2009) North Merseyside Biodiversity Action Plan: Urban Green Infrastructure	Promotion of Liverpool as a Green City See health actions and actions above to be applied across the city

PRIORITY	ISSUE	SUMMARY OF EVIDENCE	KEY SUPPORTING DOCUMENTS	POTENTIAL TYPES OF GREEN INFRASTRUCTURE ACTIONS – PLANNING OR IMPLEMENTATION
	Attracting investment and people	Green cities are a magnet for the highly educated. Green cities attract and retain skilled workers. Over 35% of companies relocating to the Southwest quoted environmental attractiveness as a key reason for their move ¹⁵⁶ .	DCLG (2009) HM Government World Class Places	Promotion Key gateways and routes to the city have high quality green infrastructure Ensure high quality management Increase GI assets for the city by creation or management
	Aspirations to significantly increase visitor numbers	40% of employment in tourism depends on high quality environment. ¹⁵⁷ Green infrastructure identified as one of the four components of quality of place (World Class Cities), CABA have championed the cause of high quality design as key to ensuring that the potential value from green infrastructure is maximised (CABA – the value of public space).	The Mersey Partnership (2009) Liverpool City Region Visitor Economy Strategy to 2020 DCLG (2009) HM Government World Class Places NWRA (2006) Regional economic strategy Liverpool First (2008) Liverpool Community Cohesion Plan	Actions for tourism include those for attracting investment and improving quality of place
	Developing a low carbon economy	Green infrastructure can help to provide "walkable communities", helping to reduce car use by providing attractive and safe routes between housing and areas for shopping and work. See also climate change issues	NWDA (2010) Rising to the Challenge: A Climate Change Action Plan for England's Northwest (Refresh) DCLG (2010) Consultation on a Planning Policy Statement: Planning for a Low Carbon Future in a Changing Climate DECC (2010) Climate change: Taking Action: Delivering the Low Carbon Transition Plan and Preparing for a changing	Increase connectivity of green infrastructure to public real and transport infrastructure Good design to create safe and attractive places and routes Use green infrastructure to sign post routes through the city. Improve recreation function close to where people live (increasing amount of accessible green spaces)

¹⁵⁶ Grippaios et al. (1997) The Role of Inward Investment in Urban Economic Development: The Cases of Bristol, Cardiff and Plymouth:

<http://usj.sagepub.com/content/34/4/579.abstract>

¹⁵⁷ http://www.nationaltrust.org.uk/main/w-east_midlands-tourism_policy.pdf

PRIORITY	ISSUE	SUMMARY OF EVIDENCE	KEY SUPPORTING DOCUMENTS	POTENTIAL TYPES OF GREEN INFRASTRUCTURE ACTIONS – PLANNING OR IMPLEMENTATION	
			climate		
		Improving walking and cycling routes	Green infrastructure can help to provide "walkable communities", helping to reduce car use by providing attractive and safe routes between housing and areas for shopping and work. Linking accessible green spaces and off road routes seamlessly into the public realm can help to increase the attractiveness of walking and cycling by creating additional connectivity as well as safe and visually attractive routes.	DEFRA (2005) Securing the future - delivering UK sustainable development strategy DCLG (2010) Planning Policy Consultation Paper on a New Planning Policy Statement: Planning for a Natural and Healthy Environment Mersey Travel (2006) Merseyside Local Transport Plan	See above Linking to sites across the City Region
A	City	Health deprivation and inequality	Recent research has shown that there is a link between poor health, areas of health deprivation and the availability of green infrastructure. The research suggests that increasing levels of green infrastructure can help to reduce health inequalities.	Liverpool City Council(2008) Health Weight, Healthy Liverpool: Healthy Weight Strategy for Liverpool Liverpool First (2009) Children’s and Young People’s Plan ‘Liverpool – where every child matters’ Key Priorities and Actions 2007 - 2008	Safeguard green infrastructure functions that support health and wellbeing Ensure mitigation of loss of function Enhance function in areas of greatest health deprivation through changing management or creation of green infrastructure with health functionality Enable local food growing
	for	High levels of coronary heart disease	Increasing physical activity levels in the population will help prevent or manage coronary heart disease, There is a synergistic effect of green exercise for both physical and mental health	Liverpool City Council (2008) Health Weight, Healthy Liverpool: Healthy Weight Strategy for Liverpool Liverpool City Council (2005) Parks Strategy for Liverpool	Increase recreation function in areas of high coronary heart disease incidence.

PRIORITY	ISSUE	SUMMARY OF EVIDENCE	KEY SUPPORTING DOCUMENTS	POTENTIAL TYPES OF GREEN INFRASTRUCTURE ACTIONS – PLANNING OR IMPLEMENTATION
	High levels of obesity in both adults and children	Obesity is linked to increased risk of diabetes and coronary heart disease. Increased physical activity as part of a healthy lifestyle can help to reduce levels of obesity. Research by Natural England has indicated that there is a link between proximity of green infrastructure and levels of activity. Programmes such as Forest School use the natural environment as part everyday living to assist in increasing activity levels, achieved whilst doing “something else”, in this case learning.	Investment for health: a plan for the Northwest of England. Children and Young Peoples Plan: Liverpool, where Every Child Matters	Increase recreation function in areas of high levels of obesity through management or creation of new areas where there are low levels of green infrastructure. Support Forest Schools, Health Walks and cycling and other programmes that use green infrastructure as the setting for health activities.
	High levels of diabetes	Increasing physical activity levels in the population will help prevent or manage diabetes. (see CHD)		Increase recreation function in areas of high levels of obesity through management or creation of new areas where there are low levels of green infrastructure.
	High levels of poor mental health	Green spaces can have a positive effect on mental well-being and cognitive function through both physical access and usage, as well as through access to views. There is evidence that even the view of green spaces and natural views of elements such as trees and lakes is enough to have a positive effect on stress levels, can promote a reduction in blood pressure and may encourage faster healing in patients following post-surgical intervention.	Department of Health (2003) Investment for health: a plan for the Northwest of England. Liverpool City Council(2005) Parks Strategy for Liverpool	Increase green infrastructure in areas of high levels of mental illness but low levels of green infrastructure. Improve quality of place (see actions above)
	Low levels of physical activity	Research has shown that levels of physical activity are greatest close to areas of accessible green spaces. Active	Merseyside Local Transport Partnership (2008) Merseyside Rights of Way	Support physical activity programmes such as Forest Schools, Military Fitness, Healthy Walking and work of SPAA etc.

PRIORITY	ISSUE	SUMMARY OF EVIDENCE	KEY SUPPORTING DOCUMENTS	POTENTIAL TYPES OF GREEN INFRASTRUCTURE ACTIONS – PLANNING OR IMPLEMENTATION
A Cool City		play by children is encouraged by programmes such as SPAA programmes, military fitness and Forest School and this increase is often passed on to parents and siblings resulting in a wider effect on physical activity.	Improvement Plan Forests Schools	Increase recreation function close to where people live. Ensure good quality management
	Reduce levels of air pollution	Trees and woodlands are particularly effective at removing some elements of pollution from the atmosphere thereby reducing pollution levels.	Action for sustainability – regional sustainable development framework Liverpool City Council (2009) Liverpool Corporate Plan	Increase removal of pollution function in areas of poor air quality e.g. appropriate urban trees along main road through the City.
	Use of green infrastructure to manage urban heat island effect	10 % increase in green infrastructure in high density urban areas has been shown to be able maintain maximum surface temperatures at today's levels and help to reduce the urban heat island effect of projected climate change (Gill PhD thesis). The NHS Heatwave plan identifies green infrastructure as one of the long term planning actions that we can take to reduce the impacts of Heatwave, particularly on the most vulnerable members of society.	Liverpool City Council (2009) Climate Change Strategic Framework: A Prospectus for Action NHS Heatwave Plan 2010 Climate Change Sub Committee Report (2010) How well prepared is the UK for climate change?	Increase cooling function in areas of greatest need in terms of vulnerable communities as set out in the NHS Heatwave Plan Safeguard existing functionality Design guide to include climate change adaptation by design principle
	The provision of new infrastructure to provide for species movement	As climate warms species will move northward. Urban areas potentially produce bottlenecks and barriers to this movement. Providing a network of green infrastructure, including road and railway verge corridors can help species movement. Gardens are potentially a key type of green infrastructure to enable some species to move to their “climate space”.	Adapting the Landscape MONARCH Merseyside EAS (2009) North Merseyside Biodiversity Action Plan: Urban Green Infrastructure	Improve corridors for wildlife migration Increase connectivity of parks with urban trees

PRIORITY	ISSUE	SUMMARY OF EVIDENCE	KEY SUPPORTING DOCUMENTS	POTENTIAL TYPES OF GREEN INFRASTRUCTURE ACTIONS – PLANNING OR IMPLEMENTATION
	Advising on the balance between accommodating new housing development and availability of green infrastructure for cooling and water management	Green Infrastructure provides evaporative cooling that helps to reduce the urban heat island effect. Loss of green infrastructure will lead to increased impacts of the urban heat island	DECC (2010) Climate Change: Taking Action: Delivering the low carbon transition plan and preparing for a changing climate Liverpool City Council(2009) Housing strategy statement DCLG (2006) Code for sustainable homes	Ensure that new development also provides or safeguards cooling functions and water management functions
	Incorporating SUDS into new developments to manage surface water in new developments	Green Infrastructure helps to manage water through rainfall interception, increased soil infiltration, water uptake, water storage and delaying & decreasing peak flows all of which decrease the volume of water that requires management, Linking Grey and Green infrastructures can help to maximise benefits. Use of SUDS can help to manage the projected increases in heavy rainfall and flooding events	Environment Agency (2009) Mersey Estuary Catchment Flood Management Plan River basin management plan: Northwest river basin Climate Change Sub Committee Report (2010) How well prepared is the UK for climate change?	Support SUDS as part of new development
	Retrofitting green infrastructure to adapt to high temperatures in the city centre	Providing shade in the city centre through planting of urban trees is one of the best ways to deal with high temperatures. Shade provided by urban trees can be 13oC cooler on hot summer days. Trees planted on the south side of buildings have been identified as one of most effective ways of dealing with high temperatures and also reducing the need for use of air conditioning (Beat the Heat - ARUP)	Rising to the Challenge: A Climate Change Action Plan for England's Northwest Agenda for growth: Regional forestry framework for England's Northwest Climate Change Sub Committee Report (2010) How well prepared is the UK for climate change?	Increase urban tree cover in areas of poor tree cover.

PRIORITY	ISSUE	SUMMARY OF EVIDENCE	KEY SUPPORTING DOCUMENTS	POTENTIAL TYPES OF GREEN INFRASTRUCTURE ACTIONS – PLANNING OR IMPLEMENTATION
A Green and Biodiverse City	Protecting core biodiversity areas	Core biodiversity areas are a key green infrastructure asset. Habitat size as well as quality is important. The extent of habitat determines species richness and population size. The urban area is potentially more hospitable to wildlife than the intensively managed agricultural areas on the fringes of the city. Non core areas also have a role to play in improving the biodiversity of the city. Parks and gardens in particular play a key role, but are not core biodiversity areas.	North Merseyside Biodiversity Action Plan: Urban Green Infrastructure PPS9 The Mersey Forest Plan for Liverpool	Safeguard core biodiversity areas
	Creating expansion areas and creating corridors	Expansion areas can help to increase habitat area and also provide links to enable species movement. Wildlife corridors may be considered as an aspect of expansion areas providing opportunities for linkage and movement. Private gardens potentially provide a large “nature reserve” for the city as well as helping to create linkage between core biodiversity areas.	Liverpool City Region Ecological Framework Merseyside green infrastructure habitat action plan Rising to the Challenge: A Climate Change Action Plan for England’s Northwest	Take opportunities through development, regeneration and land management programmes to expand and connect core biodiversity areas. Promote the biodiversity benefits and potential of gardens
	Ensuring that GI delivery programmes contribute to the delivery of biodiversity action plan habitat targets	Key factors influencing the value of green infrastructure for biodiversity are (i) the typology - (ii) the quantity/area; and (iii) proximity of other sites. The action plan provides information that can help to guide how green infrastructure interventions can help achieve biodiversity action plan targets.	Liverpool City Region Ecological Framework Merseyside green infrastructure habitat action plan	Design guide includes recommendations from the Green Infrastructure HAP for North Merseyside. Green Infrastructure Target for new development.

12.1.6. In Steps 2-4 information has been gathered to identify the green infrastructure resource for Liverpool, identification of where in the city specific functions are being delivered by green infrastructure and the areas of greatest need. This data has been assessed and analysed in the light of the information gathered in Step 1 to help the development of the recommendations in Step 5.

12.2. Information Gathering on Liverpool's Green Infrastructure - Steps 2-4

12.2.1. In the five step process, Steps 2 to 4 are mainly concerned with data gathering and analysis in order to:

- Identify the green infrastructure resource for the city
- Identify the functions that are being delivered by the green infrastructure
- Identify the areas of the city where there are particular needs related to the issues that have been identified for the city.

12.2.2. Analysis of this data provides information to enable spatial targeting of green infrastructure interventions to address the issues that have been raised for each priority across the city.

12.2.3. The full methodology and the detailed mapping that has been undertaken are provided in Appendix 1.

12.3. Historical Context

12.3.1. It is useful to consider the history of Liverpool's green infrastructure resource. The historical development of the city, its rapid growth, population and economic decline and subsequent ongoing regeneration has played a major role in determining and explaining the distribution and type of green infrastructure in the city. Open spaces provide a record of changing priorities and policies in different periods of development¹⁵⁸.

12.3.2. Extract taken from the 2005, Atkins Open Space Study:

Collectively Liverpool's historic open spaces provide an impressive resource which enables not only the story of the city to be interpreted but also charts some of the main developments in urban landscape design over the past two centuries.

1800 – 1910: Planned urban spaces: the garden squares, privately funded cemeteries, and the creation of the private parks

1865 – 1910: First phase of public parks, landscaped cemeteries and planted boulevards

1895 – 1930: Second phase of public parks; mostly parks developed from private landscaped estates, small inner city landscaped garden sites, also the appearance of allotments

1919 – 1999: Inter-and post-war planned urban spaces and regeneration initiatives: dock basin conversions and coastal reclamation schemes, creation of school and university playing fields

1999 – to Present - public realm improvements including increasing numbers of city centre trees, green roofs, boulevards, emergence of green infrastructure approach and integration of green and grey infrastructure.

12.3.3. The garden squares incorporated into the layout of new housing were the first elements of planned open space in the city. The park estates of the 1840's set out to produce

¹⁵⁸ Atkins (2005) Liverpool Open Space Study

an attractive landscape, with a range of open space and large forest trees that now provide a mature landscape in areas such as Fulwood and Grassendale. The large area of public parks in the city were originally planned to provide a belt of green around the city, linking to residential areas along tree-lined boulevards. The parks were originally funded through the sale of plots of housing land on which new housing overlooking the parks would be built. The subsequent gift and acquisition of private estates to convert to parks buffered the south of the city from subsequent urban expansion from the docks and the commercial area of the city to the north, providing the historical basis for the variation seen today in the provision of green infrastructure across the city.

12.3.4. The wide, tree lined avenues that are a feature of some areas of the city are an artefact of the new transport infrastructure that was laid out by Brodie in the early 1900's, incorporating large trees along the roads and linking these green spaces to neighbouring areas of housing.

12.3.5. Liverpool in the 1920's and 1930's was a national leader in the development of garden estates and the high percentage cover of this type is in part a legacy of that time. Private gardens along with general amenity space and grassland, accounts for over 50% of the total green infrastructure. The garden estates were a response to the clearance of slum housing and were based on the model villages such as Port Sunlight.

12.3.6. Over the last 50 years depopulation of the city has led to extensive housing clearance and rebuilding that continues up to the present. Areas of former housing have been grassed over and many infill areas of housing form incidental green spaces, often randomly scattered through the old housing estates.

12.3.7. More recently, there has been a focus on improving the quality of the public realm to support large-scale private investment in areas such as Liverpool One and public investment through large-scale intervention programmes such as Objective 1. This has led to more urban trees planted within new development, areas such as Chavasse Park in the city centre and an increasing number of green roofs being created. New proposals and plans have also tried to "tidy up" the scatter of small-scale green spaces. However, this has not always been done in full recognition of the functionality of the spaces that may be lost and so a net loss in function may be occurring¹⁵⁹.

12.3.8. The influence of this historical development of the city is reflected in the typologies that have been identified in this study. Natural England is currently working on applying the concept of landscape character to urban areas. Once this has been completed for Liverpool it can help to provide additional context for this strategy. The Merseyside Historic Landscape Characterisation work is a step towards this but at present something of an evidence gap remains.

¹⁵⁹ See case study on Liverpool Knowledge Quarter, Appendix 2

12.4. Identifying Typology

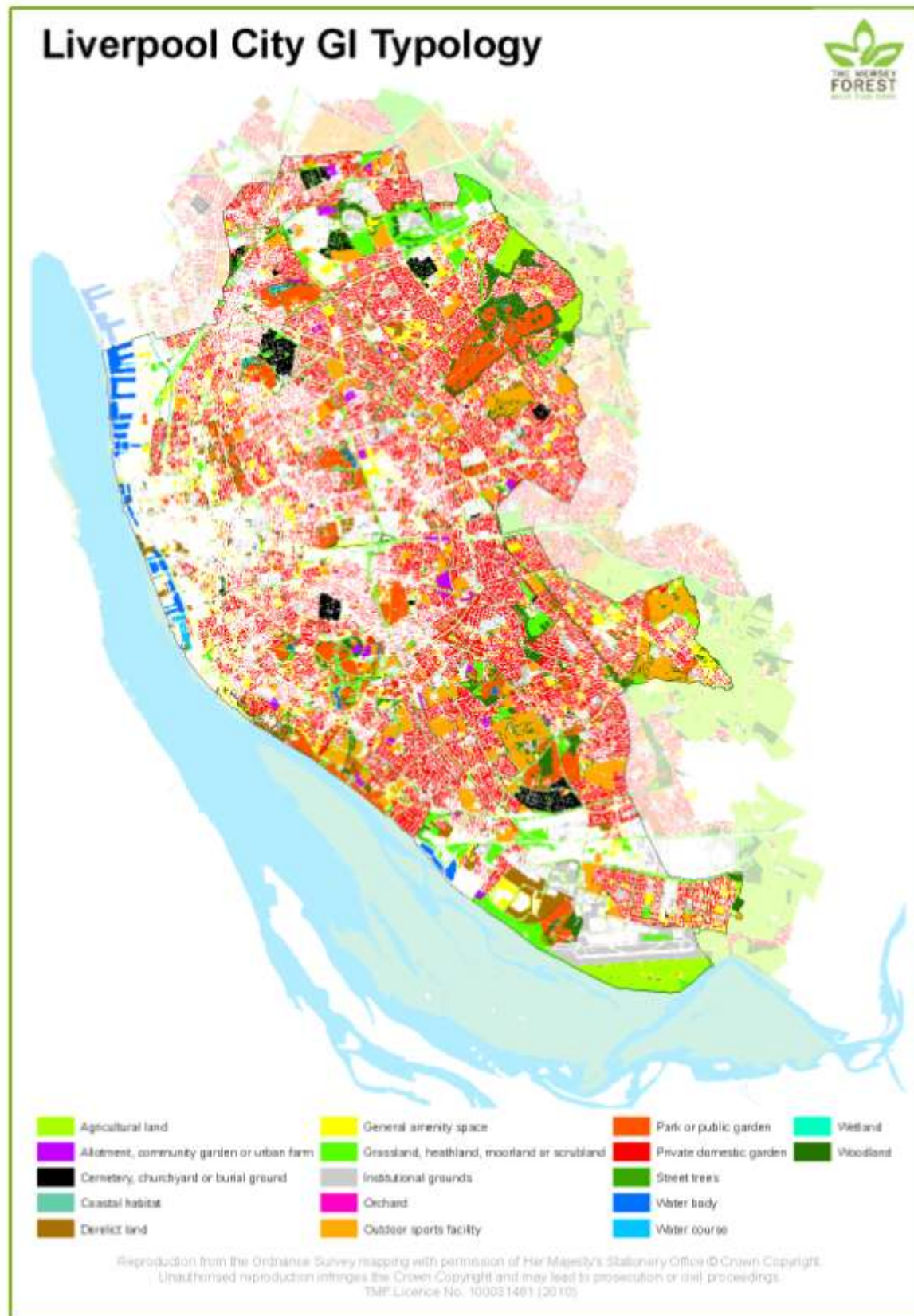
12.4.1. Assessment of Liverpool’s green infrastructure based on typology mapping provides the following results:

Table 13 Typology, area and percentage

TYPE	TOTAL AREA (HA)	TOTAL PERCENTAGE	AREA PERCENTAGE OF GREEN SPACE
Not green infrastructure	5113.0	38.12%	-
Private domestic garden	2162.3	16.12%	26.05%
Coastal habitat	1298.2	9.68%	15.64%
Water course	892.4	6.65%	10.75%
General amenity space	645.5	4.81%	7.78%
Grassland, heathland, moorland or scrubland	618.3	4.61%	7.45%
Outdoor sports facility	569.8	4.25%	6.87%
Park or public garden	518.4	3.87%	6.25%
Woodland	456.8	3.41%	5.50%
Institutional grounds	413.1	3.08%	4.98%
Agricultural land	165.5	1.23%	1.99%
Cemetery, churchyard or burial ground	154.2	1.15%	1.86%
Derelict land	129.1	0.96%	1.56%
Street trees	111.4	0.83%	1.34%
Water body	106.3	0.79%	1.28%
Allotment, community garden or urban farm	57.0	0.42%	0.69%
Orchard	0.8	0.01%	0.01%
Wetland	0.3	0.00%	0.00%

12.4.2. Based on our assessment, green infrastructure accounts for 62% of the total area of Liverpool. Private gardens constitute the largest single type in the city. Private gardens represent a major asset for the city, but obviously one that is not easily influenced by policy. Similarly, the typologies associated with the River Mersey are significant, i.e. coastal habitat and water course, as may be expected, but they are not always considered in traditional “green space” strategies. The Green Infrastructure Strategy looks to bring the land and water based types through a unified plan to maximise the functions and benefits that can be achieved through linkage and integrated assessment.

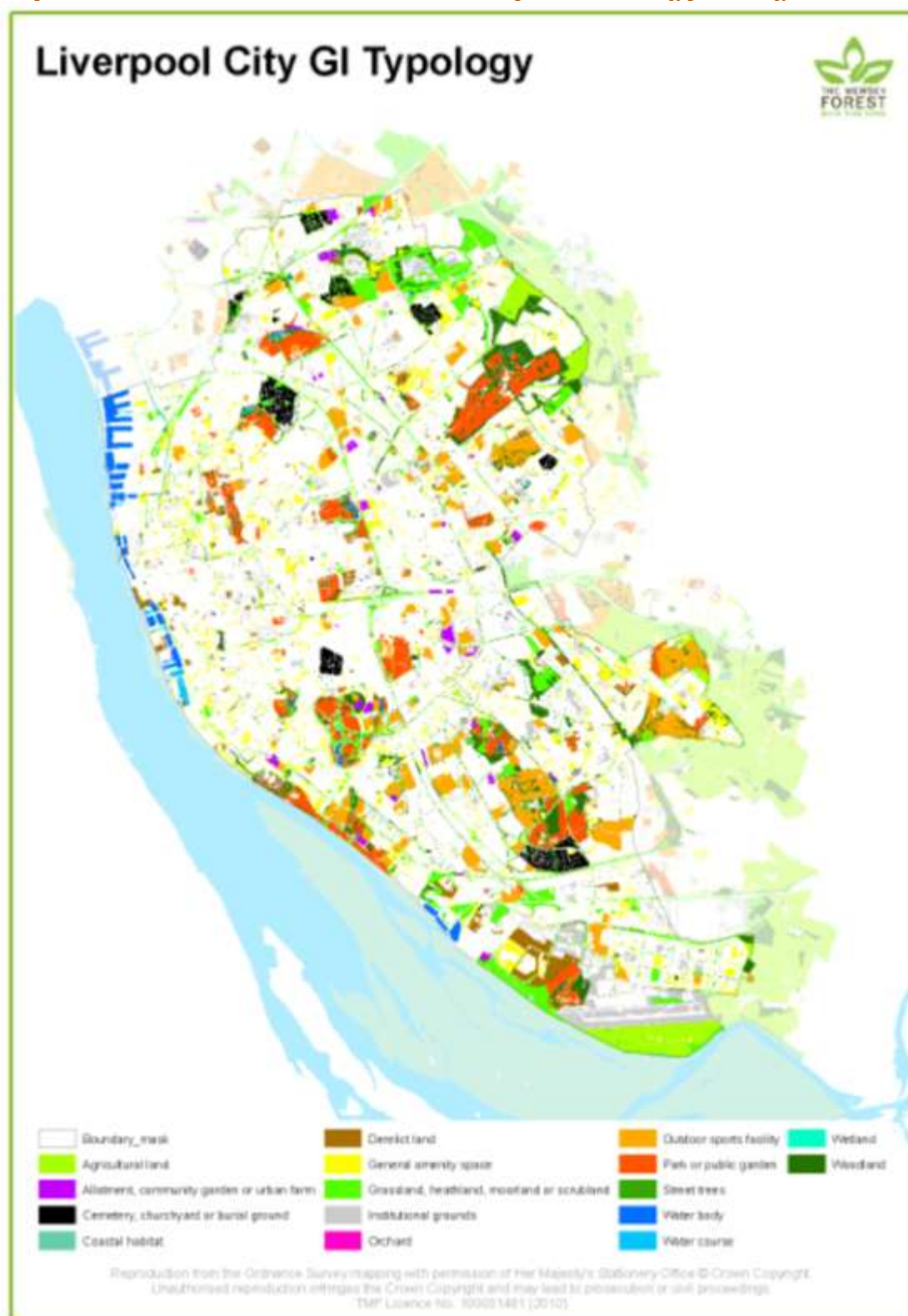
Map 7 The distribution and type of green infrastructure across the city¹⁶⁰.



¹⁶⁰ Anything with no colour assigned is not green infrastructure and represents the built surfaces of the city.

12.4.3. The importance of private gardens for Liverpool is shown by comparing Map 7 and Map 8. Our assessment indicates that 18% of private garden area is paved; this figure was established using aerial photography analysis. The areas shown on the map above as private garden are the areas that are still green.

Map 8 Green infrastructure resource in Liverpool excluding private gardens



12.4.4. Removing the information on private gardens highlights the string of large public parks through the middle of the city and the large wedges of green infrastructure that start at the city boundary and taper quickly in the outer zone of the city. A number of linear features such as the Loop Line also show up strongly, as does Otterspool alongside the River Mersey - and obviously the River Mersey itself.

12.4.5. From both maps, it is possible to see that there are areas of the city, particularly around North Liverpool with low levels of green infrastructure. Green infrastructure is not evenly distributed, either by quantity, or by type. For example, 22% of the Super Output Areas have 80% of the total accessible green infrastructure whilst some Super Output Areas have no accessible green infrastructure. The most affluent Super Output Areas of the city have 18% more green infrastructure than the most deprived.

12.4.6. Typology in relation to Neighbourhood Management Areas

12.4.6.1. To assess the distribution of green infrastructure across the city comparisons will be made using Neighbourhood Management Areas and the Core Strategy Sub Areas (see section 12.4.7). Map 9 shows the location of the Neighbourhood Management Areas

Map 9 Location of Neighbourhood management areas



12.4.6.2. Table 14 shows the detailed distribution of green infrastructure by neighbourhood and ward across the city.

12.4.6.3. Our assessment of green infrastructure typology has shown that the most affluent areas of the city have approximately 18% more green infrastructure than the most deprived¹⁶¹.

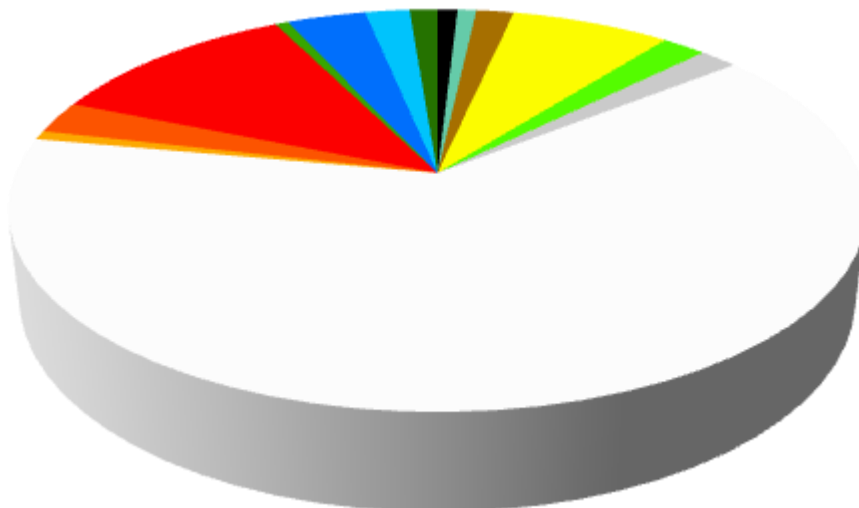
¹⁶¹ The proportion of green infrastructure cover is 18.5% less in the ten most deprived Middle Layer Super Output Areas in Liverpool than it is in the ten least deprived.

Table 14 Percentage typology cover by neighbourhood and ward

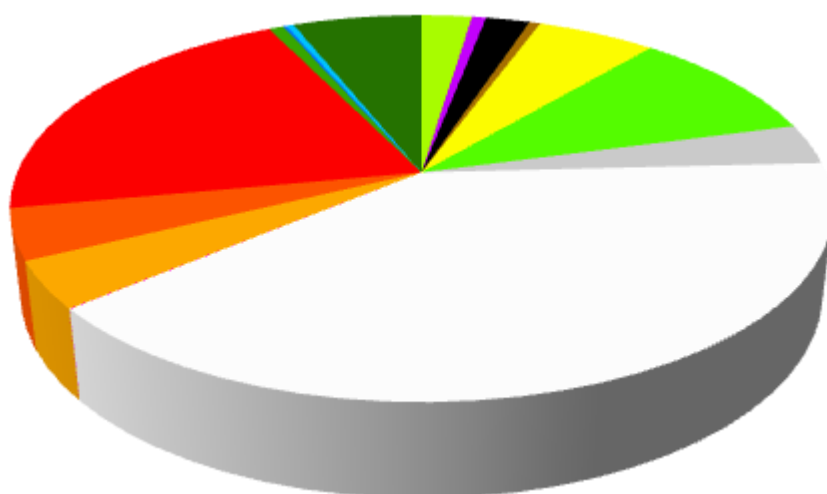
	AGRICULTURAL LAND	ALLOTMENT, COMMUNITY	CEMETERY, CHURCHYARD OR BURIAL GROUNDS	COASTAL HABITAT	DERELICT LAND	GENERAL AMENITY SPACE	GRASSLAND, HEATHLAND, MOORLAND OR SCRUBLAND	INSTITUTIONAL GROUNDS	ORCHARD	OUTDOOR SPORTS	PARK OR PUBLIC GARDEN	PRIVATE DOMESTIC	STREET TREES	WATER BODY	WATER COURSE	WETLAND	WOODLAND	GRAND TOTAL
Alt Valley	2.37	0.66	2.07	0.00	0.51	5.60	9.59	3.38	0.02	3.93	4.23	20.69	0.70	0.15	0.36	0.00	6.06	100.00
Clubmoor	0.00	0.88	0.16	0.00	0.01	5.06	4.33	1.04	0.00	6.16	0.20	33.72	2.66	0.00	0.14	0.00	0.53	100.00
County	0.00	0.00	0.08	0.00	0.20	2.11	3.44	0.87	0.00	1.70	17.65	12.95	1.01	0.28	1.02	0.00	2.46	100.00
Croxteth	9.82	0.00	2.75	0.00	0.00	6.93	5.80	0.80	0.00	2.66	9.33	18.09	0.06	0.31	0.50	0.00	15.30	100.00
Fazakerley	0.00	1.71	4.07	0.00	0.67	4.27	21.01	7.68	0.01	5.66	0.00	12.70	0.32	0.08	0.45	0.00	5.13	100.00
Norris Green	0.00	0.00	0.13	0.00	2.26	8.49	3.67	3.23	0.00	1.33	1.65	36.78	1.06	0.00	0.01	0.00	0.71	100.00
Warbreck	0.00	0.50	1.53	0.00	0.20	6.14	6.95	3.07	0.10	4.19	1.54	20.27	0.30	0.18	0.00	0.00	3.88	100.00
City and North	0.00	0.01	0.89	0.85	1.69	7.20	1.99	1.72	0.00	0.71	2.59	11.40	0.59	3.57	2.01	0.00	1.26	100.00
Central	0.00	0.00	0.04	0.52	3.69	4.49	0.63	3.47	0.00	0.02	0.88	3.31	1.15	1.32	1.61	0.00	0.76	100.00
Everton	0.00	0.00	0.20	0.00	1.09	9.68	1.61	1.54	0.00	1.64	8.20	18.9	0.62	0.03	0.04	0.00	2.78	100.00
Kensington & Fairfield	0.00	0.00	0.22	0.00	1.15	6.32	2.49	2.01	0.00	1.59	3.45	19.50	0.38	0.00	0.00	0.00	2.07	100.00
Kirkdale	0.00	0.00	0.02	1.31	0.55	7.32	3.07	0.72	0.00	0.73	0.67	9.68	0.49	9.27	4.28	0.00	0.33	100.00
Picton	0.00	0.07	5.53	0.00	2.51	5.60	1.97	2.72	0.00	0.64	4.66	11.78	0.54	0.04	0.02	0.00	1.96	100.00
Riverside	0.00	0.00	0.45	2.28	2.04	8.73	1.48	1.13	0.00	0.00	0.00	9.65	0.37	3.92	2.98	0.00	0.85	100.00
Liverpool East	0.00	0.50	2.52	0.00	0.40	4.86	3.35	2.60	0.00	5.52	6.47	23.98	0.98	0.18	0.15	0.00	3.87	100.00
Anfield	0.00	0.00	14.66	0.00	0.14	2.60	4.83	2.09	0.00	0.86	7.36	14.78	1.32	0.00	0.65	0.00	3.06	100.00
Knotty Ash	0.00	0.88	0.38	0.00	0.06	4.91	2.30	5.04	0.00	9.03	3.81	26.36	1.19	0.00	0.14	0.00	2.51	100.00
Old Swan	0.00	0.23	0.32	0.00	0.00	6.69	2.28	1.37	0.00	1.14	0.54	18.07	1.02	0.00	0.00	0.00	0.40	100.00
Tuebrook & Stoneycroft	0.00	1.91	0.20	0.00	0.47	3.52	3.06	4.03	0.00	3.49	8.68	21.61	1.21	0.98	0.00	0.00	2.67	100.00
West Derby	0.00	0.09	0.14	0.00	0.15	3.58	2.27	1.44	0.00	1.22	19.02	30.16	0.92	0.16	0.03	0.00	6.16	100.00
Yew Tree	0.00	0.00	1.96	0.00	1.39	7.13	5.35	1.38	0.00	13.54	0.04	28.20	0.42	0.04	0.15	0.00	7.06	100.00
South Central	0.00	1.33	0.17	0.11	0.09	4.80	5.26	2.01	0.00	5.56	7.12	23.85	1.59	0.38	0.19	0.00	4.46	100.00
Childwall	0.00	0.84	0.37	0.00	0.00	3.23	7.56	2.31	0.00	3.98	0.00	35.46	2.64	0.00	0.00	0.00	6.03	100.00
Church	0.00	0.83	0.04	0.00	0.00	3.61	3.82	0.81	0.00	11.54	5.07	26.95	2.64	0.36	0.10	0.00	5.91	100.00
Greenbank	0.00	2.45	0.08	0.00	0.21	5.33	4.58	2.77	0.00	5.63	3.90	18.45	0.99	0.50	0.01	0.00	6.08	100.00
Princes Park	0.00	0.00	0.00	0.00	0.39	5.75	2.42	3.34	0.00	0.71	3.76	21.54	0.85	0.41	0.00	0.00	2.05	100.00
St Michael's	0.00	0.97	0.10	0.55	0.01	8.17	8.12	0.91	0.00	1.58	17.92	16.67	0.59	0.95	0.86	0.00	5.93	100.00
Wavertree	0.00	3.18	0.40	0.00	0.05	2.89	4.07	2.70	0.00	8.73	10.09	21.66	1.37	0.05	0.00	0.00	0.20	100.00
South Liverpool	3.24	0.30	1.23	0.58	2.12	5.70	5.99	6.49	0.01	8.10	3.84	18.24	1.12	0.40	0.09	0.00	4.45	100.00
Allerton & Hunts Cross	0.00	0.34	6.19	0.00	0.81	2.82	4.69	1.61	0.02	15.15	7.03	18.28	1.64	0.01	0.00	0.00	6.42	100.00
Belle Vale	1.66	0.00	0.00	0.00	0.29	12.44	3.31	3.13	0.00	17.10	3.59	18.95	0.97	0.05	0.12	0.00	5.58	100.00
Cressington	0.00	0.18	0.12	2.35	2.13	3.75	5.93	0.77	0.00	4.56	0.00	33.84	2.24	1.11	0.03	0.00	1.12	100.00
Mossley Hill	0.00	1.18	0.00	1.40	0.00	4.65	4.24	1.57	0.00	14.32	8.49	20.71	1.55	0.00	0.45	0.00	6.36	100.00
Speke-Garston	8.12	0.22	0.09	0.60	4.57	5.16	9.30	13.68	0.01	2.49	2.40	8.02	0.45	0.78	0.07	0.00	2.37	100.00
Woolton	0.00	0.21	0.19	0.00	0.24	6.45	2.04	4.14	0.04	1.30	2.89	35.84	1.35	0.01	0.00	0.00	7.92	100.00
Grand Total	1.43	0.50	1.36	0.36	1.14	5.71	5.38	3.65	0.01	5.04	4.58	19.12	0.98	0.94	0.54	0.00	4.04	100.00

Figure 25 The percentage cover of green infrastructure types by neighbourhood management area (Legend overleaf)

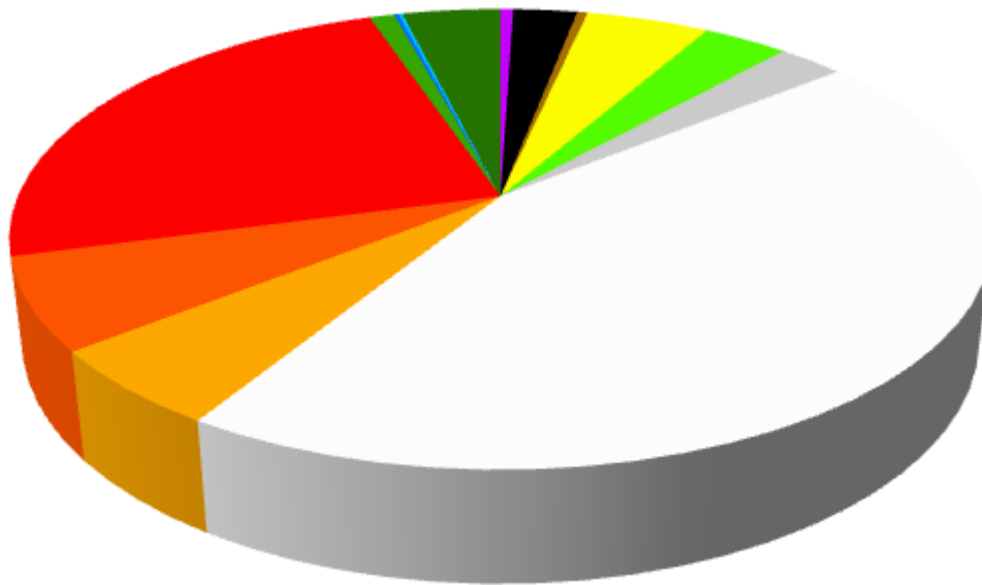
City and North



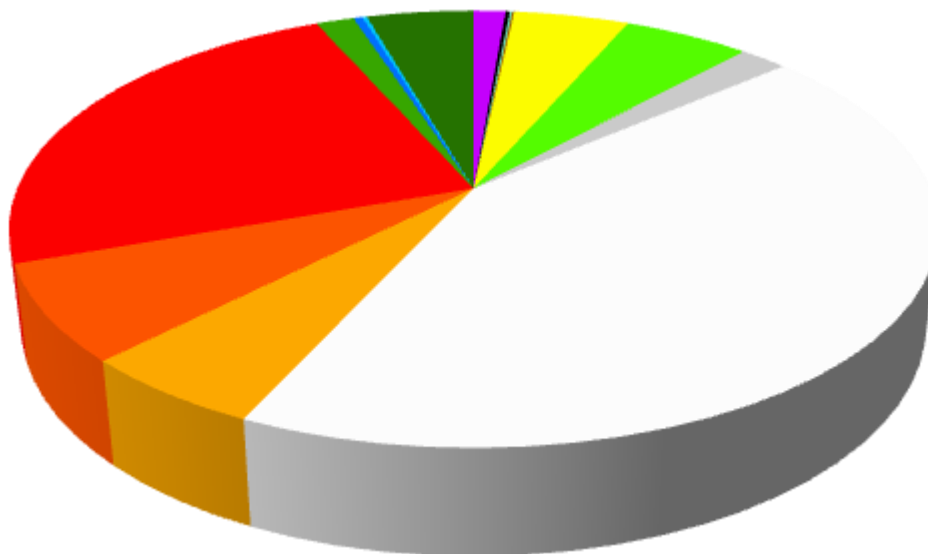
Alt Valley



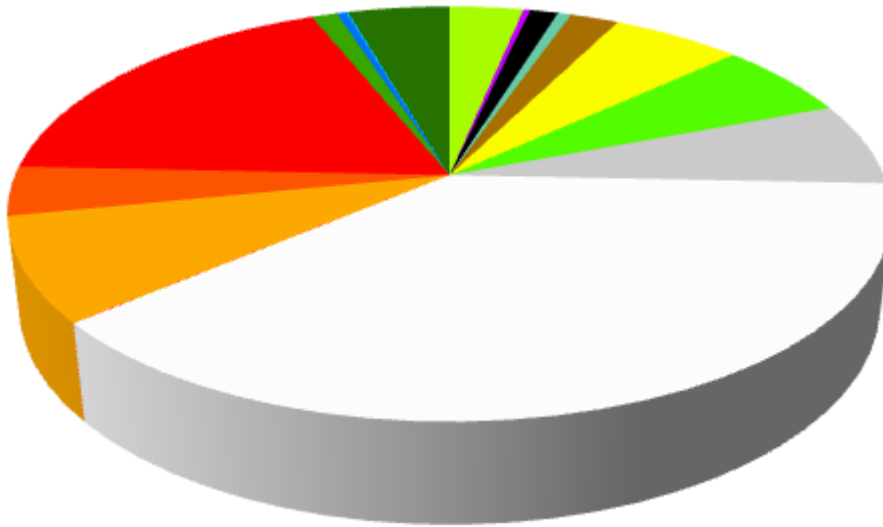
Liverpool East



South Central



South Liverpool



- Agricultural land
- Allotment, community garden or urban farm
- Cemetery, churchyard or burial ground
- Coastal habitat
- Derelict land
- General amenity space
- Grassland, heathland, moorland or scrubland
- Green roof
- Institutional grounds
- Not green infrastructure
- Orchard
- Outdoor sports facility
- Park or public garden
- Private domestic garden
- Street trees
- Water body
- Water course
- Wetland
- Woodland

12.4.6.4. As may be expected there are differences between the neighbourhoods both in extent and type of green infrastructure.

12.4.7. Typology in relation to Core Strategy Preferred Options Sub Areas

12.4.7.1. The Core Strategy document published by Liverpool City Council in February 2010 identifies the areas of the city that are likely to undergo greatest change due to housing growth or strategic investment for economic development. Three main areas, City Centre, Inner Area and Outer Area are identified along with a number of sub areas (see Map 2).

12.4.7.2. Table 15 shows the total geographic extent and the percentage green infrastructure cover in each of these sub areas.

Table 15 Green infrastructure percentages in Core Strategy Sub Areas

AREA	GEOGRAPHIC AREA EXTENT (KM ²)	% GREEN INFRASTRUCTURE
City Centre	4.6	24%
Inner Area	27.8	41%
Inner Area North	19.3	42%
Inner Area South	3.6	31%
Atlantic Gateway SIA	8.5	39%
Eastern Approaches SIA	2.8	37%
Outer Area	79.4	62%
Approach 580 SIA	4.3	66%
Speke Halewood SIA	8.9	53%
Eastern Fringe (C)	3.6	59%
Eastern Fringe (N)	11.4	64%
Eastern Fringe (S)	4.5	68%
Southern Fringe	14.1	58%

12.4.7.3. These sub areas are likely to have specific policies developed as part of the Local Development Framework and the information from this strategy may help to inform these policies and implementation strategies. Appendix 9 contains storylines for each of the Core Strategy Sub Areas providing an overview of the current green infrastructure resource, the issues present in the area and the priority actions for each area.

12.4.7.4. Table 16 provides the information on typology for each of the sub areas identified in the Liverpool City Council Core Strategy document.

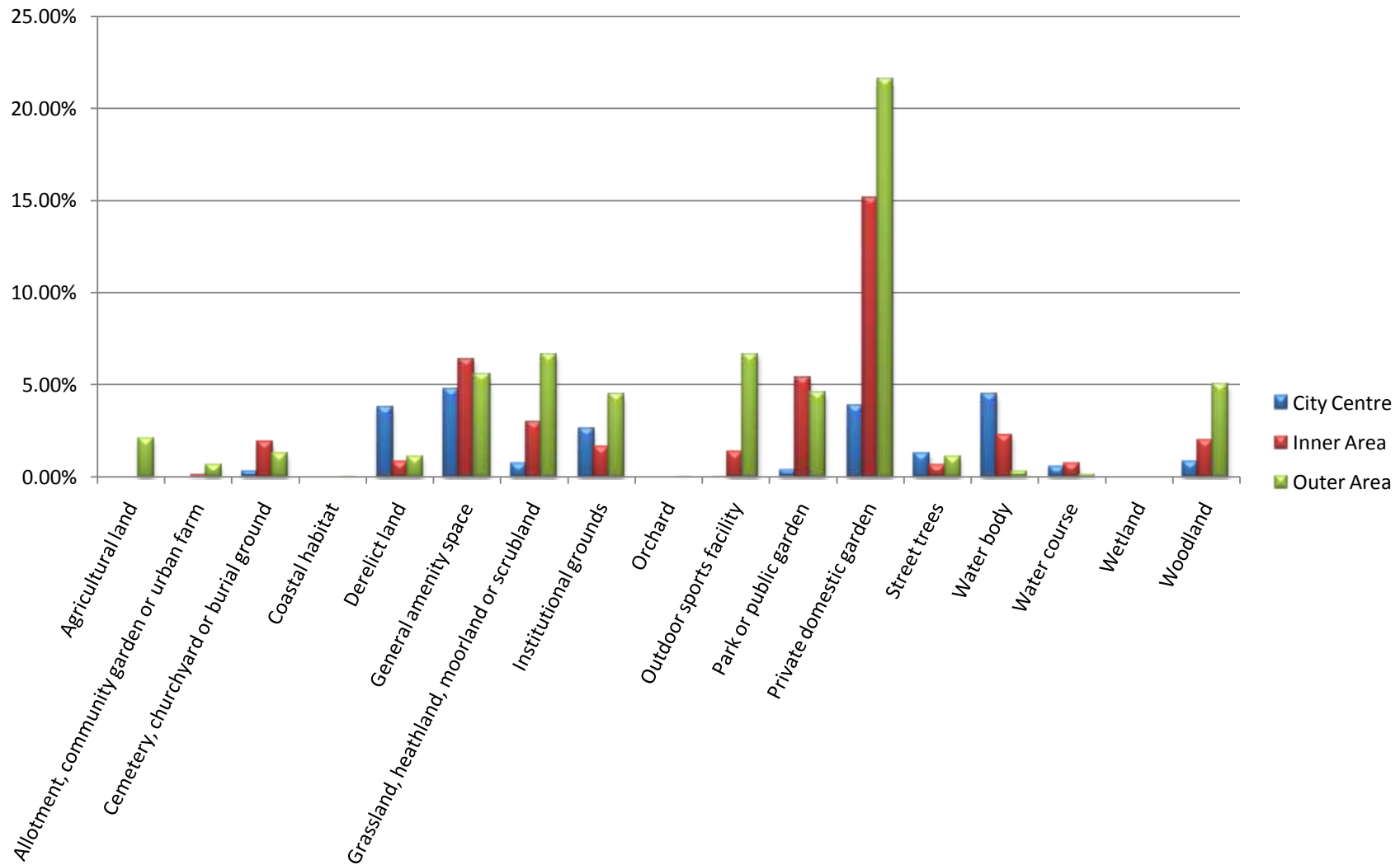
Table 16 Percentage typology distribution across the Core Strategy Sub Areas

	AREA (KM ²)	AGRICULTURAL LAND	ALLOTMENT, COMMUNITY GARDEN OR URBAN FARM	CEMETERY, CHURCHYARD OR BURIAL GROUND	COASTAL HABITAT	DERELICT LAND	GENERAL AMENITY SPACE	GRASSLAND, HEATHLAND, MOORLAND OR SCRUBLAND	INSTITUTIONAL GROUNDS	NOT GI	ORCHARD	OUTDOOR SPORTS FACILITIES	PARK OR PUBLIC GARDEN	PRIVATE DOMESTIC GARDEN	STREET TREES	WATER BODY	WATER COURSE	WETLAND	WOODLAND
City Centre	4.6	0.0	0.0	0.3	0.0	3.8	4.7	0.7	2.6	76.7	0.0	0.0	0.3	3.8	1.3	4.5	0.5	0.0	0.8
Inner Area	27.8	0.0	0.1	1.9	0.0	0.8	6.4	3.0	1.6	58.8	0.0	1.3	5.4	15.2	0.6	2.3	0.7	0.0	2.0
Inner Area North	19.3	0.0	0.2	1.9	0.0	0.9	6.1	3.0	1.7	57.7	0.0	1.5	6.7	14.1	0.7	3.0	0.5	0.0	2.2
Inner Area South	8.5	0.0	0.0	2.1	0.0	0.7	7.1	2.8	1.5	61.2	0.0	1.0	2.3	17.7	0.4	0.6	1.1	0.0	1.4
Atlantic Gateway SIA	3.6	0.0	0.0	0.0	0.0	0.5	6.3	2.8	0.5	69.3	0.0	0.3	0.4	3.2	0.4	14.7	1.2	0.0	0.5
Outer Area	79.4	2.1	0.7	1.2	0.0	1.1	5.6	6.7	4.5	38.9	0.0	6.7	4.6	21.6	1.1	0.3	0.1	0.0	5.0
Eastern Approaches SIA	2.8	0.0	0.0	0.1	0.0	2.3	7.4	5.3	3.0	62.7	0.0	1.1	5.7	9.0	0.6	0.2	0.0	0.0	2.5
Approach 580 SIA	4.3	0.0	1.1	2.7	0.0	0.5	6.1	27.7	9.1	35.9	0.0	6.3	0.0	3.7	0.2	0.1	0.5	0.0	6.0
Speke Halewood SIA	8.9	2.9	0.3	0.1	0.0	6.9	4.1	10.8	15.4	50.0	0.0	2.1	3.0	2.3	0.2	0.6	0.0	0.0	2.4
Eastern Fringe (C)	3.6	0.0	0.7	1.9	0.0	1.5	7.4	2.5	2.9	41.0	0.0	6.5	1.3	31.7	0.6	0.0	0.1	0.0	1.8
Eastern Fringe (N)	11.4	0.7	0.9	3.5	0.0	0.9	6.6	14.7	5.0	37.3	0.0	4.5	0.4	20.8	0.5	0.0	0.3	0.0	4.0
Eastern Fringe (S)	4.5	1.7	0.0	0.0	0.0	0.3	12.6	3.3	3.1	32.0	0.0	17.9	3.8	17.8	0.9	0.1	0.1	0.0	6.4
Southern Fringe	14.1	7.2	0.2	0.1	0.1	4.5	4.7	10.2	12.2	43.5	0.0	3.1	2.1	8.2	0.5	0.9	0.0	0.0	2.3

12.4.7.5. Figure 26 presents the different typologies in terms of the three Core Strategy Sub Areas, City Centre, Inner Area and Outer Area in terms of percentage of the total green infrastructure in each area that is provided by each of the types. It is important to bear in mind the large differences in total amount of green infrastructure in each of the areas too. The distribution of private gardens stands out, with over 20% of the outer areas green infrastructure being made up by this type.

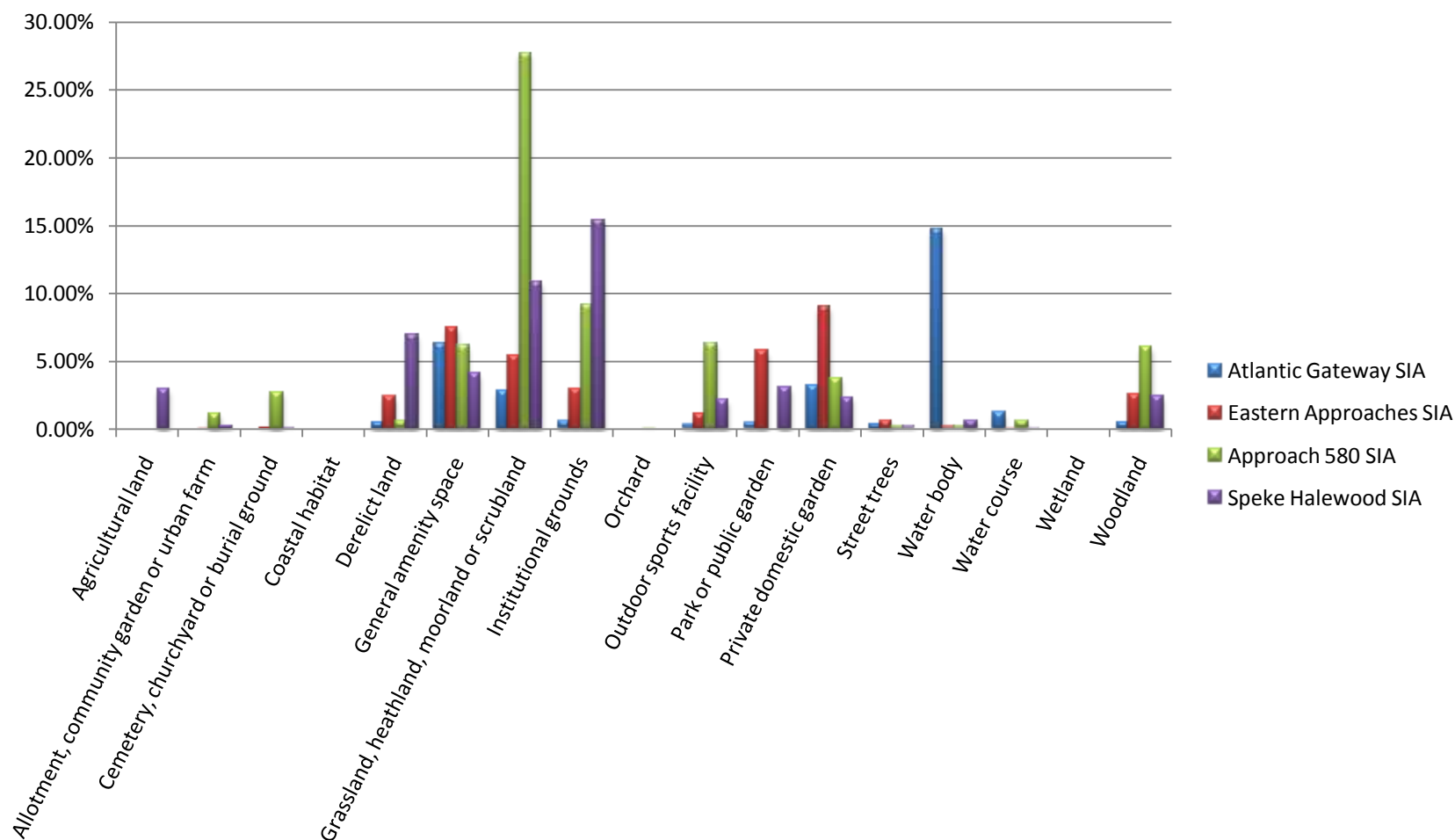
12.4.7.6. The City Centre, an area with a low green infrastructure cover, has nearly half of its green infrastructure made up of derelict land and the general amenity space types, neither of which offers great functionality (see section 12.5) and both can be environmental detractors. General amenity space is often simply left over land that has been grassed over.

Figure 26 Typology by Core Strategy Sub Area



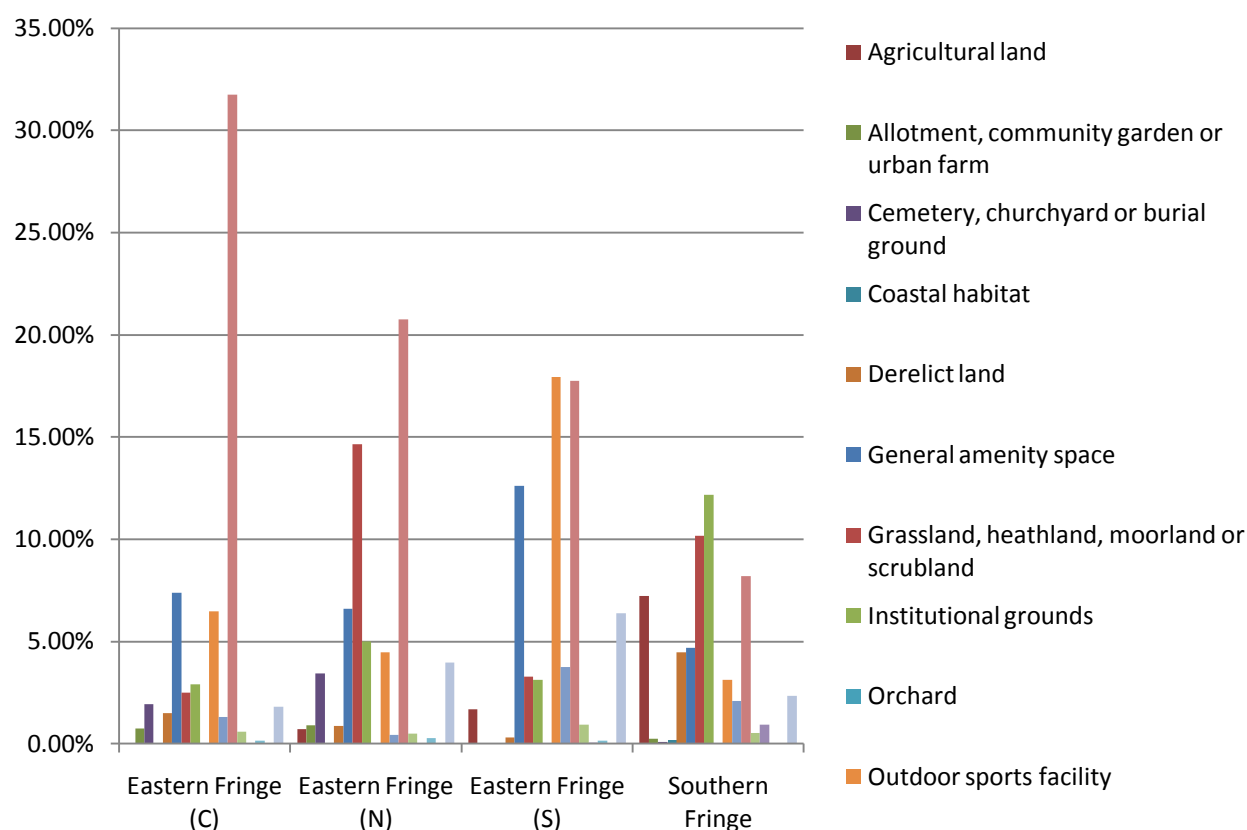
12.4.7.7. Figure 27 shows the same data analysed by the Strategic Investment Areas. The dominance of water body (The River Mersey) in Atlantic Gateway stands out. As does the large amount of institutional grounds in Speke Halewood. Also the amount of woodland and grassland in the Approach 580 SIA.

Figure 27 Typology by Strategic Investment Area



12.4.7.8. For the fringe housing areas in the Outer Area, private gardens are a major type. They are a major type in all areas apart from the southern fringe. General amenity land, features strongly across the city. In all areas there are relatively low levels of derelict land¹⁶².

Figure 28 Typology by fringe housing areas



12.4.7.9. There is a difference between the areas that the local authority would class as derelict land and the areas of land that this study has classed as derelict. The difference is due to a disparity in the technique for identifying derelict land. In this study local authority classified derelict land may be shown as different type of green infrastructure, for example, woodland.

12.4.7.10. These may be areas of previously derelict land that have naturally regenerated with woodland. This study is focused on functionality; therefore it is important that the green infrastructure type is identified correctly in relation to function. In this example the derelict land functions are related to the presence of the woodland. It is important to try to identify the correct type so that this can be used to assess functionality correctly.

12.4.7.11. Table 17 shows the typology for derelict land in Liverpool. This the area of land that would be considered derelict by the local authority, but in reality some sites are better identified using another green infrastructure type e.g. where a derelict site has naturally regenerated woodland it is classed as woodland.

¹⁶² However, see note below on green infrastructure derelict land type.

Table 17 Derelict land typology

TYPE	AREA (HA)
Agricultural land	15.19
Allotment, community garden or urban farm	0.00
Cemetery, churchyard or burial ground	1.23
Coastal habitat	0.01
Derelict land	13.40
General amenity space	153.16
Grassland, heathland, moorland or scrubland	88.67
Institutional grounds	32.36
Not green infrastructure	225.98
Orchard	0.32
Outdoor sports facility	38.66
Park or public garden	3.77
Private domestic garden	11.35
Street trees	3.40
Water body	20.62
Water course	0.54
Woodland	13.04

12.5. Identifying Function

12.5.1. 28 functions for green infrastructure in Liverpool have been assessed ranging from functions related to managing water, such as water interception and storage, through to recreation, aesthetic and carbon sequestration functions. Maps indicating the distribution of these functions across the city are provided in Appendix 1.

12.5.2. A summary of the functions identified as being most relevant for each of the four priorities for this strategy is shown in Table 18. There are some functions such as biofuel production that have not been assessed for the individual priorities, but these have all been assessed in identifying the overall functionality of the city and so the information is available for use in future if the function is seen to be key for other strategies (e.g. Climate Change Adaptation Strategy).

Table 18 Functions most relevant for the four priorities identified.

		FUNCTION																											
PRIORITY	Supporting sustainable housing and regeneration																												
	Tackling climate change																												
	Improving health across the city																												
	Increasing biodiversity																												
		Recreation - public	Recreation - private	Recreation - public with restrictions	Green travel route	Aesthetic	Shading from sun	Evaporative cooling	Trapping air pollutants	Noise absorption	Habitat for wildlife	Corridor for wildlife	Soil stabilisation	Heritage	Cultural asset	Carbon storage	Food production	Timber production	Biofuels production	Wind shelter	Learning	Inaccessible water storage	Accessible water storage	Water interception	Water infiltration	Coastal storm protection	Water conveyance	Pollutant removal from soil/water	Flow reduction through surface roughness

12.5.3. Table 19 shows the percentage distribution of the 28 functions in each neighbourhood area. Figure 29 shows this information in graphical format. This data is also provided by Core Strategy Sub Area in Table 20 and Figure 30

Table 19 Function by neighbourhood (percentages)

NEIGHBOURHOOD	RECREATION – PUBLIC	RECREATION – PRIVATE	RECREATION – PUBLIC WITH RESTRICTIONS	GREEN TRAVEL ROUTE	AESTHETIC	SHADING FROM THE SUN	EVAPORATIVE COOLING	TRAPPING AIR POLLUTANTS	NOISE ABSORPTION	HABITAT FOR WILDLIFE	CORRIDOR FOR WILDLIFE	SOIL STABILISATION	HERITAGE	CULTURAL ASSET	CARBON STORAGE	FOOD PRODUCTION	TIMBER PRODUCTION	BIOFUELS PRODUCTION	WIND SHELTER	LEARNING	INACCESSIBLE WATER STORAGE	ACCESSIBLE WATER STORAGE	WATER INTERCEPTION	WATER INFILTRATION	COASTAL STORM PROTECTION	WATER CONVEYANCE	POLLUTANT REMOVAL FROM SOIL/WATER	FLOW REDUCTION THROUGH SURFACE ROUGHNESS
Alt Valley	21.9	21.1	3.6	17.8	60.8	9.7	60.8	9.7	9.7	10.2	27.7	7.4	8.8	6.4	9.7	3.1	6.1	6.1	9.7	1.7	9.1	0.5	2.6	8.2	0.0	4.7	17.3	15.8
City and North	17.6	11.5	1.7	4.6	36.7	4.1	36.7	4.1	4.1	3.0	9.8	16.4	6.5	3.5	4.1	0.0	1.3	1.3	4.1	0.8	15.3	4.4	1.0	16.5	0.9	2.2	8.6	3.3
Liverpool East	18.3	24.1	6.6	9.9	55.4	8.0	55.4	8.0	7.6	4.9	23.8	4.9	12.5	9.0	8.0	0.5	3.9	3.9	8.0	2.6	7.7	0.3	3.0	9.8	0.0	2.2	15.5	7.2
South Central	19.3	24.5	7.5	11.2	56.9	10.4	56.9	10.4	10.4	7.1	27.9	5.7	6.8	7.3	10.4	1.3	4.5	4.5	10.4	3.9	5.1	0.5	2.4	7.3	0.5	0.2	20.0	9.7
South Liverpool	17.9	18.6	7.5	13.9	62.5	8.5	62.5	8.5	8.3	8.9	33.9	10.5	1.2	5.1	8.5	3.6	4.5	4.5	8.5	2.4	4.5	0.4	2.4	5.7	2.0	6.3	19.0	10.6
Liverpool average	18.9	19.5	5.5	11.7	55.1	8.1	55.1	8.1	7.9	7.1	25.4	9.4	6.4	6.0	8.1	2.0	4.1	4.1	8.1	2.2	8.1	1.2	2.2	9.2	0.8	3.6	16.2	9.5

Figure 29 Function by neighbourhood management area – percentage of land in each neighbourhood management area delivering each of the 28 functions

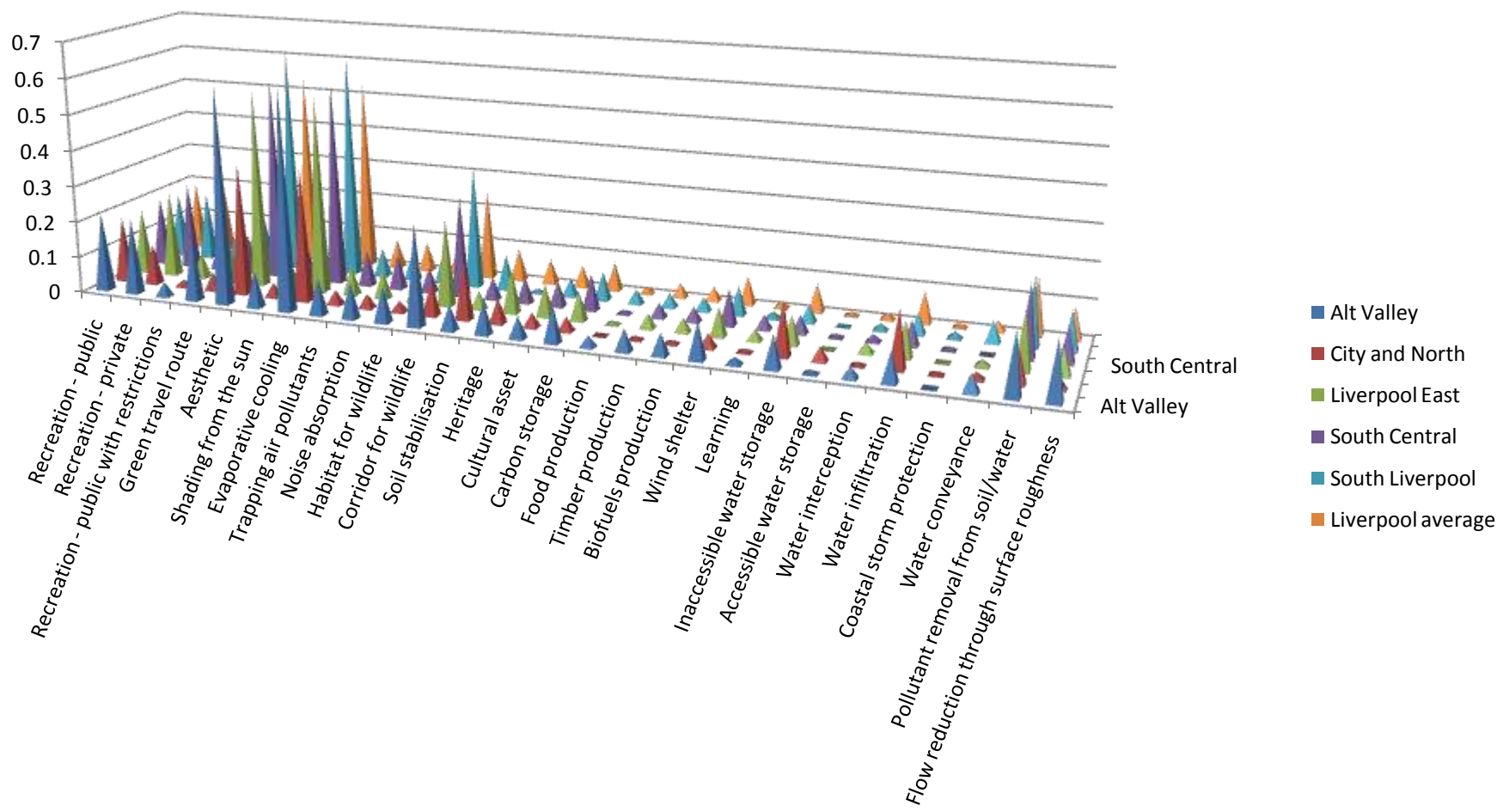
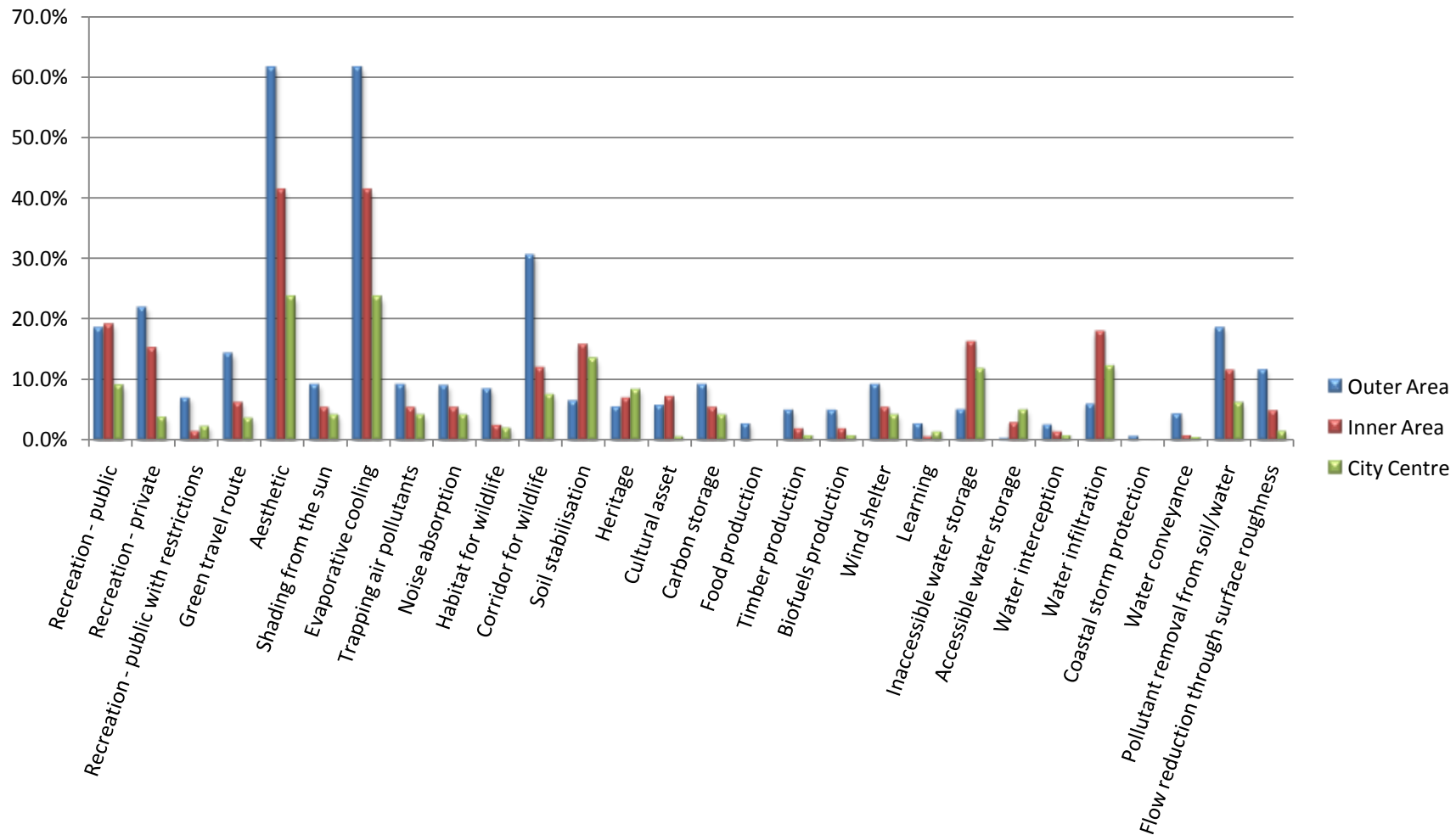


Table 20 Function by Core Strategy Sub Area (percentage)

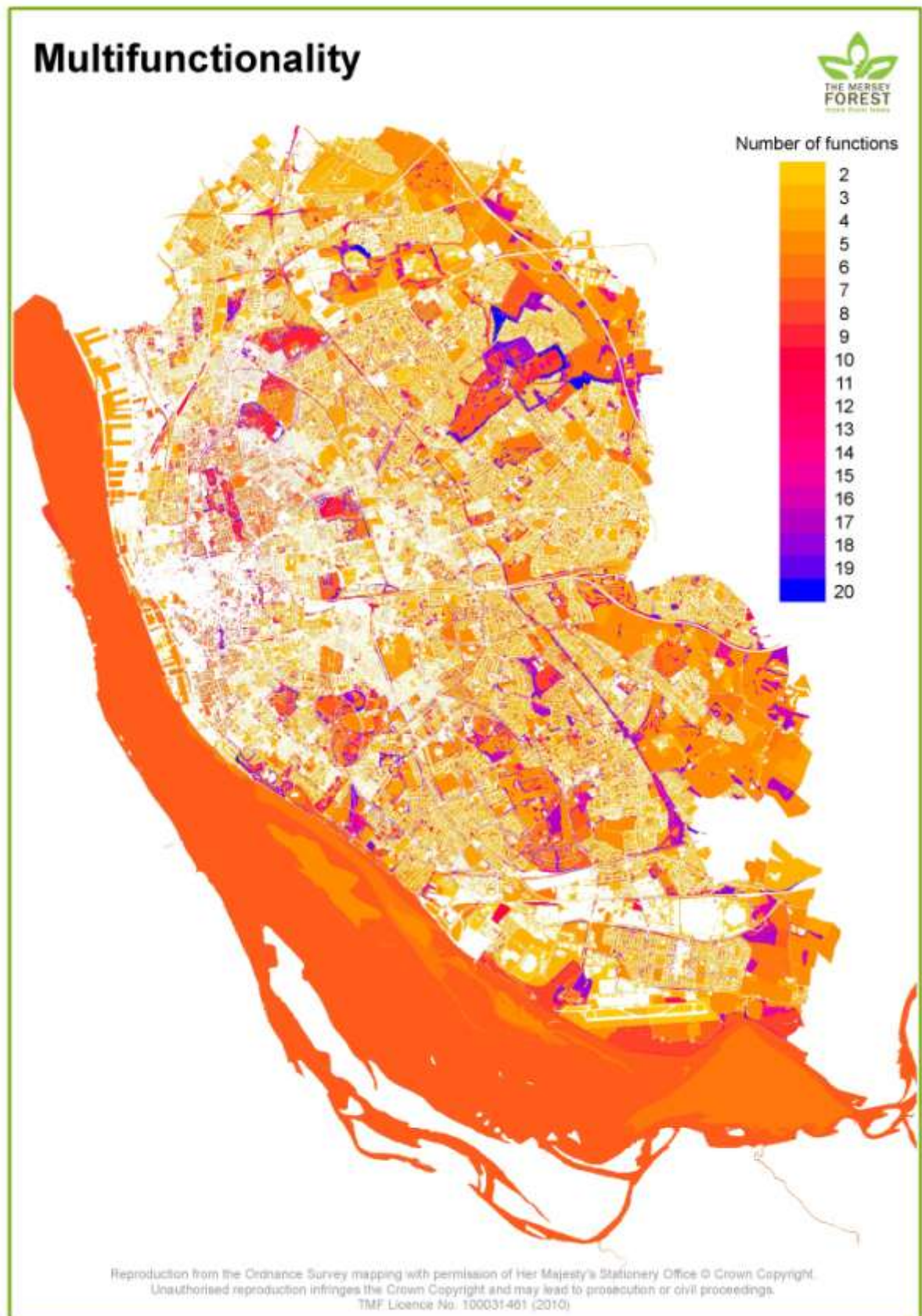
CORE STRATEGY SUB AREA		RECREATION – PUBLIC	RECREATION – PRIVATE	RECREATION – PUBLIC WITH RESTRICTIONS	GREEN TRAVEL ROUTE	AESTHETIC	SHADING FROM THE SUN	EVAPORATIVE COOLING	TRAPPING AIR POLLUTANTS	NOISE ABSORPTON	HABITAT FOR WILDLIFE	CORRIDOR FOR WILDLIFE	SOIL STABILISATION	HERITAGE	CULTURAL ASSET	CARBON STORAGE	FOOD PRODUCTION	TIMBER PRODUCTION	BIOFUELS PRODUCTION	WIND SHELTER	LEARNING	INACCESSIBLE WATER STORAGE	ACCESSIBLE WATER STORAGE	WATER INTERCEPTION	WATER INFILTRATION	COASTAL STORM PROTCTON	WATER CONVEYANCE	POLLUTANT REMOVAL FROM SOIL/WATER	FLOW REDUCTION THROUGH SURFACE ROUGHNESS
Outer Area		18.6	22.0	7.1	14.4	61.5	9.2	61.5	9.2	9.1	8.5	30.6	6.6	5.6	5.9	9.2	2.8	5.0	5.0	9.2	2.8	5.1	0.4	2.6	6.0	0.8	4.4	18.6	11.7
Inner Area		19.2	15.3	1.6	6.3	41.3	5.5	41.3	5.5	5.5	2.6	12.0	15.8	7.0	7.3	5.5	0.1	2.0	2.0	5.5	0.6	16.3	3.0	1.5	18.0	0.1	0.8	11.6	4.9
City Centre		9.1	3.9	2.4	3.7	23.6	4.2	23.6	4.2	4.2	2.1	7.6	13.5	8.4	0.6	4.2	0.0	0.8	0.8	4.2	1.4	11.8	5.0	0.9	12.3	0.0	0.5	6.3	1.5
Inner North	Area	20.9	14.2	1.9	7.0	42.5	5.7	42.5	5.7	5.7	2.9	14.3	19.3	8.0	8.6	5.7	0.1	2.2	2.2	5.7	0.6	20.2	3.5	1.7	21.5	0.0	0.7	11.3	5.2
Inner South	Area	15.5	17.9	0.7	4.6	38.8	5.2	38.8	5.2	5.2	1.8	7.0	8.1	4.8	4.4	5.2	0.0	1.4	1.4	5.2	0.7	7.6	1.7	0.9	10.2	0.4	1.2	12.3	4.3
Atlantic Gateway SIA		20.0	3.3	3.4	3.4	30.9	1.8	30.9	1.8	1.8	0.9	3.0	6.8	5.1	0.4	1.8	0.0	0.5	0.5	1.8	0.1	6.9	16.0	0.3	7.3	0.0	1.2	3.1	3.3
Eastern Approaches SIA		17.0	9.0%	0.3	10.2	37.3	6.4	37.3	6.4	6.4	3.1	14.6	0.9	6.7	5.8	6.4	0.0	2.5	2.5	6.4	0.0	2.5	0.2	2.4	5.7	0.0	1.3	14.7	7.9
Approach 580 SIA		19.5	4.9	7.6	27.0	66.4	9.4	66.4	9.4	9.4	6.4	34.9	1.4	0.0	2.8	9.4	1.2	6.2	6.2	9.4	2.7	6.2	0.7	2.9	6.0	0.0	8.9	18.0	34.9
Speke Halewood SIA		11.1	2.4	2.5	13.8	52.8	5.3	52.8	5.3	4.9	6.8	24.2	7.1	0.1	3.2	5.3	3.3	2.5	2.5	5.3	0.1	2.5	0.6	2.1	5.1	2.8	5.9	20.8	13.7
Eastern Fringe (C)		11.4	32.0	8.2	5.5	59.1	5.6	59.1	5.6	5.5	2.4	14.4	0.6	1.2	3.2	5.6	0.7	1.8	1.8	5.6	2.8	1.8	0.2	1.4	4.5	0.0	3.5	16.6	4.3
Eastern Fringe (N)		18.5	21.5	4.8	16.9	63.6	7.4	63.6	7.4	7.4	5.7	24.1	1.5	2.1	3.9	7.4	1.6	4.0	4.0	7.4	2.9	4.0	0.3	2.1	5.0	0.0	4.3	15.9	18.9
Eastern Fringe (S)		20.7	17.8	20.6	9.6	68.1	8.8	68.1	8.8	8.8	7.3	41.5	18.1	0.0	3.8	8.8	1.7	6.4	6.4	8.8	2.3	6.4	0.2	4.4	5.8	0.0	13.2	13.3	9.7
Southern Fringe		11.9	8.4	2.6	17.0	57.8	5.4	57.8	5.4	5.0	9.6	28.0	6.8	0.1	2.2	5.4	7.6	2.4	2.4	5.4	1.3	2.4	1.0	1.5	5.1	3.5	7.8	21.2	12.8

Figure 30 Function by Core Strategy Sub Areas



12.5.4. Map 10 provides a view of the overall multifunctionality of the green infrastructure across the city. This map simply displays all of the 28 function layers, with no weighting. The map shows how many functions are provided on each individual area of green infrastructure.

Map 10 Liverpool's multifunctional green infrastructure



12.5.5. Whilst an overview of multifunctionality is important, there are caveats. The areas that are most multifunctional are not necessarily the most important for the city. It is most important to consider whether there is a specific need for a particular function in a specific location.

12.5.6. For example, an area that has been identified with a single function could be a key area for the city if that function is linked to water management in a flood risk area.

12.5.7. Future detailed decisions about sites for redevelopment or re-use will need to look at the functions and need (or projected need) using the data that is provided in this strategy as the basis for decisions about the exact interventions that are appropriate for a site.

12.5.8. The multifunctional maps provide a picture of the overall distribution of functions across the city and provide a high-level assessment of Liverpool's green infrastructure functions. Map 10 identifies, in particular, the importance of the parks and the loop line in terms of multifunctionality.

12.5.9. In common with many areas of similar land outside the city, the areas of agricultural land provide few functions, though obviously they do provide a key food production function. The large areas of the city with no colour – and therefore no green infrastructure functionality are concentrated around City Centre and North Liverpool and South Liverpool, north of Speke. From Map 10 it can be seen that in general most areas show three to five functions, there are opportunities through management to help to increase this functionality to meet the needs that are identified in the next section.

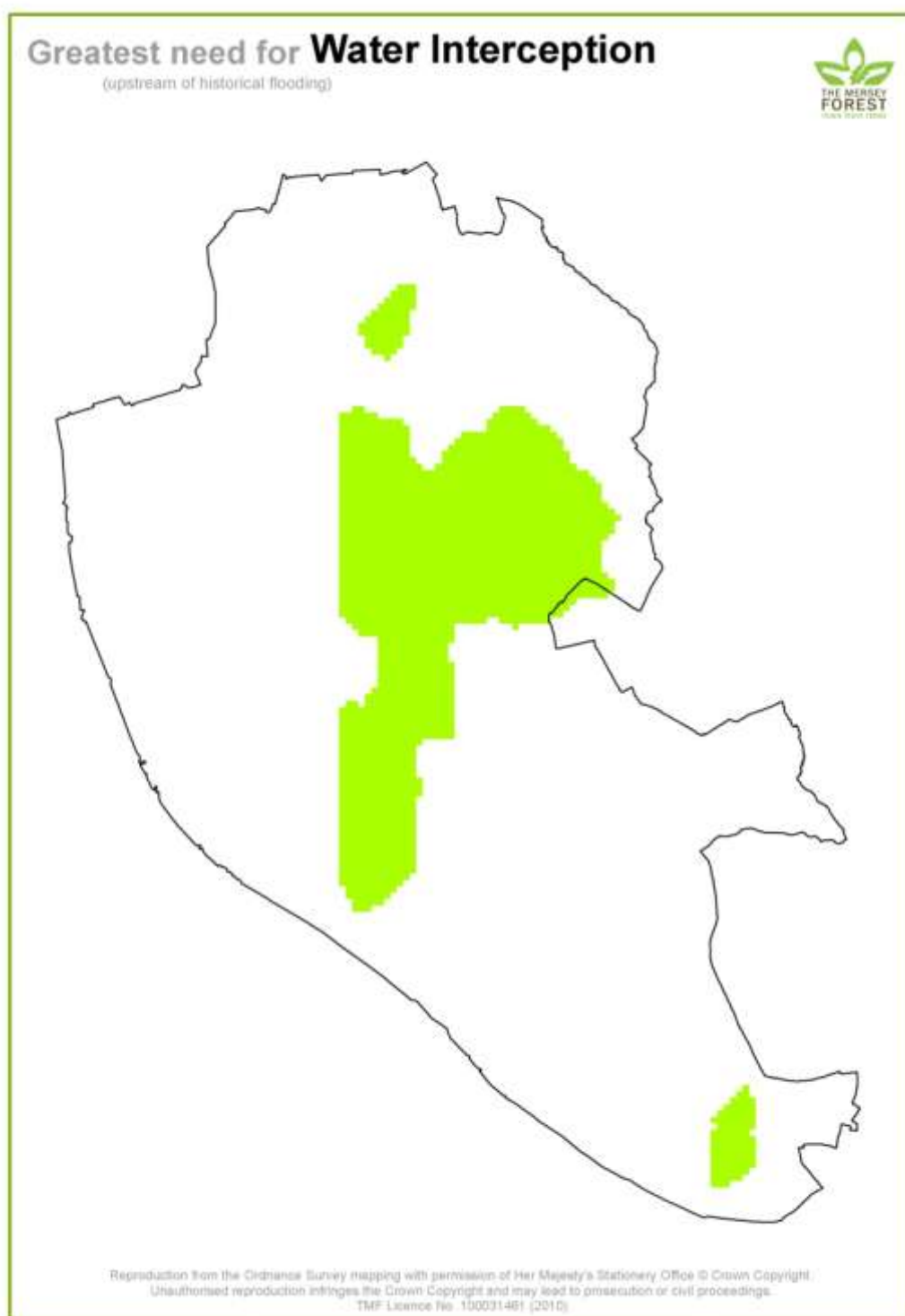
12.6. Identifying Need

12.6.1. Need for each of the 28 functions has been assessed, resulting in maps showing where the greatest need in Liverpool for provision of the function in question is to be found. These maps, and the methodology used to produce them, are included in Appendix 1.

12.6.2. The areas of greatest need are identified using a range of indicators, including socio-economic data such as population density and health deprivation, and environmental data such as incidence of flooding and wind speeds.

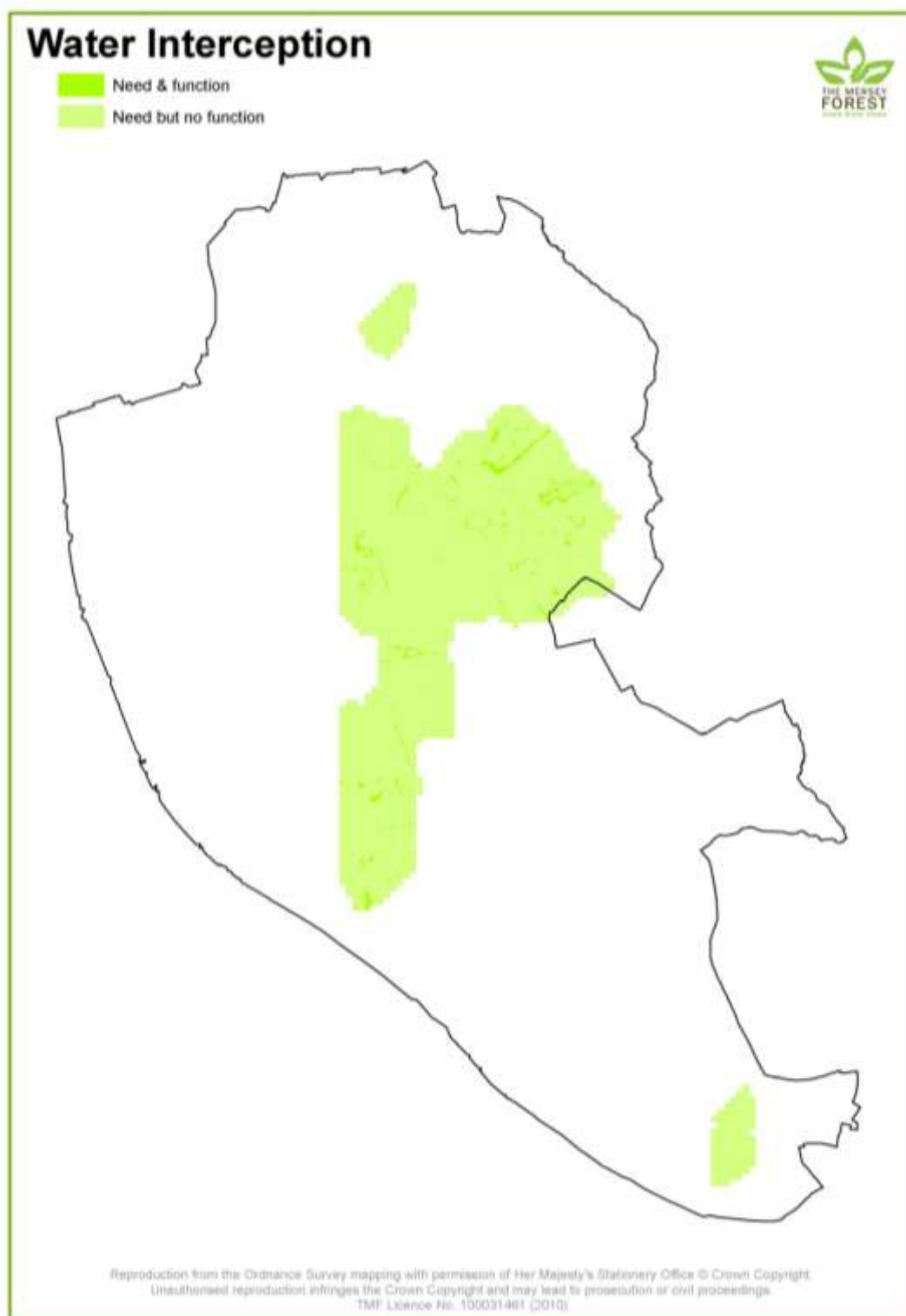
12.6.3. For example, the greatest need for the water interception function is expected to occur upstream of historic flooding, to help prevent flooding of these susceptible locations in future by slowing down the progress of rainwater at times of heavy rainfall. Therefore areas upstream of historic flooding have been mapped.

Map 11 Greatest need for water interception



12.6.4. Need is considered entirely independently from existing provision of the functions. An area of greatest need does not necessarily contain insufficient functionality to fulfil that need. Map 11 shows the areas of greatest need for water interception; Map 12 shows the areas of greatest need and the areas where the water interception function is currently performed. It is clear that there is some green infrastructure within the areas of greatest need that is performing the water interception function. In these areas the need is being fulfilled by current green infrastructure function.

Map 12 Water interception need and function



12.6.5. Mapping of need for each function should be compared with mapping of existing provision of that function to help decide exactly what interventions are required on a particular site. For example if an area has a need for a function and sufficient provision the action should be to safeguard the existing green infrastructure whereas if an area has need and no function green infrastructure which provides that function should be promoted in that area.

12.7. Identifying Assets

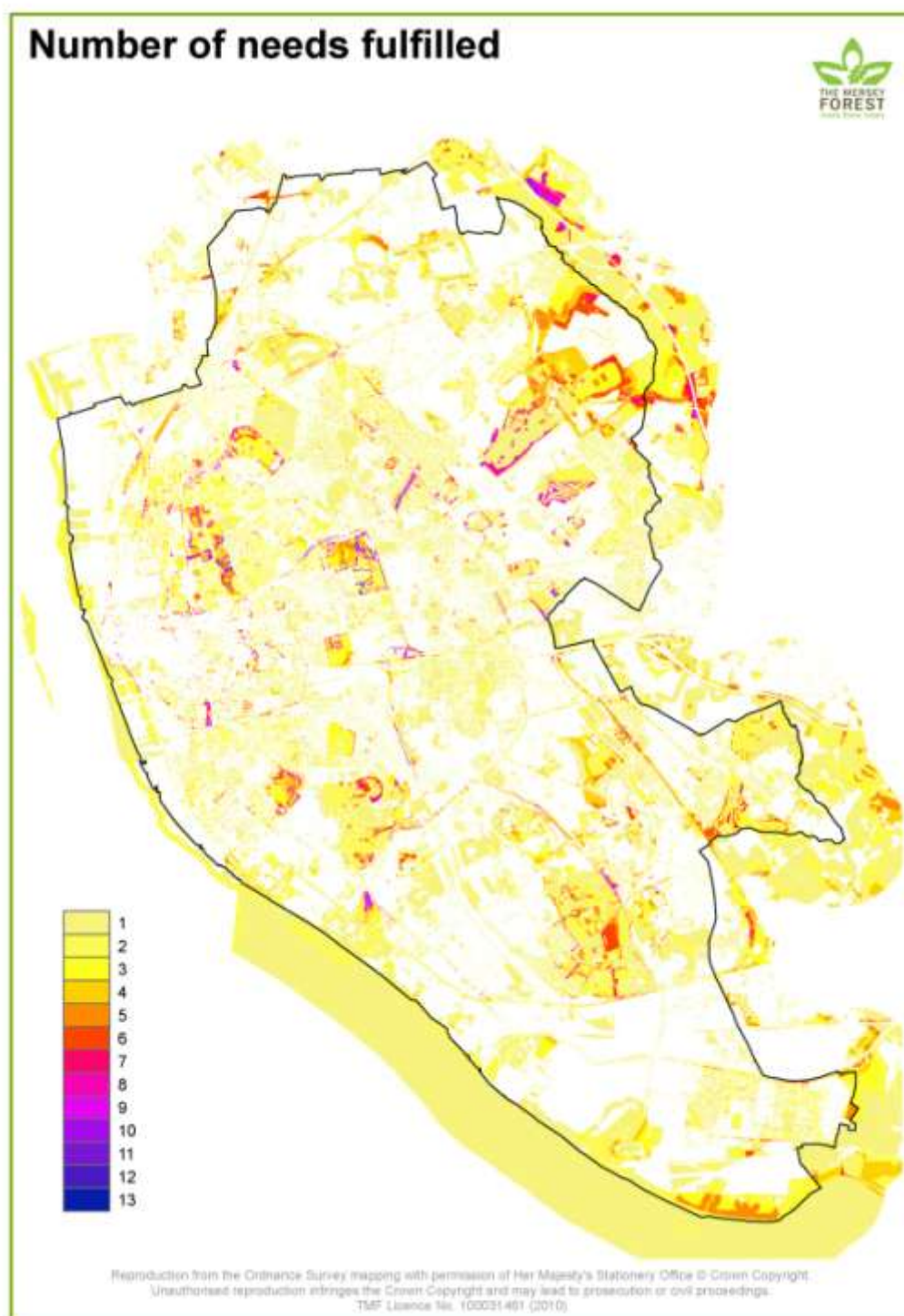
12.7.1. Green infrastructure assets in Liverpool are areas where there is an identified need (see section 12.6) for a function and the existing green infrastructure is providing this function (see section 12.5). For example where there are trees along main transport routes that can absorb pollutants or reduce noise.

12.7.2. Map 13 indicates the extent of all green infrastructure assets across the city for the priorities set for this strategy. The asset map tends not to include private gardens in some areas. As they are not publicly accessible and tend to be distributed in the more affluent areas of the city they do not appear in our assessment as assets for the priorities that we have looked at. However, they are important locally and provide a range of benefits to the local population.

12.7.3. It could be argued that all green infrastructure is an asset. However, these maps help to identify the green infrastructure that can help to tackle the most pressing problems of the city. They do not suggest that the other areas are not important, but that if resources are available to tackle image, health, climate change and improve biodiversity then they should be targeted at these identified assets and at the areas where functionality is lacking. There are some needs; such as those for improving image that are dependent not just on the presence of green infrastructure, but also on its quality. This strategy has not looked at the quality of the green infrastructure resource in Liverpool. However it is an important factor and one that is best dealt with through master planning at a neighbourhood level.

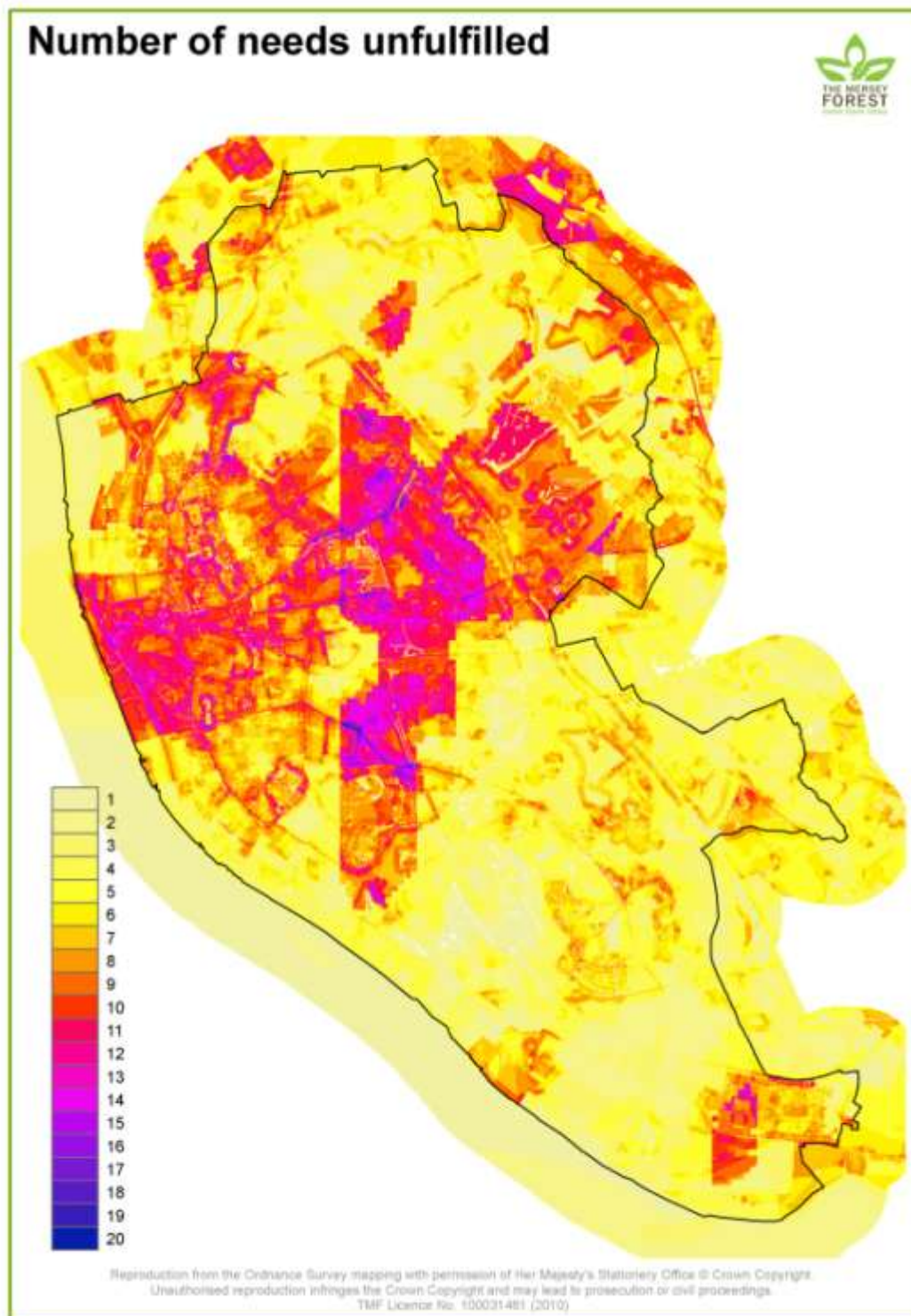
12.7.4. One of the obvious features of Map 13 is the prominence of the parks across the city. They stand out as a major asset for the city, The River Mersey has limited functions related to the issues that have been raised in this strategy, but as discussed previously it is the major green infrastructure asset for the city.

Map 13 Green Infrastructure assets – green infrastructure that fulfils identified greatest needs



12.7.5. Map 14 shows where we have identified needs that are not being met by existing green infrastructure functionality. Actions in this strategy focus on finding ways to meet these needs, particularly in the Core Strategy areas of the city, through improving the functionality of existing green infrastructure or by finding ways to create new, high quality, multifunctional green infrastructure.

Map 14 Number of needs unfulfilled at present



12.7.6. From the information gathered in Steps 2 – 4 there is now extensive information to describe the green infrastructure of the city. This is provided on a Geographic Information System (GIS).

13. STEP 5 – IMPLEMENTATION PLAN

13.1. Introduction

13.1.1. Step 5 brings together the information from the previous four steps to make recommendations and identify the actions for the city. The actions are informed by discussions with partners and feedback from the workshops that have been held.

13.1.2. In order to help to provide a framework for the actions it is suggested a long-term vision for green infrastructure in Liverpool which supports the green infrastructure policy that is set out in the proposed Core Strategy.

13.1.3. The vision is that:

“Green Infrastructure is planned in Liverpool to support a safe, more inclusive, environmentally sustainable and enjoyable city, to provide essential life support functions for a world class city, that is adapted to climate change and where healthy living is a natural choice”

13.1.4. Below this sit the four priorities that have been identified and for each priority a long-term goal has been suggested, setting out how Liverpool can use its green infrastructure to tackle the key issues for the city.

13.1.5. A fifth priority has also been added; based on the policy analysis, evidence base and stakeholder comments. The priority “A city where green infrastructure is well planned”, aims to highlight the importance of having a coherent plan to guide high quality green infrastructure interventions. This priority provides support for the other four.

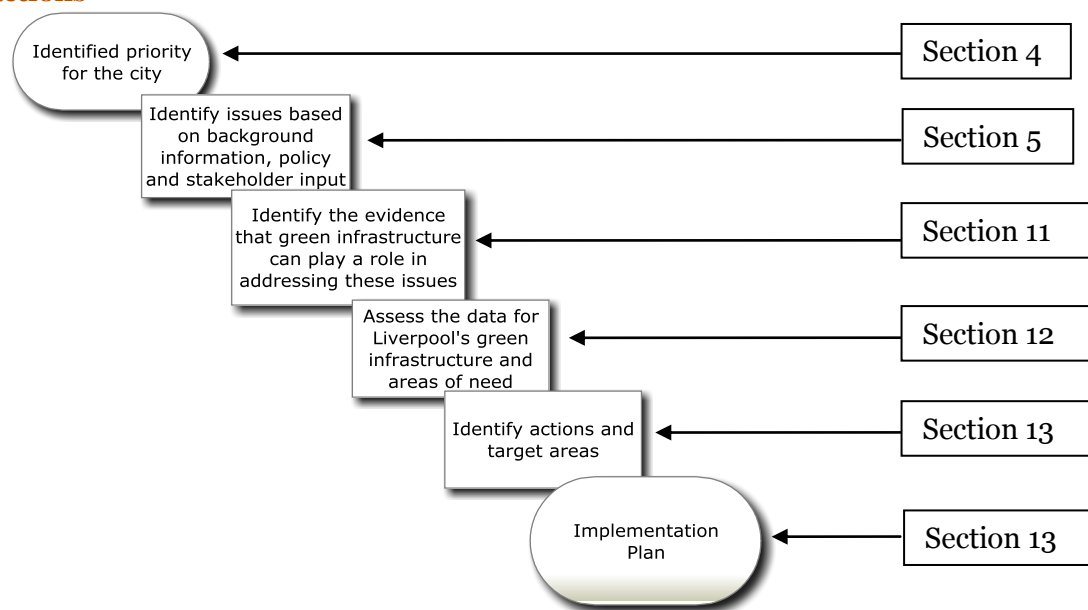
13.1.6. Alternative titles for all of the priorities, which are more promotional than the original titles have also been suggested (Table 21).

Table 21 Priorities and alternative titles

PRIORITY:	A SUSTAINABLE CITY	A COOL CITY	A CITY PROVIDING NATURAL CHOICES FOR HEALTH	A GREEN AND BIODIVERSE CITY	A CITY WHERE GREEN INFRASTRUCTURE IS WELL PLANNED AND DESIGNED
Alternative title	Supporting Sustainable Housing Growth and Regeneration	Tackling Climate Change	Improving Health across the City	Increasing Biodiversity	Multi-functionality, Valuation and Long-term Management
Long-term objective	Green infrastructure complements "grey infrastructure" planning, creating high quality new housing and sustainable regeneration and growth. Liverpool capitalises on and values its green infrastructure, maximising functionality to gain competitive advantage and support prosperity and grows within environmental limits.	Not only is Liverpool a cultural capital, it has used its green infrastructure plans to adapt to projected climate change and has tackled potential problems by taking actions to use green infrastructure to cool the city, whilst at the same time making it attractive, healthy and supportive of a new outdoor living culture	The city is planned so that taking healthy options for all for everyday living is a straightforward and natural choice.	The network of green infrastructure in the city supports thriving wildlife population, healthy habitats that provide essential and valued services for the city.	Green infrastructure is planned so that maximum benefits are gained to support sustainable development. There is a clear understanding of the value of green infrastructure amongst key decision makers.

13.1.7. The logic chain from priorities through to actions is discussed in Appendix 6. Figure 31 provides an overview.

Figure 31 Logic chain showing the process of developing the recommendations and actions



13.1.8. The actions that have been recommended all help to support sustainable development in Liverpool. The following table is based on the five elements identified in the UK Sustainable Development Strategy.

Table 22 Sustainable development and the Liverpool Green Infrastructure Strategy

SUSTAINABLE DEVELOPMENT CRITERIA	LIVERPOOL GREEN INFRASTRUCTURE STRATEGY
Living within environmental limits	The actions seek to provide environmental improvements and help the city to recognise environmental limits.
Ensuring a strong, healthy and just society	The actions are targeted at areas of need overcoming environmental injustice and help to tackle deprivation, including health deprivation.
Achieving a sustainable economy	Actions focus on setting the scene for the economy and help to support productivity increases.
Using sound science	The actions are supported by a thorough review of the science available to support the proposals.
Promoting good governance	There has been limited stakeholder engagement, but the target is to embed actions in documents and strategies that will be the subject of full public consultation.

13.2. Analysis and Action Development

13.2.1. Table 23 and Table 24 provide a brief summary of the information from the sections above, focussing on the typology, function issues and assets identified for each area.

13.2.2. Issues, in the tables below refer to wards in the city where there is an identified issue, for example high levels of coronary heart disease, but with a lack of green infrastructure functionality to address the issue.

Table 23 Summary of findings in Steps 2 to 4 for the Liverpool Green Infrastructure Strategy by Neighbourhood Management Area.

NEIGHBOURHOOD MANAGEMENT AREA	TPOLOGY	FUNCTION	ASSETS	ISSUES
Alt Valley	One of only two neighbourhood management areas with areas of agricultural land. Alt Valley has relatively high levels of private domestic gardens and parks making up the green infrastructure. The area also has the highest levels of grassland and high levels of institutional grounds. Alt Valley has the highest levels of woodland.	The public recreation function in this neighbourhood is dominated by Croxteth and Fazakerley wards with other areas such as Norris Green having low levels of functionality. Croxteth and Fazakerley have over 50% of the green infrastructure in the neighbourhood management area and so dominate the functionality. The neighbourhood therefore displays a contrasting image of functionality. There are good opportunities for green travel. In a Liverpool context this can be classed as a productive landscape, with areas of timber and food production functions. The area is important as a wildlife habitat and corridor and has high levels of carbon storage.	The functions with relatively few assets present in this area include cultural asset, flow reduction through surface roughness, inaccessible water storage, learning, public recreation, shading from the sun, soil stabilisation, trapping air pollutants, water infiltration and water interception. The key green infrastructure assets in this area are Croxteth Country Park, Fazakerley Brook and the grounds of St Mary's Church in Walton.	There are high levels of issues relating to sustainability in County, Croxteth, Norris Green and Warbreck; health in County, Fazakerley and Norris Green; and climate change in County, Croxteth and Fazakerley.
City and North	This area is dominated by the Mersey, which constitutes over 5% of its total area. The area has high levels of general amenity space, often areas that have been left over after development or incidental green spaces. There are low percentages of allotments, outdoor sports, street trees and woodland compared to other areas across the city. City and North NMA has high levels of derelict land.	The River Mersey dominates and provides much of the functionality of this area including areas of high quality public realm along the water's edge. However, elsewhere there is low private recreation, little green travel functionality and low aesthetic function. Climate change adaption functions are low as are the health functions such as trapping air pollutants and noise absorption.	The functions with relatively few assets present in this area include accessible water storage, aesthetic, carbon storage, coastal storm protection, corridor for wildlife, evaporative cooling, green travel route, habitat for wildlife, heritage, learning, noise absorption, shading from the sun, trapping air pollutants and wind shelter. The key green infrastructure assets in this area are Everton	This neighbourhood has the most issues, and they are fairly evenly spread across its constituent wards. Almost every ward has at least one extensive issue relating to each priority.

NEIGHBOURHOOD MANAGEMENT AREA	TYPOLOGY	FUNCTION	ASSETS	ISSUES
			Park, the cathedral grounds and Wavertree Park.	
Liverpool East	Liverpool East has low levels of derelict land and general amenity space, and high levels of outdoor sports, public parks. It has the highest proportion of cemeteries and private gardens. It has moderate levels of street trees and woodland.	This neighbourhood is much less variable in functionality between wards. It is in many functions close to the Liverpool average. It lies between the low functionality of City and North and the higher levels seen in South Liverpool. The neighbourhood has relatively low carbon storage and water management functions.	The functions with relatively few assets present in this area include accessible water storage, cultural asset, flow reduction through surface roughness, food production, green travel route, habitat for wildlife, public recreation, shading from the sun, water infiltration, water interception and wind shelter. The key green infrastructure assets in this area are Newsham Park, Stanley Park, Croxteth Country Park, West Derby Golf Course and the street trees along Muirhead Avenue.	There are high levels of issues relating to all of the priorities in Anfield and Old Swan, plus high levels of issues relating to climate change in the remaining wards.

NEIGHBOURHOOD MANAGEMENT AREA	TYPOLOGY	FUNCTION	ASSETS	ISSUES
South Central	This area is also influenced by the River Mersey. It has a high percentage of allotments, private gardens and street trees. It also has moderate percentages of woodland, outdoor sports and institutional grounds. It has the lowest percentage of derelict land and general amenity space.	Again, South Central is a less variable neighbourhood in terms of distribution of function between wards. It has high levels of aesthetic and private recreation functionality. Habitat and corridor for wildlife are above average functions in the area, but some water management functions are below average.	The functions with relatively few assets present in this area include evaporative cooling, noise absorption, soil stabilisation and water conveyance. The key green infrastructure assets in this area are Princes Park, Sefton Park and Childwall Woods.	There are high levels of issues relating to sustainability in all of the wards but Childwall; health in Greenbank, Princes Park and Wavertree; climate change in Greenbank, Princes Park, St Michael's and Wavertree; and biodiversity in Childwall, Princes Park and Wavertree.
South Liverpool	One of only two NMAs with agricultural land, South Liverpool has high a percentage of its green infrastructure made up of parks, street trees, gardens, outdoor sports, institutional grounds and cemeteries. In contrast, it also has high levels of derelict land and general amenity space.	In a similar way to Alt Valley, functionality here is dominated by the extent of green infrastructure in specific wards, in this case Speke Garston. The impact again is that there is a great deal of disparity in the functions provided across the neighbourhood. The area has above average levels of function for habitat and wildlife corridors as well as for aesthetic and the climate change adaptation function of evaporative cooling. The area has above average private recreation function. It has below average function for water interception and infiltration, but above average for conveyance and flow reduction functions. Like Alt Valley, it is an area well above average food production function.	The functions with relatively few assets present in this area include accessible water storage, cultural asset, green travel route, water infiltration and water interception. The key green infrastructure assets in this area are Allerton Hall and Golf Course, Lee Park Golf Course, Otterspool Park and the Oglet.	This neighbourhood has relatively few issues. However, access to green space is a significant issue in Cressington, Mossley Hill and Speke-Garston; the urban heat island effect (especially relating to those with limiting long-term illnesses) in Speke-Garston; and drought in Allerton and Hunts Cross, Belle Vale and Speke-Garston.

Table 24 Summary of findings in Steps 2 to 4 for the Liverpool Green Infrastructure Strategy by Core Strategy Sub Area

CORE STRATEGY SUB AREA	TPOLOGY	FUNCTION	ASSETS	ISSUES
City Centre	The City Centre is dominated by the Mersey. There are higher levels of general amenity space and derelict land than any other type of green infrastructure. Often these are areas that have been left over after development or incidental green spaces. This area has a low percentage of parks, outdoor sports, woodland and private gardens compared to other CSSAs. It has the highest percentage of street trees. Overall there is a low percentage of green infrastructure in the City Centre.	This area has low functionality. The lowest levels of public recreation, aesthetic and evaporative cooling functions are present here. Functionality is low for all functions, and is below average for all functions except inaccessible and accessible water storage, water infiltration and heritage. Conversely heritage is highest in the City Centre.	This is one of two areas where there are nine functions with few assets present. These are the corridor for wildlife, green travel route, noise absorption, recreation of all types, shading and trapping air pollutants functions. The key green infrastructure assets in this area are the cathedral grounds, St John's Gardens, the docks and elements of the incidental green space.	There are generally high levels of issues in this area, especially relating to housing growth and regeneration, gateways and routes, walkability, access to green space, derelict and vacant land, mental health, hospitals and health centres, and habitat for wildlife.
Inner Area	The Inner Area has a relatively high percentage of private domestic gardens and parks. There are also high levels of general amenity space and grassland but a low percentage of street trees and woodland.	The heritage and cultural asset functions are comparatively high in the Inner Area. Water infiltration is high as is inaccessible water storage. However, the climate change functions are around average in this area.	In this area there are few assets relating to green travel routes, trapping air pollutants, shading and the recreation functions. The key green infrastructure assets in the Inner Area are Princes Park, Newsham Park, Everton Park, Wavertree Park, Stanley Park & Anfield Cemetery and Walton Hall Park.	There are generally high levels of issues in this area, especially relating to housing growth and regeneration, walkability, and mental health.
Inner Area North	Private gardens are the highest percentage cover in the Inner Area North, along with high levels of general amenity space and grassland. The area has moderate levels of street trees, outdoor sports, cemeteries and woodland.	This area has the highest levels of soil stabilisation, which is well above average. It has high levels of public recreation. Water infiltration is high as is inaccessible water storage. All other functions are around average.	Inner Area North has few assets relating to green travel routes, recreation of all types, trapping air pollutants and shading functions. The key green infrastructure assets here are Stanley Park & Anfield Cemetery, Everton Park, Newsham Park and	There are generally high levels of issues in this area, especially relating to housing growth and regeneration, walkability, mental health, hospitals and health centres, and habitat for wildlife.

CORE STRATEGY SUB AREA	TYPOLOGY	FUNCTION	ASSETS	ISSUES
Inner Area South	There is a high percentage of private gardens and general amenity space in the Inner Area South. In comparison to the other CSSAs there are a high percentage of cemeteries and a low percentage of woodlands.	Private recreation is above average but other forms of recreation and green travel route are low. Habitat for wildlife is very low; corridor is slightly higher but is still well below average.	the tree lined street Muirhead Avenue. In Inner Area South there are few assets relating to inaccessible water storage, noise absorption, trapping air pollutants and the recreation functions. The key green infrastructure assets here are Princes Park and Toxteth Park Cemetery.	There are generally high levels of issues in this area, especially relating to housing growth and regeneration, gateways and routes, walkability, mental health, drought, and habitat for wildlife.
Atlantic Gateway SIA	The Mersey dominates in this CSSA and accounts for 15% of the area, the highest cover in comparison to the other areas. It also has the lowest percentage cover for allotments, cemeteries, institutional grounds and woodland.	Atlantic Gateway has the lowest functionality of all the areas. It has the lowest functionality of all areas for the green travel route, shading, pollutant control, timber and biofuels production, and wildlife functions. However it has the highest amount of accessible water storage.	In this area there are few assets relating to the aesthetic, habitat & corridor for wildlife, evaporative cooling, green travel route, noise absorption and shading functions. The only key green infrastructure asset in the Atlantic Gateway SIA is the railway corridor.	There are generally high levels of issues in this area, especially relating to housing growth and regeneration, walkability, access to green space, derelict and vacant land, mental health, coronary heart disease, obesity, diabetes, hospitals and health centres, the urban heat island effect (especially as it affects older people and those with limiting long-term illnesses), and tree cover.
Eastern Approaches SIA	The area has a moderate percentage of private gardens, woodland and grassland, but a reasonably high percentage of parks and derelict land.	This area is the only area to have no learning functionality. It also has low public recreation with restrictions and accessible water storage function. It scores above average though for heritage and cultural functionality. Most water management functions are below average.	In this area there are few assets relating to water infiltration and storage (accessible & inaccessible), flow reduction through surface roughness, green travel route, and public recreation with restrictions. The key green infrastructure assets here are Wavertree Park, Wavertree Technology Park and private gardens.	There are generally high levels of issues in this area, especially relating to housing growth and regeneration, gateways and routes, walkability, mental health, coronary heart disease, diabetes, the urban heat island effect, SUDS, habitat for wildlife, and habitat connectivity.

CORE STRATEGY SUB AREA	TYPOLOGY	FUNCTION	ASSETS	ISSUES
Outer Area	This area has an above average percentage cover of woodland, allotments and agricultural land, but a relatively low percentage of blue infrastructure cover. This is one of only four areas which contain orchards and one of only two areas to contain coastal habitat.	The Outer Area is above average for nearly all functions. Carbon storage, evaporative cooling, wind shelter and aesthetic are notably high. Private recreation is also very dominant here. Food production is relatively high. Functions relating to water management are below average.	In the Outer Area there are few assets relating to accessible water storage, flow reduction through surface roughness, food production, habitats and public recreation (with restrictions) functions. The key assets in this area are Craven Wood, Croxteth Country Park, Allerton, Childwall & Lee Park Golf Courses, Sefton Park and Rice Lane City Farm	There are generally low levels of issues in this area, although there are quite extensive issues relating to water management.
Approach 580 SIA	This area has the highest percentage cover of allotments, orchards and grassland. The amount of grassland in this area is markedly higher. This area is the only area not to contain parks.	This area has high functionality, having the highest functionality percentage for seven functions including the green travel route, aesthetic, shading, food production, evaporative cooling and pollutant management functions. Carbon storage, timber and biofuels production and wind shelter are also high here.	In the Approach 580 SIA there are few assets relating to food production, water conveyance, habitat for wildlife and pollutant removal from soil and water functions. The key green infrastructure assets in this area are Fazakerley Brook and Playing Fields and Sugar Brook.	There are generally low levels of issues in this area, although there are exceptions relating to coronary heart disease, obesity, tree cover, drought, and de-culverting of watercourses
Speke Halewood SIA	This area has the highest percentage of institutional grounds, notably higher than other areas. It also has the highest percentage of derelict land. Agricultural land is also present. It has the lowest amount of private gardens, and a moderate amount of grassland, woodland and general amenity space.	Pollutant removal from soil and water is high here. Most functions are about average. Recreation of all forms is below average. Water management functions are average or below average. The main exceptions being green travel route, aesthetic, evaporative cooling, habitat and corridor for wildlife which are above average.	In this area the key green infrastructure assets are Speke Hall and farm and the Oglet.	There are generally low levels of issues in this area, although there are exceptions relating to access to green space, obesity, drought, and de-culverting of watercourses.
Eastern	This area has by far the largest	The highest percentage of	One of two areas where there are	There are generally low levels of

CORE STRATEGY SUB AREA	TYPOLOGY	FUNCTION	ASSETS	ISSUES
Fringe (C)	percentage of private gardens; it also has comparatively high levels of street trees and allotments. It has a very low percentage cover of blue infrastructure.	private recreation is here. The aesthetic and evaporative cooling functions are also above average. The habitat and corridor for wildlife functions are below average. Soil stabilisation and water storage are particularly low.	9 functions with few assets is present. These are the green travel route, flow reduction through surface roughness, habitat for wildlife, shading, public recreation and public recreation with restrictions, water conveyance, infiltration and storage functions. The key assets in this area are school grounds and private gardens.	issues in this area, although there are exceptions relating to gateways and routes, SUDS, drought, and de-culverting of watercourses.
Eastern Fringe (N)	This area has the highest percentage of cemeteries and a high percentage of private gardens, grassland and allotments. There is moderate cover of woodland, general amenity space and outdoor sports.	Functionality is high in the Eastern Fringe (N), in particular aesthetic, evaporative cooling, timber and biofuels production and pollutant control. Water infiltration is lowest here; other water management functions are also below average.	In the Eastern Fringe (N) there are few assets relating to food production, green travel route and water conveyance functions. The key green infrastructure assets are Dam Wood and the cemetery.	There are generally low levels of issues in this area, although there are exceptions relating to tree cover, drought, and de-culverting of watercourses.
Eastern Fringe (S)	Outdoor sports and general amenity space dominate in the Eastern Fringe (S); both the highest percentages for these types are present here, along with the highest woodland cover of all the CSSAs. This area is the only area with no cemeteries and a low percentage of derelict land.	This area has the highest functionality; the highest percentage for each of these functions appears here: the recreation with restrictions, aesthetic, corridor for wildlife, timber and biofuels production and water interception and conveyance functions. Yet this area has no functionality for heritage.	In this area there are few assets relating to accessible water storage, food production, habitat for wildlife and pollutant removal from soil and water. The key green infrastructure assets are Childwall and Lee Park Golf Courses.	There are generally low levels of issues in this area, although there are exceptions relating to derelict and vacant land, SUDS, tree cover, drought, and de-culverting of watercourses.
Southern Fringe	One of only two areas containing coastal habitat, and the only area containing wetland. It also has the	The area has low recreational function, it scores highly as a habitat, and for food production	In the Southern Fringe there are few assets relating the inaccessible water storage. The	There are generally low levels of issues in this area, although there are exceptions relating to access

CORE STRATEGY SUB AREA	TPOLOGY	FUNCTION	ASSETS	ISSUES
	highest percentage of agricultural land. There is a high percentage of institutional grounds and a moderate percentage of all other green infrastructure types.	and highest for coastal storm protection. All other functions are around average.	key green infrastructure assets are Speke Hall and farm, the Oglet, Mill Wood & Alderwood, and the private domestic gardens.	to green space, drought, and de-culverting of watercourses.

13.3. Developing Actions

13.3.1. A wide range of information has been consulted as part of this strategy, from looking at the evidence that green infrastructure can help with each of the priorities, analysis of supportive policy and specific green infrastructure data for Liverpool (types, functions, needs, assets etc.). Based on this information a series of actions have been developed. The actions have been developed in response to the issues for each priority. The actions are targeted at areas of the city where “need” is greatest, based on the Core Strategy Sub Areas.

13.3.2. In addition to the actions a series of recommendations have also been developed. These form the basis for getting agreement and support to take forward the actions.

13.3.3. From the assessment of green infrastructure in Liverpool areas in the city have been identified where there is a “need” to address specific issues by providing additional functionality. For example there is likely to be a need to provide cooling in parts of the city with higher numbers of vulnerable people, as part of climate change adaptation. These areas have been identified as areas to take (or make) opportunities to add green infrastructure.

13.3.4. Secondly, green infrastructure assets as areas of the city have been identified; these are areas where there is an overlap of need for a certain function and provision of green infrastructure that provides this function. Either development or other restructuring of the city should safeguard these assets or, where they are to be lost, measures should be taken to ensure that the loss of function is mitigated.

13.3.5. This may be an important issue, it is not necessarily the loss of space that is the driver for mitigation; it is the benefits and values that are provided by a site that need to be mitigated.

13.3.6. The type of action, whether it is to increase the level of green infrastructure provision, manage existing areas to increase functions, or to safeguard existing functionality to meet identified needs, will vary across the city. The appropriateness of management actions will vary. Areas across the city have differing constraints on the different types of green infrastructure that may be appropriate when implementing actions. The constraint could be physical, space is more limited in the City Centre than in the outer area for instance, or linked to design, not all interventions are appropriate in urban design terms.

13.3.7. For example, the range of options in the City Centre will be limited by the premium on the land, the existing urban form, and the need to safeguard and enhance character. Therefore large scale green infrastructure interventions are unlikely here. In addition, creation of the “general amenity” type to add to the already high quantities in this area is not recommended as this type can pose a burden on management (as it can be costly to maintain) and has limited functionality. In this area, urban trees effectively linked to the city fringes, sustainable urban drainage systems, green roofs and small scale, well designed spaces for public recreation could provide the functionality required if planned and implemented effectively.

13.3.8. As a starting point for ways to guide actions, Table 25 provides some recommendations of the green infrastructure types that may be appropriate in each Neighbourhood Management Area across the city based on the issues described. Table 25 should be used to inform discussion, the suggestions should not however restrict innovation.

13.3.9. In Table 25 the following colour scheme is used:

	Key typology to promote in this area
	Possible typology depending on exact location
	Probably not appropriate or possible

Table 25 Appropriate interventions for each neighbourhood management area

	AGRICULTURAL LAND	ALLOTMENT, COMMUNITY GARDEN OR URBAN FARM	CEMETERY, CHURCHYARD OR BURIAL GROUND	COASTAL HABITAT	DERELICT LAND	GENERAL AMENITY SPACE	GRASSLAND, HEATHLAND, MOORLAND OR SCRUBLAND	INSTITUTIONAL GROUNDS	ORCHARD	OUTDOOR SPORTS FACILITIES	PARK OR PUBLIC GARDEN	PRIVATE DOMESTIC GARDEN	STREET TREES	WATER BODY	WATER COURSE	WETLAND	WOODLAND
Alt Valley	Unlikely but possible	Possible on derelict or amenity grassland and possibly areas of parkland				Do not want to create more of this type which in this context may be difficult to manage			Possibly on similar areas to allotments or school grounds					Liverpool has a relatively low level of water bodies, away from the Mersey.	Deculverting as part of regeneration where possible		
City and North		Possible on derelict or amenity grassland and possibly areas of parkland		Unlikely			Where well managed /or involving green roof	Unless built into new build of school and hospitals etc.	Possibly on similar areas to allotments or school grounds	Conversion of general amenity space to provide this important type	Unlikely	As part of housing development	Linking to the street tree rich areas and Brodie avenues	Unlikely	Deculverting as part of regeneration where possible	Unlikely	Unlikely
Liverpool East		Possible on derelict or amenity grassland and possibly areas of parkland													Unlikely	Unlikely	Small scale
South Central		Possible on derelict or amenity grassland and possibly areas of parkland													Unlikely	Unlikely	Small scale
South Liverpool		Possible on derelict or amenity grassland and possibly areas of parkland													Deculverting as part of regeneration where possible		

13.3.10. Table 25 shows that City and North, the area with most issues is also the area with most limitation on action, but options such as urban trees, green roofs, water courses and potentially well designed and managed amenity spaces are potentially suitable.

13.3.11. There are fewer constraints on action further out from the City Centre. Private gardens, water bodies, woodland and urban trees are all key typologies. It is suggested that the general amenity type should not be encouraged unless it is of high quality.

13.4. Locating Issues and Actions

13.4.1. A number of issues have been identified for each of the five priorities of the Liverpool Green Infrastructure Strategy – please refer to section 5.

13.4.2. This section focuses on where the issues are present in the city. Table 26 and Table 27 (ordered by Core Strategy Sub Areas and Neighbourhood Management Areas respectively) provide more detailed information about where in the city it will be most important to intervene to improve green infrastructure functionality to help to address the issues identified for the four spatial priorities set for this strategy. Mapping of this data is provided in Appendix 1.

13.4.3. A cell within the table with a “1” indicates an area that requires intervention to improve green infrastructure functionality; a “0” indicates an area where it is important to safeguard and enhance existing functionality, focusing on quality improvements.

Table 26 Green Infrastructure functions to address issues by Core Strategy Sub Area

	ACTIONS																					PRIORITIES				
CORE STRATEGY SUB AREA	1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.7	3.1	3.1	3.1	3.2	3.4	3.5	3.10	4.1	4.2	A SUSTAINABLE CITY	A CITY PROVIDING NATURAL CHOICES FOR HEALTH	A COOL CITY	A BIODIVERSE CITY	TOTAL CORE STRATEGY SUB AREA
City Centre	1.00	1.00	1.00	0.67	0.67	1.00	0.33	0.00	0.00	0.33	0.67	1.00	0.00	0.33	0.00	0.00	0.33	0.33	0.00	0.67	0.33	3.7	4.0	1.0	1.0	9.7
Inner Area	0.72	0.36	0.64	0.16	0.24	0.52	0.36	0.40	0.44	0.36	0.44	0.64	0.28	0.40	0.44	0.28	0.32	0.36	0.08	0.48	0.24	1.9	3.4	2.2	0.7	8.2
Inner Area North	0.67	0.33	0.56	0.17	0.17	0.50	0.33	0.44	0.44	0.33	0.50	0.56	0.33	0.44	0.39	0.28	0.39	0.22	0.11	0.50	0.28	1.7	3.3	2.2	0.8	7.9
Inner Area South	0.89	0.56	0.89	0.22	0.44	0.67	0.44	0.22	0.33	0.44	0.44	0.89	0.11	0.33	0.44	0.22	0.22	0.56	0.00	0.56	0.22	2.6	3.9	1.9	0.8	9.1
Atlantic Gateway SIA	1.00	0.33	1.00	1.00	0.67	1.00	0.33	0.67	0.67	0.67	1.00	1.00	0.67	0.67	0.33	0.00	0.67	0.00	0.00	0.33	0.33	3.3	6.0	2.3	0.7	12.3
Eastern Approaches SIA	0.75	0.50	0.75	0.00	0.25	0.50	0.25	0.50	0.25	0.50	0.25	0.75	0.50	0.50	0.75	1.00	0.00	0.00	0.25	0.75	0.50	2.0	3.3	3.0	1.3	9.5
Outer Area	0.18	0.18	0.18	0.18	0.07	0.02	0.14	0.14	0.18	0.05	0.09	0.18	0.09	0.05	0.14	0.36	0.16	0.43	0.43	0.16	0.11	0.7	0.9	1.7	0.3	3.5
Approach 580 SIA	0.25	0.00	0.25	0.00	0.25	0.00	0.00	0.50	0.50	0.25	0.00	0.25	0.25	0.25	0.25	0.25	0.75	0.50	1.00	0.00	0.00	0.5	1.8	3.3	0.0	5.5
Speke Halewood SIA	0.25	0.00	0.00	0.75	0.25	0.00	0.00	0.25	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.50	0.75	0.00	0.00	1.0	1.0	1.5	0.0	3.5
Eastern Fringe (C)	0.00	0.50	0.25	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.75	0.00	0.75	0.75	0.25	0.25	0.8	0.5	2.3	0.5	4.0
Eastern Fringe (N)	0.25	0.25	0.38	0.00	0.13	0.00	0.13	0.25	0.25	0.13	0.00	0.38	0.13	0.13	0.25	0.25	0.50	0.63	0.50	0.13	0.13	0.9	1.3	2.4	0.3	4.8
Eastern Fringe (S)	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50	1.00	1.00	0.00	0.00	0.0	0.5	3.0	0.0	3.5
Southern Fringe	0.17	0.00	0.00	0.50	0.17	0.00	0.00	0.17	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.67	0.67	0.00	0.00	0.7	0.7	1.5	0.0	2.8

13.4.4. Map 15 shows the information from the end column of Table 26, displayed spatially across the city. Atlantic Gateway has the highest targeting score in the city; the outer areas have lower targeting scores than the rest of the city.

Map 15 Targeting for all priorities

All Priorities

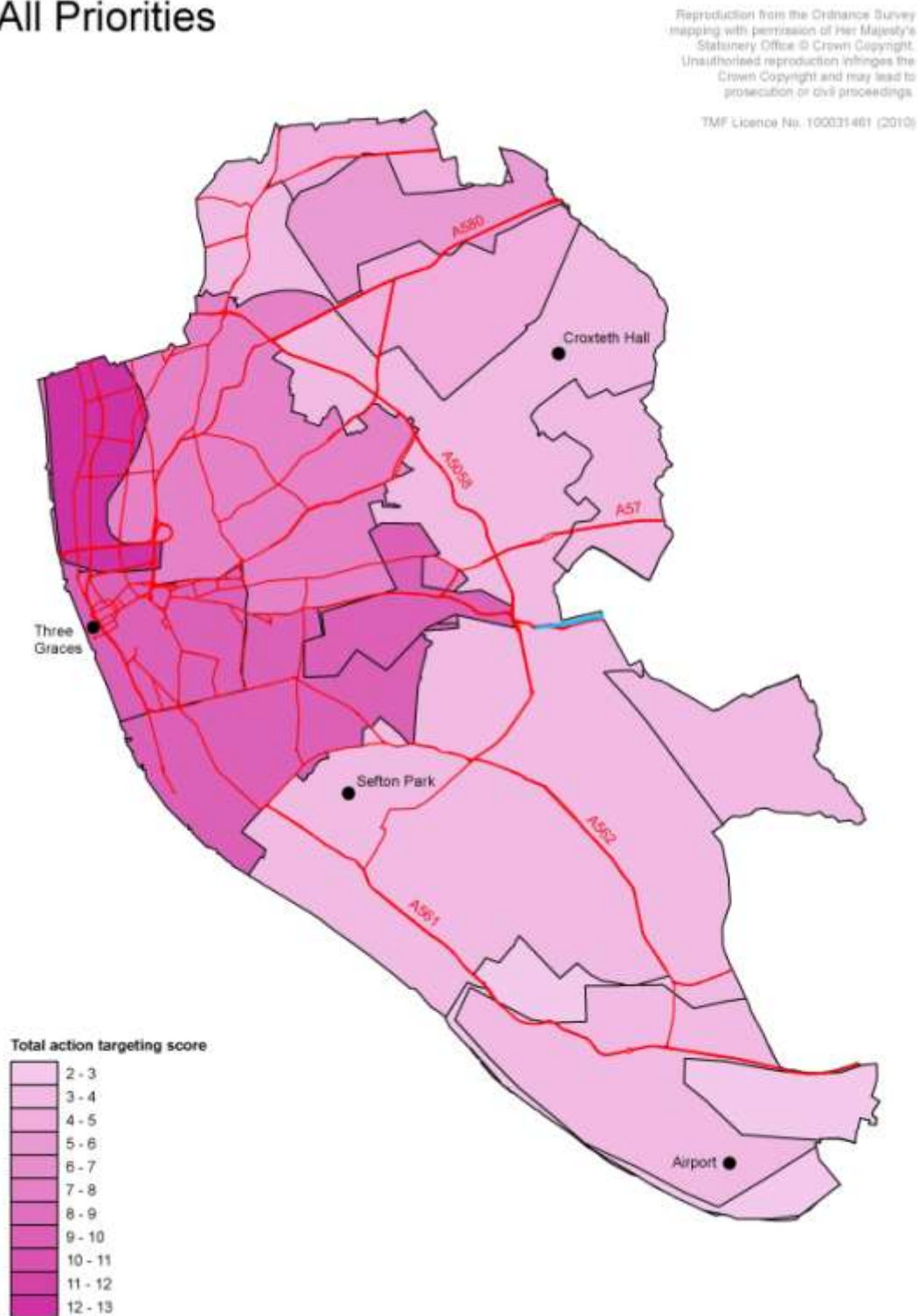


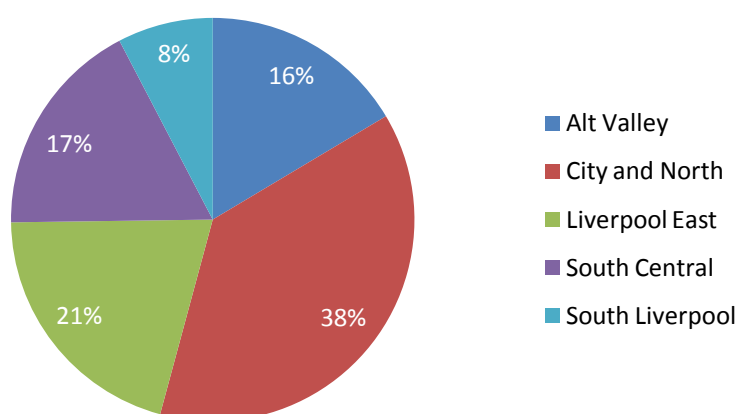
Table 27 Green infrastructure functions to address issues by Neighbourhood Management Area

		ACTIONS																					PRIORITIES					
NEIGHBOURHOOD MANAGEMENT AREA	WARD	1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.7	3.1	3.1	3.1	3.2	3.4	3.5	3.10	4.1	4.2	A SUSTAINABLE CITY	A CITY PROVIDING NATURAL CHOICES FOR HEALTH	A COOL CITY	A GREEN AND BIODIVERSE CITY	TOTAL	TOTAL FOR NEIGHBOURHOOD MANAGEMENT AREAS
Alt Valley	Clubmoor	0.20	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.20	0.20	0.20	0.40	0.20	0.40	0.40	0.20	0.20	0.6	0.4	2.0	0.4	3.4	26.2
	County	0.67	0.33	0.33	0.00	0.00	0.00	0.33	0.67	0.67	0.00	0.33	0.33	0.00	0.00	0.33	0.00	0.67	0.00	0.00	0.33	0.33	1.3	2.3	1.0	0.7	5.3	
	Croxteth	0.00	0.75	0.25	0.00	0.25	0.00	0.00	0.25	0.25	0.25	0.00	0.25	0.00	0.00	0.00	0.50	0.25	1.00	0.50	0.25	0.25	1.0	1.3	2.3	0.5	5.0	
	Fazakerley	0.25	0.00	0.00	0.00	0.25	0.00	0.25	0.50	0.50	0.25	0.00	0.00	0.00	0.00	0.25	0.25	0.75	0.50	0.75	0.00	0.00	0.3	1.8	2.5	0.0	4.5	
	Norris Green	0.00	0.33	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.33	0.00	0.33	0.33	0.33	0.33	1.0	0.7	1.0	0.7	3.3	
	Warbreck	0.67	0.00	0.33	0.00	0.00	0.00	0.33	0.33	0.33	0.33	0.00	0.33	0.33	0.33	0.33	0.33	0.00	0.33	0.33	0.33	0.00	0.00	1.0	1.7	2.0	0.0	
City and North	Central	1.00	1.00	1.00	0.50	0.50	1.00	0.50	0.00	0.00	0.50	1.00	1.00	0.00	0.50	0.00	0.00	0.50	0.00	0.00	1.00	0.50	3.5	4.5	1.0	1.5	10.5	60.2
	Everton	0.75	0.00	0.75	0.25	0.50	0.75	0.25	0.50	0.50	0.50	0.50	0.75	0.50	0.75	0.25	0.00	0.50	0.50	0.00	0.25	0.00	1.8	4.3	2.5	0.3	8.8	
	Kensington & Fairfield	0.67	0.33	0.67	0.00	0.00	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.33	0.67	0.33	0.67	0.67	0.67	0.33	0.67	0.00	1.7	4.7	3.3	0.7	10.3	
	Kirkdale	1.00	0.50	1.00	0.75	0.50	0.75	0.50	0.75	0.75	0.50	0.75	1.00	0.50	0.50	0.50	0.00	0.75	0.00	0.00	0.50	0.50	3.3	5.5	2.3	1.0	12.0	
	Picton	0.80	0.60	0.80	0.00	0.20	0.60	0.40	0.20	0.20	0.60	0.40	0.80	0.00	0.40	0.40	0.60	0.20	0.40	0.20	0.60	0.20	2.2	3.4	2.2	0.8	8.6	
	Riverside	1.00	0.50	1.00	0.50	0.75	0.75	0.50	0.25	0.50	0.25	0.50	1.00	0.25	0.25	0.50	0.00	0.25	0.50	0.00	0.50	0.25	3.0	4.5	1.8	0.8	10.0	
Liverpool East	Anfield	0.67	0.33	0.33	0.00	0.00	0.67	0.33	0.33	0.33	0.00	0.33	0.33	0.33	0.67	0.67	0.00	0.33	0.33	0.00	0.67	0.67	1.3	2.3	2.3	1.3	7.3	32.8
	Knotty Ash	0.00	0.00	0.20	0.00	0.00	0.00	0.20	0.20	0.20	0.00	0.00	0.20	0.20	0.00	0.20	0.60	0.00	0.20	0.60	0.40	0.40	0.2	0.8	1.8	0.8	3.6	
	Old Swan	0.67	0.33	0.67	0.00	0.00	0.33	0.33	0.67	0.67	0.33	0.33	0.67	1.00	0.33	1.00	1.00	0.00	0.00	0.00	0.67	0.33	1.7	3.3	3.3	1.0	9.3	
	Tuebrook & Stonecroft	0.40	0.40	0.20	0.00	0.00	0.40	0.40	0.40	0.40	0.20	0.40	0.20	0.40	0.40	0.40	0.80	0.20	0.00	0.40	0.40	0.20	1.0	2.4	2.6	0.6	6.6	
	West Derby	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.33	0.67	0.00	0.00	0.3	0.0	2.0	0.0	2.3	
	Yew Tree	0.00	0.40	0.20	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.80	0.00	0.60	0.80	0.20	0.20	0.6	0.4	2.2	0.4	
South	Childwall	0.20	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.20	0.00	0.20	0.20	0.00	0.00	0.40	0.60	0.40	0.4	0.2	1.0	1.0	2.6	28.0

		ACTIONS																					PRIORITIES						
NEIGHBOURHOOD MANAGEMENT AREA	WARD	1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.7	3.1	3.1	3.1	3.2	3.4	3.5	3.10	4.1	4.2	A SUSTAINABLE CITY	A CITY PROVIDING NATURAL CHOICES FOR HEALTH	A COOL CITY	A GREEN AND BIODIVERSE CITY	TOTAL	TOTAL FOR NEIGHBOURHOOD MANAGEMENT AREAS	
Central	Church	0.00	0.20	0.00	0.60	0.00	0.00	0.20	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.20	0.00	0.20	0.40	0.20	0.00	0.8	0.4	0.8	0.2	2.2	12.2	
	Greenbank	0.25	0.50	0.25	0.50	0.00	0.00	0.50	0.00	0.00	0.00	0.50	0.25	0.00	0.00	0.00	0.75	0.00	1.00	0.25	0.00	0.00	1.5	1.3	2.0	0.0	4.8		
	Princes Park	0.75	0.25	0.75	0.25	0.50	0.75	0.50	0.25	0.50	0.50	0.25	0.75	0.25	0.25	0.50	0.00	0.25	1.00	0.00	0.50	0.00	2.0	4.0	2.3	0.5	8.8		
	St Michael's	0.25	0.00	0.25	0.50	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.25	0.00	0.00	0.25	0.50	0.00	0.50	0.25	0.00	0.00	1.0	0.5	1.5	0.0	3.0		
	Wavertree	0.50	0.50	0.50	0.17	0.17	0.17	0.33	0.17	0.00	0.17	0.33	0.50	0.17	0.17	0.33	0.67	0.00	0.33	0.33	0.67	0.50	1.7	1.8	2.0	1.2	6.7		
South Liverpool	Allerton & Hunts Cross	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.50	0.75	0.00	0.00	0.0	0.0	1.5	0.0	1.5	12.2	
	Belle Vale	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.33	0.67	0.67	0.00	0.00	0.0	0.3	2.0	0.0	2.3		
	Cressington	0.25	0.00	0.00	0.75	0.25	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.50	0.00	0.00	1.0	0.5	0.8	0.0	2.3		
	Mossley Hill	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.20	0.20	0.00	0.00	1.0	0.0	0.8	0.0	1.8		
	Speke-Garston	0.33	0.00	0.00	0.67	0.33	0.00	0.00	0.00	0.33	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.67	0.00	0.00	1.0	1.3	1.3	0.0		3.7
	Woolton	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.3	0.0	0.3	0.0		0.7

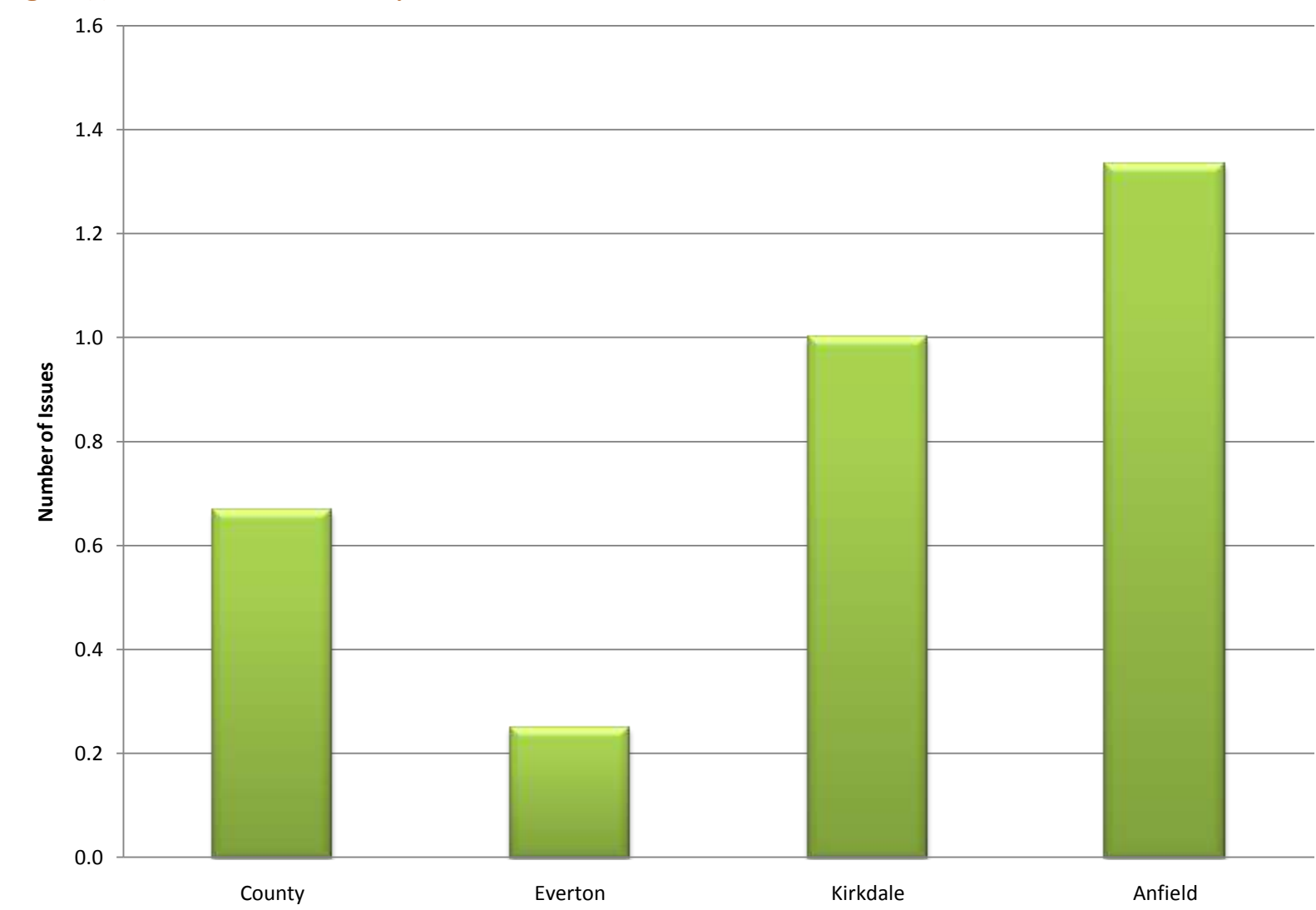
13.4.5. The following figures present an overview of this detailed information. Figure 32 shows that the City and North Liverpool Neighbourhood Management Area has the largest proportion of issues to deal with through green infrastructure interventions. It is double the proportion for other Neighbourhood Management Areas, excluding Liverpool South (7% of the issues) where the difference is even greater. However, it will be important not to ignore the issues outside of the city and North Liverpool, and to ensure that the areas of functional green infrastructure across the city are safeguarded and enhanced.

Figure 32 Proportion (%) of issues identified by Neighbourhood Management Area



13.4.6. Figure 33 shows the number of issues per ward across the city. There are several wards with few or no issues indicated. This does not mean that there are no requirements for interventions to improve the functionality of the green infrastructure. The methodology for this strategy does not include a qualitative assessment of open spaces, and it is likely, based on the recommendations of the Open Space Study, that there is a need to improve quality.

Figure 33 Total number of issues by ward



13.4.7. The following sections sets out the actions, supported by analysis and additional information. Information on the deliverability of each action is also provided. Where appropriate, we have mapped the areas of the city to target for the actions, based on the functionality and needs assessment. The maps are provided in Appendix 5. As with the recommendations, the actions are categorised under land change, support or guidance.

13.4.8. The actions are set out in the following way:

- An assessment of the issues for Liverpool, including the current assets
- Long term goal for the priority – what would we like to see in 20 years time
- The Actions – with maps (with links to further mapping in Appendix 5 where appropriate)
- Rationale - the reasoning behind the actions
- The implications for the Core Strategy Sub Areas

13.4.9. Where appropriate the land change actions take into account the projected population increases anticipated for city, distributed as set out in the Core Strategy document (see section 6.5 and Map 3,

13.4.10. Map 4 and

13.4.11.

13.4.12. Map 5).

13.4.13. From the analysis of the data, two overview maps for each of the four priorities that have been agreed for this strategy have been produced. The first map shows the distribution of green infrastructure functions that can help to tackle the issues raised for each priority across the city. This indicates the green infrastructure to safeguard. The second map shows the areas where additional green infrastructure functionality is required to address identified needs. These are areas where more green infrastructure could be provided or management of existing areas changes to enable different functions to be provided.

13.4.14. In developing these maps super output area boundaries have been used as they give the greatest level of detail. However, they do not correspond to political subdivisions of the city to neighbourhood or ward. The information has been translated to administrative ward boundaries and included all wards where are least 10% of the ward area is covered by the need for green infrastructure interventions.

13.5. PRIORITY 1: A Sustainable City

13.5.1. Introduction

13.5.1.1. The key strategic documents for Liverpool all set out ambitious goals to develop Liverpool as a leading city, not just in UK, but also in world terms: “...one of the best places to live, work, invest and enjoy life”¹⁶³.

13.5.1.2. The review of the main strategic documents for Liverpool highlights the need to tackle a range of economic issues across the city, to build on areas of strength by attracting new business investment in the high tech and knowledge economy sectors, and to provide a place where people choose to live and work, increasing the population to reverse the decline of recent decades, in particular ensuring that the city retains talented graduates from its universities.

13.5.1.3. There are also ambitious plans to build on the success of Capital of Culture and continue to increase the numbers of visitors to the city. There is a need to improve economic performance, not just by increasing numbers of jobs, although that is important, but also by increasing skill levels and productivity in a low carbon economy.

13.5.1.4. 40,000 new homes need to be provided with 3,000 as part of the Growth Point programme. The Department for Communities and Local Government (DCLG) explicitly references green infrastructure as a key component for sustainable growth and improved environmental outcomes in the Growth Points programme, and encourages the inclusion of green infrastructure providers within partnerships.

13.5.1.5. Natural England highlights green infrastructure as a primary consideration in planning, developing and maintaining new developments, with a policy statement that states, “Necessary housing growth should be accommodated with minimum impact on the natural environment and deliver maximum benefits for the natural environment and people together”¹⁶⁴. It sets out guidelines for Growth Point areas, which outlines a ‘Green Test’ against which all new developments should be measured¹⁶⁵.

13.5.1.6. The potential target areas for new housing in Liverpool have been assessed through the Strategic Housing Land Availability Assessment¹⁶⁶ (SHLAA) and have been the subject of public consultation. Detailed allocations will take account of the green infrastructure. The range of new development will generate needs and put pressure on existing infrastructure, but will also create opportunities for new green infrastructure.

13.5.1.7. Major developments, such as Super Port and Liverpool Knowledge Quarter¹⁶⁷ will provide opportunities for green infrastructure interventions. The redevelopment of Alder Hey hospital is already using a green infrastructure approach, looking to maximise the benefits from green infrastructure in terms of the image of the area and the health and wellbeing of the children and parents using the hospital.

13.5.1.8. In addition, there is a need to ensure that key gateways and routes to the city are of high quality and promote a positive image for Liverpool.

¹⁶³ Liverpool Vision (2009) People Place and Prosperity: An economic prospectus

¹⁶⁴ Natural England (2009) Housing Growth and Green Infrastructure Policy

¹⁶⁵ Natural England (2008) Green Infrastructure Strategies: An Introduction for Local Authorities and their Partners

¹⁶⁶ Liverpool City Council (2009) Strategic Housing Land Allocation Assessment

¹⁶⁷ Liverpool Knowledge Quarter – See Appendix 2

13.5.1.9. Liverpool is currently ranked 11th in the list of sustainable cities¹⁶⁸ in England. The aspiration to compete as a world class city will not only require green infrastructure planning and delivery to help achieve a higher ranking within England, but will need to look at the way in which competitor cities worldwide use their green infrastructure for competitive advantage.

13.5.1.10. Liverpool is one of a group of cities in the CABI initiative “Sustainable Cities”. The city is also seen as potentially a leading local authority in delivering another CABI initiative “Grey to Green”. The actions below support the objectives of both these national programmes as well as the city’s key priorities.

13.5.1.11. Map 16 and Map 17 show firstly, the current distribution of green infrastructure functions that can support the Sustainable City Priority and secondly the areas of the city that have been targeted for one or more of the land change actions set out later in this section. The actions are aimed at meeting the specific issues that have been identified for each priority; the number of issues for each Super Output Area of the city is shown on the map. The areas that are not coloured do not indicate that no action is required. These are areas where management should be targeted at safeguarding or enhancing the functions that are already being provided, that help to support the vision for this priority and address local needs.

13.5.1.12. Map 16 shows that the areas with high levels of functionality are mainly around the periphery of the City, with the city parks predominant through the centre of the city area. The areas with low functionality are mainly around the City Centre and Atlantic Gateway SIA, along with industrial areas north of Speke.

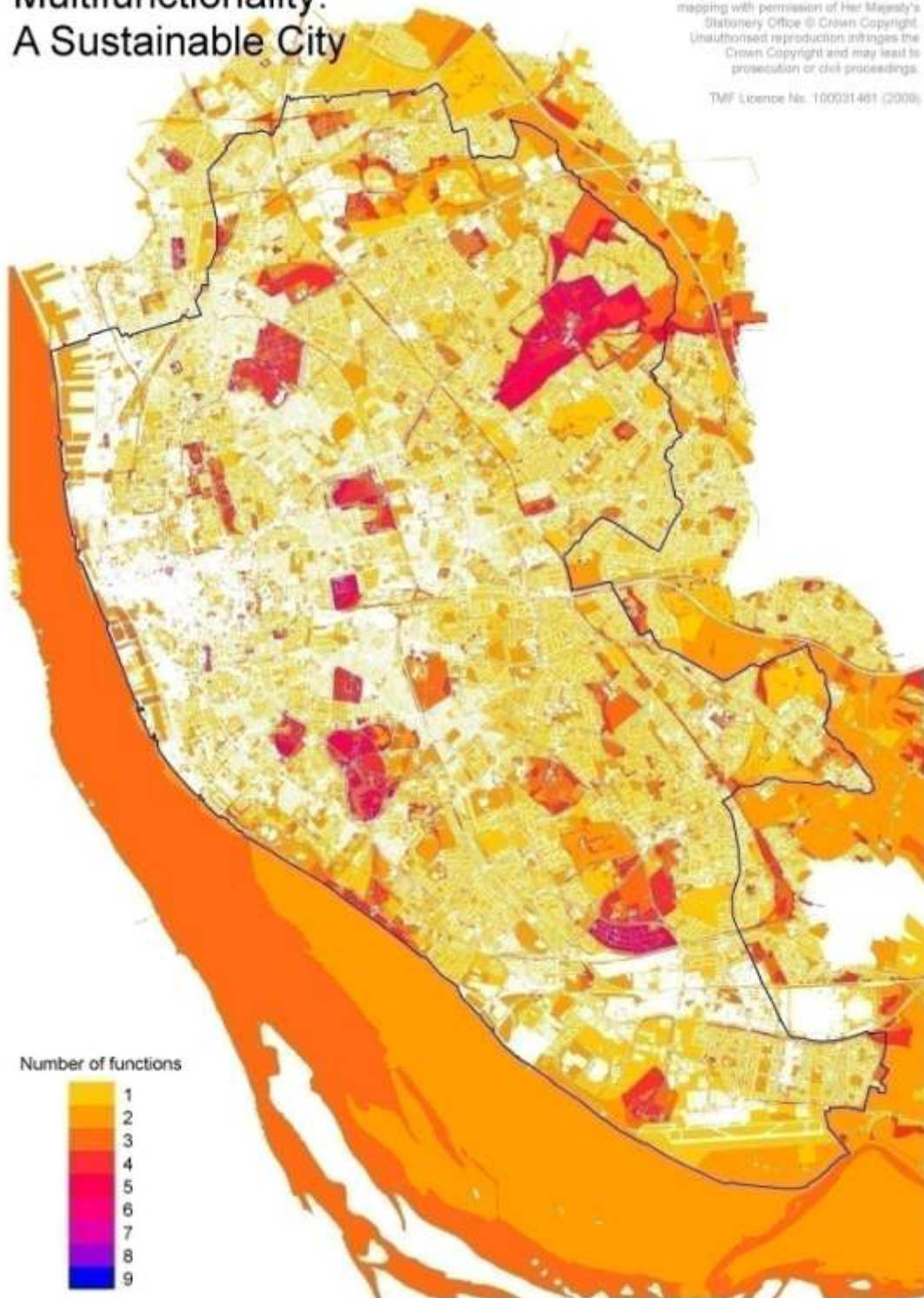
¹⁶⁸ <http://www.forumforthefuture.org/projects/sustainable-cities09>

Map 16 Multifunctionality: A Sustainable City

Multifunctionality: A Sustainable City

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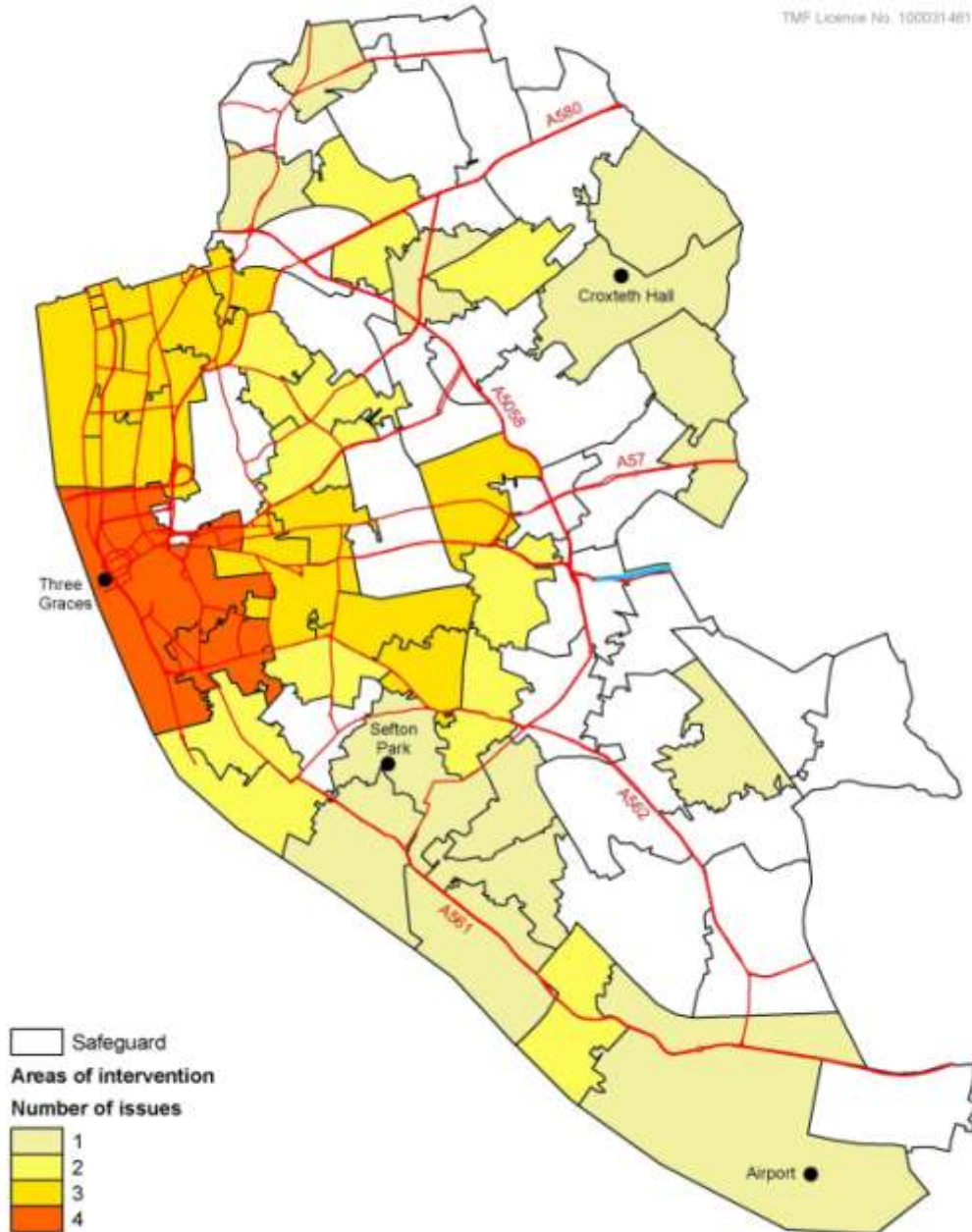


Map 17 Targeting of actions for Priority 1 issues across Super Output Areas

A Sustainable City

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Issues

- Super Output Areas with <50% green infrastructure cover that intersect Strategic Investment Areas, Growth Point wards, HMR areas or Housing SPD Fringe Areas
- Super Output Areas with <30% green infrastructure cover in Environmental Improvement Corridors and near key gateways
- Super Output Areas with <5% green travel route functionality cover that intersect Growth Point wards, HMR areas or Housing SPD Fringe Areas
- Super Output Areas where five or more ANGSI or Space for People standards are not completely fulfilled

13.5.2. Long term goal

“Green infrastructure complements ‘grey infrastructure’ planning, creating high quality new housing environments and regeneration. Liverpool capitalises on and values its green infrastructure, maximising functionality to gain competitive advantage and support prosperity and grows within environmental limits.”

13.5.3. Recommended actions

13.5.3.1. The actions have been colour coded to indicate whether they are land change, guidance, or supporting actions.

	Land change
	Supporting
	Guidance

ACTION 1.1
13.5.3.2. Green infrastructure actions are targeted at the main areas for housing growth and regeneration across the city, where possible safeguarding the existing assets and seeking to provide green infrastructure in the areas of need. Map 124 (p335) shows the spatial distribution of areas of greatest need for intervention.

Areas with greatest need for this action include (by Core Strategy Sub Area):	
City Centre	Central
Inner Area	Anfield, County, Everton, Kensington and Fairfield, Kirkdale, Picton, Princes Park, Riverside
Outer Area	Old Swan, Wavertree, Yew Tree

ACTION 1.2
13.5.3.3. Opportunities are taken to improve the green infrastructure around major gateways and routes into the city such as the A57 and the A5080. Map 126 (p338) indicates the key areas for intervention at ward level, whilst Map 127 (p339) provides more detailed information on the specific road corridors and gateways.

Areas with greatest need for this action include (by Core Strategy Sub Area):	
City Centre	Central
Inner Area	Kirkdale, Picton, Riverside
Outer Area	Croxteth, Greenbank, Wavertree

ACTION 1.3
13.5.3.4. Green infrastructure is used as a mechanism to help create “walkable” neighbourhoods, linking green infrastructure with wider public realm to encourage walking and cycling. In particular, there is an opportunity to develop this approach in the New Heartlands and Growth Point programme areas. Map 129 (p342) indicates where this issue is most relevant.

Areas with greatest need for this action include (by Core Strategy Sub Area):	
City Centre	Central
Inner Area	Everton, Kensington and Fairfield, Kirkdale, Picton, Princes Park, Riverside
Outer Area	Norris Green, Old Swan, Wavertree

ACTION 1.4

13.5.3.5. Access to good quality open spaces is an important part of quality of place and life. The Access to Natural Green Space target (ANGST¹⁶⁹) and The Woodland Trust Space for People¹⁷⁰ targets have been used to identify areas of Liverpool that meet these aspirational standards and those that at present do not. Map 132 (p346) shows the spatial distribution of these areas.

Areas with greatest need for this action include (by Core Strategy Sub Area):

City Centre	Central
Inner Area	Kirkdale, Riverside
Outer Area	Church, Cressington, Greenbank, Mossley Hill, Speke Garston, St Michael's

ACTION 1.5

13.5.3.6. Require detailed green infrastructure plans for all major developments. An example is provided in Appendix 2. The plan should be prepared by the project proposer, showing how the development will contribute to the Liverpool Green Infrastructure Strategy¹⁷¹. (See Action Area 1.1).

ACTION 1.6

13.5.3.7. The Green Infrastructure Target (an approach to ensure that development uses green infrastructure to best effect) is developed and used for all development in Liverpool with specific targets for each of the Core Strategy Sub Areas.

ACTION 1.7

13.5.3.8. Develop a Design Guide, as a Supplementary Planning Document to support green infrastructure delivery across the city.

169 Handley et al. (2005) Accessible Natural Green Space Standards in Towns and Cities: A Review and Toolkit for their Implementation, English Nature Research Report No. 526

170 Woodland Trust (2005) Space for People

171 Green Infrastructure Plans should bring together a number of studies that would normally be required for a major development such as ecological assessments, landscape proposals, water management, travel plans, etc. The Plan should not entail a great deal of additional work, but will require a new approach to assessing the information gathered so that the focus is on a coordinated assessment of the functionality of the proposals in relation to the identified needs for the area.

13.5.4. Rationale

13.5.4.1. Green infrastructure is a critical infrastructure and high quality green infrastructure should be seen as a necessity rather than an amenity. It underpins the sustainability and vitality of the city. The actions set out for this priority are each based on an extensive and growing evidence base, that has been established over the last few years.

13.5.4.2. The evidence shows that high quality green infrastructure has a positive influence on property values and investment decisions, and that, as a key element of the visual quality of an area, is closely linked to the satisfaction that people express with an area^{172,173}.

13.5.4.3. Green infrastructure has also been shown to help to improve productivity. Research conducted by ECOTEC¹⁷⁴ proposes that ‘high quality green infrastructure supports improved productivity through improved health, stress alleviation and attracting and retaining motivated people’. Productivity benefits can be achieved in two ways. Firstly, by a general uplift in the quality of green infrastructure across the city, and secondly, by targeted improvements in the business and commercial districts of the city. Whilst there is no specific action for this key issue for Liverpool, all of the actions in this section, and in the other priorities can contribute to the general improvement that can support improved productivity.

13.5.4.4. Green infrastructure can help to provide attractive walking and cycling routes. Increasing the opportunities available for non-motor journeys is a key issue in tackling congestion, quality of life, and noise and air pollution. It also contributes to reducing carbon emissions and thereby mitigating climate change. In addition, it is perhaps one of the most important aspects in improving health through more active lifestyles.

13.5.4.5. The development of a guide to promote high quality design of green infrastructure, and the introduction of a green infrastructure target system, could help to guide developers and support development managers in making decisions about how to integrate green infrastructure into development proposals.

13.5.4.6. Liverpool has some distinct advantages in terms of gaining competitive advantage from green infrastructure. It is already endowed with a large area of green infrastructure, with historic public parks forming the “jewels” on a chain of accessible green infrastructure around the landward side of the city. Furthermore The River Mersey provides a great opportunity to plan the city within a matrix of green infrastructure and is a key asset in linking the “green” with the “blue”.

13.5.4.7. Unlike other cities, there is no need for large scale restructuring in order to create green infrastructure, the city has a large area of green infrastructure. Rather, the issue for Liverpool is how to best target where green infrastructure is most needed to achieve the many benefits and how to improve the quality of the existing resource in order to ensure the benefits that the city needs are delivered. Table 25 (p140) provides guidance on the types of green infrastructure interventions that may be appropriate in each of the neighbourhood management areas.

¹⁷² Cabinet Office Strategy Unit (2009) Quality of Place – Improving the Design and Planning of the Built Environment

¹⁷³ Mc Mahon (2009) Speaking at the “Park City Conference”, CABA

¹⁷⁴ Natural Economy Northwest (2009) Economic Benefits of Green Infrastructure

13.5.4.8. Whilst there has to be a focus on economic recovery and sustainable growth, green infrastructure is an £8bn¹⁷⁵ asset for the city that has not been fully exploited. These actions start to address this issue. In the future, it will be possible to use this strategy as a baseline to assess whether the city is increasing the value it gets from its green infrastructure.

13.5.5. Core Strategy Sub Areas

¹⁷⁵ This figure is draft, based on use of the GENECON toolkit for valuing green infrastructure. We will continue to work on this to provide what we think is a reasonable figure based on the toolkit.

Table 28 indicates which of the Land Change actions from the list above are required in each of the Core Strategy Sub Areas. The Support and Guidance Actions apply to all areas of the city.

13.5.5.1. The targeting score that is shown for each action is a simple measure of the extent to which the action is required to meet the needs that have been identified in each Core Strategy Sub Area. Details of how the score is determined are provided in Appendix 1 of the Technical Document. The score does not however take account of quality of the green infrastructure. Only the quantity of green infrastructure which performs a related function. A high score indicates an area for high priority. For example, Atlantic Gateway has an issue around “walkability”, therefore it is an area targeted for action.

13.5.5.2. As this strategy does not look at quality, it will be important to ensure that the detailed design plans that are developed for areas such as Approach 580 SIA and the Eastern Fringe (south), consider how the quality of the existing green infrastructure can be improved, using the data from this strategy to identify the functions that are needed to address local needs.

13.5.5.3. Due to the low levels of green infrastructure and the high levels of identified need the City Centre and Atlantic Gateway are shown as key target areas. Map 18 shows the “total” scores shown in Table 28. Map 18 is based on the assessment of assets for this priority and provides a detailed view of where needs are not currently being met by green infrastructure functions. This provides a more detailed view of exactly where within the Core Strategy Sub Areas functionality is missing.

13.5.5.4. The GIS that has been developed to support this strategy can provide additional information on the nature of the needs that have not been fulfilled at a detailed scale if required for individual plans and master plans.

Table 28 Priority 1: Targeting score for each action by Core Strategy Sub Area

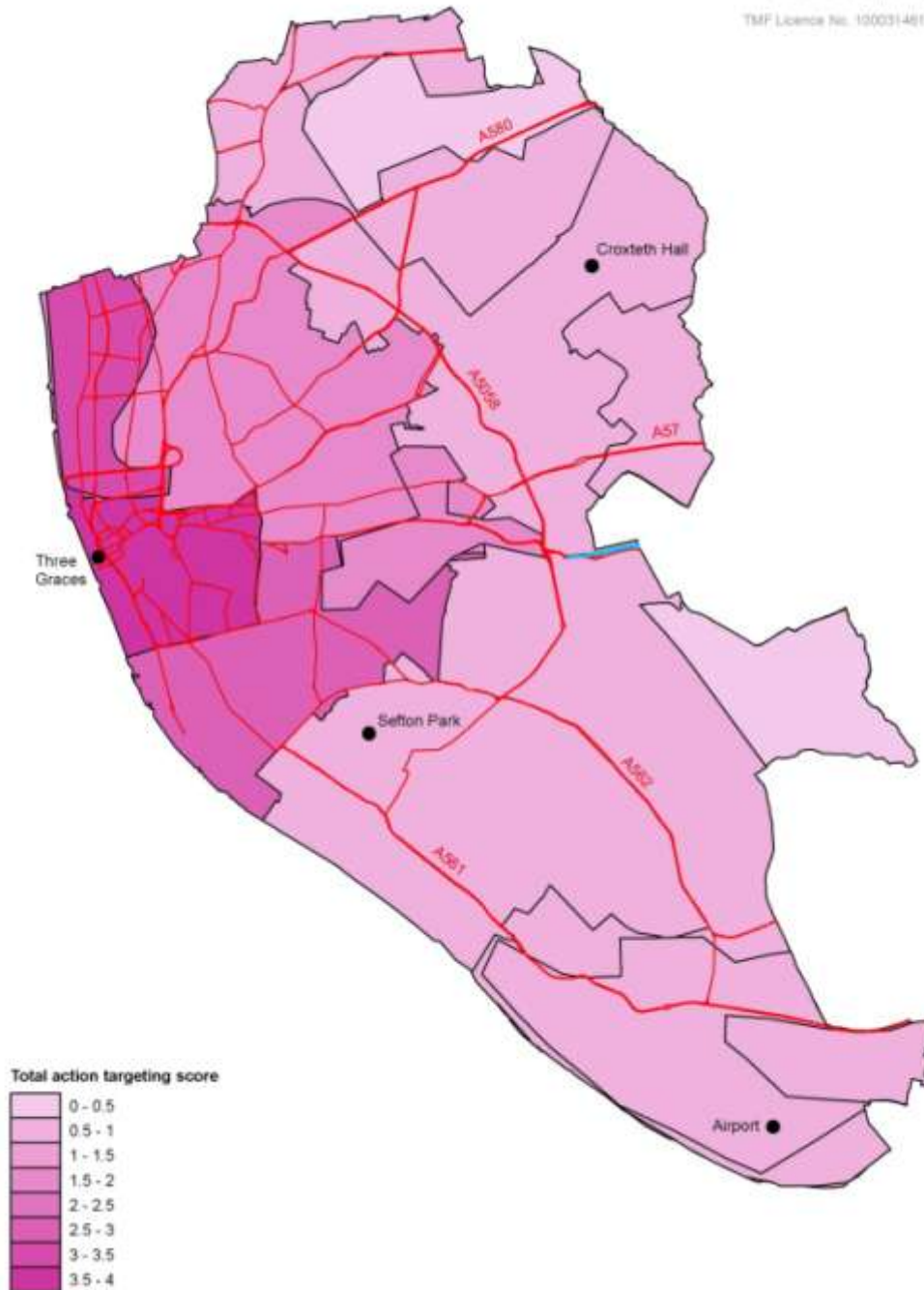
CORE STRATEGY SUB AREA	ACTIONS				TOTAL
	1.1	1.2	1.3	1.4	
City Centre	1.00	1.00	1.00	0.67	3.7
Inner Area	0.72	0.36	0.64	0.16	1.9
Inner Area North	0.67	0.33	0.56	0.17	1.7
Inner Area South	0.89	0.56	0.89	0.22	2.6
Atlantic Gateway SIA	1.00	0.33	1.00	1.00	3.3
Eastern Approaches SIA	0.75	0.50	0.75	0.00	2.0
Outer Area	0.18	0.18	0.18	0.18	0.7
Approach 580 SIA	0.25	0.00	0.25	0.00	0.5
Speke Halewood SIA	0.25	0.00	0.00	0.75	1.0
Eastern Fringe (C)	0.00	0.50	0.25	0.00	0.8
Eastern Fringe (N)	0.25	0.25	0.38	0.00	0.9
Eastern Fringe (S)	0.00	0.00	0.00	0.00	0.0
Southern Fringe	0.17	0.00	0.00	0.50	0.7

Map 18 Total targeting score for Priority 1 by Core Strategy Sub Area

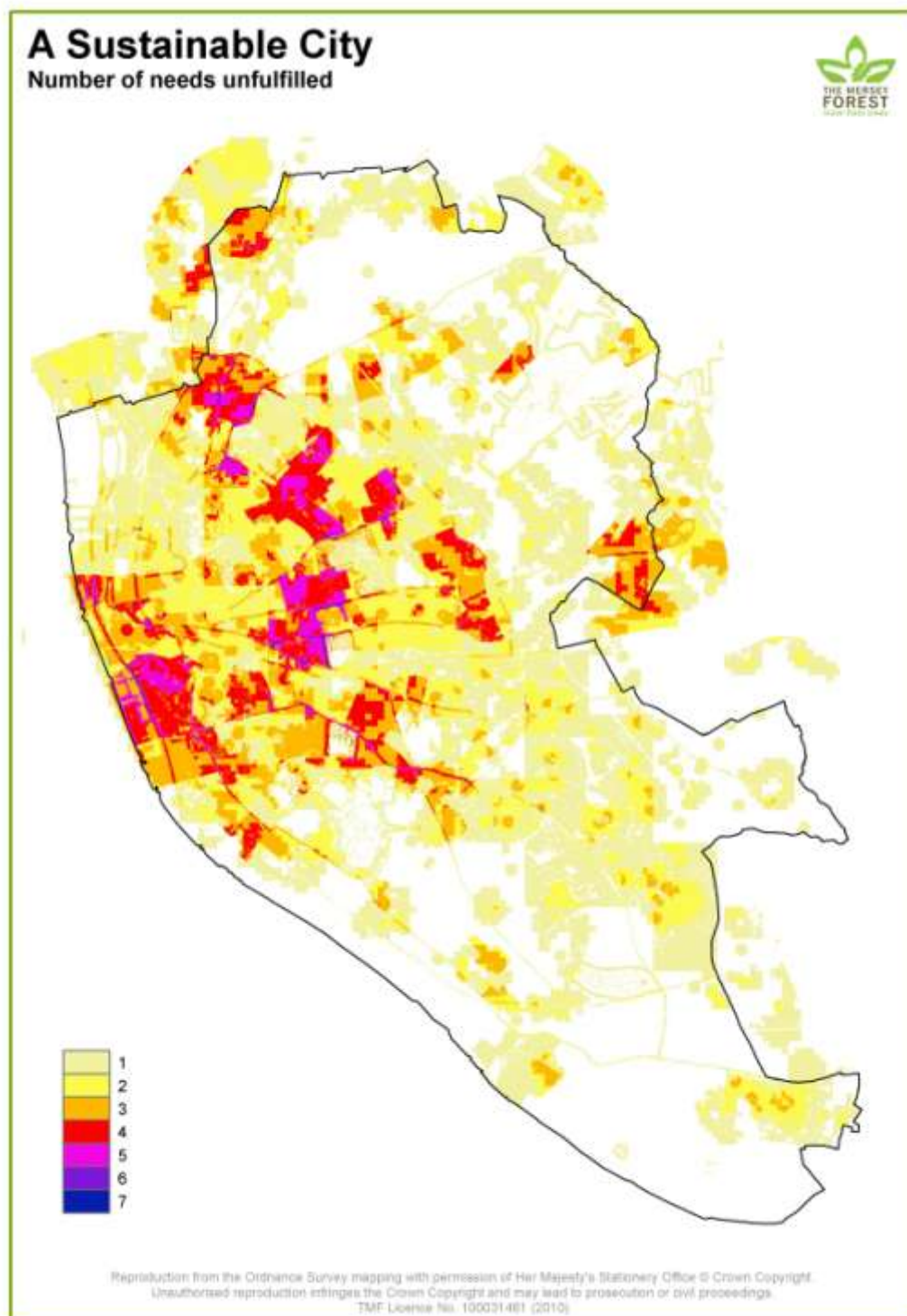
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Map 19 Needs unfulfilled at present for Priority 1



13.6. PRIORITY 2: A City Providing Natural Choices for Health

13.6.1. Introduction

13.6.1.1. Improving health and wellbeing is a key priority for Liverpool.

13.6.1.2. “Our city faces some of the greatest health challenges in the Country. It has some of the highest levels of deprivation and lowest levels of life expectancy. It has a high burden of disease and a relatively low take up of healthy lifestyles.”¹⁷⁶

13.6.1.3. In England the life expectancy rates are 77 years for males and 82 years for females, whereas in Liverpool the life expectancy rates are only 74 years for males and 78 years for females. Health statistics show that 27 of Liverpool's 30 wards are included in the national pentile of wards that have the lowest life expectancy at birth.

13.6.1.4. Similarly health inequalities within Liverpool are high. A male born in a disadvantaged ward can expect to live 10.9 years less than males born in the most affluent areas¹⁷⁷. This inequality across the city almost mirrors the inequality for the whole of the UK. Of the 26 indicators shown in Liverpool's health profile¹⁷⁸, including mental health, only one is better and 22 are worse than the England average.

13.6.1.5. Liverpool has a long history of leading the public health agenda¹⁷⁹ and is part of the “Healthy Cities” programme¹⁸⁰. Liverpool has designated 2010 as the Year of Health and Wellbeing, promoting five key actions; Connect, Be Active, Take Notice, Keep Learning and Give¹⁸¹.

13.6.1.6. The evidence that green infrastructure can improve health and well-being and contribute to many of these key actions is extensive¹⁸². The evidence points to five main areas of health benefit that can be achieved through green infrastructure planning, management and delivery:

- Increasing physical activity
- Improving air quality
- Opportunities for growing food locally
- Improving mental health
- Social cohesion

13.6.1.7. As well as a human cost in terms of “Quality of Life”, poor health also has an economic cost directly related to the issues discussed in the section on A Sustainable City and the drive to increase productivity in the city. The Health is Wealth Commission¹⁸³ set out the challenge of poor health in the City Region, and called for a greater use of the natural environment as a part of the solution.

¹⁷⁶ Liverpool Primary Care Trust (2009) Primary Care Trust Strategic Commissioning Plan 2009 – 2014

¹⁷⁷http://www.liverpool.gov.uk/Environment/Environmental_health/healthyhomes/programme_intervention/index.asp

¹⁷⁸ NHS (2007) Liverpool Health Profile

¹⁷⁹ <http://www.liverpool.gov.uk/Images/tcm21-98273.pdf>

¹⁸⁰ <http://www.euro.who.int/healthy-cities>

¹⁸¹ www.2010healthandwellbeing.org.uk

¹⁸² DEFRA (2010) Benefits of Green Infrastructure

¹⁸³ Health Is Wealth Commission (2008) Health is Wealth

13.6.1.8. In this plan actions have been developed that can contribute to making healthy lifestyles a simple, natural choice. This means looking at a range of issues such as proximity of accessible green spaces, size and linkage to hubs of activity such as shops and commercial centres. Equally important to provision is quality of design and safety of areas, the barriers to choosing healthy lifestyles are not solely about availability but also linked to perception, culture and attitudes. As with many of the key issues for the city, it is only through taking action to address all the major factors affecting an issue that will enable a transformation to take place.

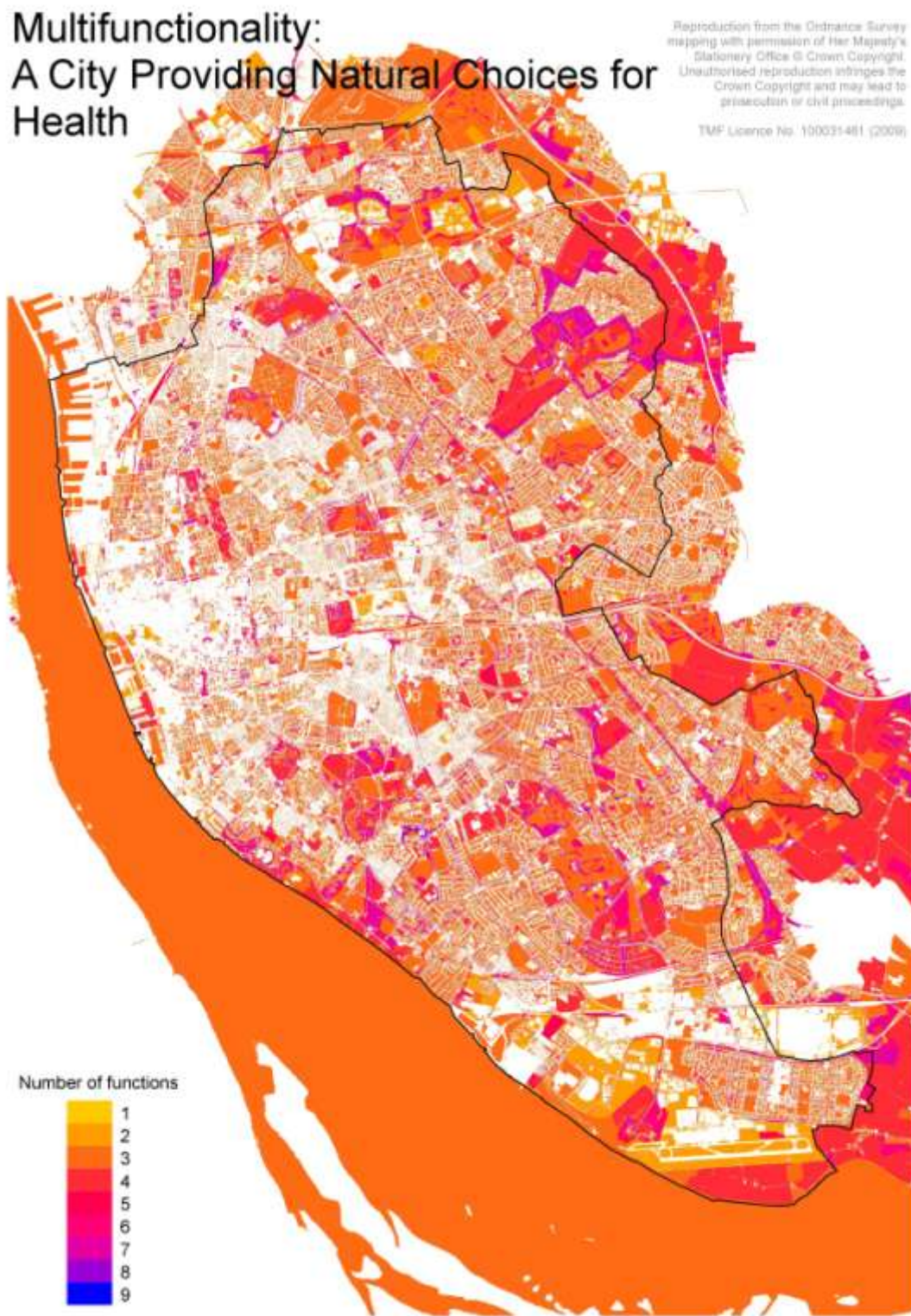
13.6.1.9. Map 20 and Map 21, show firstly the overall distribution of existing green infrastructure functions that can support good health across the city and secondly the areas of the city that have been targeted one or more of the possible land change actions for this priority. Map 21 shows areas for both intervention and safeguarding.

13.6.1.10. The lack of functionality in the City Centre and the North Liverpool area is clear, as is the importance in terms of health function of the green wedge areas on the city boundary and extending into neighbouring authorities. Other obvious features are the city parks and the loop line.

13.6.1.11. Whilst there are needs to improve health cross the city, Map 21 identifies the City Centre and the Inner Area of the city as having the greatest numbers of issues. Again it is important to highlight that the other areas are not to be ignored. Safeguarding and enhancing these areas will help to maintain their value for public health.

13.6.1.12. For the actions that look to increase physical activity, the actual use of sites is affected by a range of issues including several that are looked at in this strategy, but also by quality, which is not. However, the Open Space Study will look at quality and a combination of the data from these two pieces of work can provide a clear picture of where improvement in quality is required as well as indicating where there are issues of provision and quality that have a negative impact on health.

Map 20 Multifunctionality: A City Providing Natural Choices for Health

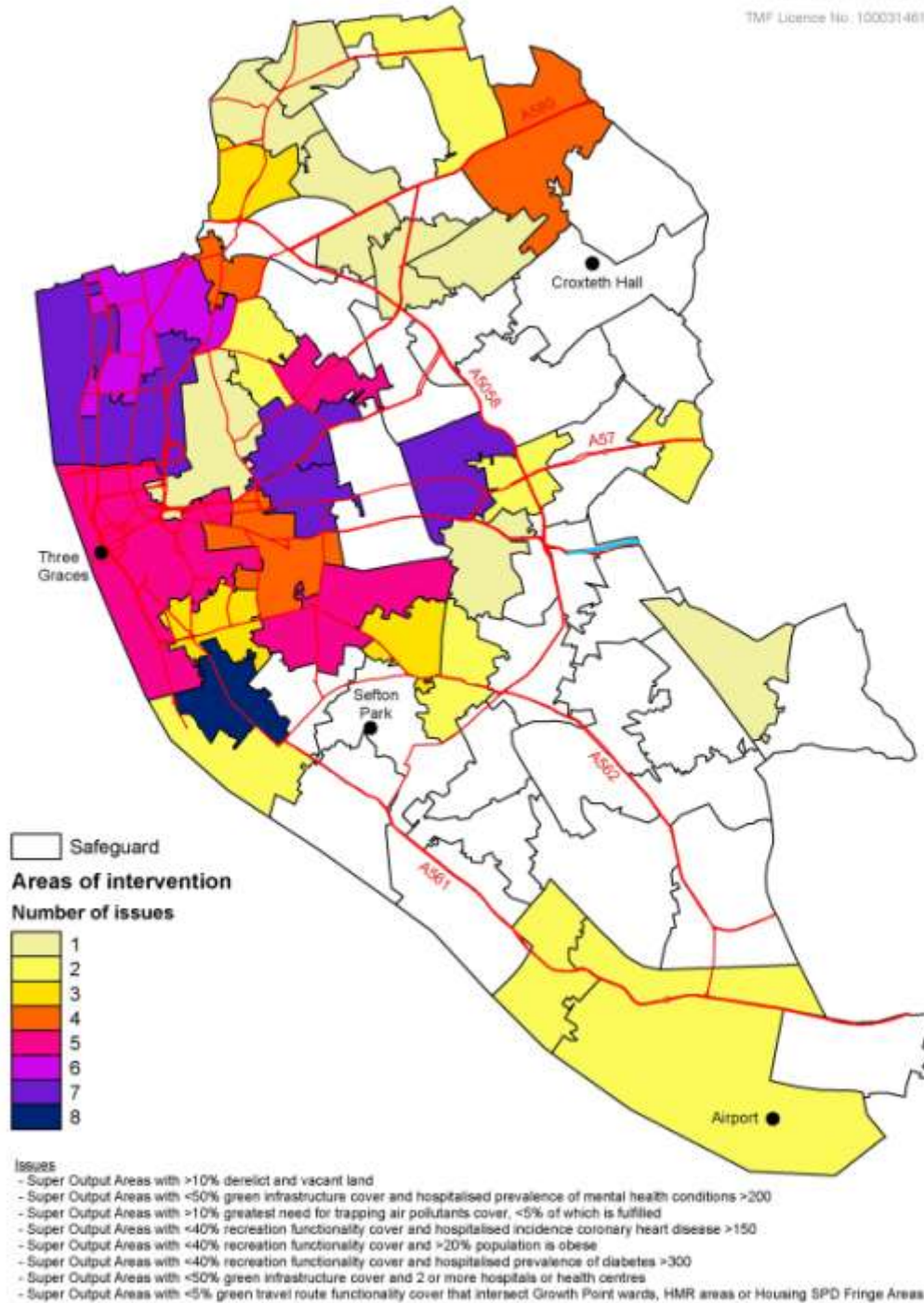


Map 21 Targeting of actions for Priority 2 issues across Super Output Areas

A City Providing Natural Choices for Health

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13.6.2. Long term goal

“The city is planned so that taking healthy options for all for everyday living is a natural choice.”

13.6.3. Recommended actions

13.6.3.1. The actions have been colour coded to indicate whether they are land change, guidance, or supporting actions.

	Land change
	Supporting
	Guidance

ACTION 2.1
13.6.3.2. Planning and other strategies support the temporary or “meanwhile” use of vacant or derelict land for food and fuel growing or other suitable uses, as part of the Liverpool City Council “Greening the City” programme. Map 134 (p349) shows the distribution of vacant and derelict land across the city. The remediation of derelict land is an area of expertise for the Liverpool Universities who could be a key partner in developing and implementing this action. This action also contributes to improving the image of the city, linked to Action 1.1.

Areas with greatest need for this action include (by Core Strategy Sub Area):	
City Centre	Central
Inner Area	Everton, Kirkdale, Princes Park, Riverside
Outer Area	-

ACTION 2.2
13.6.3.3. Increase the quality and quantity of green infrastructure to provide places of relative tranquillity in areas where there are higher levels of poor mental health. Map 136 (p352) indicates the areas of the city where there are high levels of poor mental health, but low levels of green infrastructure. The evidence suggests that like productivity benefits, the benefits from mental health come not just from specific areas interventions but also from a general improvement in quality of green infrastructure.

Areas with greatest need for this action include (by Core Strategy Sub Area):	
City Centre	Central
Inner Area	Anfield, Everton, Kensington and Fairfield, Kirkdale, Picton, Princes Park, Riverside
Outer Area	-

ACTION 2.3

13.6.3.4. Green infrastructure can be used to reduce air pollution along main road routes into the city. Map 138 (p355) indicates the lengths of road, focussed on the Environmental Improvement Corridors, where there is a need to increase green infrastructure.

Areas with greatest need for this action include (by Core Strategy Sub Area):

City Centre	Central
Inner Area	Kensington and Fairfield, Kirkdale, Princes Park, Riverside
Outer Area	Greenbank

ACTION 2.4

13.6.3.5. Target provision of green infrastructure and improve accessibility of existing green infrastructure toward areas of the city that have high incidence of coronary heart disease, obesity and/or diabetes and low levels of accessible green infrastructure. Map 141 (p359), Map 143 (p361) and Map 145 (p363) show the distribution of these areas. The areas that require action are extensive and so may more appropriately be termed action areas rather than target areas.

Areas with greatest need for this action include (by Core Strategy Sub Area):

City Centre	Central
Inner Area	County, Everton, Kensington and Fairfield, Kirkdale, Picton, Princes Park, Riverside
Outer Area	Fazakerley, Old Sawn, Speke-Garston

ACTION 2.5

13.6.3.6. Take the opportunity provided by redevelopment of hospitals and health centres through programmes such as LIFT¹⁸⁴, to maximise the opportunity to use green infrastructure as part of an approach to improving health outcomes and sustainability, by creating attractive settings and maximising views of “green”. Alder Hey and Liverpool Knowledge Quarter provide examples and opportunities of what could be achieved. Map 147 (p366) shows the distribution of health centres, hospitals and GP surgeries across the city and these should all be targeted to ensure that they contribute to the delivery of green infrastructure improvements to meet local need and encouraged to make use of green infrastructure to help to improve health outcomes.

Areas with greatest need for this action include (by Core Strategy Sub Area):

City Centre	Central
Inner Area	Everton, Kensington and Fairfield, Kirkdale, Riverside
Outer Area	Greenbank

¹⁸⁴ LIFT Programme

<http://www.dh.gov.uk/en/Aboutus/Procurementandproposals/Publicprivatepartnership/NHSLIFT/index.htm>

ACTION 2.6

13.6.3.7. Ensure planning applications for new developments at all scales always prioritise the need for people (including those whose mobility is impaired) to be physically active as a routine part of their daily life and where possible use green infrastructure to enable this.

ACTION 2.7

13.6.3.8. Ensure local facilities and services are easily accessible on foot, by bicycle and by other modes of transport involving physical activity. Ensure children can participate in physically active play and use green infrastructure to develop natural play opportunities. Whilst this is a priority across the whole of Liverpool, Map 149 (p369) shows the areas that have been assessed as having both poor “walkability” and plans for housing growth or redevelopment that may provide the opportunity to improve access. This action is closely linked to Action 1.3 above.

Areas with greatest need for this action include (by Core Strategy Sub Area):

City Centre	Central
Inner Area	Everton, Kensington and Fairfield, Kirkdale, Picton, Princes Park, Riverside
Outer Area	Norris Green, Old Swan, Wavertree

ACTION 2.8

13.6.3.9. Maximise opportunities for support to be provided to programmes such as Green Gym Sport and Physical Activity Alliance (SPAA) programmes, forest schools, horticultural therapy etc. to develop a network of opportunities for health improvement for those in need of support.

ACTION 2.9

13.6.3.10. Maximise opportunities to support the public parks as part of the “Natural Health Service”, highlighting the fact that public health was a key reason for the development of the public parks. This can be supported by the use of the health and green infrastructure functionality data gathered for this strategy in the development of the Parks Strategy for Liverpool.

13.6.4. Rationale

13.6.4.1. There is now a wealth of evidence and policy drivers to promote the public health role of green infrastructure planning. For example, a Natural England study¹⁸⁵ showed that:

- People who live furthest from public parks were 27% more likely to be overweight or obese.
- Children able to play in natural green space gained 2.5 kg less per year than children who did not have such opportunities.
- 1,300 extra deaths occur each year in the UK amongst lower income groups in areas where the provision of green space is poor.

13.6.4.2. The actions set out above are in line with guidance, such as that produced by World Health Organisation (WHO) and National Institute for Clinical Excellence (NICE), on incorporating health into the planning system.

13.6.4.3. There is good evidence to show that green infrastructure interventions can have a positive health benefit, helping to address coronary heart disease, obesity and diabetes¹⁸⁶. Assessment of the health functions of green infrastructure across the city shows that the areas of poorest health have lower green infrastructure provision and functions associated with health compared to the areas of better health and so many of the actions set out above are targeted at the areas of low green infrastructure health functionality.

Map 22 Links between health and well being multifunctionality and poor health



13.6.4.4. Whilst there is good evidence to show that provision of green infrastructure contributes to improved physical health, the evidence for the role that it plays in improving mental health and well being, particularly in urban area, is even more compelling.

¹⁸⁵ Natural England (2008) Natural Health Service

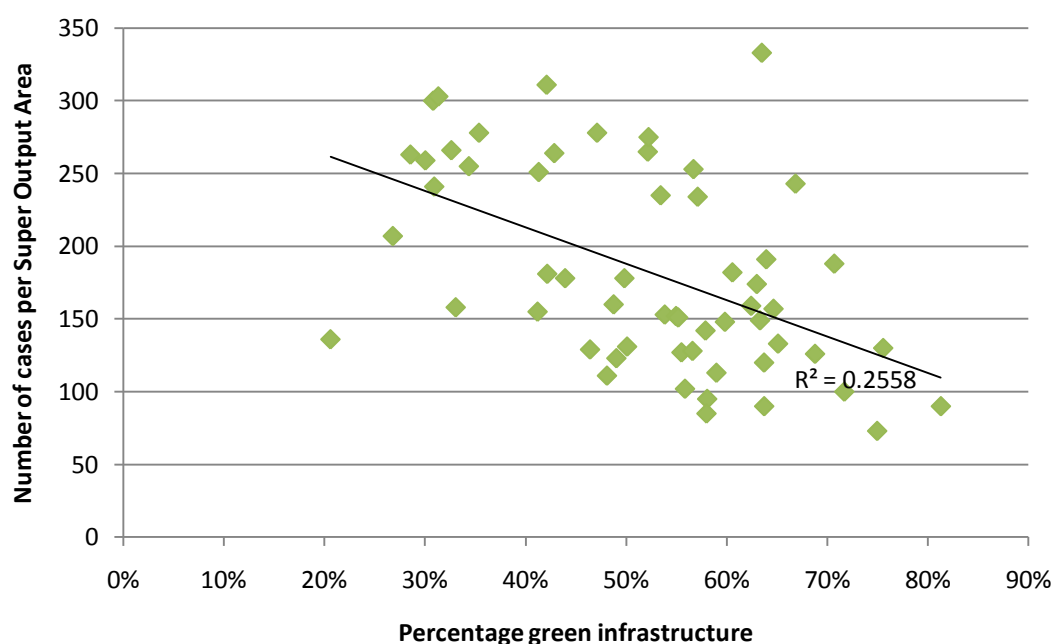
¹⁸⁶ These are all related, we need to identify if this creates a problem if we are targeting areas where there are high levels several of these illnesses or whether that is in effect double counting the same problems and so giving undue weight to an area.

13.6.4.5. Figure 34 shows the relationship between the percentage of accessible green infrastructure and the level of hospitalised mental health illness at Super Output Area level in Liverpool. It would appear from the information that there is a relationship, obviously complicated by the many determinants of mental health, between the levels of green infrastructure and the levels of hospitalised cases of mental ill health.

13.6.4.6. The R^2 value shows the proportion of variability in the dataset that is accounted for by the line drawn. This indicates that a moderate relationship exists between the two datasets. It does not imply cause and effect. The other analyses carried out below all show similar “moderate” relationships.

13.6.4.7. For comparison, the Health is Wealth study also looked at relationships between IMD and a range of issues. It found similar moderate (negative) relationships between, for example, IMD and percentage of adults who eat healthily and IMD and percentage of adults that take regular physical exercise. We have used the same banding of the r squared values as the Health is Wealth study - 0.091- 0.16 (weak relationship), 0.16 - <0.36 (moderate relationship). 0.36-1 (strong relationship).

Figure 34 Hospitalised prevalence of mental health conditions and percentage green infrastructure cover in Liverpool¹⁸⁷



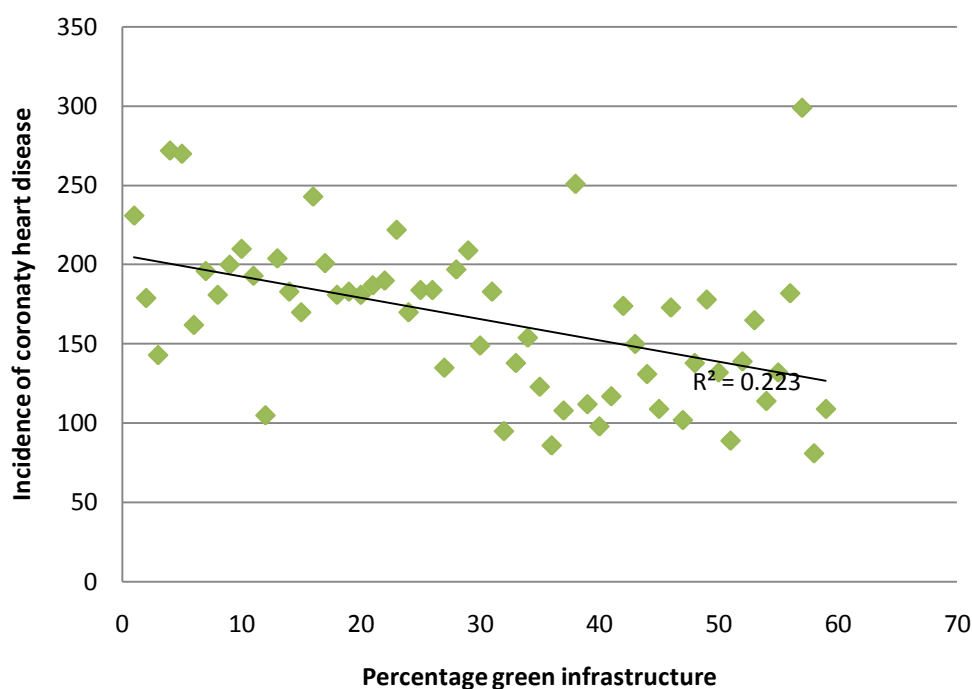
13.6.4.8. This has therefore been highlighted as a key action across the city. The study has used data on hospitalised cases of mental health problems, but the mental health strategies for the city also point out that there is concern to improve the well-being of those who are “languishing”. These are individuals who, perhaps not registering in the data that has been used to identify the target areas, but who are at risk of slipping into more serious mental and physical health problems. Improvements in green infrastructure across the city can help as part of a holistic approach.

¹⁸⁷ This data has had two data points that were outliers and were identified as having specific issues related to high numbers of care facilities clustered in particular areas of the city. With the two data points added R^2 reduces to 0.16

13.6.4.9. Public parks have a particularly important role to play in delivering both mental and physical health benefits, with an extensive evidence base to support this role. The original role of public parks was “to benefit health, reduce disease, crime and social unrest and provide green lungs for the city”¹⁸⁸. Liverpool already has an extensive programme of health walks in its public parks, but not all areas are covered and there are opportunities to develop shared initiatives around improving mental health. Some of the areas of the city with highest levels of poor mental health are close to public parks and improving access could help with improving mental health (see Action 1.3).

13.6.4.10. The chart below plots the incidence of coronary heart disease (CHD) against green infrastructure percentage in each Super Output Area. As with mental health, there are many determinants affecting CHD rates, but it would appear that the levels of accessible green infrastructure can be shown to be one and that there is lower provision in many of the areas of highest CHD incidence.

Figure 35 Coronary heart disease and accessible green infrastructure in Liverpool

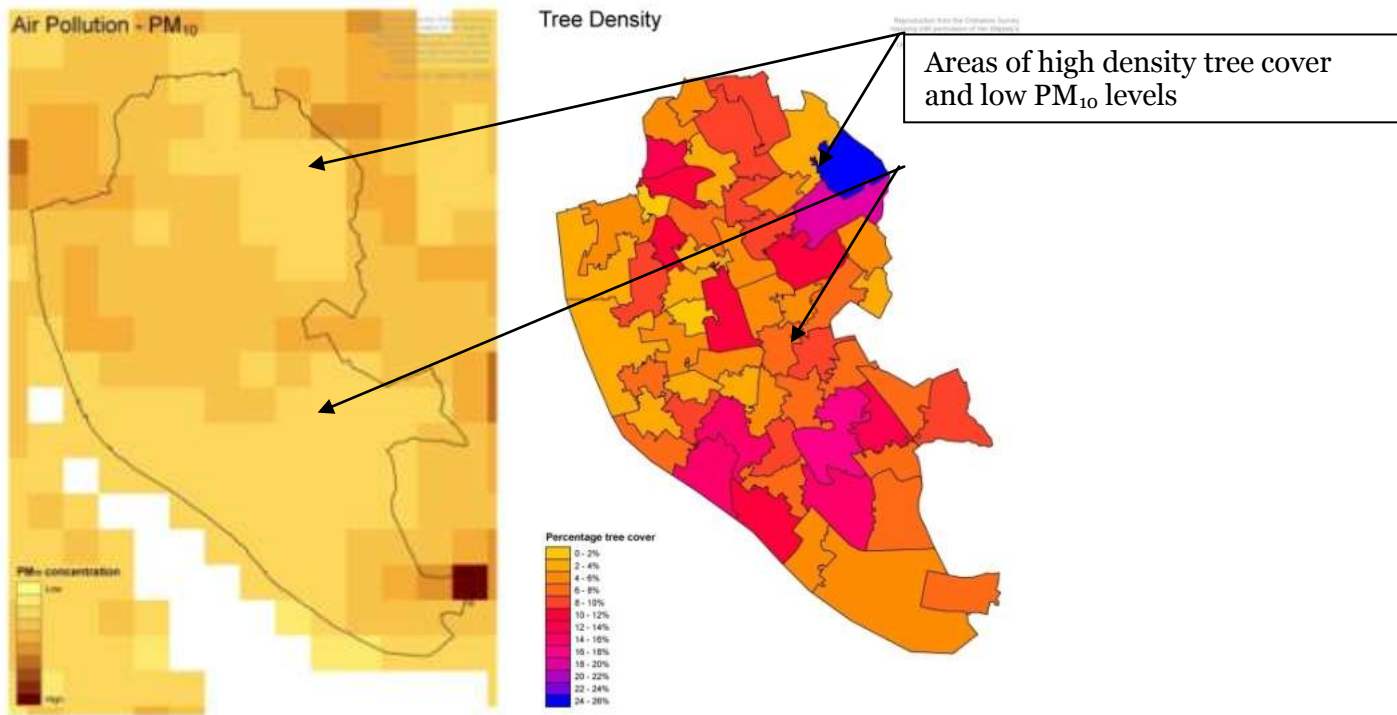


13.6.4.11. In addition, information has been used that was provided from the Greening the City project¹⁸⁹ to support Action 3.1 that focuses on using vacant land across the city to grow food.

13.6.4.12. There are opportunities to use urban trees to help to reduce air pollution, and Action 3.3 has been targeted at tree-poor areas along the city’s road network.

¹⁸⁸ Centre for Public Health, Liverpool John Moores University (2007) Returning urban parks to their public health roots
¹⁸⁹ SQW (2010) Greening the City

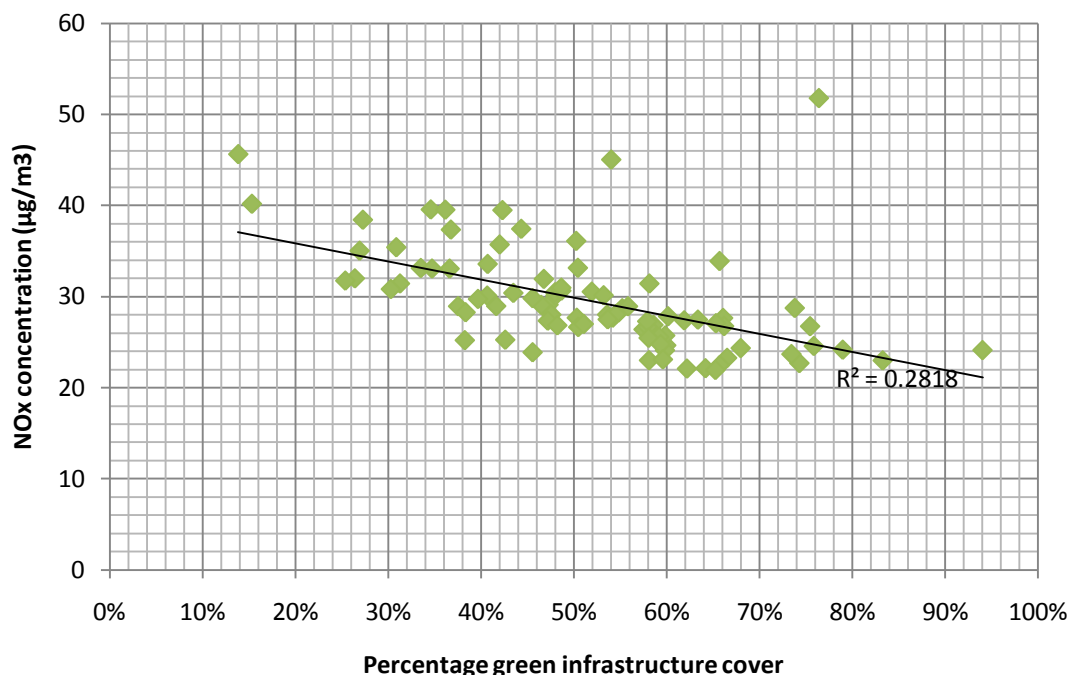
Map 23 Tree Density in relation to PM₁₀ data



13.6.4.14. Map 23 shows the relationship between tree density and PM_{10} concentrations, it appears to show correlation between the density of tree cover and PM_{10} levels. However, it is not possible to show a relationship in the same way as we have for coronary heart disease, possibly due to the coarse nature of the PM_{10} data.

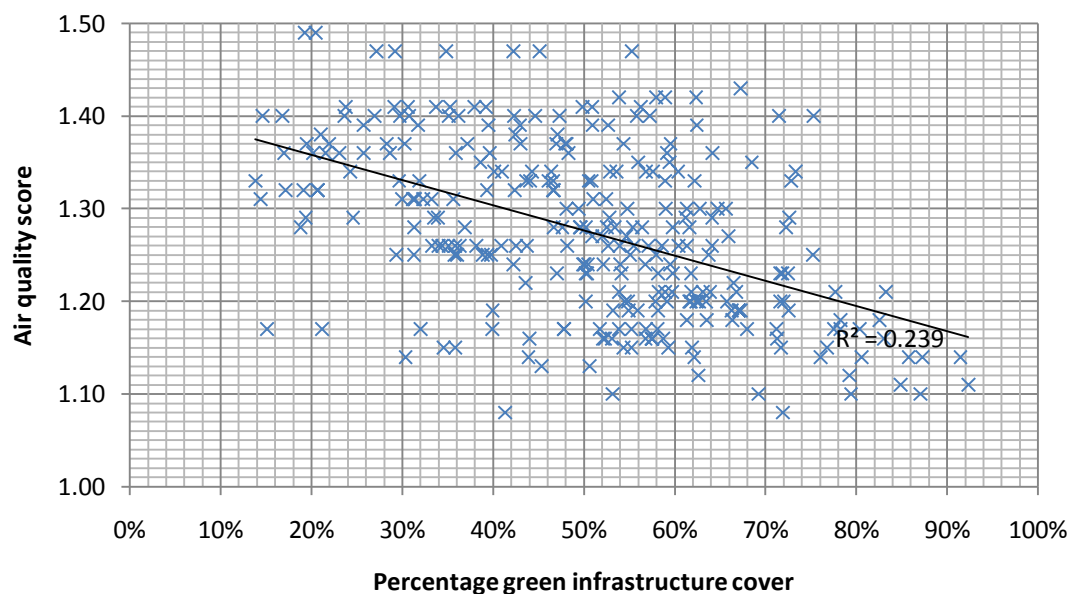
13.6.4.15. The main routes into the city are the main areas where green infrastructure could play a role in helping to improve air quality across the city. There is a moderate relationship between percentage green infrastructure cover and the level of nitrous oxide in the city, shown in Figure 36.

Figure 36 Nitrous oxides air pollution and percentage green infrastructure cover



13.6.4.16. Figure 37 shows the moderate relationship between green infrastructure and air quality score (data from Local Transport Plan).

Figure 37 Air quality score and green infrastructure cover



13.6.4.17. There is increasing awareness that the natural environment, when planned as part of hospital redevelopment, or health centre building, can contribute to improving health outcomes. Extensive work by Roger Ulrich¹⁹⁰ and examples of hospital building programmes from around the world that have built in views of green infrastructure to reduce hospital stays has led to increased awareness of this issue in the UK and led to proposals such as those for the Children's Health Park as part of the redevelopment of Alder Hey.

13.6.4.18. Increasing the amount of green infrastructure or improving its quality can have positive physical and mental health benefits, there is still a need for coordinated action with organisations such as the Sports and Physical Activity Alliance (SPAA) and the "Walking the Way to Health" programme to make best use of the available opportunities and to ensure that the target population, those with the poorest health, are supported in using parks and open spaces.

13.6.4.19. There is a particular need to engage young people, to improve health and to develop a culture of activity that can be sustained as they get older. Programmes such as Forest School¹⁹¹ have been successful in addressing a whole range of health and education issues. The programme is supported for schools across Liverpool.

13.6.4.20. Key to the implementation of the actions will be to develop support within the health sector. Action 5.7 below is a specific action to look to find opportunities to include green infrastructure planning and action into a wide range of strategies and plans, including the health strategies for the city.

13.6.4.21. Finally, actions already underway have not been included in this action plan. For example, we have not included the use of Health Impact Assessments as a way of ensuring that health benefits are secured through development.

13.6.5. Core Strategy Sub Areas

13.6.5.1. Map 24 shows a very stark contrast between the action targeting score for the Outer Area of the city against the Inner and City Centre areas. The image is almost one of a set of concentric circles of need for action around the area with the highest score, Atlantic Gateway SIA, within Inner Area North.

13.6.5.2. Many of the health issues for Liverpool such as high levels of poor mental health and obesity and coronary heart disease are highest in the City Centre and Inner Areas, the areas with the lowest proportion of accessible green infrastructure and also areas where there are opportunities to improve "walkability" to GP surgeries. Action 2.7 is closely aligned to Action 1.3.

13.6.5.3. The City Centre and Inner Area also have the highest levels of derelict land providing opportunities for "meanwhile" uses that not only could help to improve health, but also help to improve the image of these areas too if well managed.

13.6.5.4. shows the great difference in targeting score between the Outer Area and the City Centre/Inner Area reflecting a great difference in need for action to help improve public health.

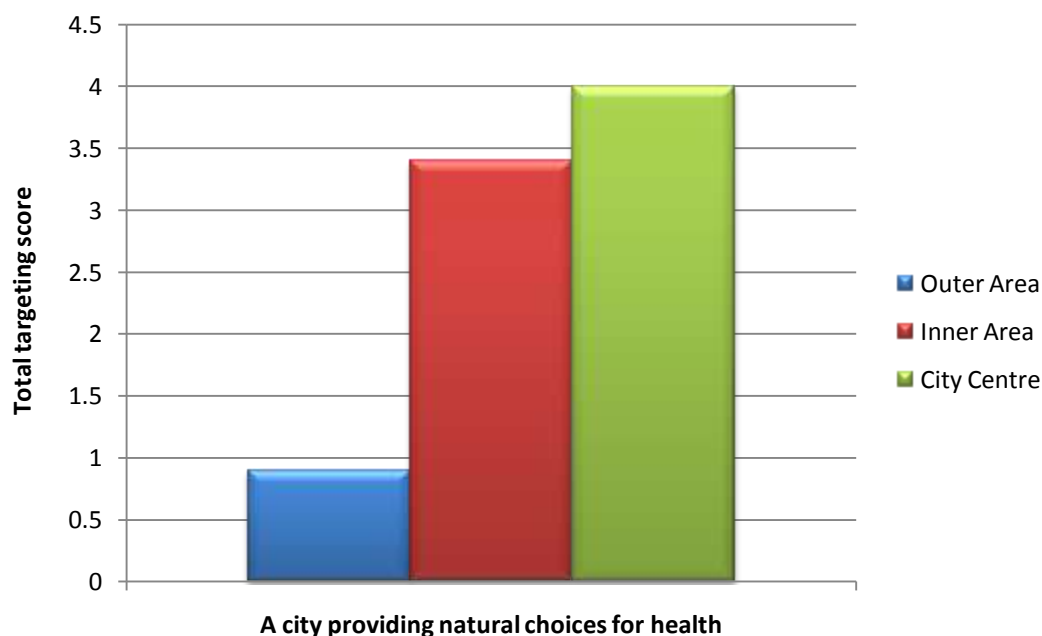
¹⁹⁰ Ulrich (2002) Health Benefits of Gardens in Hospitals Paper for conference, Plants for People International Exhibition Floriade

¹⁹¹ <http://www.forestschools.com/what-happens-at-a-forest-school.php>

Table 29 Priority 2: Targeting score for each action by Core Strategy Sub Area

CORE STRATEGY SUB AREA	ACTIONS								TOTAL
	2.1	2.2	2.3	2.4 CHD	2.4 OBESITY	2.4 DIABETES	2.5	2.7	
City Centre	0.67	1.00	0.33	0.00	0.00	0.33	0.67	1.00	4.0
Inner Area	0.24	0.52	0.36	0.40	0.44	0.36	0.44	0.64	3.4
Inner Area North	0.17	0.50	0.33	0.44	0.44	0.33	0.50	0.56	3.3
Inner Area South	0.44	0.67	0.44	0.22	0.33	0.44	0.44	0.89	3.9
Atlantic Gateway SIA	0.67	1.00	0.33	0.67	0.67	0.67	1.00	1.00	6.0
Eastern Approaches SIA	0.25	0.50	0.25	0.50	0.25	0.50	0.25	0.75	3.3
Outer Area	0.07	0.02	0.14	0.14	0.18	0.05	0.09	0.18	0.9
Approach 580 SIA	0.25	0.00	0.00	0.50	0.50	0.25	0.00	0.25	1.8
Speke Halewood SIA	0.25	0.00	0.00	0.25	0.50	0.00	0.00	0.00	1.0
Eastern Fringe (C)	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.25	0.5
Eastern Fringe (N)	0.13	0.00	0.13	0.25	0.25	0.13	0.00	0.38	1.3
Eastern Fringe (S)	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.5
Southern Fringe	0.17	0.00	0.00	0.17	0.33	0.00	0.00	0.00	0.7

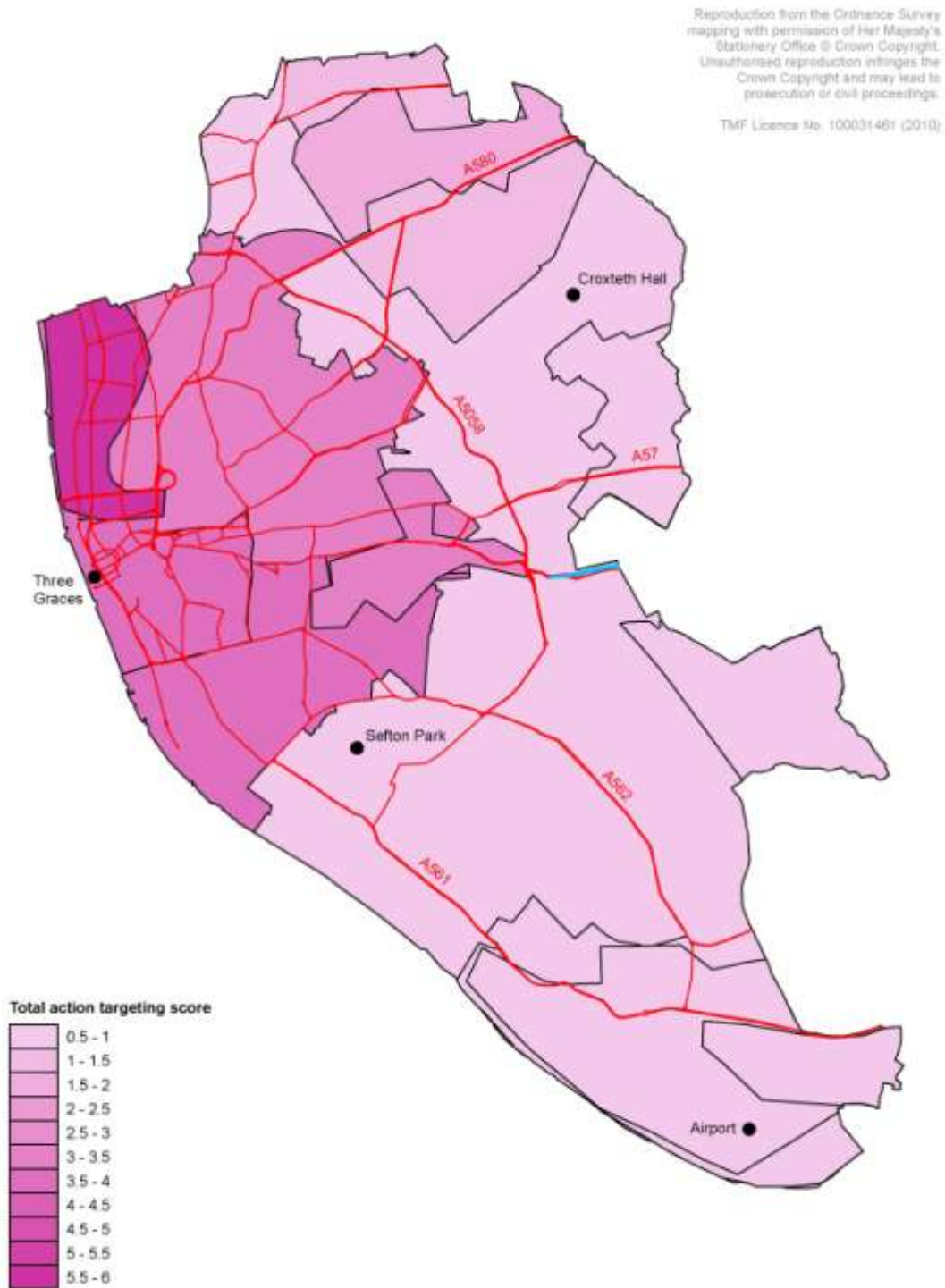
Figure 38 Total targeting score for health in the main Core Strategy areas



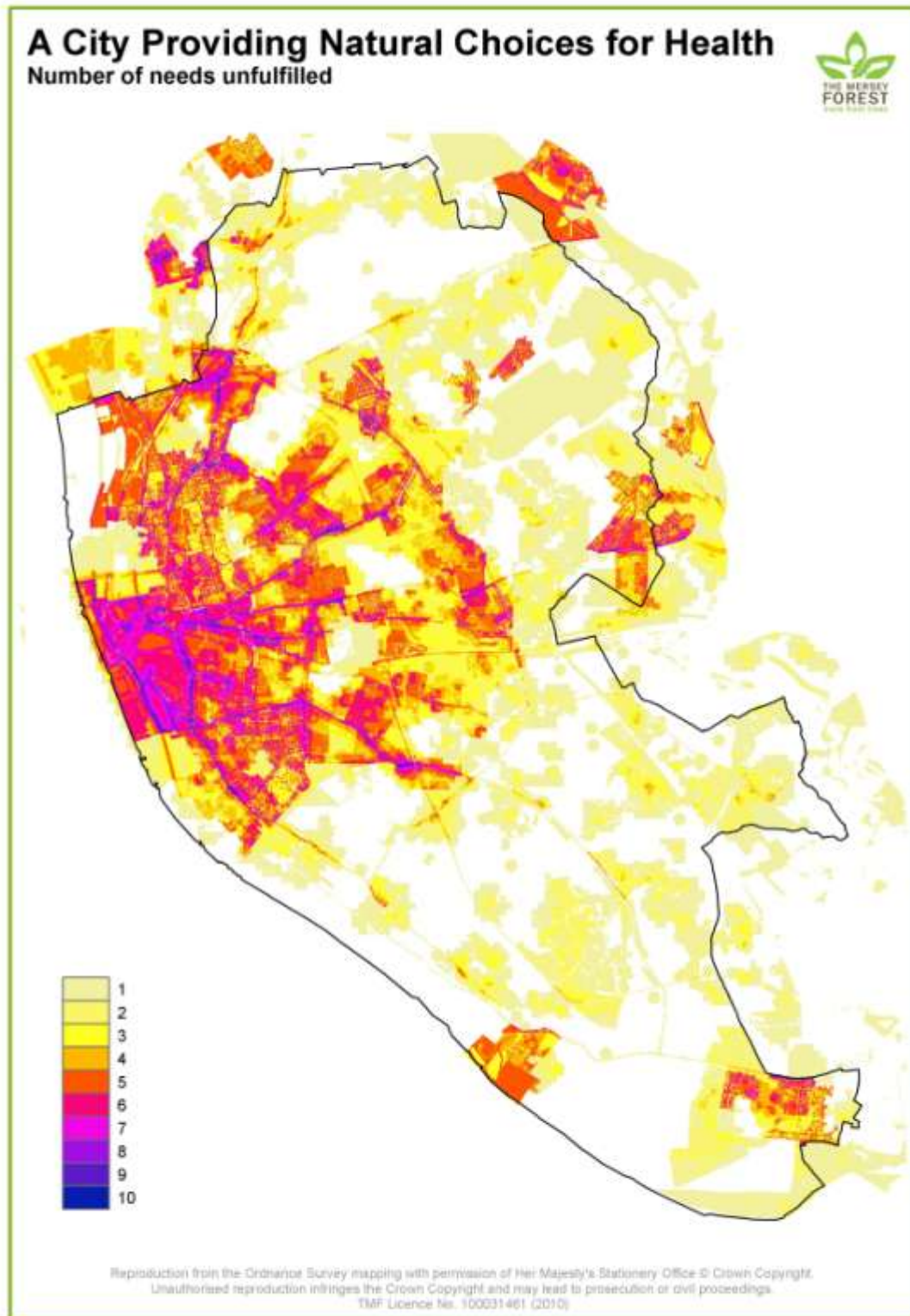
13.6.5.5. Figure 38 highlights the stark difference in targeting scores between the Outer Area and the Inner Area/City Centre. There is clearly a difference in the need for action across the city.

Map 24 Total targeting score for Priority 2 by Core Strategy Sub Area

A City Providing Natural Choices for Health



Map 25 Number of needs unfulfilled at present for Priority 2



13.7. PRIORITY 3: A Cool City

13.7.1. Introduction

13.7.1.1. Tackling the negative impacts of climate change, whilst taking advantage of opportunities that it may bring, is a key issue for the city. A Climate Change Adaptation Action Plan is currently being developed by Liverpool City Council.

13.7.1.2. Liverpool is perhaps one of the better positioned UK cities in terms of coping with warmer temperatures. Its extensive waterfront helps in cooling the city. However, it still experiences an urban heat island effect that will become more significant as both the climate changes and with increasing development in the city. Higher temperatures could affect the thermal comfort and health of residents, workers and employees, which may make Liverpool less attractive to visitors and impact on businesses. In extreme cases this can lead to mortality. In the Northwest, there were approximately 60 excess deaths in the heat wave of July 2006; this is approximately 15% above the baseline¹⁹². By the 2080s, it is predicted that a heat wave similar to that experienced in England in 2003 will happen every year. Provision of parks and green spaces as cool oases and shade, for example from tree canopies, is particularly important in city centre and district centres and the most built up areas of Liverpool¹⁹³.

13.7.1.3. Some members of the community will be more vulnerable to increased temperatures. The NHS Heatwave Action Plan¹⁹⁴ sets out long term planning to increase green infrastructure as a key action to help to reduce the impacts of heat waves. There are certain factors that increase an individual's risk of suffering in a heat wave:

13.7.1.4. Older age: especially women over 75 years old, or those living on their own who are socially isolated, or in a care home.

- Chronic and severe illness: including heart conditions, diabetes, respiratory or renal insufficiency, Parkinson's disease or severe mental illness. Medications that potentially affect renal function, the body's ability to sweat, thermoregulation or electrolyte balance can make this group more vulnerable to the effects of heat.
- Inability to adapt behaviour to keep cool: having Alzheimer's, a disability, being bed bound, too much alcohol, babies and the very young.
- Environmental factors and overexposure: living in urban areas and south facing top floor flats, being homeless, activities or jobs that are in hot places or outdoors and include high levels of physical exertion.

13.7.1.5. Green infrastructure provision could be targeted to areas of the city in order to protect the most vulnerable communities. Whilst it is not possible to identify specific areas to target for outdoor workers, a general increase across the city in the provision of green infrastructure, and shade in particular, would assist in tackling this issue.

13.7.1.6. In addition to its role in providing urban cooling, green infrastructure can also help to reduce riverine and coastal flood risk and to manage surface water flooding. The Pitt Review

¹⁹² NHS (2010) Heatwave Plan for England

http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/@ps/documents/digitalasset/dh_114423.pdf

¹⁹³ Research from the ASSCUE project in Manchester identified areas of shade on hot summer days in a city centre were 13 degrees cooler than the surrounding areas.

¹⁹⁴ NHS (2009) Heatwave Plan for England

advocates working with natural processes to manage flooding¹⁹⁵. Green infrastructure in the wider catchment can reduce the frequency of river floods, but in extreme rainfall events this is less significant. Land use management has a significant effect on runoff at local levels; wetlands and riparian and floodplain woodlands help to reduce peak flood volumes, and provide areas where rivers can flood without causing damage¹⁹⁶.

13.7.1.7. In more urban areas green infrastructure intercepts (especially trees), infiltrates (especially on permeable soils, where water can percolate underground most easily), stores and evaporates rainwater, thereby reducing both the rate and volume of water entering drains. This reduces the chances of them being overwhelmed during extreme rainfall but also reduces the volume of water that needs to be treated. This means that less pressure is placed on the existing water “grey” infrastructure. Surface water should increasingly be managed through Sustainable Urban Drainage Systems (SUDS). Green infrastructure should be safeguarded in areas where the soils are most permeable.

13.7.1.8. Projected climate change could mean that the city faces increasing periods of drought in the summer months. This will mean that some types of green infrastructure, such as grassland, will evapotranspire less and, as a result, will provide less of the cooling function that is so important for the health of communities, and the “comfort” of commercial and business centres, just at the time when it is most needed. In the medium term, plans to capture water in the wettest months for irrigation use in the drier months should be investigated.

13.7.1.9. Climate change will also have an impact on biodiversity in and around the city. This will be considered within the “Green and Biodiverse City” section.

13.7.1.10. Map 26 and Map 27 show firstly, the overall distribution of green infrastructure functions that can help to tackle climate change through adaptation and secondly the areas of the city that have been targeted one or more of the possible land change actions for this priority. Map 27 shows areas for both intervention and safeguarding. Mitigation issues are dealt with in the Sustainable City section above.

13.7.1.11. The Outer Area of the city again has a higher level of functionality, the River Mersey also provides important functionality, the areas of low functionality can be seen to be surrounded by areas of higher functionality, However, the areas of projected increasing population, City Centre and Inner Area North have the lowest levels of functionality overall, though the importance of the canal and the gardens are obvious in these areas as they stand out as moderately multifunctional areas in areas of very low functionality.

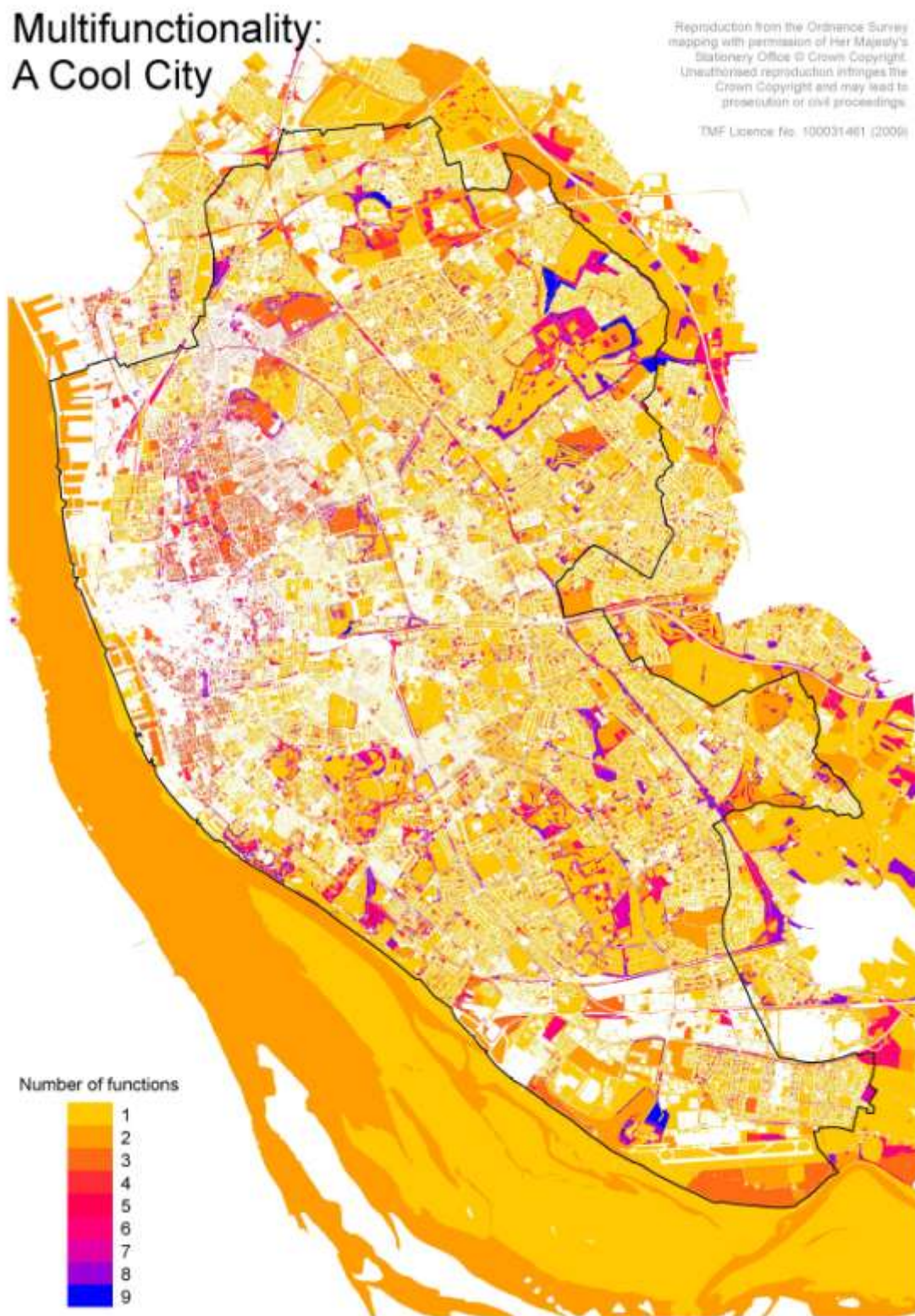
13.7.1.12. Map 27 highlights the key areas for action including the City Centre and Atlantic Gateway and also areas that have flood risk around the A580 and the Eastern Fringes.

13.7.1.13. In addition to climate change adaptation, safeguarding green infrastructure will also help to lock up carbon, so it also acts as a climate change mitigation measure for the city.

¹⁹⁵ Pitt (2008) Learning lessons from the 2007 floods
http://archive.cabinetoffice.gov.uk/pittreview/thepittreview/final_report.html

¹⁹⁶ Handley & Gill (2009) Woodlands helping society to adapt. In Read et al. (2009) Combating climate change: a role for UK forests. An assessment of the potential of the UK's trees and woodlands to mitigate and adapt to climate change www.tsoshop.co.uk/gempdf/Climate_Change_Main_Report.pdf

Map 26 Multifunctionality: A Cool City

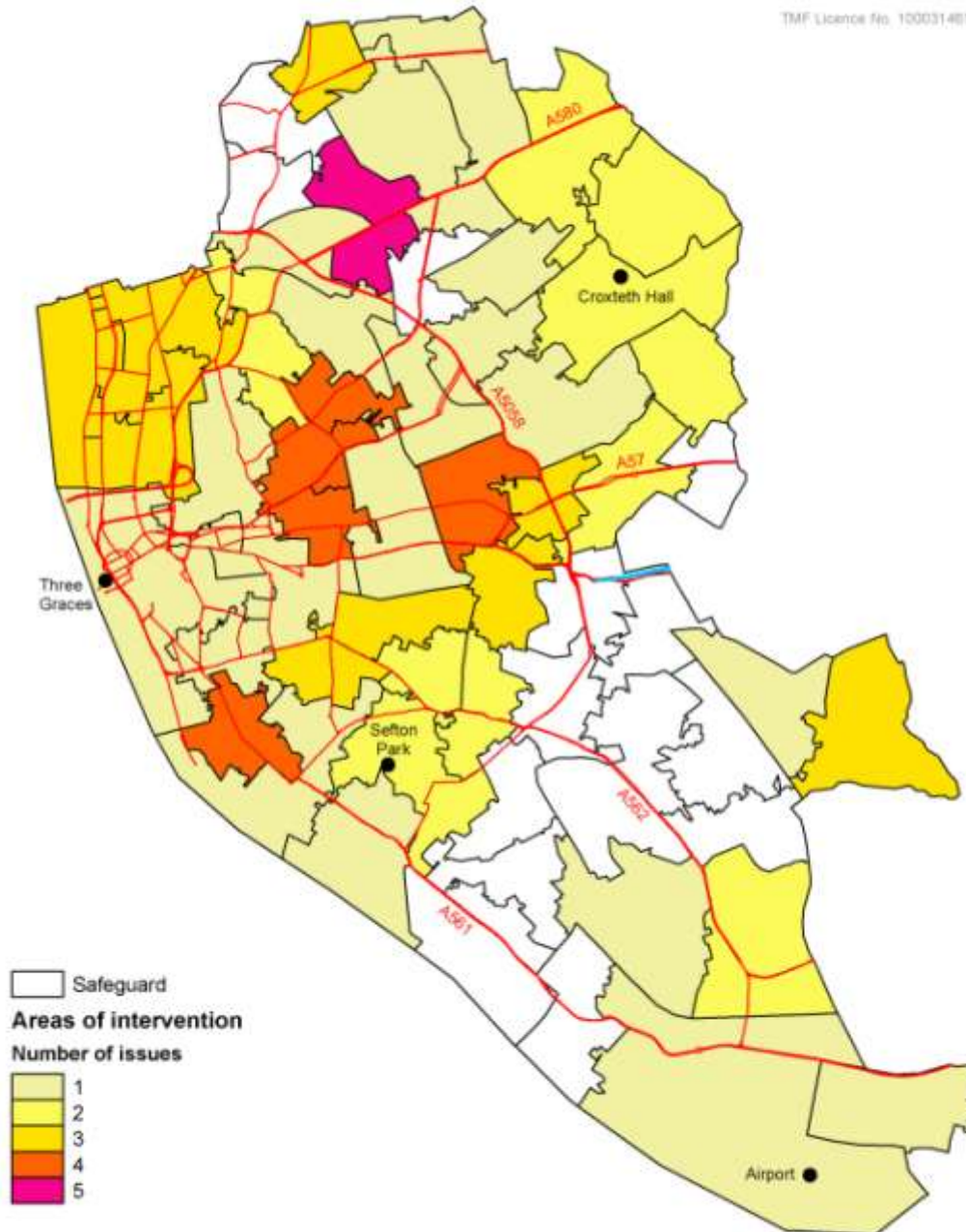


Map 27 Targeting of actions for Priority 3 issues across Super Output Areas

A Cool City

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Issues

- Super Output Areas with <50% green infrastructure cover and >1000 population aged 65+
- Super Output Areas with <50% green infrastructure cover and >2000 population with limiting long-term illness
- Super Output Areas with <50% green infrastructure cover and >400 population aged 0 - 4
- Super Output Areas with SUDS targeting score >1
- Super Output Areas where tree cover is >2 percentage points lower than TMF Plan target
- Super Output Areas with <1% accessible water storage functionality cover and >10% high drought susceptibility green infrastructure cover

13.7.2. Long Term Goal

“Liverpool is well adapted to the changing climate. The green infrastructure network provides a vital urban cooling function, whilst also helping other species to adapt and move to new climate spaces. Action is also being taken to mitigate against further climate change.”

13.7.3. Recommended actions

13.7.3.1. The actions have been colour coded to indicate whether they are land change, guidance, or supporting actions.

	Land change
	Supporting
	Guidance

ACTION 3.1	Areas with greatest need for this action include (by Core Strategy Sub Area):						
<p>13.7.3.2. Green infrastructure can help to reduce the urban heat island effect. Safeguard areas of green infrastructure cooling functionality and increase green infrastructure for urban cooling in areas with the most vulnerable communities. The NHS has identified four communities who are at risk, three of which have been targeted below:</p> <ul style="list-style-type: none"> • Older people: Map 151 (p372) and Targeting Map 152 (p373) • Those with chronic and severe illness: Map 153 (p374) and Targeting Map 154 (p375) • Those with inability to adapt behaviour to keep cool (including young children) Map 155 (p376) and Targeting Map 156 (p377) 	<table> <tr> <td>City Centre</td><td>Central</td></tr> <tr> <td>Inner Area</td><td>Anfield, Everton, Kensington and Fairfield, Kirkdale, Princes Park, Riverside</td></tr> <tr> <td>Outer Area</td><td>Old Swan</td></tr> </table>	City Centre	Central	Inner Area	Anfield, Everton, Kensington and Fairfield, Kirkdale, Princes Park, Riverside	Outer Area	Old Swan
City Centre	Central						
Inner Area	Anfield, Everton, Kensington and Fairfield, Kirkdale, Princes Park, Riverside						
Outer Area	Old Swan						
ACTION 3.2	Areas with greatest need for this action include (by Core Strategy Sub Area):						
<p>13.7.3.3. Sustainable drainage systems (SUDS) are actively encouraged in policy to help to reduce the needs for additional grey infrastructure and the pressure on existing water management infrastructure. (The areas for action have been identified with support data in the Strategic Flood Risk Assessment) Safeguard and where possible increase green infrastructure on permeable soils as part of the city's water management system. This action will also help to protect the water environment from deterioration and help improve water bodies to good status. The key areas for this action are shown on Map 157 (p379).</p>	<table> <tr> <td>City Centre</td><td>-</td></tr> <tr> <td>Inner Area</td><td>Picton, Tuebrook and Stoneycroft</td></tr> <tr> <td>Outer Area</td><td>Croxteth, Greenbank, Knotty Ash, Old Swan, St Michael's, Wavertree, West Derby, Yew Tree</td></tr> </table>	City Centre	-	Inner Area	Picton, Tuebrook and Stoneycroft	Outer Area	Croxteth, Greenbank, Knotty Ash, Old Swan, St Michael's, Wavertree, West Derby, Yew Tree
City Centre	-						
Inner Area	Picton, Tuebrook and Stoneycroft						
Outer Area	Croxteth, Greenbank, Knotty Ash, Old Swan, St Michael's, Wavertree, West Derby, Yew Tree						

ACTION 3.3

13.7.3.4. Promote green roofs, particularly in areas of the city centre that are undergoing redevelopment. Green roofs, along with urban trees, offer the best opportunity to create space in these areas for some of the cooling functions that are needed, as well as contributing towards surface water management. (See Appendix 7 for information on the potential for green roofs in Liverpool)

ACTION 3.4

13.7.3.5. Deliver The Mersey Forest Plan for Liverpool, to provide additional woodland and urban trees in the areas of greatest need for shade and cooling. Map 159 (p382) shows the areas where the existing tree cover is 2% below the target figure set in The Mersey Forest Plan.

Areas with greatest need for this action include (by Core Strategy Sub Area):

City Centre	Central
Inner Area	County, Everton, Kensington and Fairfield, Kirkdale
Outer Area	Fazakerley

ACTION 3.5

13.7.3.6. Provide for water storage and use for irrigation to reduce the impacts of drought; planning now for projected increase in drought frequency. Drought can reduce the ability of plants to transpire and so provide the evaporative cooling function. Map 160 (p384) identifies the wards across the city where there may be problems obtaining water for irrigation from existing surface water sources, potential areas to target for improved storage in the future.

Areas with greatest need for this action include (by Core Strategy Sub Area):

City Centre	-
Inner Area	Everton, Kensington and Fairfield, Princes Park, Riverside
Outer Area	Allerton and Hunts Cross, Belle Vale, Croxteth, Fazakerley, Greenbank, Speke-Garston, St Michael's, Yew Tree.

ACTION 3.6

13.7.3.7. Green infrastructure planning and appropriate actions incorporated into the Liverpool Climate Change Adaptation Strategy (Action 5.7 also covers this point).

ACTION 3.7
13.7.3.8. Incorporate climate change adaptation design principles into all planning and development briefs and documents. This may be included in the design guide, Action 1.7 above.

ACTION 3.8
13.7.3.9. Take advantage of the waterfront location of Liverpool for its urban cooling and potential to provide an attractive and comfortable visitor attraction in a warmer climate.

ACTION 3.9
13.7.3.10. Protect green infrastructure assets which encourage air flow into urban areas and align new development and restructuring to encourage air flows.

ACTION 3.10
13.7.3.11. Take opportunities to de-culvert watercourses and re-naturalise floodplains.

Areas with greatest need for this action include (by Core Strategy Sub Area):	
City Centre	-
Inner Area	-
Outer Area	Allerton and Hunts Cross, Belle Vale, Cressington, Croxteth, Fazakerley, Knotty Ash, Speke-Garson, West Derby, Yew Tree

13.7.4. Rationale

13.7.4.1. It is widely recognised that green infrastructure is a key adaptation response to projected climate change. Table 30 shows the services that green infrastructure can play in both mitigation and adaptation. The adaptation services are potentially more substantial, especially for Liverpool.

Table 30 Mitigation and adaptation services of green infrastructure

Mitigation services <ul style="list-style-type: none"> • Carbon storage and sequestration • Fossil fuel substitution • Material substitution • Food production • Reducing need to travel by car 	Adaptation services <ul style="list-style-type: none"> • Managing high temperatures • Managing water supply • Managing riverine flooding • Managing coastal flooding • Managing surface water • Reducing soil erosion • Helping other species to adapt • Managing visitor pressure
---	---

13.7.4.2. Incorporating the principles set out in “Climate Change Adaptation by Design”¹⁹⁷ into all regeneration and development programmes can help to ensure that over time major areas of the city become adapted to climate change.

13.7.4.3. We have identified the areas where there are high levels of population most vulnerable to heat waves, as identified in the NHS Heatwave Plan, as a way to target Action 2.1.

13.7.4.4. Many of the actions are challenging, SUDS are now widely acknowledged as being effective, but are not extensively implemented, often due to issues about ownership and ongoing management. Cambridge City Council has recently produced a Sustainable Drainage Design and Adoption Guide¹⁹⁸, this document could be adapted or a similar document produced for Liverpool. Green roofs have been identified as a real opportunity to increase green infrastructure in the heart of the city and there are good examples in Liverpool, but again they are not yet extensively used as they are beginning to be in other UK cities such as London and Sheffield.

13.7.4.5. Maintaining the green infrastructure on the more permeable soils of the city is a way to help to manage some of the projected future increase in stormwater.

13.7.4.6. Liverpool lost over 70,000 elm trees in the 1970s; many of these urban trees have never been replaced. Planting new urban trees is often a challenge, with issues of ownership, long-term management, cost and conflict with underground services. However, in our towns and cities they represent one of the main ways of “retro-fitting” green infrastructure into the public realm, and they are multifunctional. Other towns and cities in the UK are starting to recognise the need to increase urban tree numbers, not least because of the positive impacts for climate change adaptation. Liverpool is a partner in The Mersey Forest, and the delivery of the forest plan for the city can assist in adapting to and mitigating climate change as well as supporting many of the other actions. Mab Lane is an example of 20,000 new trees being planted within the city to provide a range of benefits¹⁹⁹.

¹⁹⁷ TCPA (2008) Climate Change Adaptation by Design

¹⁹⁸ Cambridge City Council (2009) Sustainable Drainage Design and Adoption Guide

<http://www.cambridge.gov.uk/ccm/content/planning-and-building-control/urban-design/sustainable-drainage-systems.ene>

¹⁹⁹ www.mablane.com

Figure 39 Examples of green infrastructure for city cooling in the City Centre



13.7.5. Core Strategy Sub Areas

13.7.5.1. From Table 31 and Map 28 the areas for intervention across the Core Strategy Sub Areas, in relation to priority a cool city can be identified. Eastern Approaches SIA, Atlantic Gateway SIA and Approach 580 SIA have high targeting score as they all have high populations vulnerable to urban heat island. Perhaps it is unusual to see that the City Centre does not score highly. This is because it has low flood risk as set out in the SFRA and also has low levels of vulnerable communities, however, it does require additional urban tree cover, to provide shade and shelter as indicated in Action 3.4 and will require water storage to irrigate its green infrastructure and provide the existing levels of cooling.

13.7.5.2. Because we have focused on areas of greatest need the areas of the city with the highest levels of vulnerable population have scored highly. These vulnerable populations tend to be in the Inner Area of the city.

Table 31 Priority 3: Targeting score for each action by Core Strategy Sub Area

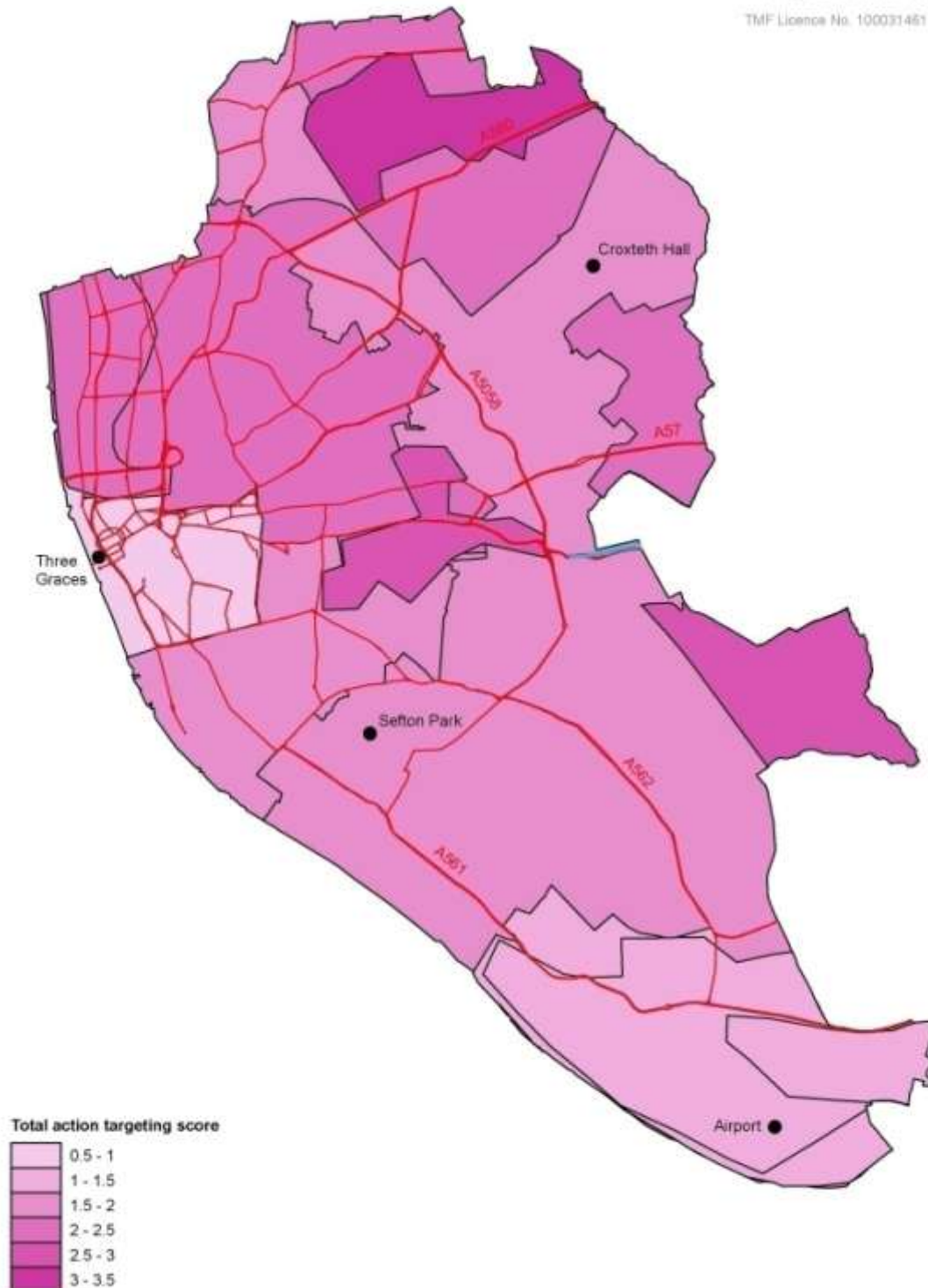
CORE STRATEGY SUB AREA	ACTIONS							TOTAL
	3.1 OLDER PEOPLE	3.1 LIMITING LONG TERM ILLNESS	3.1 YOUNG CHILDREN	3.2	3.4	3.5	3.10	
City Centre	0.00	0.33	0.00	0.00	0.33	0.33	0.00	1.0
Inner Area	0.28	0.40	0.44	0.28	0.32	0.36	0.08	2.2
Inner Area North	0.33	0.44	0.39	0.28	0.39	0.22	0.11	2.2
Inner Area South	0.11	0.33	0.44	0.22	0.22	0.56	0.00	1.9
Atlantic Gateway SIA	0.67	0.67	0.33	0.00	0.67	0.00	0.00	2.3
Eastern Approaches SIA	0.50	0.50	0.75	1.00	0.00	0.00	0.25	3.0
Outer Area	0.09	0.05	0.14	0.36	0.16	0.43	0.43	1.7
Approach 580 SIA	0.25	0.25	0.25	0.25	0.75	0.50	1.00	3.3
Speke Halewood SIA	0.00	0.00	0.00	0.00	0.25	0.50	0.75	1.5
Eastern Fringe (C)	0.00	0.00	0.00	0.75	0.00	0.75	0.75	2.3
Eastern Fringe (N)	0.13	0.13	0.25	0.25	0.50	0.63	0.50	2.4
Eastern Fringe (S)	0.00	0.00	0.00	0.50	0.50	1.00	1.00	3.0
Southern Fringe	0.00	0.00	0.00	0.00	0.17	0.67	0.67	1.5

Map 28 Total targeting score for Priority 3 by Core Strategy Sub Area

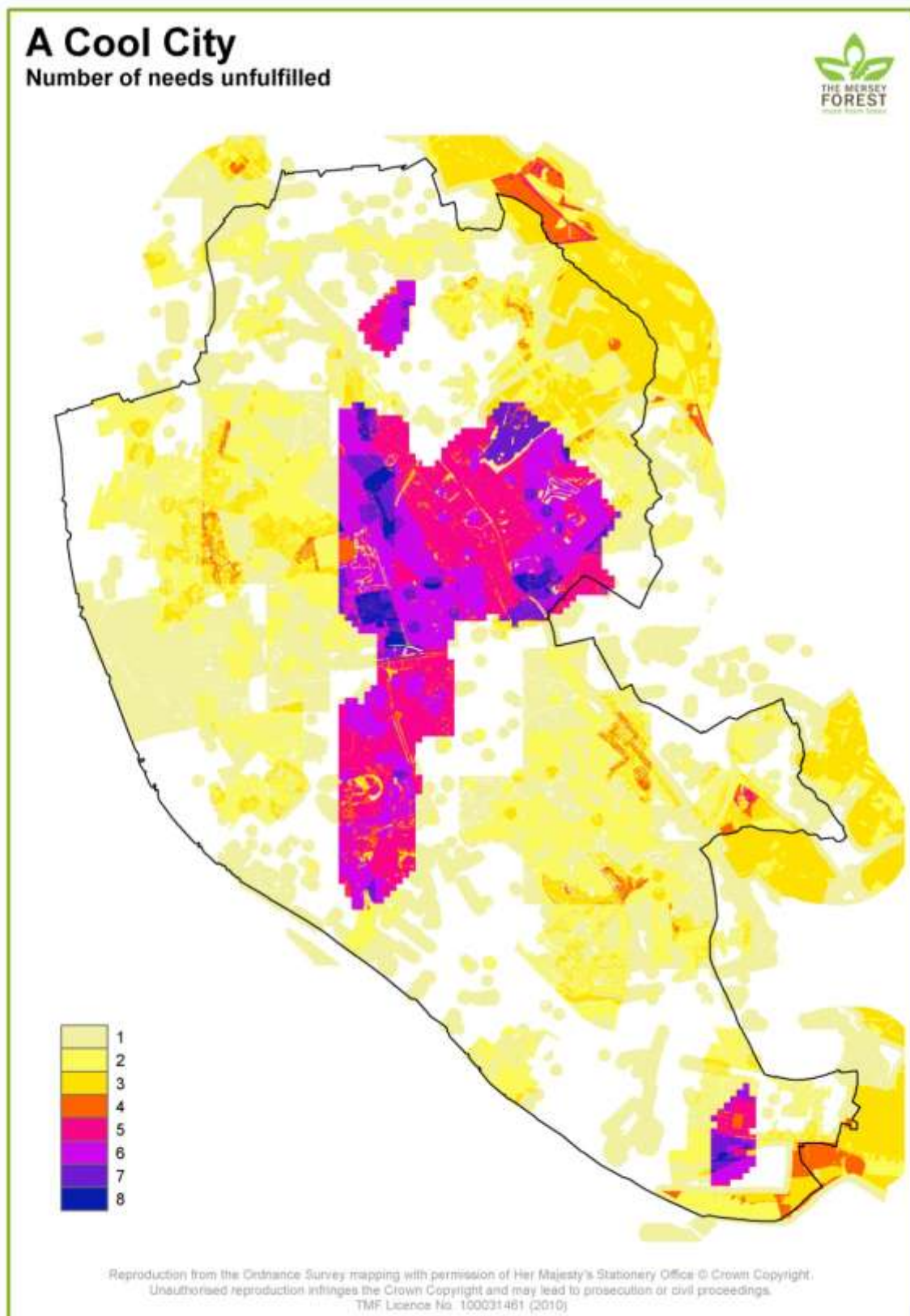
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Map 29 Number of needs unfulfilled at present for Priority 3



13.8. PRIORITY 4: A Green and Biodiverse City

13.8.1. Introduction

13.8.1.1. Nearly all of the land change actions in this strategy can help to improve biodiversity in Liverpool. These benefits can be maximised by making sure that the actions to increase/manage green infrastructure have guidance on opportunities for connectivity, species choice and spatial layout.

13.8.1.2. Liverpool is a green city; more than 60% of the city is green infrastructure if private gardens are included. A number of studies have been carried out to assess habitats and biodiversity across the city including the 2006 Phase 1 Habitat Survey²⁰⁰. Currently Merseyside Environment Advisory Service (MEAS) are undertaking work at the city region scale to develop an ecological framework²⁰¹.

13.8.1.3. The city has areas of high biodiversity value with 25 Local Wildlife Sites, four Local Nature Reserves, one SSSI, and the Mersey Estuary, which also has the highest level of designation, as it is both a Special Protection Area and a Ramsar site. The 2008 Ecological Framework for Liverpool identified 608 ha of Core Biodiversity Areas; these are the areas of the city that are most important in nature conservation terms.

13.8.1.4. All public bodies are required to consider biodiversity conservation; this is referred to as the “biodiversity duty”²⁰². The national target to halt the decline in biodiversity by 2010 has not been achieved and actions will have to continue to meet the target in the future.

13.8.1.5. The North Merseyside Green Infrastructure Habitat Action Plan²⁰³ provides an excellent starting point to guide the implementation of green infrastructure in all of the actions identified in this plan to support the biodiversity needs of the city.

13.8.1.6. Biodiversity is in part a measure of the health of the city’s green infrastructure resource. A thriving green infrastructure resource is likely to have a range of sustainably managed habitats that support a wide range of species. Providing connectivity offers opportunities for species movement, habitat expansion and enables south-north movement of species as the climate warms.

13.8.1.7. 2010, as well as being the Liverpool Year of Health and Wellbeing, is also the International Year of Biodiversity. One of the objectives for the year is to highlight the importance of biodiversity to policy makers. This strategy can help to deliver part of this aspiration for Liverpool.

13.8.1.8. Map 30 and Map 31 show firstly the overall distribution of existing green infrastructure functions that can support biodiversity across the city and secondly the areas of the city that have been targeted for either or both of the land change actions for this priority.

Existing functionality highlights the importance of the Green Wedges, The River Mersey, the parks and loop line. The Ecological Framework that is being prepared by MEAS will provide additional information on areas to target for expansion of habitat. This expansion can be supported by all of the actions that are set out in the action plan for this strategy.

200 White Young Green (2006) Liverpool Space for Nature – Phase 1 Habitat Survey Report

201 MEAS (2010) Liverpool City Region Ecological Framework (draft for consultation)

202 The Natural Environment and Rural Communities (NERC) Act (2006): Section 40 of the Act requires all public bodies to have regard to biodiversity conservation when carrying out their functions

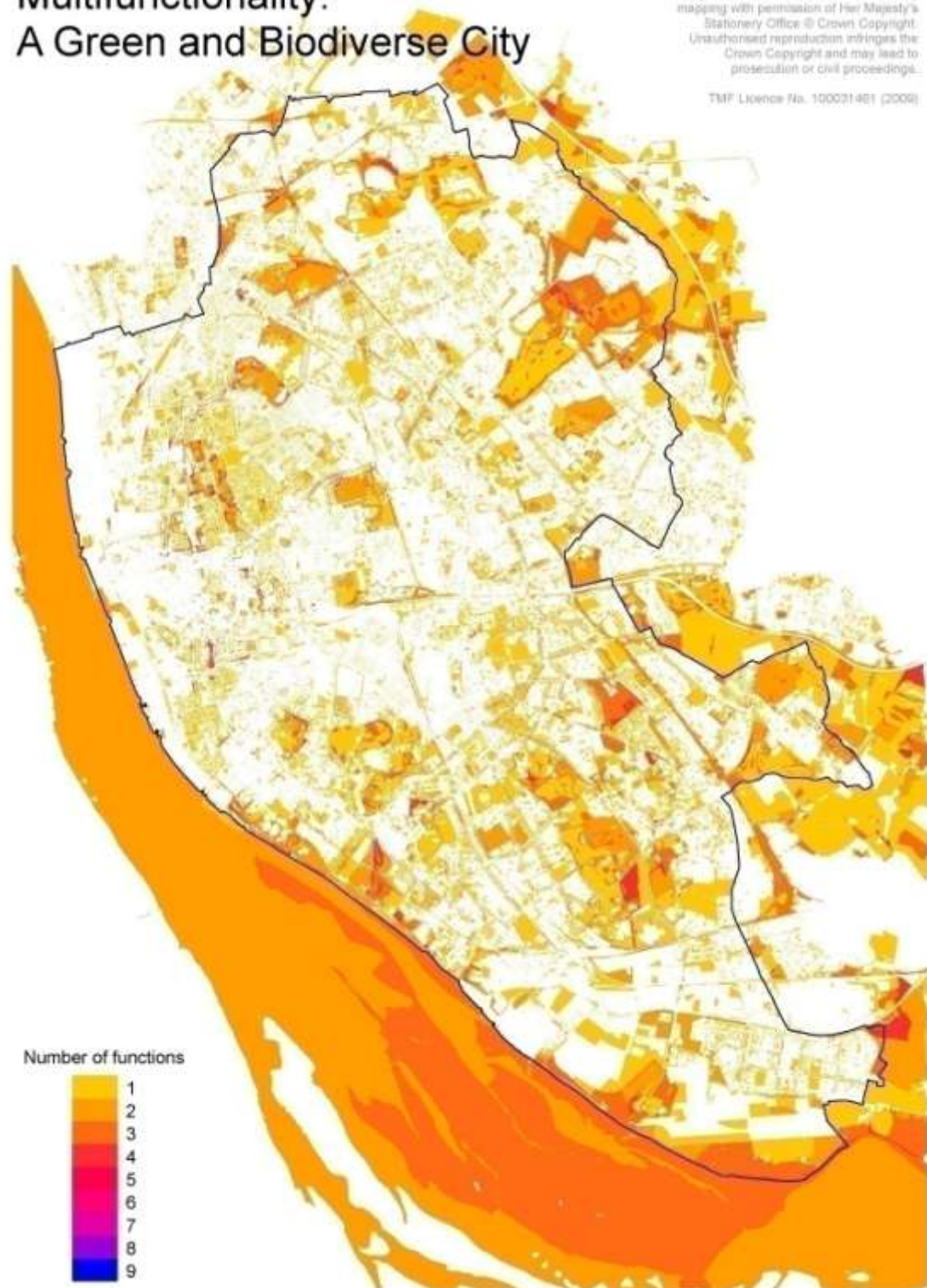
203 MEAS (2008) North Merseyside Green Infrastructure Habitat Action Plan

Map 30 Multifunctionality: A Green and Biodiverse City

Multifunctionality: A Green and Biodiverse City

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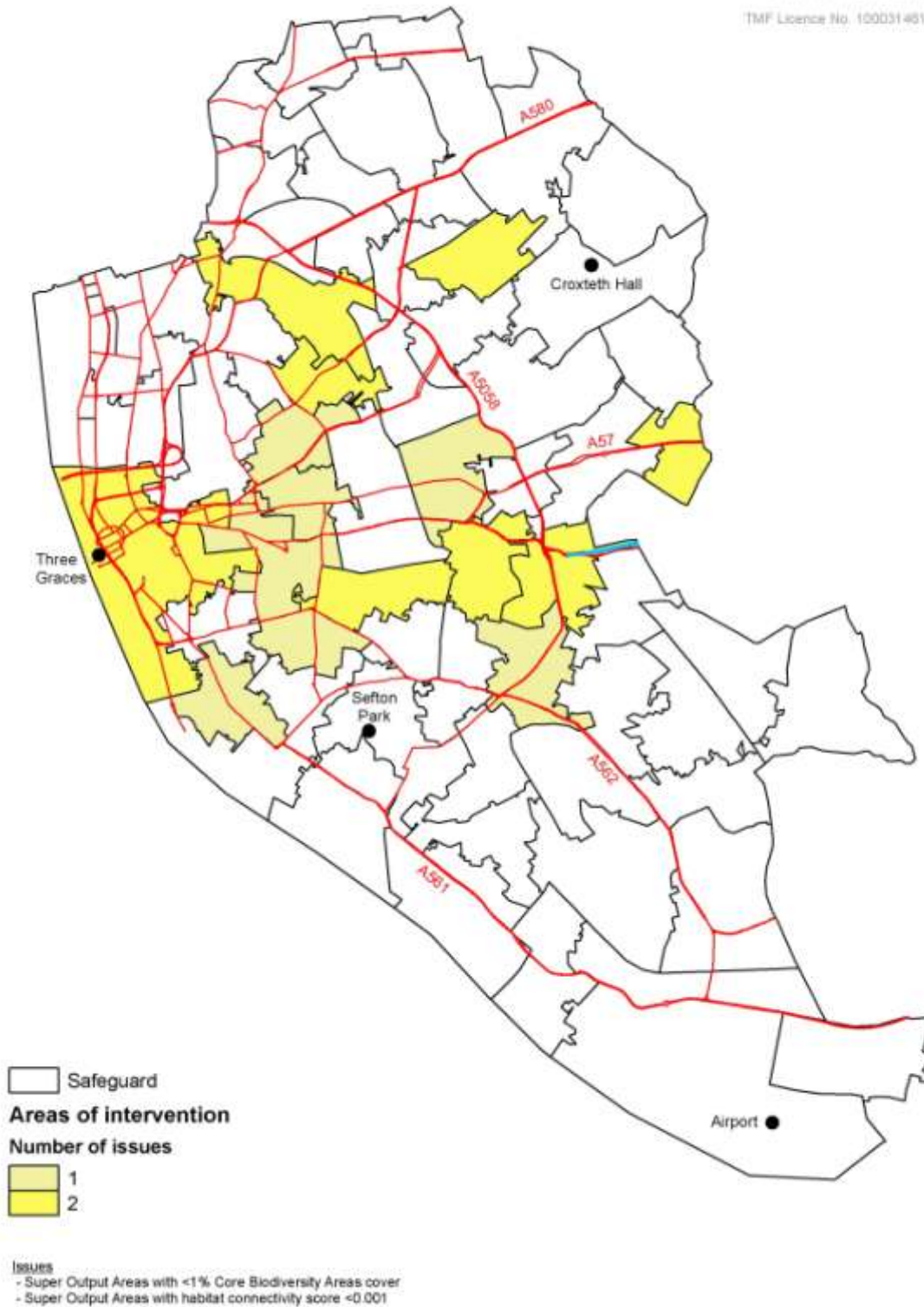


Map 31 Targeting of actions for Priority 4 issues across Super Output Areas

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13.8.2. Long Term Goal

“The network of green infrastructure in the city supports thriving wildlife populations and healthy habitats that provide essential and valued services for the city.”

13.8.3. Recommended actions

13.8.3.1. The actions have been colour coded to indicate whether they are land change, guidance, or supporting actions.

	Land change
	Supporting
	Guidance

ACTION 4.1

13.8.3.2. The existing ecological network should be safeguarded. Map 164 (p390) shows the existing core biodiversity areas. The distribution of the target areas is shown on Map 165 (p391).

Areas with greatest need for this action include (by Core Strategy Sub Area):

City Centre	Central
Inner Area	Anfield, Kensington and Fairfield, Kirkdale, Picton, Princes Park, Riverside
Outer Area	Childwall, Old Swan, Wavertree

ACTION 4.2

13.8.3.3. Connectivity of habitats supported through planning based on identification of areas for habitat expansion. Map 166 (p393) shows the current connectivity of parks and urban trees. Map 167 (p394) shows the areas to target to improve connectivity. The methodology set out to assess this action is provided in Appendix 1. Action 3.5 should be targeted to assist in this action too.

Areas with greatest need for this action include (by Core Strategy Sub Area):

City Centre	Central
Inner Area	Anfield, Kirkdale
Outer Area	Wavertree

ACTION 4.3

13.8.3.4. Biodiversity by Design principles²⁰⁴ are developed for Liverpool as part of the Design Guide (Action 1.8).

ACTION 4.4

13.8.3.5. Support the North Merseyside Green Infrastructure Habitat Action Plan targets in the city by ensuring that they are taken into account in the delivery of all of the green infrastructure intervention actions. This could be taken forward as an element of the design guide (Action 1.8).

²⁰⁴ TCPA (2004) Biodiversity by Design, A guide for sustainable communities

13.8.4. Rationale

13.8.4.1. All of the actions listed in the previous sections should be delivered to maximise biodiversity benefits through appropriate choice of species used and habitats created based on the North Merseyside Biodiversity Action Plan. Where possible opportunities to extend and link habitats should be taken, this is a key objective for the City Region Ecological Framework.

13.8.4.2. The extent of habitat matters. Ensuring that key areas are safeguarded and that opportunities are taken to reduce fragmentation by linking areas or extending habitats will be crucial in helping to improve the biodiversity of the city.

13.8.4.3. Due to a number of factors, Natural England²⁰⁵ has identified The Merseyside Conurbation, and so Liverpool, as an area of the Northwest where the natural environment has high vulnerability to climate change. Climate change will put additional pressure on both designated areas and the wider landscape of the city. Actions to buffer and reduce fragmentation of habitat can help species to adapt and move in response to a changing climate.

13.8.4.4. Parks in the city are important areas for biodiversity, and particularly bird populations, linking parks, with urban trees for instance, can assist in providing opportunities for these populations to use other areas of the city.

13.8.4.5. For most people, contact with nature is health promoting, and when given a choice, people will choose to live and visit green places. The concept of biophilia suggests that this is because humans are genetically predisposed to seek out green environments. People also recognise that biodiversity has intrinsic value and many of the economic models to assess the value of the natural environment or green infrastructure will include this as "existence" value.

13.8.4.6. The North Merseyside Green infrastructure Habitat Action Plan (HAP) provides the basis for incorporating biodiversity into all of the actions set out in this document. The HAP also contains targets for specific intervention types including urban green spaces, verges, school grounds, green roofs, urban trees and SUDS.

13.8.4.7. The HAP also recognises that due to the way in which green infrastructure planning tries to focus on multifunctionality, that there should be opportunities in all interventions to assess how biodiversity benefits can be achieved.

13.8.4.8. Biodiversity is one of the measures used as part of the Forum for the Future's annual Sustainable Cities Index. The index is meant to encourage cities to think about how sustainable their city is and what can be changed to become more sustainable. In 2009, Liverpool was ranked 15th in the UK. Improving biodiversity across the city, along with a range of other actions can help to move Liverpool up the rankings.

13.8.4.9. Actions and rationale for this priority have been identified that do not repeat the statutory obligations to safeguard and enhance biodiversity.

²⁰⁵ As part of the NW Climate Change Adaptation Plan: Natural England (2010) An Assessment of the vulnerability of the Natural Environment in the North West to climate change at the National Character Area scale

13.8.5. Core Strategy Sub Areas

13.8.5.1. The City Centre and Eastern Approaches score highly in this targeting due to the fact that there are areas of action across what are small geographic areas, the scale of activity in the Outer Area is greater, but it is dispersed over a wider geographic area.

Table 32 Priority 4: Targeting score for each action by Core Strategy Sub Areas

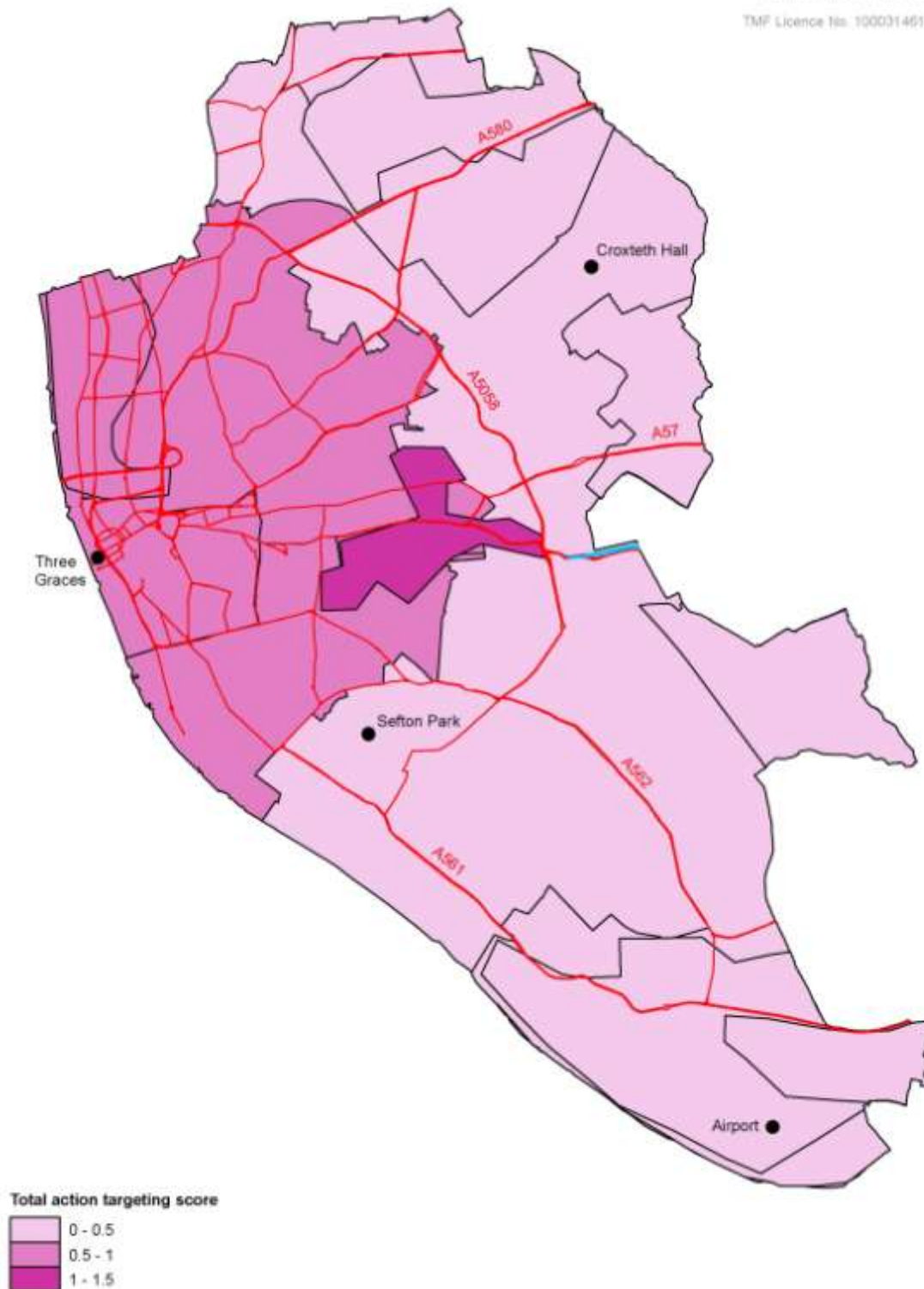
CORE STRATEGY SUB AREA	ACTIONS		TOTAL
	4.1	4.2	
City Centre	0.67	0.33	1.0
Inner Area	0.48	0.24	0.7
Inner Area North	0.50	0.28	0.8
Inner Area South	0.56	0.22	0.8
Atlantic Gateway SIA	0.33	0.33	0.7
Eastern Approaches SIA	0.75	0.50	1.3
Outer Area	0.16	0.11	0.3
Approach 580 SIA	0.00	0.00	0.0
Speke Halewood SIA	0.00	0.00	0.0
Eastern Fringe (C)	0.25	0.25	0.5
Eastern Fringe (N)	0.13	0.13	0.3
Eastern Fringe (S)	0.00	0.00	0.0
Southern Fringe	0.00	0.00	0.0

Map 32 Total targeting score for Priority 4 by Core Strategy Sub Area

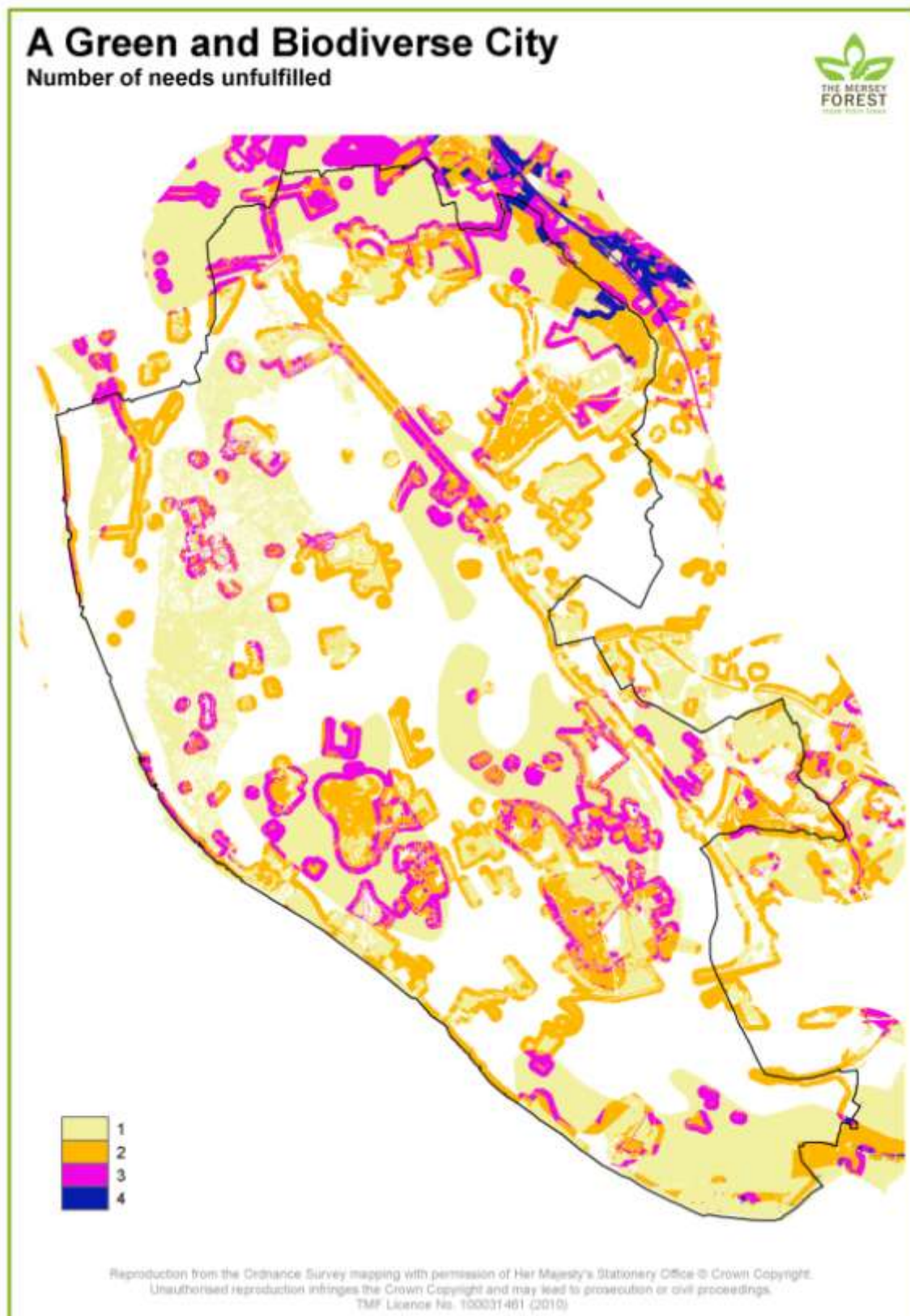
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Map 33 Number of needs unfulfilled at present



13.9. PRIORITY 5: A City where Green Infrastructure is Well-Planned and Designed

13.9.1. Introduction

13.9.1.1. Green infrastructure planning can support the way in which Liverpool develops, by influencing decisions that are made at the city scale or determining where to target resources to enhance or safeguard green infrastructure for instance. It can also inform urban design, for example as has been the case for Liverpool Knowledge Quarter. Green infrastructure planning should form an integral part of new development; as seen at Chavasse Park and Alder Hey Hospital. This type of approach needs to be championed so that it becomes the norm and not, as is the case presently, the subjects of case study.

13.9.1.2. There is an opportunity to link green infrastructure planning with that for grey infrastructure, to gain long term and multiple benefits for the city. CABE have identified the benefits of this joined up approach and launched the Grey to Green campaign in Liverpool in 2010²⁰⁶. Good planning will link up the areas of green infrastructure across the city with the public spaces to develop a seamless public realm that will encourage walking and cycling²⁰⁷ (Action 1.3).

13.9.1.3. This Green Infrastructure Strategy for Liverpool sets out for the first time a full picture of the benefits that the city derives from its green infrastructure as well as highlighting where it can be used to even greater effect in tackling some of the most pressing needs for the city.

13.9.1.4. However, the actions set out above will require an effective framework within which they can be delivered. This will include:

- Effective planning policy and development management
- Economic value of green infrastructure incorporated into decision making²⁰⁸
- Influencing a range of other policies and strategies to build the actions into key documents enabling them to be delivered
- Coordination of activity/sharing of available resources to ensure that they are used to target the areas of greatest need
- Focus on multifunctionality – one of the strengths of a green infrastructure approach is that it can be used to deliver several functions from a single intervention. For example, the opportunity to expand a key habitat may also provide an opportunity to improve water management, improve image and capture air borne pollution. Often, because the wider functions are not considered, the opportunities to get more value from an intervention are not taken.

13.9.1.5. The actions below set out ways in which these points could start to be addressed and provide a better framework for the delivery of the other 36 actions set out in this document.

²⁰⁶ CABE (2010) Grey to Green

²⁰⁷ Cabinet Office Strategy Unit (2009) Quality of Place: improving the planning and design of the built Environment

²⁰⁸ Genecon (2010) Valuation toolbox

13.9.2. Long term goal

“Green infrastructure is valued and planned, so that maximum benefits are gained to support sustainable development, taking opportunities to provide multiple functions. There is a clear understanding of the value of green infrastructure amongst key decision makers and coordinated actions by delivery organisations.”

13.9.3. Recommended actions

13.9.3.1. The actions have been colour coded to indicate whether they are land change, guidance, or supporting actions.

	Land change
	Supporting
	Guidance

ACTION 5.1

13.9.3.2. Biodiversity by Design principles²⁰⁹ are developed for Liverpool as part of the Design Guide (Action 1.8).

ACTION 5.2

13.9.3.3. The land change actions from this Liverpool Green Infrastructure Strategy included as part of the menu for the Community Infrastructure Levy.

ACTION 5.3

13.9.3.4. A guide, promoting high quality design, taking into account landscape and urban design as well as climate change adaptation and biodiversity by design principles will be developed to support green infrastructure delivery across the city. (See action 1.8)

ACTION 5.4

13.9.3.5. An agreed model is used assess the value of green infrastructure in the city and enable proper evaluation of policy and intervention in line with Future Land Use²¹⁰ recommendations.

²⁰⁹ TCPA (2004) Biodiversity by Design, A guide for sustainable communities

²¹⁰ Department for Science (2010) Future Land Use Report

ACTION 5.5

13.9.3.6. Ensure that the cross boundary issues such as City Region image and the impacts of cumulative development on recreational and nature conservation areas identified in the City Region Green Infrastructure Framework are incorporated into policy.

ACTION 5.6

13.9.3.7. Create a Liverpool Green Infrastructure Forum – or promote a sub regional forum linking to the city region green infrastructure framework and the work promoted by the City Region Environment and Waste Board.

ACTION 5.7

13.9.3.8. Embed this Green Infrastructure Strategy within other city strategic documents including the Local Development Framework, the Sustainable Community Strategy and the range of economic, health, open space, trees and woodlands, tourism and other relevant strategies and plans that are developed for the city.

13.9.4. Rationale

13.9.4.1. Promoting green infrastructure as an asset for the city requires planning policies to be delivered robustly and in a coordinated manner with grey infrastructure planning and delivery. Emerging valuation methods enable the economic value of green infrastructure to be assessed in line with UK Treasury Green Book Guidance²¹¹, and so be comparable against alternative grey infrastructure investments.

13.9.4.2. Quality is critical. The benefits that can be delivered are best achieved through high quality design and management, ensuring that areas are attractive, welcoming, safe, manageable, and help to create or define local character. Many of the benefits that can be gained from green infrastructure are dependent on quality. Image and many quality of life/place benefits are not achieved if design is poor or areas are neglected. In such instances, there may be a call to remove the “eyesore”, an action that will also mean that functions that perhaps do not rely on quality, but which are nonetheless important for the city, such as evaporative cooling, will also be lost. High quality design and management not only helps to provide some of the benefits, it actually safeguards them all.

13.9.4.3. Resources to help deliver the necessary green infrastructure for the city will be required. Taking the opportunities to include the Green Infrastructure Strategy within the Community Infrastructure Levy (CIL), and the use of S106 will be important. There are also opportunities to use the strategy as the evidence base to secure other non- planning sources of funding. For example, the Liverpool Knowledge Quarter study has been used as an evidence base to bid for “City Cooling” funds to Europe and to charitable trusts.

²¹¹ HM Treasury (2010) The Green Book, Appraisal and Evaluation in Central Government

13.9.4.4. The development of Design Guidance (Action 5.3) as Supplementary Planning Document within the Local Development Framework will support the S106 and CIL approach and ensure that the key actions are delivered through development management whenever possible.

13.9.4.5. Mechanisms to support the long-term management of existing and new green infrastructure, and in particular the green infrastructure assets of the city, need to be developed. This may include a the “green infrastructure” fund (Action 5.1) for the city, ring-fencing resources from CIL and S106 along with other funds managed through the Green Infrastructure Forum as part of the LSP structure (for instance). It may also include development of training programmes to support people to get back to work through work in the natural environment, managing the green infrastructure of the city.

13.9.4.6. Examples of community ownership or stewardship have been identified in “Greening the City”²¹² and taking a flexible approach to long-term management, encouraging wider involvement will help to target scarce public resources on the critical areas of green infrastructure across the city.

13.9.4.7. Coordinated delivery of well-designed green infrastructure may be facilitated by a Green Infrastructure Forum, linked to the city region structures. This can help to update and evolve the Green Infrastructure Strategy as well as take opportunities to tackle larger issues collectively and seek ways to coordinate and target activity in priority areas identified in this strategy.

13.9.4.8. The forum should also assist in embedding the Green Infrastructure Strategy into the wide range of policies and strategies that it needs to influence.

13.10. Recommendations

13.10.1. Based on the data gathered, consultations and discussion a number of recommendations for the city to achieve the vision set out in the main city strategies and address some of the key issues facing the city have been identified.

13.10.2. The recommendations are grouped under three headings

- Land Change – recommendations that require physical action on the ground to be achieved. This may be specific areas or more general recommendations.
- Support - recommendations that enable the land changes to happen
- Guidance – recommendations that guide land change by providing information on needs, standards and priorities

13.10.3. Land Change

13.10.3.1. Liverpool is a green city, with large areas of historic parks and remnants of other green areas that are a legacy from previous periods of the city’s development. However, the green infrastructure is not always in the right place to address current and projected issues for the city. Whilst the city has many green infrastructure assets, there are areas of the city where functionality is not being provided, where needs such as health, image, access and biodiversity have been identified. At the very least, these are issues of equity. Evidence suggests that green infrastructure has a role to play in helping to address these issues. The city should:

²¹² Green ing the City, 2010, SQW, Liverpool City Council

13.10.3.2. As a first step ensure that existing green infrastructure assets are well managed so as to maintain the functionality that is being provided, making best use of what is already available.

- In partnership with the health sector promote parks and the city's other accessible green spaces as a key element of the public health infrastructure.
- Target green infrastructure interventions to areas where provision is low but there are identified needs (e.g. City Centre, Growth Point wards) , emphasising the importance of functional and high quality places that take into account the existing urban character. Use the planning system effectively to plan and support positive change in green infrastructure functionality.
- Use green spaces and rights of way within green infrastructure to create attractive places for walking and cycling as part of a wider network.
- Promote the use of vacant and underused land for food growing or for the creation of community gardens.
- Limit paving of gardens or sealing of surfaces in areas that are in flood risk or identified in the Strategic Flood Management Plan.
- Gardens are a key part of Liverpool's green infrastructure (over 25%). In partnership with relevant stakeholders; initiate an awareness-raising campaign about the detrimental environmental impact of paving over front gardens, and to raise the profile of environmentally sustainable alternatives to concrete and paving slabs.
- Manage green infrastructure along key transport corridors to maximize reduction in air and noise pollution. Where there are gaps seek ways to increase green infrastructure, particularly tree cover, targeting the areas with lowest green infrastructure cover.

13.10.3.3. In addition, there are a number of specific issues have emerged:

- Everton Park is an anomaly, an outlier in almost every dataset gathered for this strategy. It has the potential to provide extensive functionality and is central to many of the planned investments in the city, but at present is a drag on the local area. There is a need to assess how this area can contribute to the development and wellbeing of people in the area.
- Urban trees have been identified as a key typology, particularly in the most built up areas of the city. There are however issues that need to be addressed in order to enable more planting with the required long term funding for management addressing these issues should be a priority for the city.
- The green infrastructure within the SIA's should continue to be enhanced and provide the setting for inward investment. A green infrastructure plan for each of these areas should be developed from the data gathered in this strategy to support their sustainable economic growth.
- The city can start to deliver these recommendations by supporting the delivery of the actions set out in this strategy.

13.10.4. Support

13.10.4.1. In order to bring about the changes required to ensure that Liverpool's green infrastructure plays a role as a critical infrastructure in the sustainable development of the city, support will be required, it is recommended that the city should:

- Maintain a strong green infrastructure policy in the Local Development Framework to support the recommendations and actions set out in this strategy and ensure that area action plans also support the actions and make use of the data gathered.
- Ensure that the Green Infrastructure Action Plan is part of the Community Infrastructure Levy (CIL) menu or similar mechanisms.

- Develop a “Green Infrastructure and Health” fund to make use of CIL and S106 funds, targeted at delivery of green infrastructure actions to improve health and wellbeing.
- In partnership with others support the development of a green infrastructure forum.

13.10.5. Guidance

13.10.5.1. Guidance can help to disseminate, advocate and develop the actions and recommendations set out in this strategy. The city should:

- Develop a design guide to support the implementation of the Green Infrastructure Strategy- to include climate change by design, biodiversity by design, GRaBs and ForeStClim principles.
- Develop a Green Infrastructure Target for each neighbourhood and use this as part of the formal planning approval process - including emphasis on green roofs and SUDS where most appropriate.
- Adopt recommendations from the ecological framework and ensure that interventions help to achieve the green infrastructure habitat action plan.

13.10.6. Deliverability

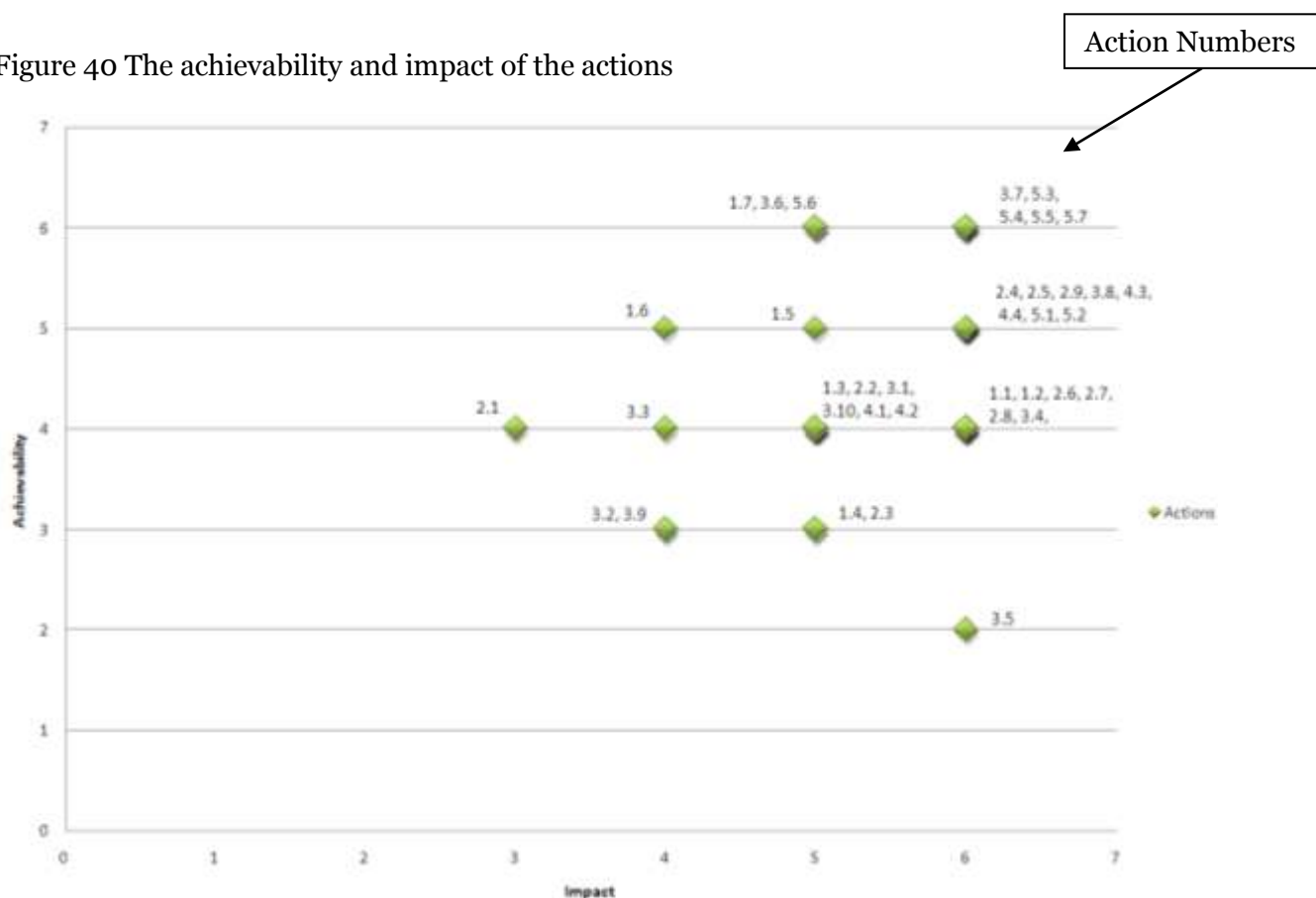
13.10.6.1. The deliverability of the actions has been assessed to ensure that they can be seen to be sound in terms of recommendations for plans and strategies.

13.10.6.2. In Appendix 3 (of the Liverpool City Green Infrastructure Strategy Action Plan) there is a table which provides information on all of the actions that have been identified including assessment of the technical achievability of the action, its impact, likely leads and support and availability of resources (See Table 11 in Appendix 3 of the Action Plan).

13.10.6.3. From this assessment, which has been consulted on as part of the development of the Strategy, there are no actions that are considered undeliverable. There are a number that are challenging and which will require significant work both in terms of policy support and resources e.g. SUDS, urban trees and water storage. There are also a number that are straightforward to achieve and could provide early success in the delivery of the Action Plan.

13.10.6.4. Figure 40 shows the achievability and the impact of the different actions²¹³.

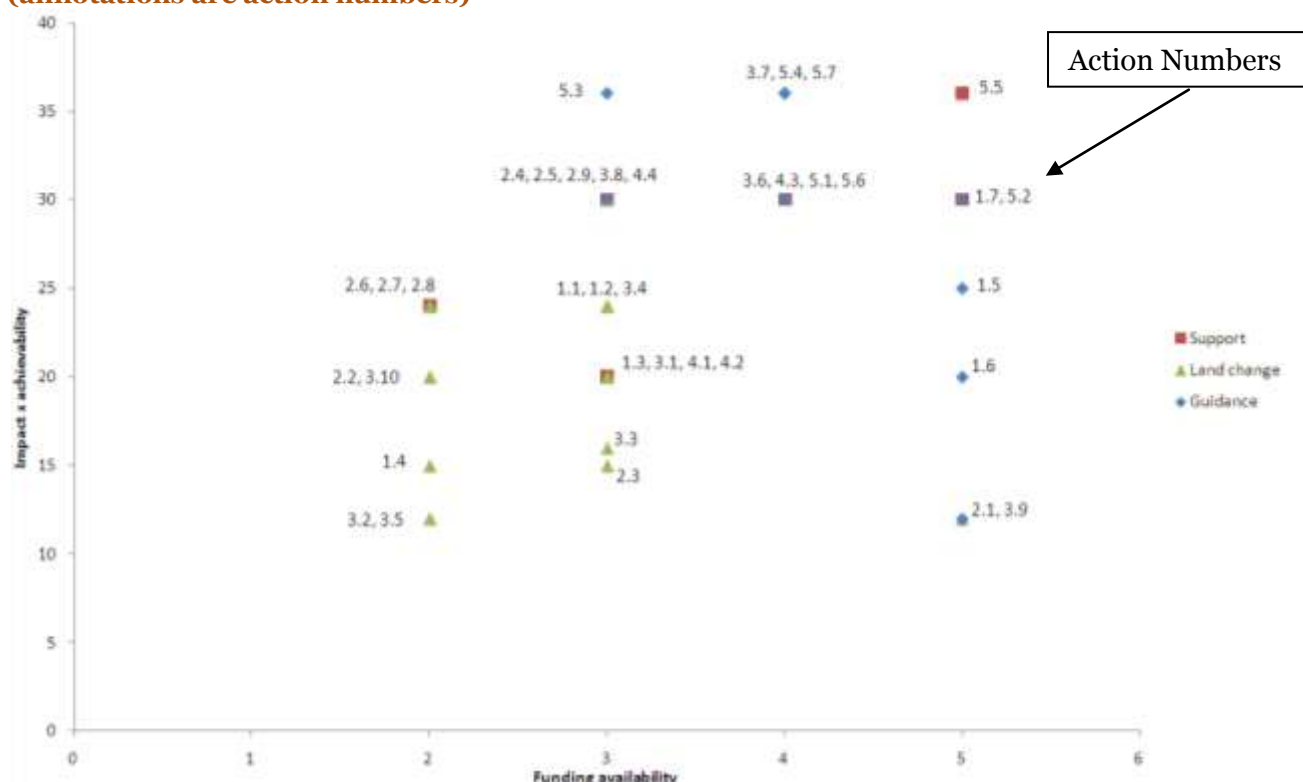
Figure 40 The achievability and impact of the actions



13.10.6.5. Priority actions could be seen to be those that are achievable, high impact actions that have some resources already, or potentially available. Figure 41 shows the shows impact x achievability against funding availability. It should be noted that all actions are seen as important and actions which do not score highly should not be discounted, this exercise simply highlights the “easy wins”. Actions achieve a lower score may be more challenging to achieve but this should not lead to them being discounted.

²¹³ The achievability and impact are scored on a scale of 1 to 6 with 1 being not achievable or no impact and 6 being easily achievable and high impact.

Figure 41 The opportunity and availability of funding for each of the actions (annotations are action numbers)



13.10.6.6. For each action a Lead Agency (Figure 42) along with examples of suggested support agencies have been identified. Again this information has been consulted upon, but the lead agencies are not “signed up” to lead actions. In the Action Plan, a Green Infrastructure Forum is proposed that could also operate as an exchange, to share information and deliver the Action Plan. Individuals from the agencies in Figure 42, along with the stakeholder group could be invited to be the initial members of the forum.

Figure 42 Potential lead agencies for actions



14. APPENDIX 1 – METHODOLOGY FOR STEPS 2 – 4

14.1. Mapping Methodology

14.1.1. Mapping for this study falls into five main stages:

- Typology
- Functionality
- Benefits
- Needs
- Targeting

14.1.2. The first four stages follow a methodology that has been developed by The Mersey Forest team for green infrastructure planning in general, whereas the fifth has been developed specifically for this study. The general methodology (a version of which has been published²¹⁴) has garnered significant acclaim in the region and further afield, and has been used for several previous studies, although it is always evolving.

14.2. Typology

14.2.1. The first step was to classify all of the land in the city, together with a 1km buffer, as either not green infrastructure, or one of a list of green infrastructure types, which are defined below.

14.2.2. Agricultural land

Land managed for agriculture, including grazing lands, crop production fields and hedgerows. Potentially irregular field margin trees may be included.

14.2.3. Allotment, community garden or urban farm

Allotments are small plots which collectively make up a larger green space. These plots are available for members of the public to rent for the cultivation of fruit, vegetables and flowers. Community gardens and urban farms are community-managed projects ranging from wildlife gardens, to fruit and vegetable plots on housing estates, community polytunnels, to large city farms. They exist predominantly in urban areas and are often community led projects, created in response to a lack of access to green space. They combine a desire to encourage strong community relationships and an awareness of gardening and farming. Most projects provide food-growing activities, training courses, school visits, community allotments and community businesses. Dedicated orchards are classified separately.

²¹⁴ http://www.ginw.co.uk/resources/A_Green_Infrastructure_Mapping_Method.pdf

14.2.4. Cemetery, churchyard or burial ground

Land used as burial grounds, including cemeteries and churchyards, usually grass covered with occasional shrubs and trees.

14.2.5. Coastal habitat

Beaches, sand dunes, marshes, mudflats and semi-natural open land by the coast.

14.2.6. Derelict land

Land which has been disturbed by previous development or land use but is now abandoned. Waste or derelict land is often re-colonised by processes of natural succession. Land is classed as derelict whilst it is in the early stages of natural succession. As succession proceeds land that may be officially classified as derelict land by the local authority, will have a different green infrastructure type e.g. grassland or woodland (or will fall under non green infrastructure).

14.2.7. General amenity space

Usually publicly owned and managed, and always accessible for public enjoyment. Their function is usually as a green 'landscape backdrop' but their landscape value can sometimes be minimal because of poor design. They include the 'left over' green spaces within housing and other forms of development, as well as most road verges. Most commonly, but not exclusively in housing areas - including informal recreation spaces, green spaces in and around housing, and village greens.

14.2.8. Grassland/ heathland/ moorland or scrubland

Grassland which is not agriculturally improved. Could include established vegetation on reclaimed derelict land which is not part of a formal recreation green space. Includes downlands, commons and meadows. Also includes areas of moorland and heathland vegetation consisting mainly of ericaceous species, and including moorland grass, shrub moor, shrub heath and bracken. Likely to include some commons within urban areas. Scrubland areas predominantly consist of shrubs, with grasses and herbs also present.

14.2.9. Green roof

Roofs of buildings, bus shelters or any other form of construction which are partially or completely covered with vegetation. Vegetation may be sedums, plants, perennials, grasses, trees and shrubs.

14.2.10. Institutional grounds

Green space in the grounds of institutions such as schools, universities and colleges, hospitals and nursing homes, and associated with commercial and industrial premises. Land usually consists of expanses of grass, scattered trees, hedgerows and shrubs. Outdoor sports facilities are not included.

14.2.11. Orchard

Areas populated with fruit bearing trees, can be publicly or privately owned, could be for commercial selling or local community use.

14.2.12. Outdoor sports facility

Includes sports pitches, school and other institutional playing fields, golf courses and other outdoor activities. Usually consist of vegetated sports surface and boundary shrubbery, trees and hedges. Can be publicly or privately owned and often occur within parks.

14.2.13. Park or public garden

Includes urban parks, country parks and formal gardens (including ones where you may have to pay for access). Generally designed for public access and enjoyment, combining a variety of landscape and horticultural elements. Extraneous facilities for the public may be present onsite which enhance visitor attraction.

14.2.14. Private domestic garden

Privately owned green space within the curtilage of individual dwellings, which is generally not publicly accessible. These plots of private land vary in size but often make up a significant part of the green fabric of urban areas. Land may include trees, shrubs, grass and flowering plants.

14.2.15. Street trees

Generally in urban areas, a row/collection of individual trees along the side of a road. Trees will vary in size and species depending on location and size of street. Usually located on the pavement edge in tree pits, requires reasonably wide pavements. Tree pits may be planted with small flowering plants.

14.2.16. Water body

Expanses of open water, including large lakes, small ponds, reservoirs and harbours. The sea is also classed as a water body.

14.2.17. Water course

All areas of running water, including large rivers, small streams, canals and aqueducts.

14.2.18. Wetland

Land dominated by wet habitats, including fen, marsh, bog and wet flush vegetation. Wetland associated with the coast, such as salt marshes, is classified as coastal habitat.

14.2.19. Woodland

All forms of woodland including deciduous woodland (both ancient semi-natural and woodlands of more recent origin) and mixed and coniferous woodland (including plantations and shelterbelts). Includes newly planted woodland. Small clusters of trees will be classed as woodlands.

14.2.20. This list was developed from the Planning Policy Guidance Note 17²¹⁵ typology to cover all green infrastructure in broad, functionally distinct categories. This mapping gives a complete picture of the green infrastructure resource of the city.

14.2.21. Instead of defining a bespoke system of land divisions, types have simply been applied to all of the non-overlapping polygons from Ordnance Survey's MasterMap Topography Layer. The main advantages of this approach are enumerated in the methodology document mentioned above.

14.2.22. In order to classify the MasterMap polygons, a three-step process was employed.

²¹⁵ <http://www.communities.gov.uk/publications/planningandbuilding/planningpolicyguidance17> For more information about how this typology differs from the PPG17 typology please refer to http://www.greeninfrastructurenw.co.uk/resources/A_Green_Infrastructure_Mapping_Method.pdf

14.2.23. The 3 Step Process

1. 'Automated' classification using standard MasterMap attributes and other existing vector datasets (with each step only classifying areas that hadn't already been classified)

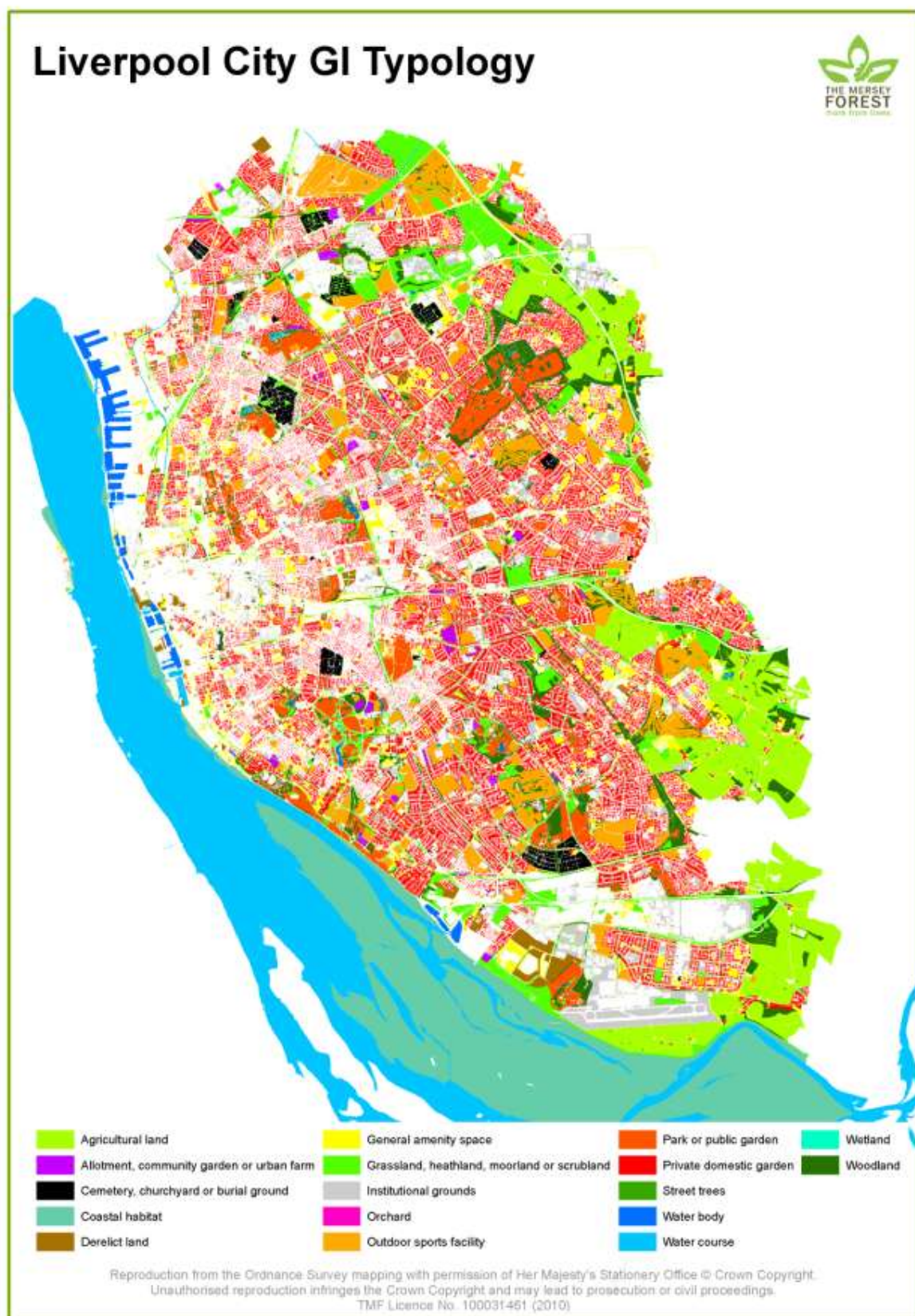
- Firstly, a figure, called E, was calculated for each shape which is a measure of how intricate it is, or conversely how similar to a circle of the same area. For example, a long thin shape such as a river will have a higher E than a round or square shape such as a pond.
- Areas where land is identified in MasterMap as pylon, rail, road or track, path, steps, building, glasshouse or slope and where the area is identified as man-made – defined as 'features that have been constructed, for example, areas of tarmac or concrete' – were classed as not green infrastructure.
- Shapes identified in MasterMap as tidal water were classed as water course.
- Shapes identified in MasterMap as inland water were classified as follows.
 - $E < 3.5$: water body
 - E between 3.5 & 5 and area < 1ha: water course
 - E between 3.5 & 5 and area > 1ha: water body
 - $E > 5$: water course
- Areas where land is identified in MasterMap as natural environment and is described as trees, but not scattered trees, were classed as woodland.
- Areas where land is identified in MasterMap as natural environment and is described as marsh land were classed as wetland.
- Areas where land is identified in MasterMap as orchard were classed as orchard.
- Areas where land is identified in MasterMap as natural environment were classed as grassland, heathland, moorland or scrubland.
- Polygons with their centroids within areas classed in the Open Space Survey as natural/semi-natural were classed as grassland, heathland, moorland or scrubland.
- Areas where land is identified in MasterMap as rail were classed as grassland, heathland, moorland or scrubland.
- Areas where land is identified in MasterMap as general surface or multi surface, the shape area is less than or equal to 800m² and E is less than or equal to 10 were classed as private domestic garden.
- Areas where land is identified in MasterMap as unclassified were classed as derelict land.
- Areas where land is identified in MasterMap as foreshore were classed as coastal habitat.
- Other areas where land is identified in MasterMap as general surface or multi surface were classed as general amenity space.
- Areas where land is identified in MasterMap as roadside and where there is significant tree cover according to Liverpool City Council's tree database were classed as street trees.
- Other areas where land is identified in MasterMap as roadside were classed as general amenity space.
- Areas where MasterMap annotation indicates that the land is allotments were classed as allotment, community garden or urban farm.
- Areas where MasterMap annotation indicates that the land is used for football, rugby, cricket, bowling, golf, tennis, recreation ground, sports ground or playing field was classed as outdoor sports facility.
- Areas where MasterMap annotation indicates that the land is a cemetery or graveyard were classed as cemetery, churchyard or burial ground.
- Polygons with their centroids within areas classed in the Open Space Survey as parks were classed as public park or garden.
- Areas where land is identified in MasterMap as general surface, shape area is greater than or equal to 0.6ha and E is less than or equal to 4 were classed as agricultural land.

- Polygons of area greater than or equal to 0.3ha and E less than or equal to 5, and polygons intersecting a 2m buffer of these were classed as agricultural land.
- Polygons of area greater than or equal to 0.6ha were classed as grassland, heathland, moorland or scrubland.
- Areas where MasterMap annotation indicates that the land is part of the grounds of a school, university, college, museum, library or other educational establishment were classed as institutional grounds.
- Polygons intersecting a 10m buffer of those already classed as agricultural land were also classed as agricultural land.
- Polygons adjoining buildings of area greater than 150m² were classed as institutional grounds.
- Remaining polygons were classed as general amenity space.

2. A series of manual 'sweeps' to check for significant errors in each type relative to aerial photography, Ordnance Survey raster mapping and the Liverpool Open Space Survey (concentrating on types not adequately addressed by the above process, such as institutional grounds, cemetery, churchyard or burial ground, agricultural land and green roof)

3. 'Automated' aerial photography analysis to reclassify private domestic gardens with insufficient green infrastructure cover as not green infrastructure. An 'automated' method for pulling shades of green out of aerial photography is described in the general methodology document mentioned above. This was adapted to suit the specific nature of the Liverpool aerial photography held by the team.

Map 34 Typology of green infrastructure in Liverpool



14.3. Functionality

14.3.1. The next step was to determine which polygons currently perform which of a list of 28 functions, which again comes from the general methodology document. The functions are defined below, which references confirming that green infrastructure can perform them where necessary and available.

14.3.2. Recreation – public

Anyone can use for recreational purposes (formal/informal and active/passive), without having to pay or have access to keys. Can include areas which are closed at night, on specific days, or seasonally but a judgement call will be required as to whether this restricts public use. Can include sports fields, fishing lakes, playgrounds, etc, and open access land.

14.3.3. Recreation – private

Land which is used for recreation but only by owners of the land or those invited by the owners to use. This includes private gardens and other privately owned green spaces to which access for the public is prohibited.

14.3.4. Recreation public – with restrictions

Public use for recreational purposes (formal/informal and active/passive) is allowed but is restricted to those who pay or have keys. Can include sports fields, golf courses, fishing lakes, allotments, etc, but not public rights of way.

14.3.5. Green travel route

Off road routes through greenery for pedestrians and cyclists (for recreational purposes as well as for getting between places), can include public rights of way, Sustrans, and private routes which are not on roads. Useful in urban areas and often located close to large centres of population. Also includes the green infrastructure which surrounds green travel routes, making them an attractive alternative route.

14.3.6. Aesthetic (CABE, 2005)

Improves the image of an area for people as they arrive, and for those who reside there. Examples may include street trees, trees along major roads, etc. Applies equally to towns, cities and the rural landscape. Green infrastructure can make the town/village etc. a more attractive place to live and visit. The improved aesthetic which green infrastructure can provide will be reflected in surrounding property prices.

14.3.7. Shading from sun (Huang et al. 2006, Parker, 1981)

Shading of people, buildings, and surfaces from solar radiation to reduce temperatures and increase comfort levels. Usually provided by trees and taller plants and vegetation. Particularly found in urban areas to reduce the urban heat island, this function will become more critical as we have to adapt to a changing climate. Green infrastructure which provides shade will also be important for protecting agricultural land and other species from solar damage.

14.3.8. Evaporative cooling (Kramer & Kozlowski, 1960)

As plants transpire water is evaporated from their surfaces cooling their immediate locality. All types of green infrastructure can provide this function, including open water. Plants with a larger leaf area are likely to be better than those with a smaller leaf area. During a drought, irrigation is likely to be necessary to maximise this function in plants, whilst open water will continue to be valuable in its own right.

14.3.9. Trapping air pollutants (Hill, 1971, Beckett et al., 1998, Smith, 1990, Hewitt et al., 2005)

Removal of pollutants, especially ozone, nitrogen dioxide and particles from the air, through uptake via leaf stomata and deposition on leaf surfaces. Once inside the leaf, gases diffuse into intercellular spaces and may be absorbed by water films to form acids or react with inner leaf surfaces. This function is usually associated with more urban areas, especially close to travel routes.

14.3.10. Noise absorption (Fang & Ling, 2002)

Screening of noise, especially from major transport routes. Requires certain types of green infrastructure which are tall enough to intercept and absorb sound waves. This function is usually associated with more urban areas, especially close to travel routes.

14.3.11. Habitat for wildlife (Tree People, 2009)

Providing a habitat for wildlife – a place to live with a source of food. Different types of green infrastructure will provide habitats for a widely different range of species. The range of species will also be dependent on other factors such as climate and disturbance.

14.3.12. Corridor for wildlife (Benedict & McMahon, 2006)

Conduit of green and blue spaces through which wildlife can disperse to and from habitat spaces. This function will increase in importance in the future; species will need the capacity to move upwards and northwards as the climate changes. Connectivity is vital for this function. Different types of green infrastructure will provide a corridor for a widely different range of species. Range of species will also be dependent on other factors such as climate and disturbance.

14.3.13. Soil stabilisation (Barker, 1995)

Root structures of all vegetation can help improve the strength and stability of soil, holding together the top soil and preventing it from eroding.

14.3.14. Heritage

Historic links in the landscape (including ancient woodlands, canals, designated sites and monuments). Heritage is "that which is inherited".

14.3.15. Cultural asset

Green space used for cultural purposes, the hosting of public art, events and festivals. Examples include international garden festivals and sculpture parks.

14.3.16. Carbon storage (Milne & Brown, 1995)

Removing carbon from the atmosphere and storing it in plants, trees and soils. Trees and peat soils are particularly important types of green infrastructure for storing carbon. Varying types of green infrastructure will take different amounts of time to sequester carbon; some types of green infrastructure are slow growing in nature and therefore will take longer to sequester carbon. Stored carbon in trees will stay locked away inside the wood if felled for material substitution.

14.3.17. Food production (TCPA, 2008)

Land used for growing crops or the grazing of animals.

14.3.18. Timber production

Growing trees and woodlands for timber. Includes for use as a substitute for other materials. Can be on a large scale for construction materials or a smaller scale for smaller wood products. Stored carbon in trees will stay locked away inside the wood if felled for material substitution.

14.3.19. Biofuels production

Using vegetation as biofuels – a form of energy production. Biofuel crops include wood from trees which may or may not be coppiced, miscanthus, rapeseed and waste from other crops.

14.3.20. Wind shelter

Green infrastructure can provide shelter from winds at a local level by slowing or diverting currents.

14.3.21. Learning

Opportunities for lifelong learning. Green infrastructure can provide a backdrop for outdoor classrooms and learning outside of the indoor school environment, and also a setting for learning new skills that may help adults back to work.

14.3.22. Inaccessible water storage

Water stored in soils and vegetation. Certain types of sustainable urban drainage systems and soils will store large amounts of water. Certain soils such as clay and peat will store more water than others. This water is inaccessible for human use or for irrigation.

14.3.23. Accessible water storage

Water stored in ponds, lakes, reservoirs and certain wetlands. This water is accessible for human use and for irrigation should it be required.

14.3.24. Water interception (Centre for Urban Forest Research, 2002)

Interception of rainwater before it reaches the ground, e.g. by the leaves of trees and plants. This will slow the flow of water to the ground. All types of green infrastructure will intercept water in some way, though certain types with a greater leaf area will intercept a greater amount and slow its flow to greater extent. This can help to reduce the risk of flooding.

14.3.25. Water infiltration

Vegetation and roots aid in the movement of rainwater and floodwater into the ground. Green infrastructure will help water to drain naturally into the soil. Includes both surface infiltration and deep infiltration. Green infrastructure is a permeable surface as opposed to hard surfacing such as concrete. It aids in the natural passage of water to the ground – helping reduce the risk of flooding.

14.3.26. Coastal storm protection

Green infrastructure can be used to protect infrastructure and agriculture close to the shore. It can protect against winds, sea spray and slow the speed and impact of waves and large tidal surges. Could include areas of woodland and marsh.

14.3.27. Water conveyance

Green infrastructure can transport water to areas which are in need of water and also away from areas at risk of saturation or flooding. Examples include rivers and canals. Irrigation ditches in agricultural land are another example of water conveyance.

14.3.28. Pollutant removal from soil/water (Barret et al. 2005)

Vegetation can remove pollutants from soil and water. For example green infrastructure at the side of the road can clean contaminated road runoff (reducing concentrations of pollutants such as heavy metals), and certain plants can remove pollutants from contaminated soil.

14.3.29. Flow reduction through surface roughness

The speed and amount of water passing through a site can be reduced by vegetation. If the site has a varied green topography as opposed to hard standing, water will be retained onsite for longer, potentially helping to reduce flooding. Some types of green infrastructure perform this function more than others – for example, a woodland floor tends to be rougher than grass.

14.3.30. Table 33 shows which types of green infrastructure perform which functions. Where there is an A in a cell, land of the type in question almost always performs the function in question to a level above a notional threshold (where it becomes ‘significant’), so all polygons of that type can simply be said to perform that function. Where there is a dash in a cell, land of the type in question almost never performs the function in question to a level above the threshold, so all polygons of that type can simply be said not to perform that function. Where there is an S in a cell, land of the type in question sometimes performs the function in question to a level above the threshold and sometimes doesn’t, depending on other factors. The conditions in the second part of the table were used to determine whether each polygon of that type would be said to perform that function. Most of the conditions involve comparison with other datasets. In some cases this can be partially automated, whereas in others visual interpretation is required, mostly of Ordnance Survey raster mapping, aerial photography or even Google’s Street View or Microsoft’s Bird’s Eye view.

Table 33 Linking typology and function

A= this type ALWAYS has this function
S= this type SOMETIMES has this function, see notes below as to when

		FUNCTIONS																												
		Recreation - public	Recreation - private	Recreation - public with restrictions	Green travel route	Aesthetic	Shading from sun	Evaporative cooling	Trapping air pollutants	Noise absorption	Habitat for wildlife	Corridor for wildlife	Soil stabilisation	Heritage	Cultural asset	Carbon storage	Food production	timber production	Biofuels production	Wind shelter	Learning	Inaccessible water storage	Accessible water storage	Water interception	Water infiltration	Coastal storm protection	Water conveyance	Pollutant removal from soil/water	Flow reduction through surface roughness	
TYPE	Park or public garden	S1	-	S6	S3 7	A	S5 1	A	S5 1	S5 2	S1 9	S2 2	S2 3	S2 4	A	S5 1	-	-	-	S5 1	S3 3	S3 8	-	-	S4 1	-	S4 3	S4 6	-	
	General amenity space	A	-	-	-	A	S5 1	A	S5 1	S5 2	S1 9	S2 2	S2 3	S2 4	S3 5	S5 1	-	-	-	S5 1	-	S3 8	-	-	S4 1	-	S4 3	S4 6	-	
	Outdoor sports facility	S2	-	S7	-	A	-	A	-	-	S1 9	S2 2	S2 3	S2 4	-	-	-	-	-	-	S3 3	S3 8	-	-	S4 1	-	S4 3	S4 6	-	
	Woodland	S3	S8	S5	S3 7	A	A	A	A	S1 7	A	S2 2	S2 3	S2 5	S2 8	A	-	A	A	A	S3 3	A	-	S4 0	S4 1	S4 2	S4 3	A	A	
	Water course	A	-	-	S3 7	A	-	A	-	-	S1 9	S2 2	-	S2 6	-	-	-	-	-	-	-	-	S5 6	-	-	-	-	A	S4 7	-
	Water body	S4	S8	S5	S3 7	A	-	A	-	-	S1 9	S2 2	-	S2 4	-	-	-	-	-	-	-	-	S5 6	-	-	-	-	S4 5	S4 7	-
	Grassland, heathland, moorland or scrubland	S3	-	-	S3 7	A	S5 1	A	S5 1	S5 2	S1 9	S2 2	S2 3	S2 4	-	S2 9	-	-	-	S5 1	-	S3 8	-	-	S4 1	S4 2	S4 3	S4 6	A	
	Coastal habitat	A	-	-	S3 7	A	-	A	-	-	S1 9	S2 2	S2 3	S2 4	-	-	-	-	-	-	-	S3 8	-	-	S4 1	S4 2	S4 3	S4 6	-	
	Agricultural land	-	-	-	S3 7	A	-	A	-	-	S2 0	S2 2	-	S2 4	-	-	A	-	S3 1	-	-	S3 8	-	-	S4 1	-	S4 3	S4 6	-	
	Allotment, community garden or urban farm	S5	-	S3 6	S3 7	A	-	A	-	-	S1 9	S2 2	-	S2 4	-	-	A	-	-	-	S3 4	S3 8	-	-	S4 1	-	S4 3	S4 6	-	
Cemetery, churchyard or burial ground	A	-	-	S3 7	A	S5 1	A	S5 1	S5 2	S1 9	S2 2	S2 3	S2 4	A	S5 1	-	-	-	S5 1	-	S3 8	-	-	S4 1	-	S4 3	S4 6	-		

	Derelict land	-	-	-	-	A	-	A	-	-	S1 9	S2 2	S2 3	S2 4	-	-	-	-	-	-	-	S3 8	-	-	S4 1	-	S4 3	S4 6	-
	Private domestic garden	-	A	-	-	A	S5 1	A	S5 1	S5 2	S1 9	S2 2	S2 3	S2 4	-	S5 1	-	-	-	S5 1	-	S3 8	-	-	S4 1	-	S4 3	S4 6	-
	Institutional grounds	-	-	-	-	A	S5 1	A	S5 1	S5 2	S1 9	S2 2	S2 3	S2 4	-	S5 1	-	-	-	S5 1	S3 3	S3 8	-	-	S4 1	-	S4 3	S4 6	-
	Wetland	-	-	-	S3 7	A	-	A	-	-	A	S2 2	S2 3	S2 4	-	-	-	-	-	-	A	-	-	-	S4 2	S4 4	A	A	
	Orchard	S3	-	S5 5	S3 7	A	A	A	A	S1 7	A	S2 2	S2 3	S2 4	A	A	A	-	-	A	-	A	-	S4 0	S4 1	-	S4 3	A	S4 8
	Street trees	-	-	-	S3 7	A	A	A	A	S1 7	A	S2 2	S2 3	S2 7	-	A	-	-	-	A	-	S3 9	-	S4 0	S3 9	-	-	S3 9	-
	Green roof	S4 9	S 8	-	-	A	S5 0	A	S5 1	S5 2	A	-	-	-	S5 3	S5 1	S5 3	-	-	S5 0	S5 3	S5 4	-	-	-	-	-	A	-

WHEN		DATASETS / HOW TO IDENTIFY
1	Most, except when have to pay for access or restricted opening	Open space survey / local knowledge / visual interpretation
2	Most, except when have to pay for access or restricted opening (e.g. golf courses)	Open space survey / local knowledge / visual interpretation
3	If open access land	Open space survey / Woods for People / local knowledge / visual interpretation
4	If adjacent to open access land	Other types
5	Community gardens may have public access without restrictions	Open space survey / local knowledge / visual interpretation
6	E.g. formal gardens with entrance fee	Open space survey / local knowledge / visual interpretation
7	E.g. golf courses...	Open space survey / local knowledge / visual interpretation
8	If private / no public access	Other types / local knowledge / visual interpretation
17	Proximity to major roads, airports, railway lines	Main roads, railway lines and airport, proximity = 250m (based on anecdotal evidence)
19		Designated sites (if has centre in), ponds
20	When managed for nature	Countryside stewardship / agri-environment scheme (if has centre in) (limited as data is whole farm scale) OR designated (as above)
22	Depending on connectivity	Buffer of 10m around and including habitats (if intersects by >10%)

23	Areas prone to erosion	When steep slopes > 7° (from DTM) (very high risk of water erosion when combined with sandy soils & high risk of runoff/soil wash on all soils, upland areas especially with slopes and peaty soils at high risk - from DEFRA guidance) OR land in floodplains (DEFRA guidance says at least 1 in 3 yr flooding, best available dataset is EA flood zone 3, which is 100 year for rivers & 200 year for the sea)
24	Formal designation or veteran trees	World Heritage Site / scheduled monuments / English Heritage parks & gardens / battlefields / heritage coast / orchards: old according to local knowledge / TMF veteran trees
25	Ancient woodland	Natural England dataset
26	Canals (and canalised rivers)	
27	Ancient or veteran trees	TMF veteran trees
28	E.g. if concerts are put on there	Google / local knowledge
29	If occur on peaty soils OR significant tree cover	NATMAP Soils (Peaty') (if intersects) OR significant tree cover
31	Biofuels growing	Aerial photograph interpretation - bright yellow fields (will be limited by timing of photos)
33	When visitor centre exists OR grounds of educational establishment	Ordnance Survey mapping
34	When urban farm	MasterMap annotation / local knowledge
35	Village greens	DEFRA Village Green database 1993
36	Unless publicly accessible with no restrictions	Open space survey / local knowledge / visual interpretation
37	Likely to have a significant impact on use of green travel routes (by proximity)	Within 2m of MasterMap Path/Roadside, PRow or Sustrans route
38	Water stored in soil or SUDS substrate	If soil has high porosity (NATMAP Soils) or one of the following SUDS is present (which are specifically designed to store water in substrate): swale, detention basin, infiltration trench or basin, bioretention/rain garden or sand filter
39	Planted in open ground	Visual interpretation
40	Trees are of significant size	Visual interpretation: canopy closure test where appropriate
41	Soil has high infiltration rate or trees of significant size present (roots increase infiltration)	Visual interpretation: canopy closure test where appropriate
42	On coast and sufficient width of perpendicular to it	If there is a sufficient total width (10m) of semi-natural types perpendicular to the coast and intersecting a 100m buffer of it
43	Suitable SUDS or other open air drain present	If one of the following SUDS, or other open air drain (MasterMap annotation), is present: filter drain, filter strip, swale, infiltration trench

44	Suitable SUDS or other open air drain present, or water flows through	If one of the following SUDS, or other open air drain (MasterMap annotation), is present: filter drain, filter strip, swale, infiltration trench; or water flows through (i.e. linked to water courses)
45	Water flows through	If water flows through (i.e. linked to water courses)
46	Suitable SUDS or high levels of vegetation	If one of the following SUDS, or high levels of vegetation (visual interpretation), present: bioretention, sand filter, infiltration/filter trench or basin, swale
47	Suitable SUDS or vaguely natural	If vaguely natural (visual interpretation) or one of the following SUDS is present: bioretention, sand filter, infiltration/filter trench or basin, swale
48	Dense vegetation	If vegetation is dense enough (visual interpretation)
49	If publicly accessible	Open space survey / local knowledge / visual interpretation
50	If includes trees	Visual interpretation
51	If significant tree cover	Visual interpretation
52	Significant tree cover and proximity to major roads, airports, railway lines	Main roads, railway lines and airport, proximity = 250m (based on anecdotal evidence), visual interpretation of tree cover
53	If designed accordingly	Local knowledge / visual interpretation
54	If substrate thick enough to grow trees	Local knowledge / visual interpretation
55	If entrance fee or restricted opening hours	Open space survey / local knowledge / visual interpretation
56	If not salt water	MasterMap attribution

14.3.31. The number of functions performed by each polygon was also then calculated to give multifunctionality.

14.4. Benefits

14.4.1. The functions that green infrastructure performs lead to benefits for humans and other species. A list of these that is widely accepted has been developed by the Natural Economy Northwest programme²¹⁶.

- Climate change adaptation and mitigation
- Flood alleviation and water management
- Quality of place
- Health and well-being
- Land and property values
- Economic growth and investment
- Labour productivity
- Tourism
- Recreation and leisure
- Land and biodiversity
- Products from the land

14.4.2. For mapping purposes, climate change adaptation and mitigation are separated because the functions that lead to them are different. Where the benefits are currently provided they can be mapped by creating multifunctionality maps based on subsets of the complete function list. The network of causality between functions and benefits is very complicated, but it is possible to identify those functions that most directly and undeniably lead to each benefit. The following table illustrates this relationship.

²¹⁶ <http://www.natureconomyNorthwest.co.uk/download.php?The Economic Value of Green Infrastructure.pdf>

Table 34 Function and benefit matrix

[illegible]

14.4.3. In addition, this study has identified five long term objectives for the city inspired by the benefits that green infrastructure can provide. Where green infrastructure is already contributing to four of these, objectives can be mapped in a similar way to the benefits, whereas the fifth is more overarching and cannot be spatially articulated in this way. The following table indicates which functions correspond to which objectives, based on the actions proposed in pursuit of the latter.

Table 35 Function and objective matrix

PRIORITY		FUNCTION																							
		Recreation - public	Recreation - private	Recreation - public with restrictions	Green travel route	Aesthetic	Shading from sun	Evaporative cooling	Trapping air pollutants	Noise absorption	Habitat for wildlife	Corridor for wildlife	Soil stabilisation	Heritage	Cultural asset	Carbon storage	Food production	Timber production	Biofuels production	Wind shelter	Learning	Inaccessible water storage	Accessible water storage	Water interception	Water infiltration
	A Sustainable City																								
	A City Providing Natural Choices for Health																								
	A Cool City																								
	A Green and Biodiverse City																								

14.5. Needs

14.5.1. In order to plan interventions, it is necessary to know where there is particular need for each function, as well as where they are currently performed. Therefore the areas where there is the greatest need for each function were identified. Because need is not necessarily linked to provision, this mapping was carried out independently from the previous stages and the MasterMap Topography Layer. The following table explains how greatest need was mapped for each function.

Table 36 Thresholds for identification of need

FUNCTION	THRESHOLDS
Recreation - public	Reverse Access to Natural Green Space Standard score (see section 14.5.2) > 8 or percentage households without a car >70% or Index of Multiple Deprivation health score >2.5 or percentage population aged 0 - 15 >25% or city centre
Recreation - private	Reverse Access to Natural Green space Standard score > 8 or percentage households without a car >70% or Index of Multiple Deprivation health score >2.5 or percentage population aged 0 - 15 >25% or city centre
Recreation - public with restrictions	Reverse Access to Natural Green space Standard score > 8 or percentage households without a car >70% or Index of Multiple Deprivation health score >2.5 or percentage population aged 0 - 15 >25% or city centre
Green travel route	Population movement gradient >70°
Aesthetic	100m buffer of key gateways, 25m buffer of Environmental Improvement Corridors
Shading from sun	Lower Layer Super Output Areas with population density >10,000km ⁻² in 2008, 2014 or 2024, >500 population with limiting long-term illness, >30% population aged 65+ (male) or 60+ (female), or >25% population aged 0 - 15, Grade 1 agricultural land, 100m buffer of schools, 100m buffer of city, district, local and neighbourhood centres and out-of-centre facilities
Evaporative cooling	Urban Lower Layer Super Output Areas with >500 population with limiting long-term illness, >30% population aged 65+ (male) or 60+ (female), or >25% population aged 0 - 15
Trapping air pollutants	Population density >5,000km ⁻² in 2008, 2014 or 2024 and Core Biodiversity Areas, both within 100m of motorways or A roads
Noise absorption	Population density >5,000km ⁻² in 2008, 2014 or 2024 within 30m of motorways, A roads or railways
Habitat for wildlife	Core Biodiversity Areas, Connectivity Zone
Corridor for wildlife	Connectivity Zone
Soil stabilisation	Slope >4° or Flood Zone 3 or 'sandy' soil
Heritage	50m buffer of existing heritage functionality
Cultural asset	Population density >7,000km ⁻² in 2008, 2014 or 2024
Carbon storage	Everywhere equal
Food production	Best and most versatile agricultural land

Timber production	5km buffer of potential timber station sites
Biofuels production	1km buffer of areas with energy use >50GWh/km ²
Wind shelter	Average wind speed >5.5m/s at 10m above ground level
Learning	Population density >7,000km ⁻² in 2008, 2014 or 2024, 100m buffer of educational establishments
Inaccessible water storage	Upstream of historical flooding
Accessible water storage	Upstream of historical flooding, 100m buffer of most multifunctional green infrastructure, 100m buffer of best and most versatile agricultural land
Water interception	Upstream of historical flooding
Water infiltration	Upstream of historical flooding
Coastal storm protection	Population density >1,000km ⁻² in 2008, 2014 or 2024 within 500m of the coast
Water conveyance	Downstream of historical flooding, best and most versatile agricultural land
Pollutant removal from soil/water	Best and most versatile agricultural land
Flow reduction through surface roughness	Upstream of historical flooding

14.5.2. The reverse Access to Natural Green space Standard (ANGSt) score was calculated as follows.

- Estimated population figures for 2008 were obtained from the Office for National Statistics.
- Housing projection figures for 2014 and 2024 were obtained from Merseyside Information Service and used to estimate population figures for those years.
- Focal statistics calculations were run on population densities for each of the three years to each of the four distances quoted in the ANGSt documentation (300m, 2km, 5km and 20km).
- The twelve resulting datasets were added together with equal weighting.

14.5.3. The population movement gradient used a hydrological model as an analogy for the movement of people through the city. Centres of population (both present and future) were made analogous to mountain peaks, and destinations (schools and centres of employment) were made analogous to low points in the terrain. A surface was interpolated and areas of greatest slope were considered to be where the greatest numbers of people would want to travel. This implies a bias towards short-range travel, which is the primary role of green travel routes.

14.6. Targeting

14.6.1. For each function, the mapping showing provision was compared with the need mapping. This effectively splits the city into four categories of land:

- Where there is particular need and the function is currently performed, potentially fulfilling the need – these areas of land are green infrastructure assets and their functionality should be protected
- Where there is particular need but the function is not currently performed – which should be remedied by suitable creation or enhancement of green infrastructure
- Where there is no particular need but the function is currently performed – here the green infrastructure should also be protected if possible, because there is likely to be a lower level of need, which may increase in the future, and the functionality may be mitigating a lack of provision elsewhere
- Where there is no particular need and the function is not currently performed – no action required, except to take any opportunities that present themselves, for the reasons described above

14.6.2. Maps were also created showing the number of needs fulfilled and unfulfilled respectively, in total and relating to each priority.

14.6.3. These, together with the functionality and need mapping separately and some mapping of more specific needs, was then used to identify where each action should be targeted as a priority. This was carried out at a Middle Layer Super Output Area (MSOA) level. For each action (of those that can be sensibly spatially targeted – some relate more to city-wide policy etc.) thresholds were set within the need and provision data that gave a small number of MSOAs to prioritise. The data used and thresholds were as follows.

Table 37 Targeting criteria by MSOA

PRIORITY	ACTION	CRITERIA
A Sustainable City	1.1	Super Output Areas with <50% green infrastructure cover that intersect Strategic Investment Areas, Growth Point wards, HMR areas or Housing SPD Fringe Areas
	1.2	Super Output Areas with <30% green infrastructure cover in Environmental Improvement Corridors and near key gateways
	1.3	Super Output Areas with <5% green travel route functionality cover that intersect Growth Point wards, HMR areas or Housing SPD Fringe Areas
	1.4	Super Output Areas where five or more ANGSt or Space for People standards are not completely fulfilled
A City providing Natural Choices for Health	2.1	Super Output Areas with >10% derelict and vacant land
	2.2	Super Output Areas with <50% green infrastructure cover and hospitalised prevalence of mental health conditions >200
	2.3	Super Output Areas with >10% greatest need for trapping air pollutants cover, <5% of which is fulfilled
	2.4	Super Output Areas with <40% recreation functionality cover and hospitalised incidence coronary heart disease >150
	2.4	Super Output Areas with <40% recreation functionality cover and >20% population is obese
	2.4	Super Output Areas with <40% recreation functionality cover and hospitalised prevalence of diabetes >300
	2.5	Super Output Areas with <50% green infrastructure cover and 2 or more hospitals or health centres
& A Cool City	2.7	Super Output Areas with <5% green travel route functionality cover that intersect Growth Point wards, HMR areas or Housing SPD Fringe Areas
	3.1	Super Output Areas with <50% green infrastructure cover and >1000 population aged 65+
	3.1	Super Output Areas with <50% green infrastructure cover and >2000 population with limiting long-term illness
	3.1	Super Output Areas with <50% green infrastructure cover and >400 population aged 0 – 4
	3.2	Super Output Areas with SUDS targeting score >1
	3.4	Super Output Areas where tree cover is >2 percentage points lower than TMF Plan target
	3.5	Super Output Areas with <1% accessible water storage functionality cover and >10% high drought susceptibility green infrastructure cover
A Green Biodiverse City	3.10	Super Output Areas with >1km of culverted water courses and functional floodplain
	4.1	Super Output Areas with <1% Core Biodiversity Areas cover
	4.2	Super Output Areas with habitat connectivity score <0.001

14.6.4. Action targeting scores were assigned to each Core Strategy sub-areas by calculating the proportion of MSOAs intersecting the sub-area (by more than 10% of the MSOA's area) that had been identified for targeting. The sums of these action targeting scores were also calculated for each priority.

14.6.5. A habitat connectivity score was devised for this analysis and calculated as follows. A 100m grid of points was created, each of which was given a value of 1 if it was within a 50m buffer of the Core Biodiversity Areas from the sub-regional Ecological Framework (or within a Core Biodiversity Area itself), or a value of 0 if it wasn't. Then some code was written to

calculate how many connections there were between points within each MSOA, this was then divided by the number of connections there would be if the whole MSOA was covered by habitat, to give the connectivity score for the MSOA. A connection was counted for points with value 1 adjacent to each other, orthogonally or diagonally, and for points with value 1 connected via other points with value 1. So three points in a line, all with value 1, would give three connections out of a possible three, giving a score of 1. This method has been endorsed by the Merseyside Environmental Advisory Service.

14.6.6. A SUDS targeting score was also devised. This equates to the mean number of needs unfulfilled by existing functionality in the MSOA, only taking into account functions that can be performed by SUDS (inaccessible water storage, accessible water storage, water conveyance, pollutant removal from soil/water, flow reduction through surface roughness).

14.7. Mapping

14.7.1. The following sections provide the maps that have been produced based on the methodology described above.

14.7.2. The following table shows the datasets used for the mapping.

Table 38 Data sources

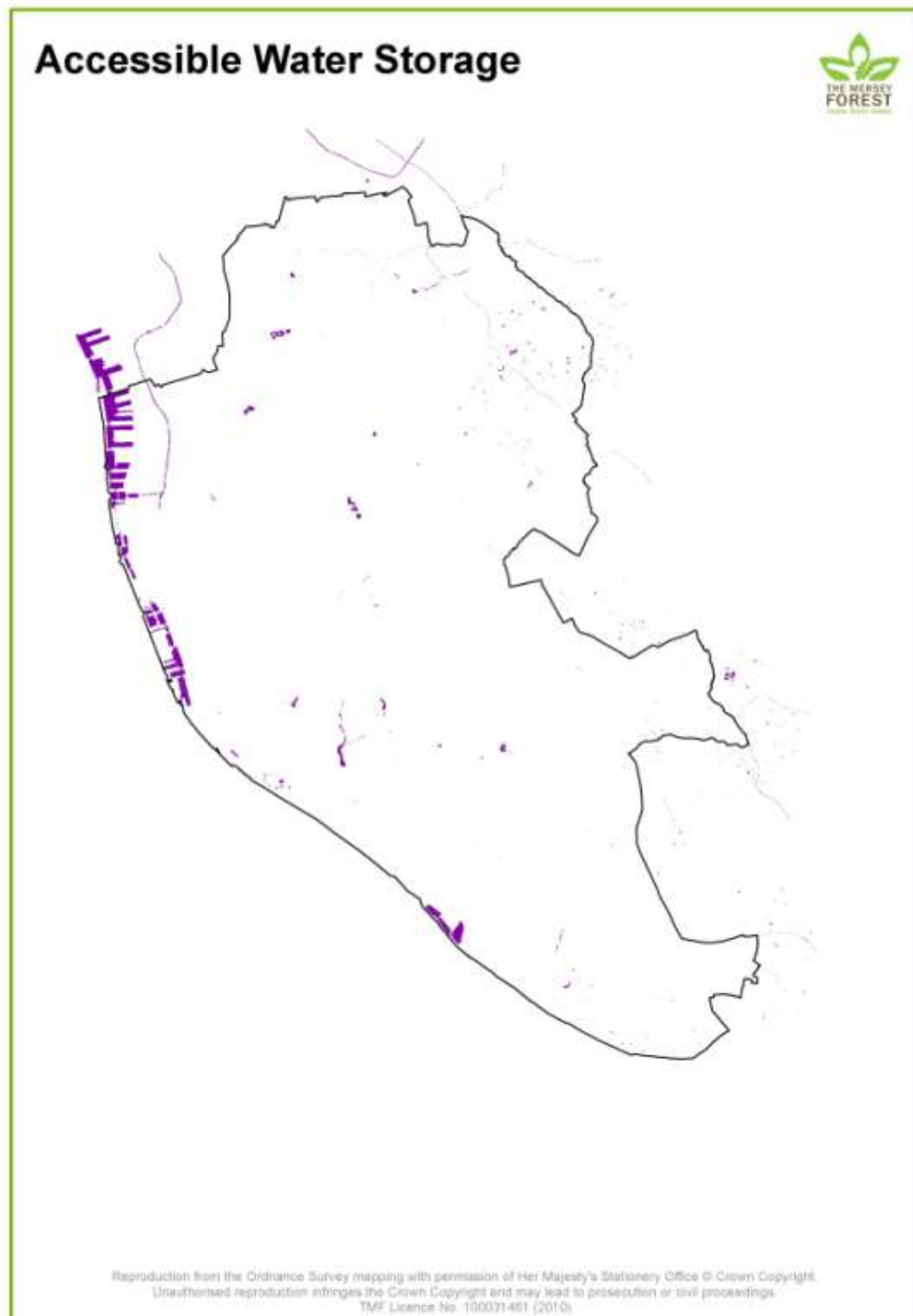
NAME		SOURCE	APPLICATION
MasterMap Layer	Topography	Ordnance Survey	Primarily typology & functionality mapping
Open Space Surveys		Liverpool City Council, Sefton Council, Knowsley Council, Halton Council, Wirral Council, St Helens Council, Warrington Council, Cheshire West and Chester Council	Primarily typology & ANGSt mapping
Aerial photography		Merseyside Information Service	Primarily typology & functionality mapping
1:25,000 raster mapping		Ordnance Survey	Primarily typology mapping
Woods for People		Woodland Trust	Functionality & ANGSt mapping
MasterMap Transport Layer	Integrated	Ordnance Survey	Functionality & needs mapping
Railways		ESRI	Functionality & needs mapping
Sites of Special Scientific Interest		Natural England	Functionality mapping
Local Nature Reserves		Natural England	Functionality & ANGSt mapping
Countryside Stewardship Agreements		Natural England	Functionality mapping
Land-Form Profile		Ordnance Survey	Functionality & needs mapping
Flood Zone 3		Environment Agency	Functionality & needs mapping
World Heritage Sites		English Heritage	Functionality mapping
Scheduled Ancient Monuments		English Heritage	Functionality mapping
Heritage Parks & Gardens		English Heritage	Functionality mapping

Ancient Woodlands	Natural England	Functionality mapping
NATMAP soilscapes	Cranfield University	Functionality & needs mapping
Village Greens	Defra	Functionality & ANGSt mapping
Public Rights of Way	Liverpool City Council, Sefton Council, Knowsley Council, Halton Council, Wirral Council, St Helens Council, Warrington Council, Cheshire West and Chester Council	Functionality & ANGSt mapping
Sustrans routes	Sustrans	Functionality & ANGSt mapping
Doorstep Greens	Natural England	ANGSt mapping
Agri-environment access routes	Natural England	ANGSt mapping
Agri-environment open access	Natural England	ANGSt mapping
Millennium Greens	Natural England	ANGSt mapping
Country Parks	Natural England	ANGSt mapping
National Nature Reserves	Natural England	ANGSt mapping
CRoW access land	Natural England	ANGSt mapping
Estimated populations 2008	Office for National Statistics	Needs mapping
Housing projections for 2014 & 2024	Merseyside Information Service	Needs mapping & targeting
Car ownership 2001	Office for National Statistics	Needs mapping
Indices of Multiple Deprivation 2007	Department for Communities & Local Government	Needs mapping
Broad age structure 2008	Office for National Statistics	Needs mapping & targeting
Core Strategy areas & sub-areas	Liverpool City Council	Primarily targeting
Educational establishments	Department for Children, Schools & Families	Needs mapping
Workplace populations 2001	Office for National Statistics	Needs mapping
Environmental Improvement Corridors	Liverpool City Council	Needs mapping & targeting
Limiting long-term illness 2001	Office for National Statistics	Needs mapping & targeting
Agricultural Land Classification	Natural England	Needs mapping
Likelihood of Best & Most Versatile Agricultural Land	Natural England	Needs mapping
City, district, local and neighbourhood centres and out-of-centre facilities	Liverpool City Council	Needs mapping
Core Biodiversity Areas	Merseyside Environmental Advisory Service	Needs mapping & targeting
Connectivity Zone	Merseyside Environmental Advisory Service	Needs mapping

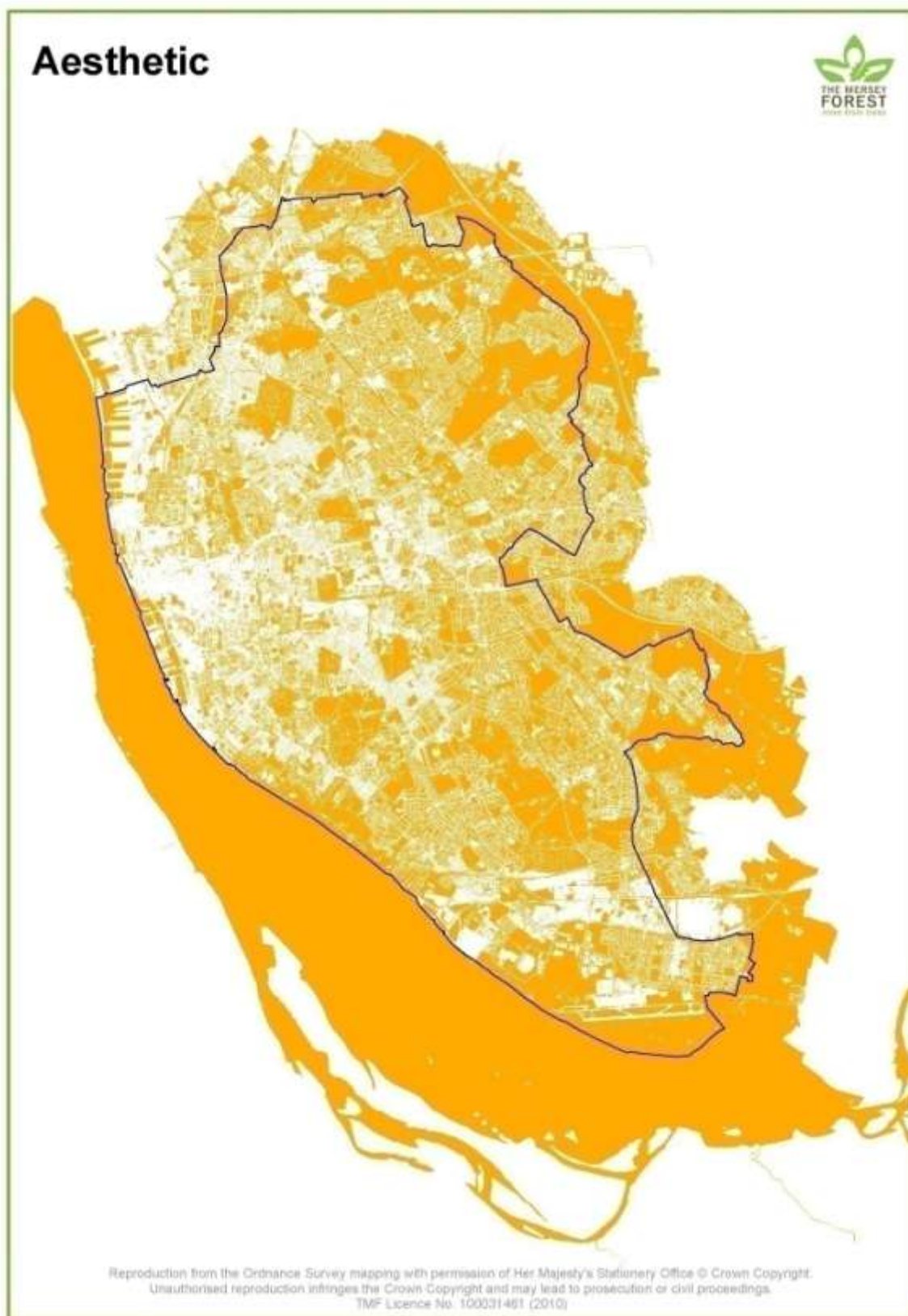
Summary Valuations 2005	Valuation Office Agency	Needs mapping
Wind Speed Database	Department for Business, Enterprise & Regulatory Reform	Needs mapping
Historical flooding	Liverpool City Council	Needs mapping
Housing Market Renewal areas	Liverpool City Council	Targeting
Derelict & vacant land	Liverpool City Council	Targeting
Hospitalised prevalence of mental health conditions	North West Public Health Observatory	Targeting
Hospitalised incidence of coronary heart disease	North West Public Health Observatory	Targeting
Obesity 2004	Office for National Statistics	Targeting
Hospitalised prevalence of diabetes	North West Public Health Observatory	Targeting
Hospitals & health centres	National Health Service	Targeting
Culverted watercourses	Liverpool City Council	Targeting
Functional floodplain	Liverpool City Council	Targeting

14.8. Functions Maps

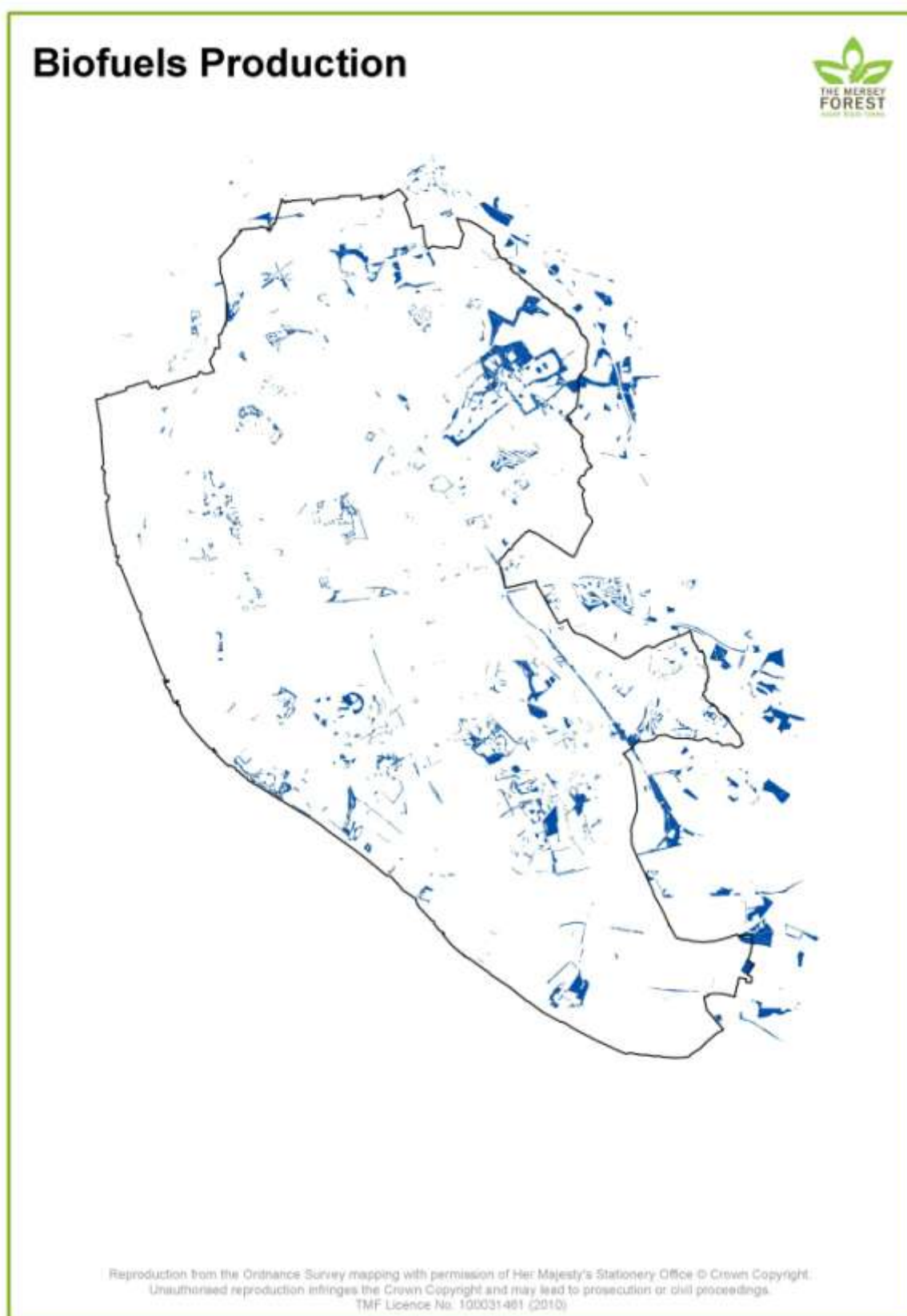
Map 35 Accessible Water Storage Function



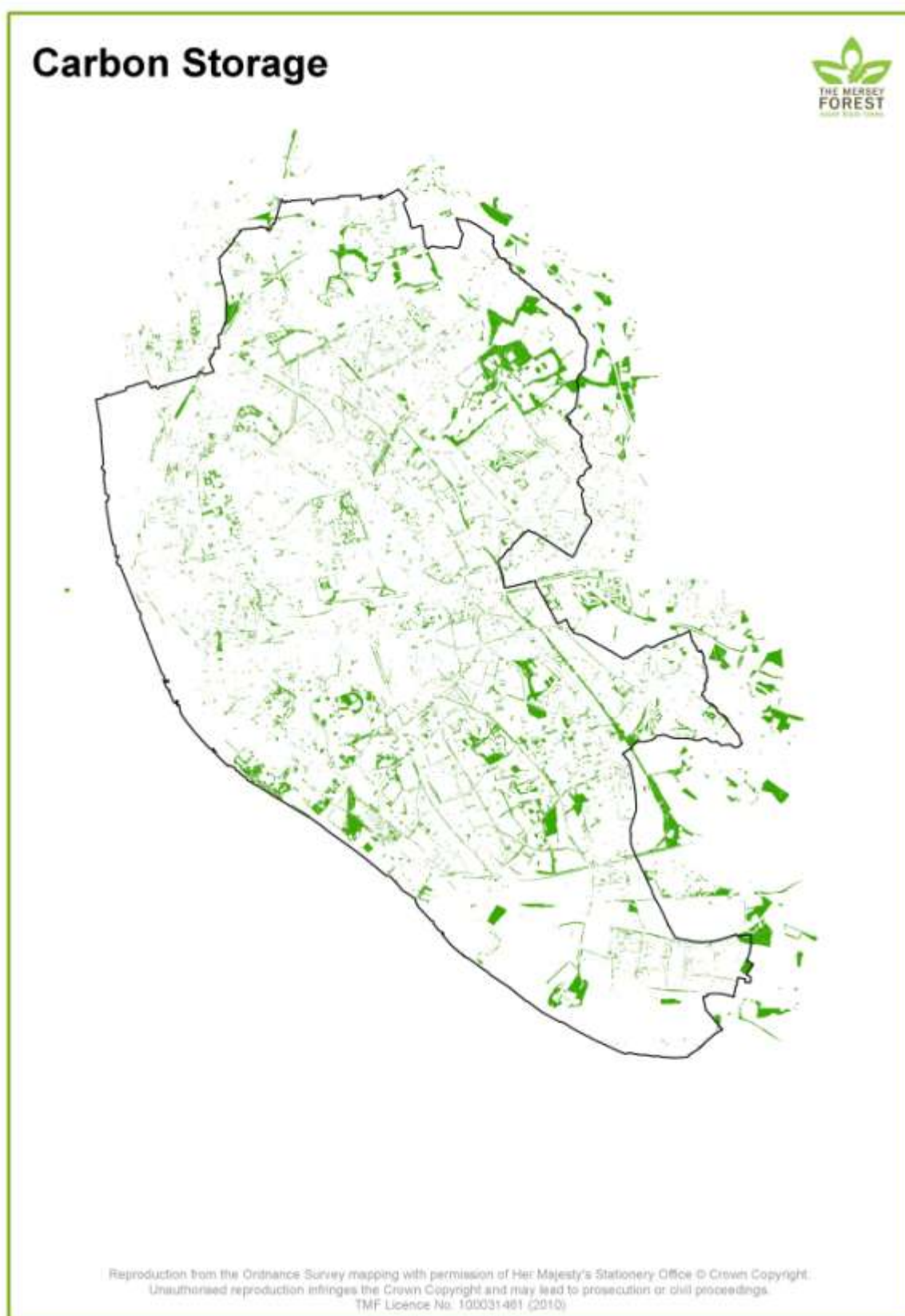
Map 36 Aesthetic Function



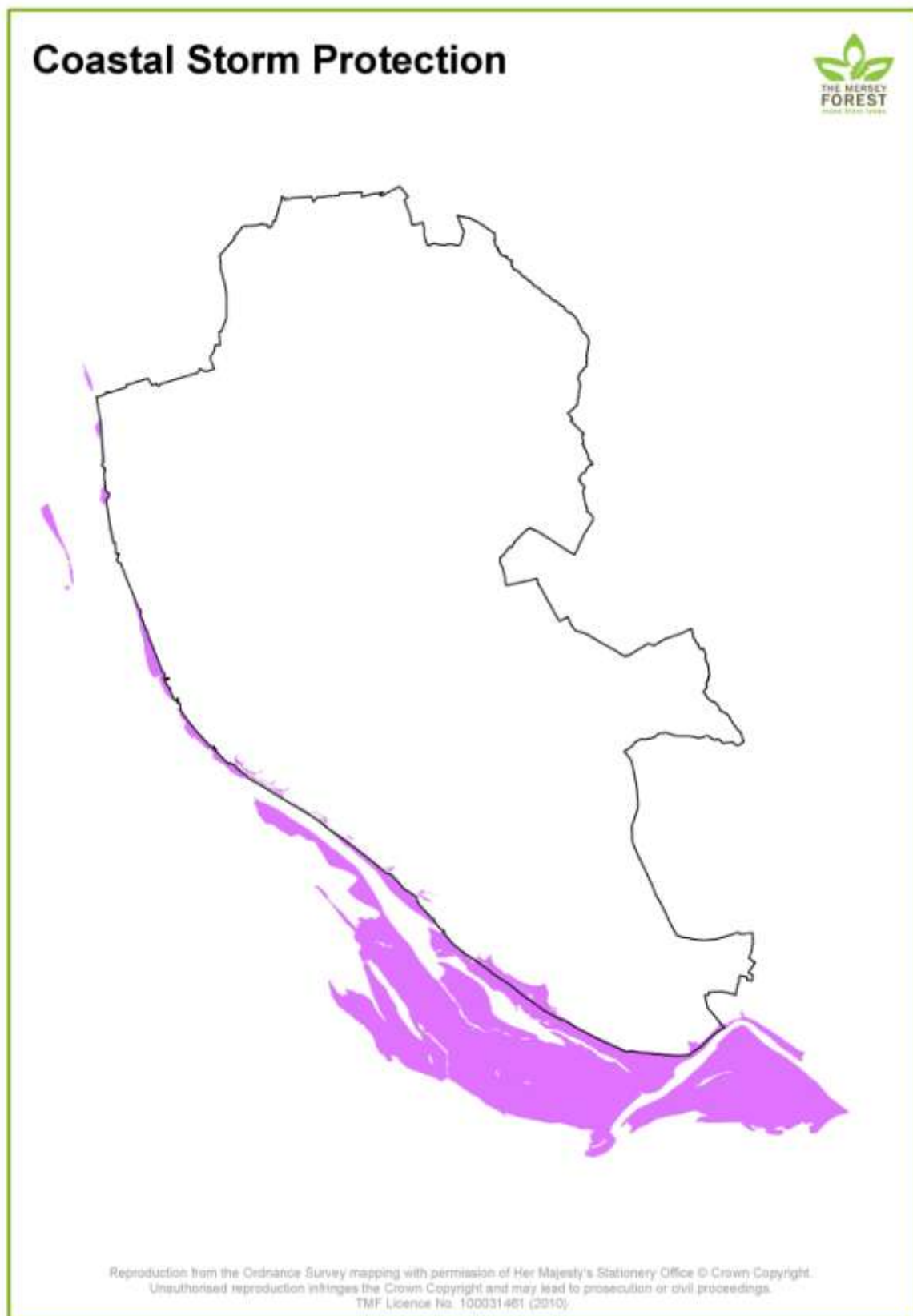
Map 37 Biofuels Production Function



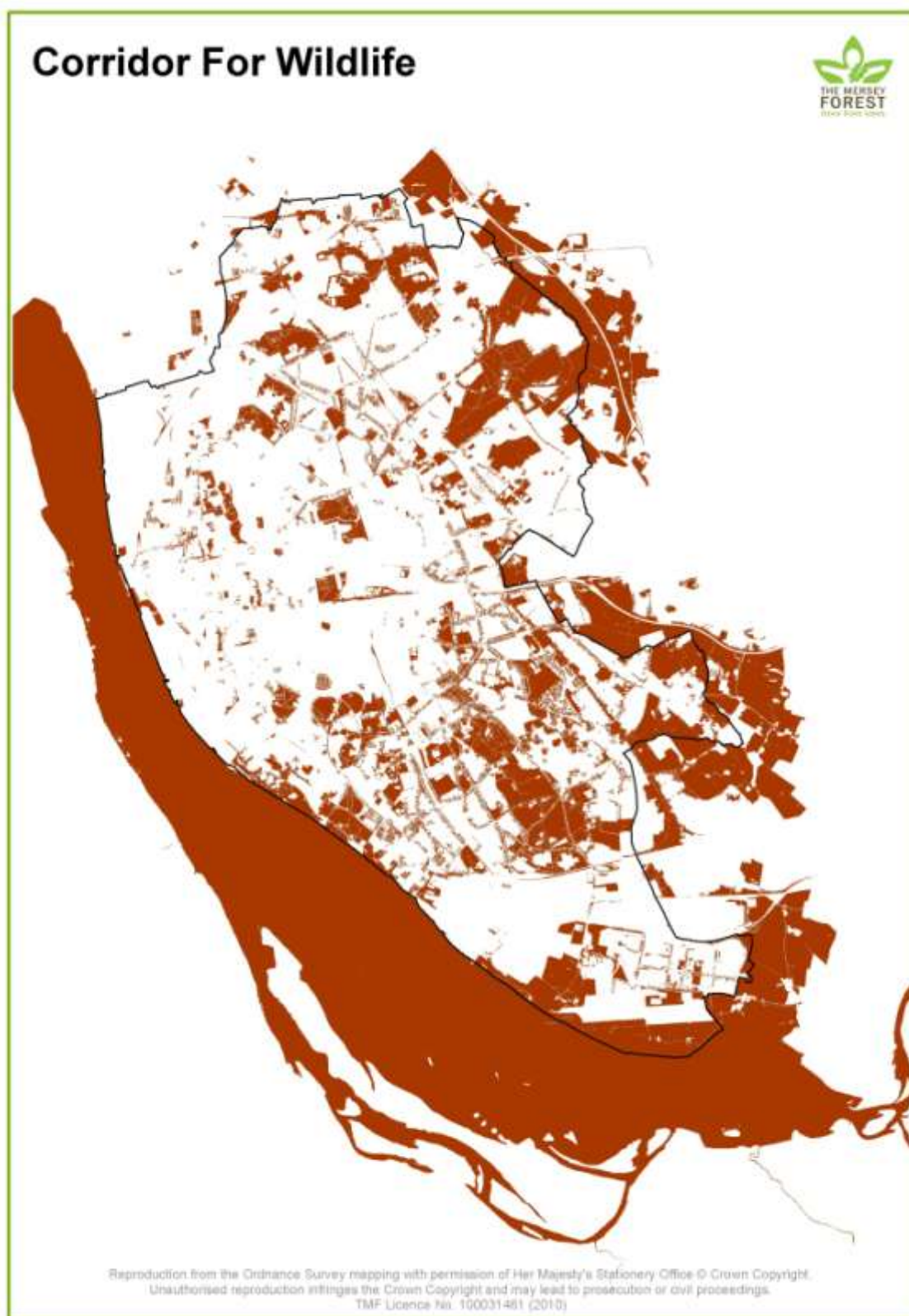
Map 38 Carbon Storage Function



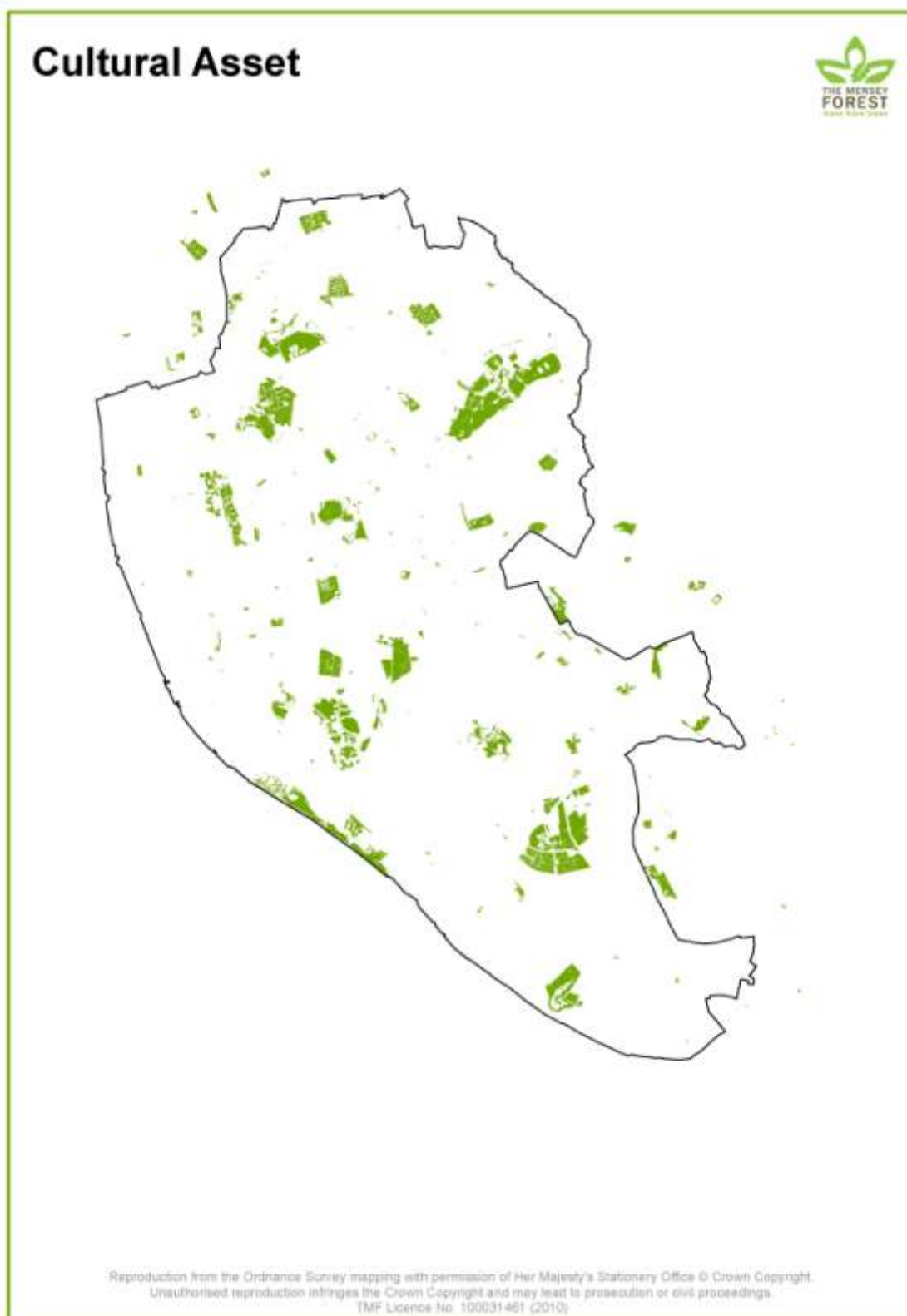
Map 39 Coastal Storm Protection Function



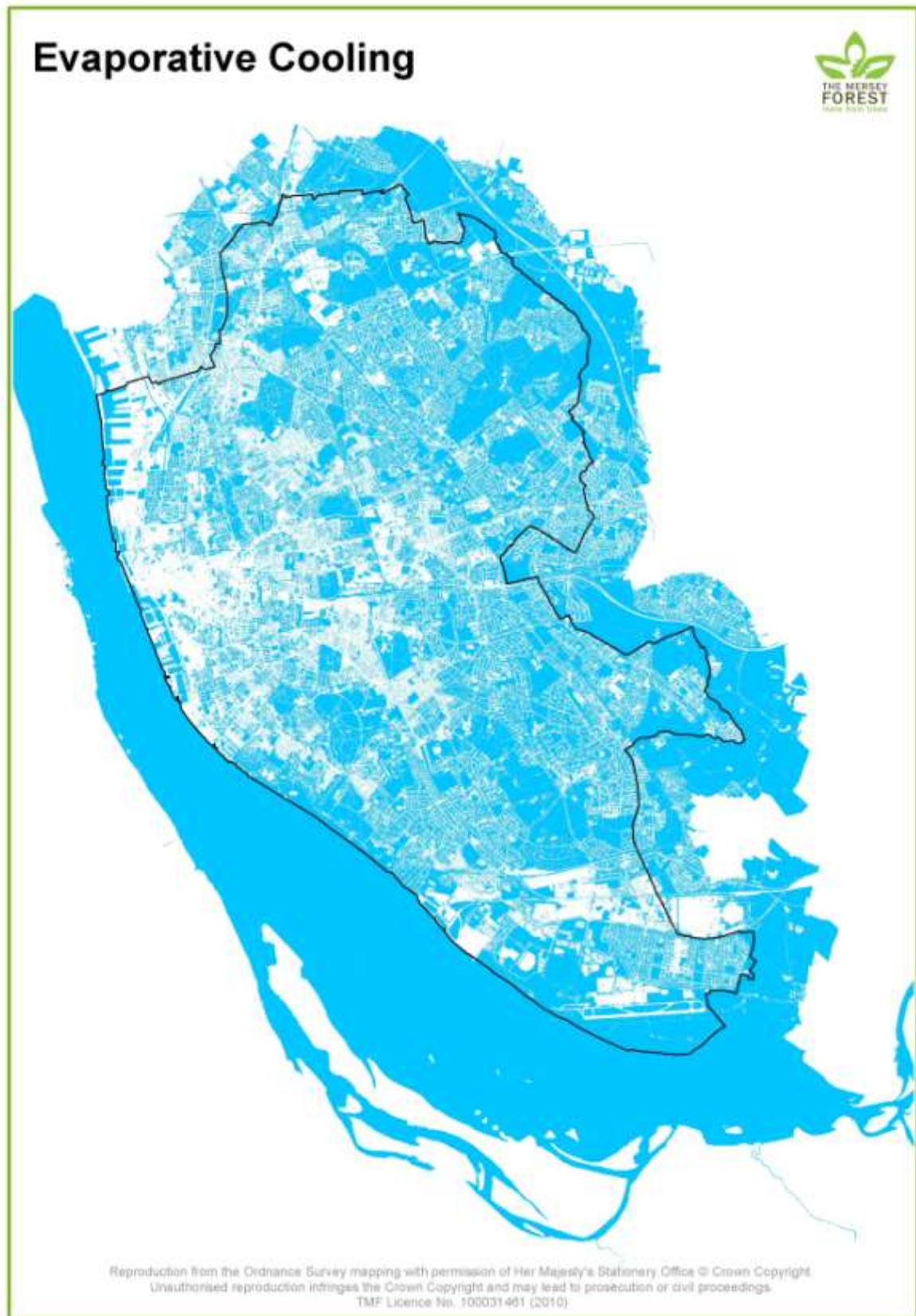
Map 40 Corridor for Wildlife Function



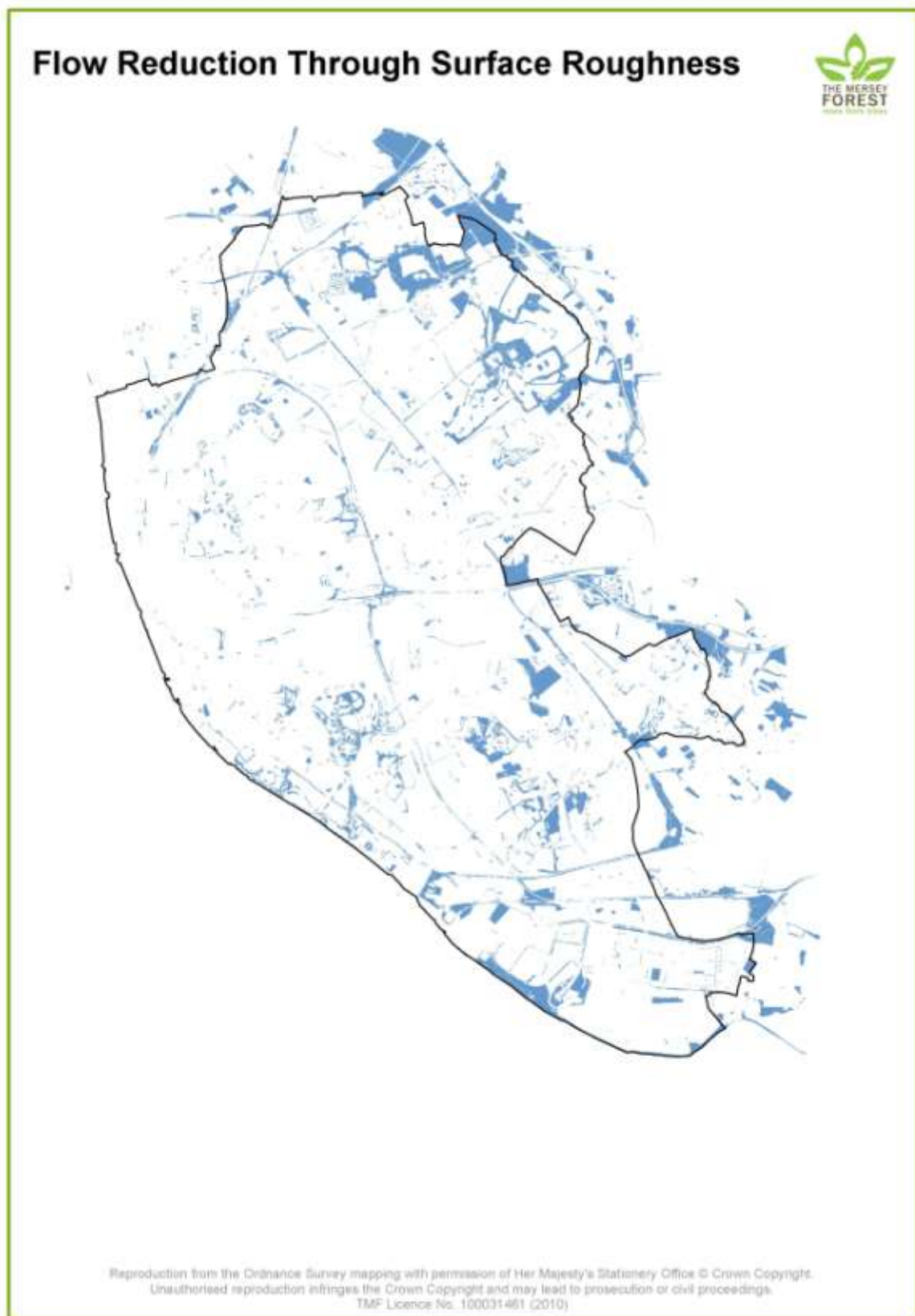
Map 41 Cultural Asset Function



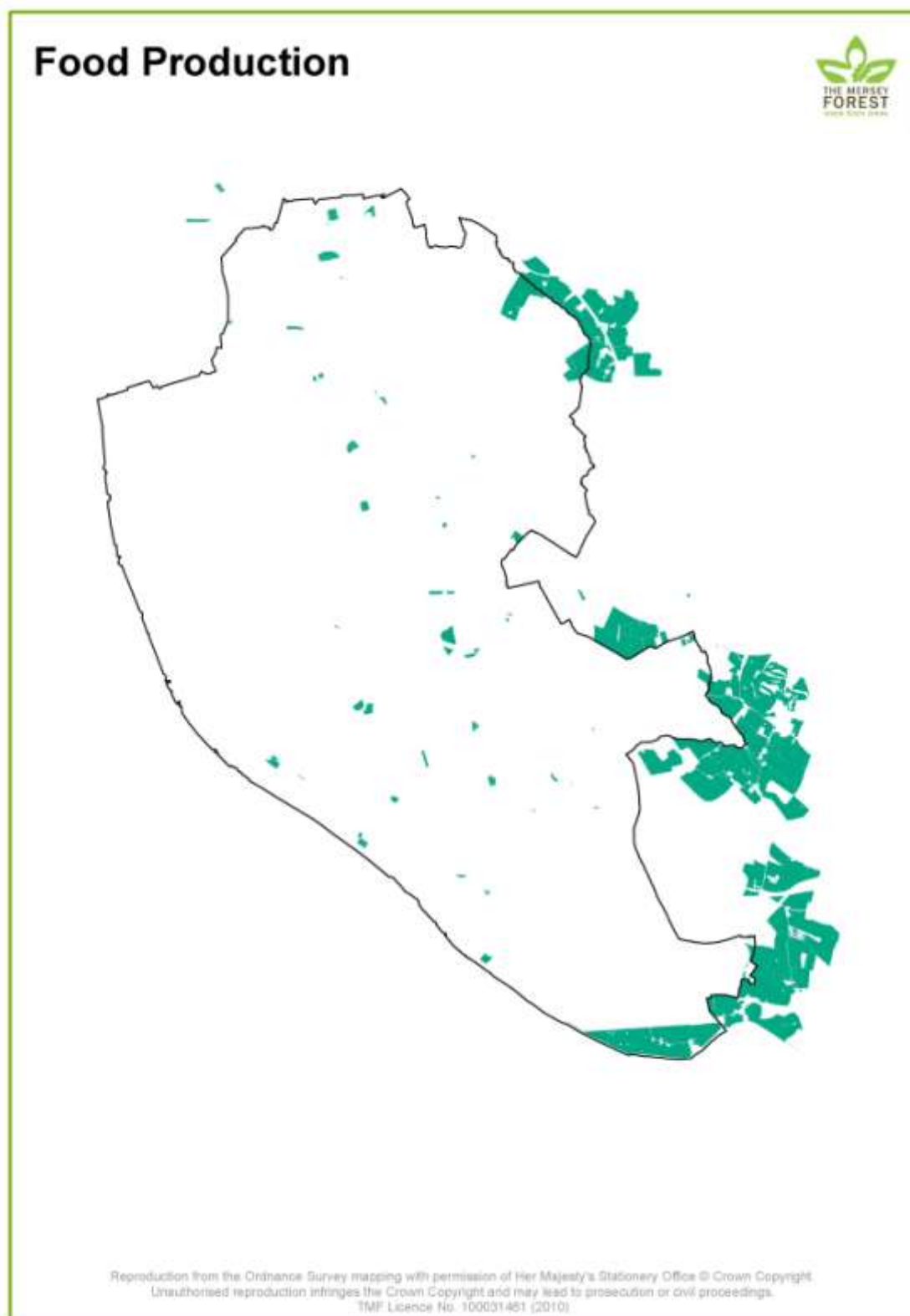
Map 42 Evaporative Cooling Function



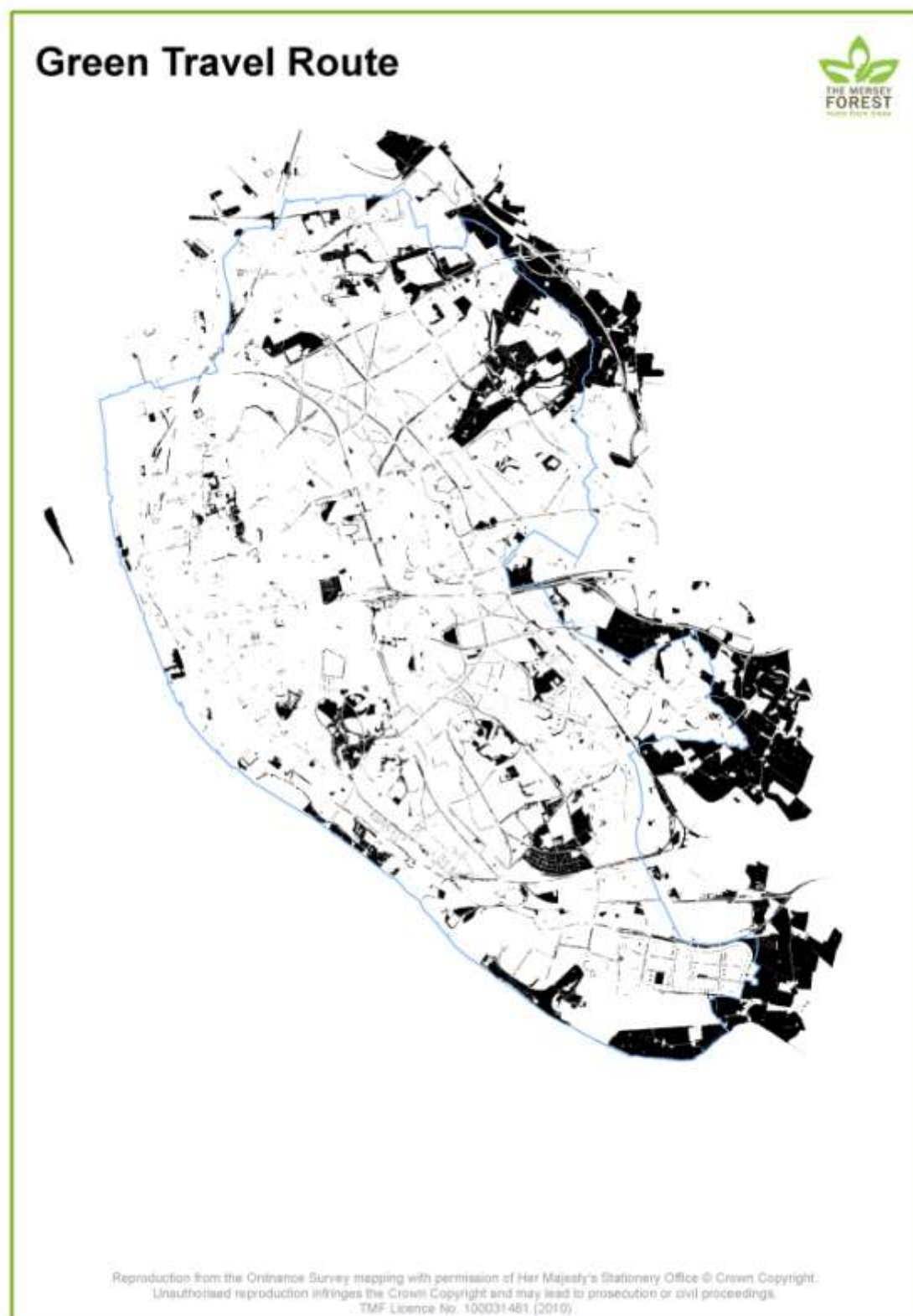
Map 43 Flow Reduction Through Surface Roughness Function



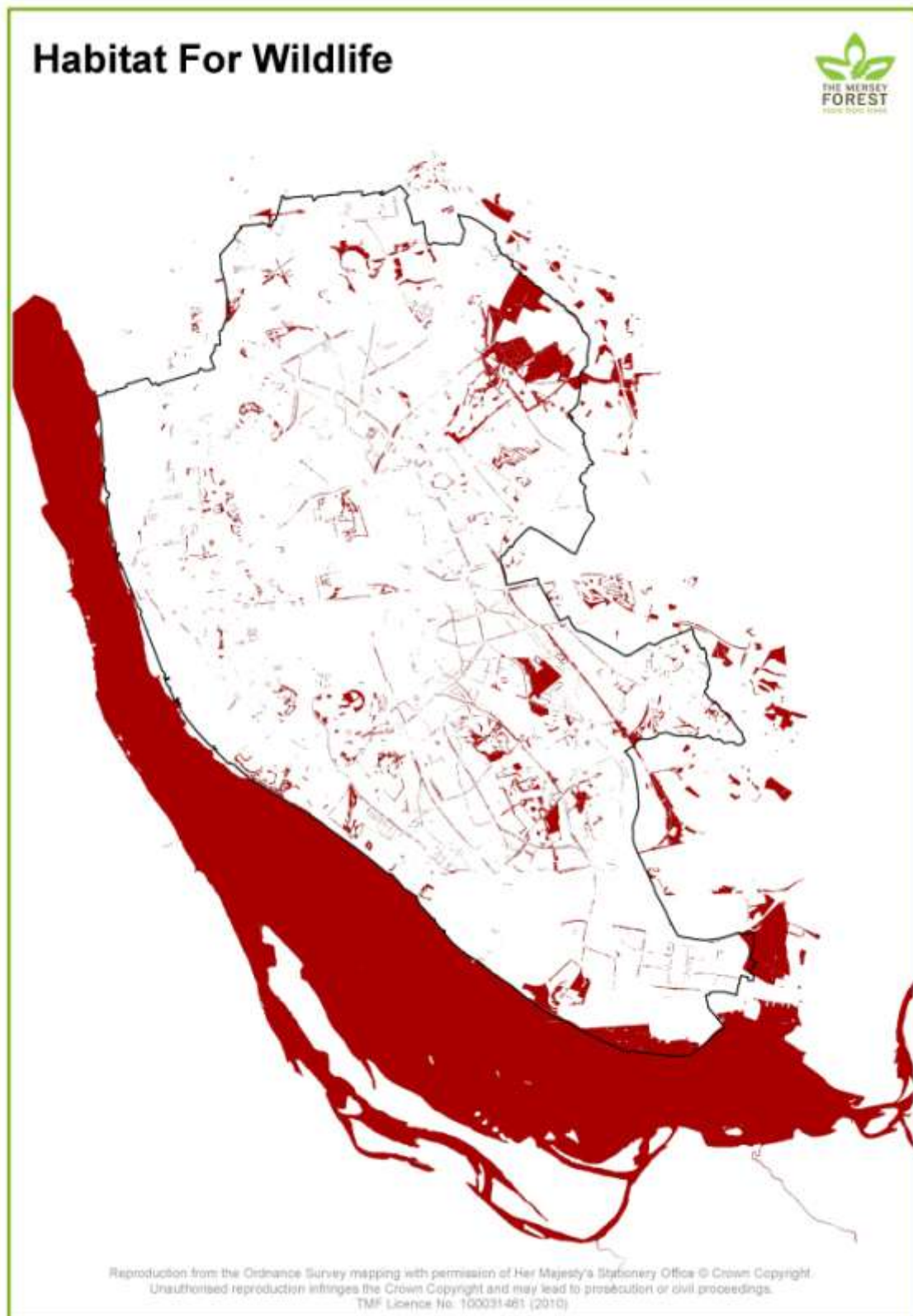
Map 44 Food Production Function



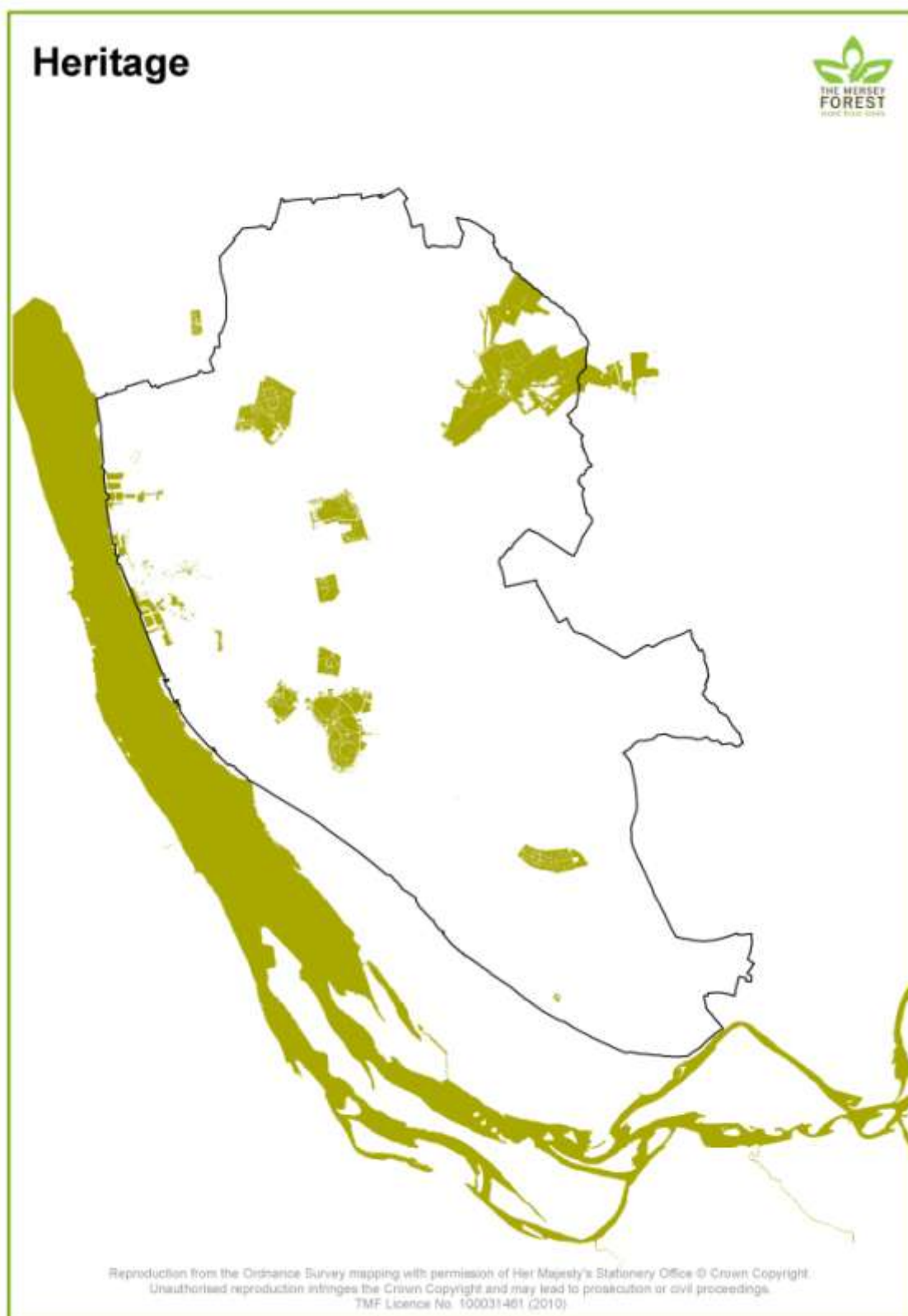
Map 45 Green Travel Route Function



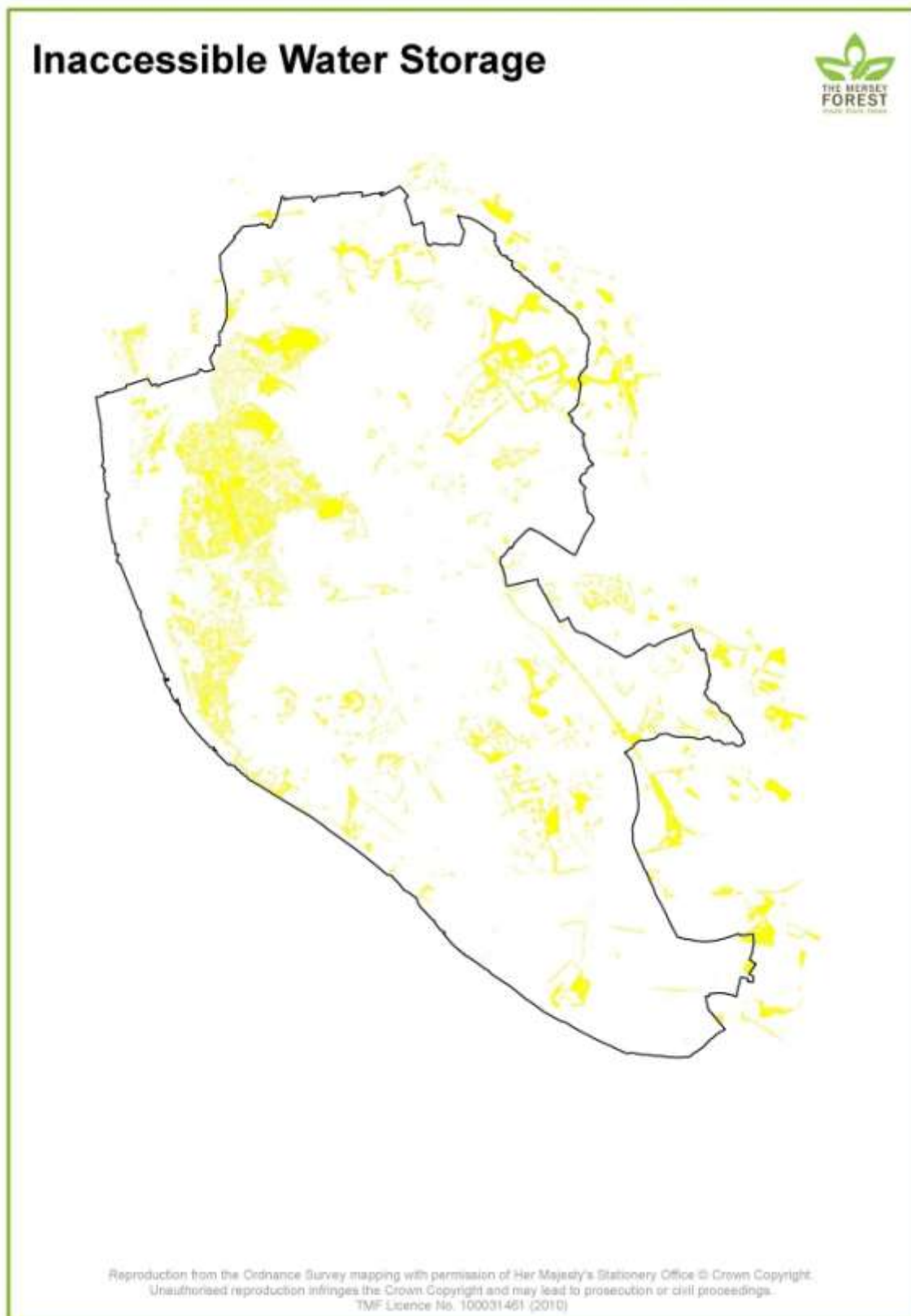
Map 46 Habitat for Wildlife Function



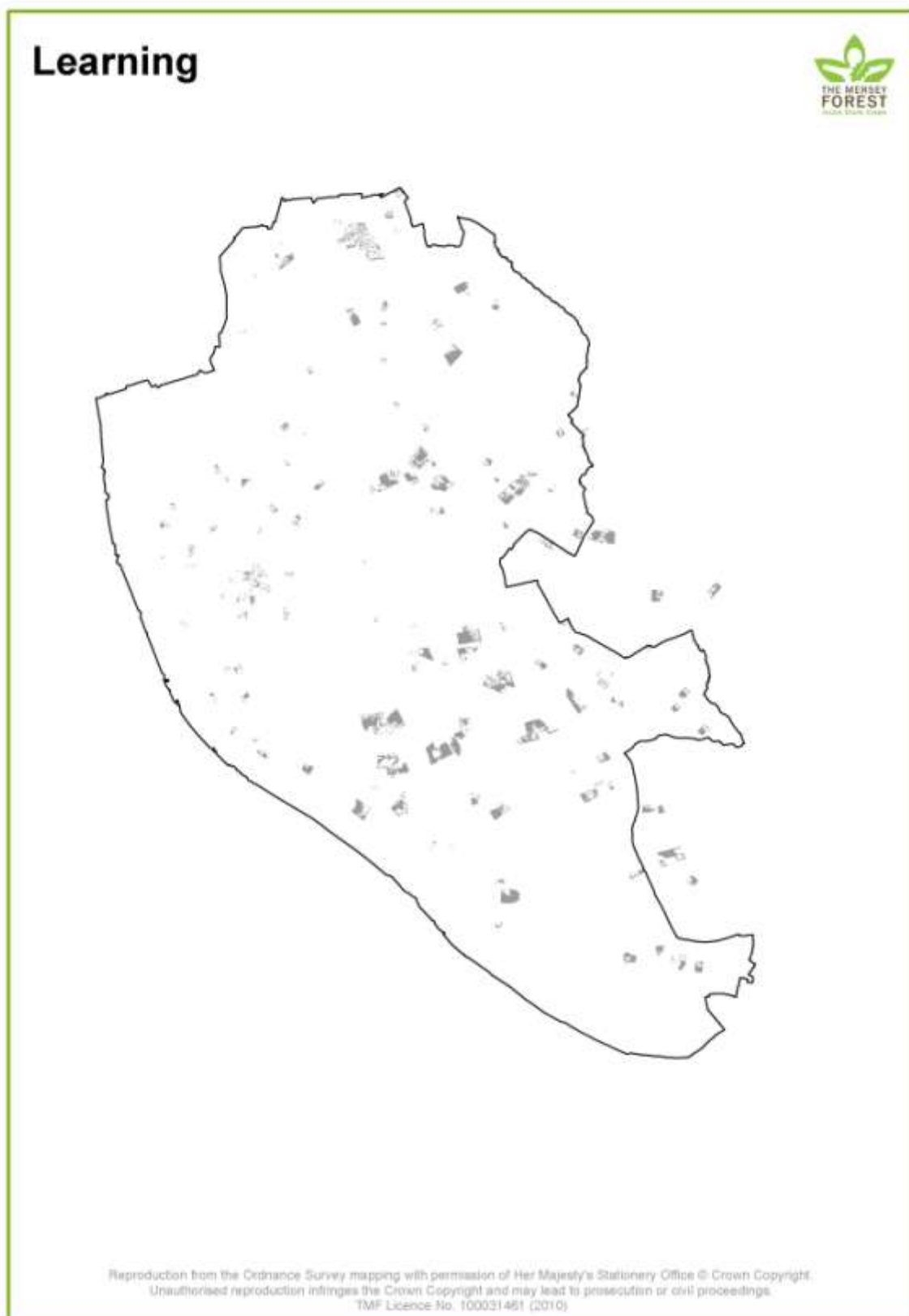
Map 47 Heritage Function



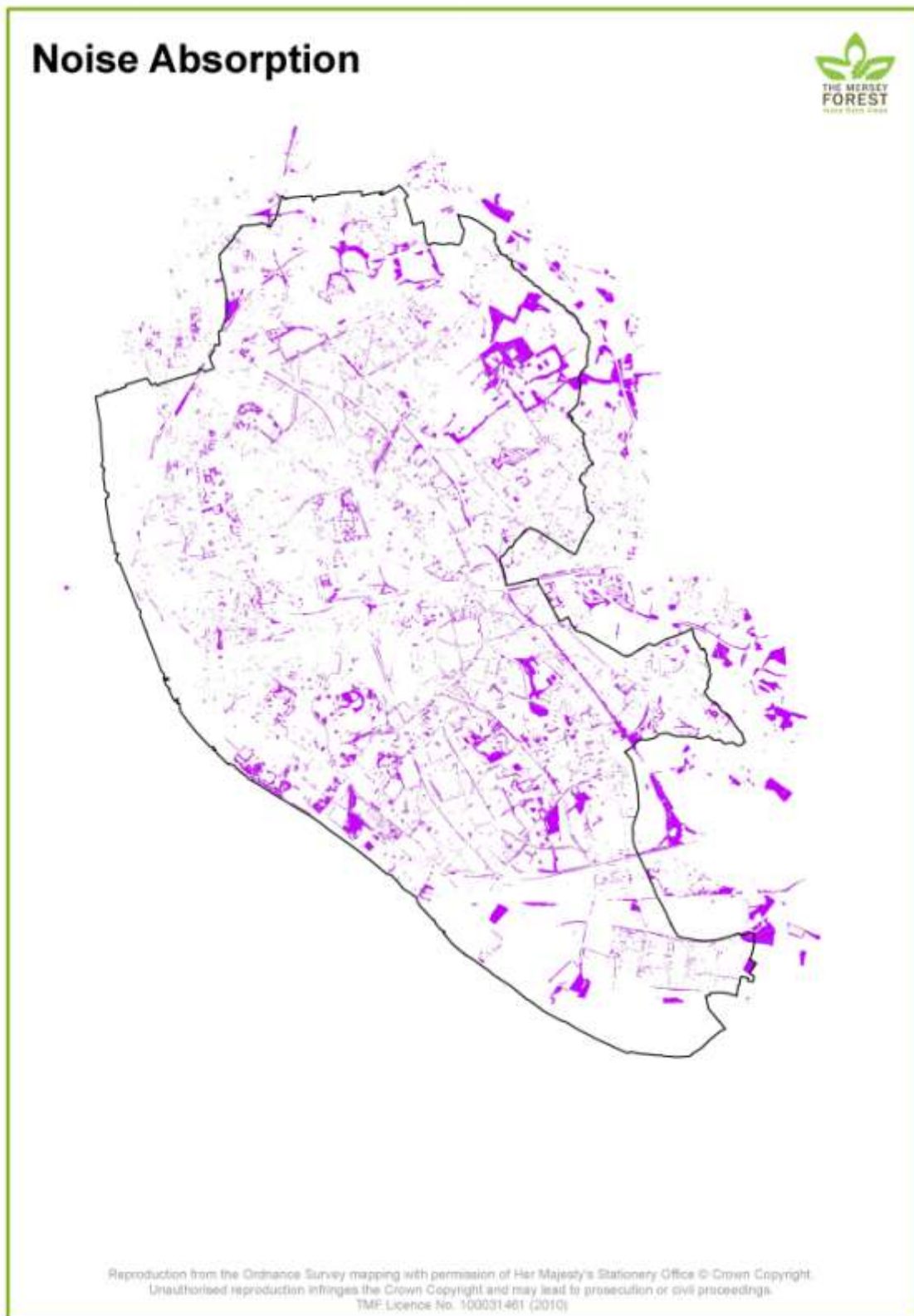
Map 48 Inaccessible Water Storage Function



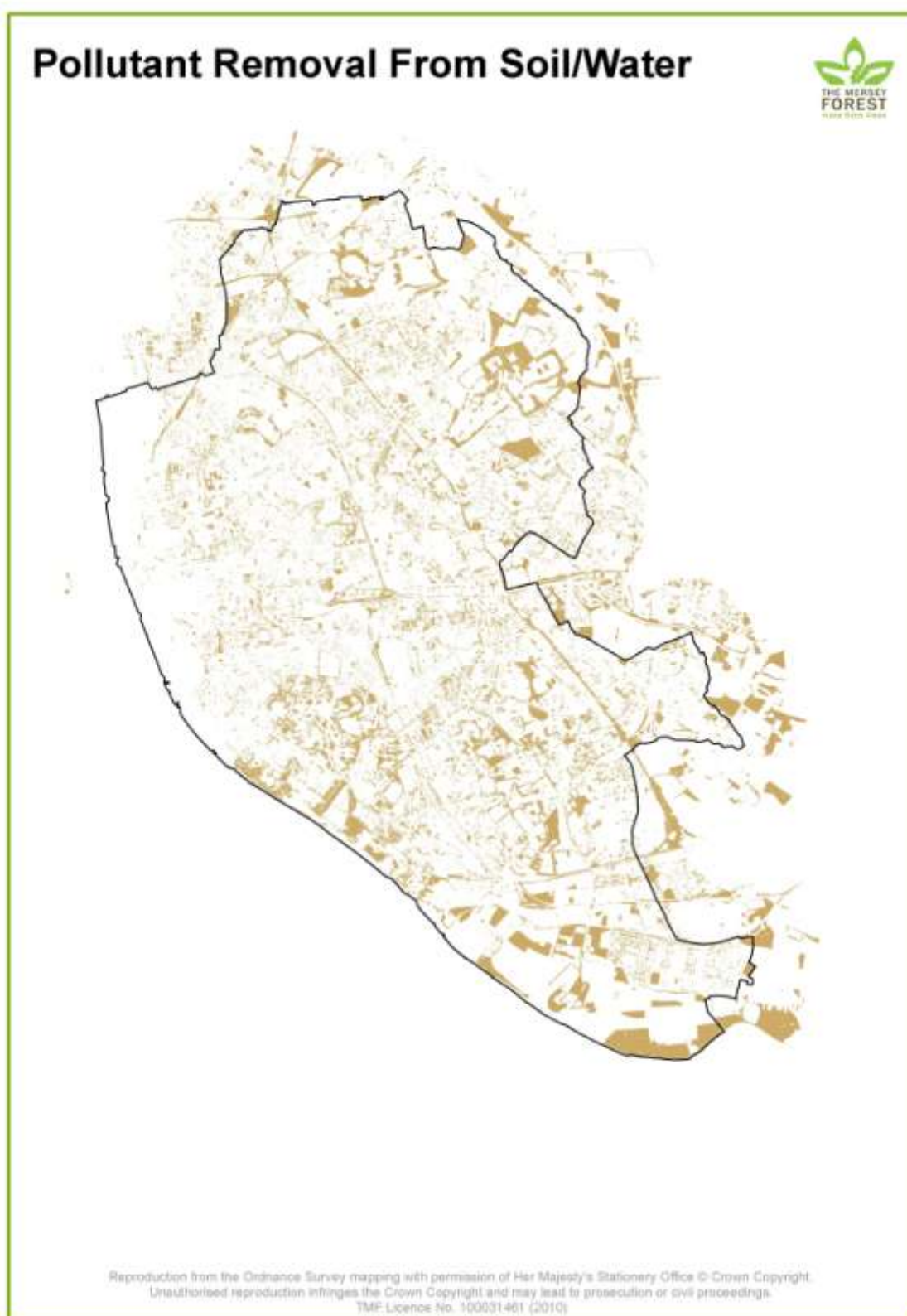
Map 49 Learning Function



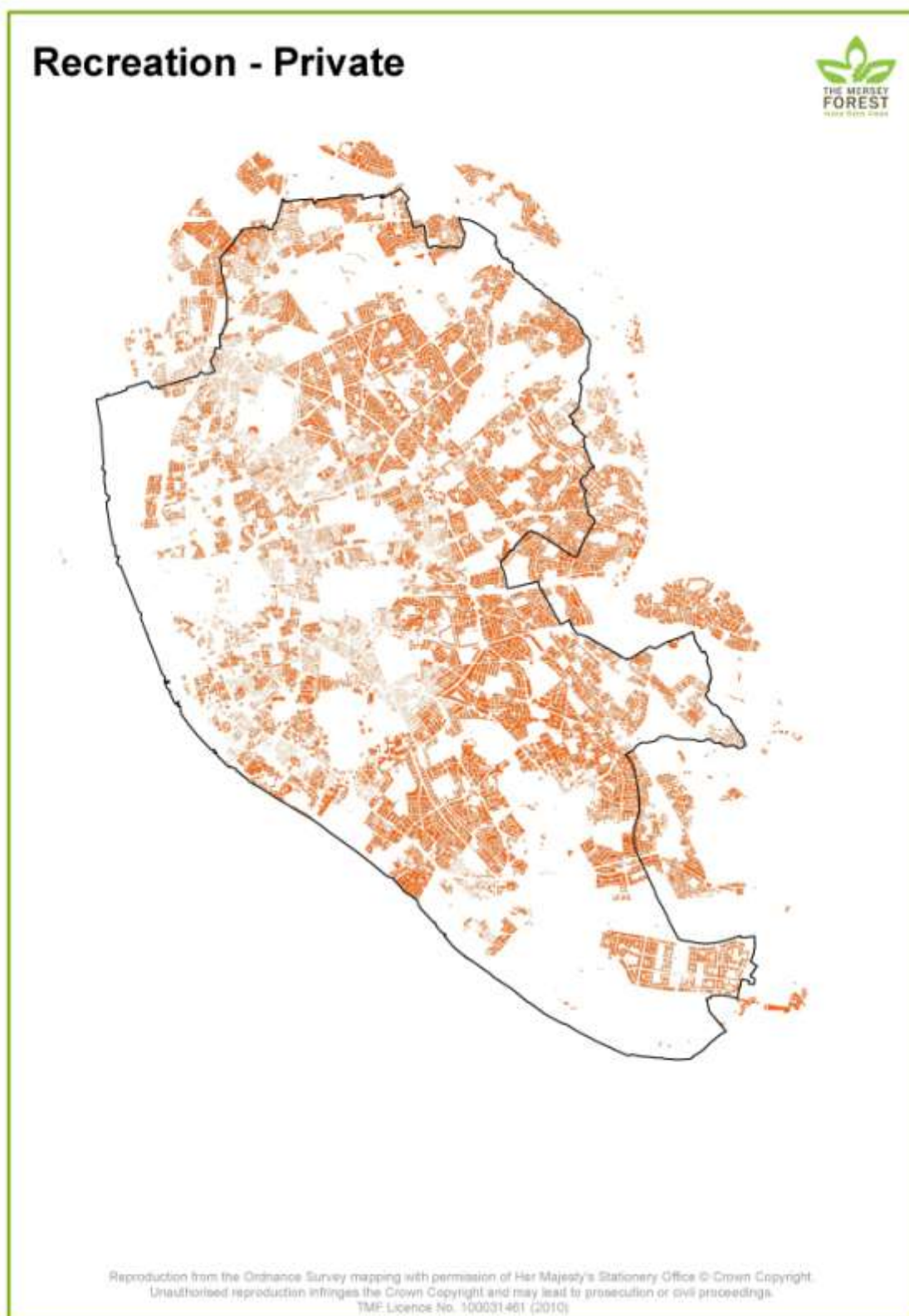
Map 50 Noise Absorption Function



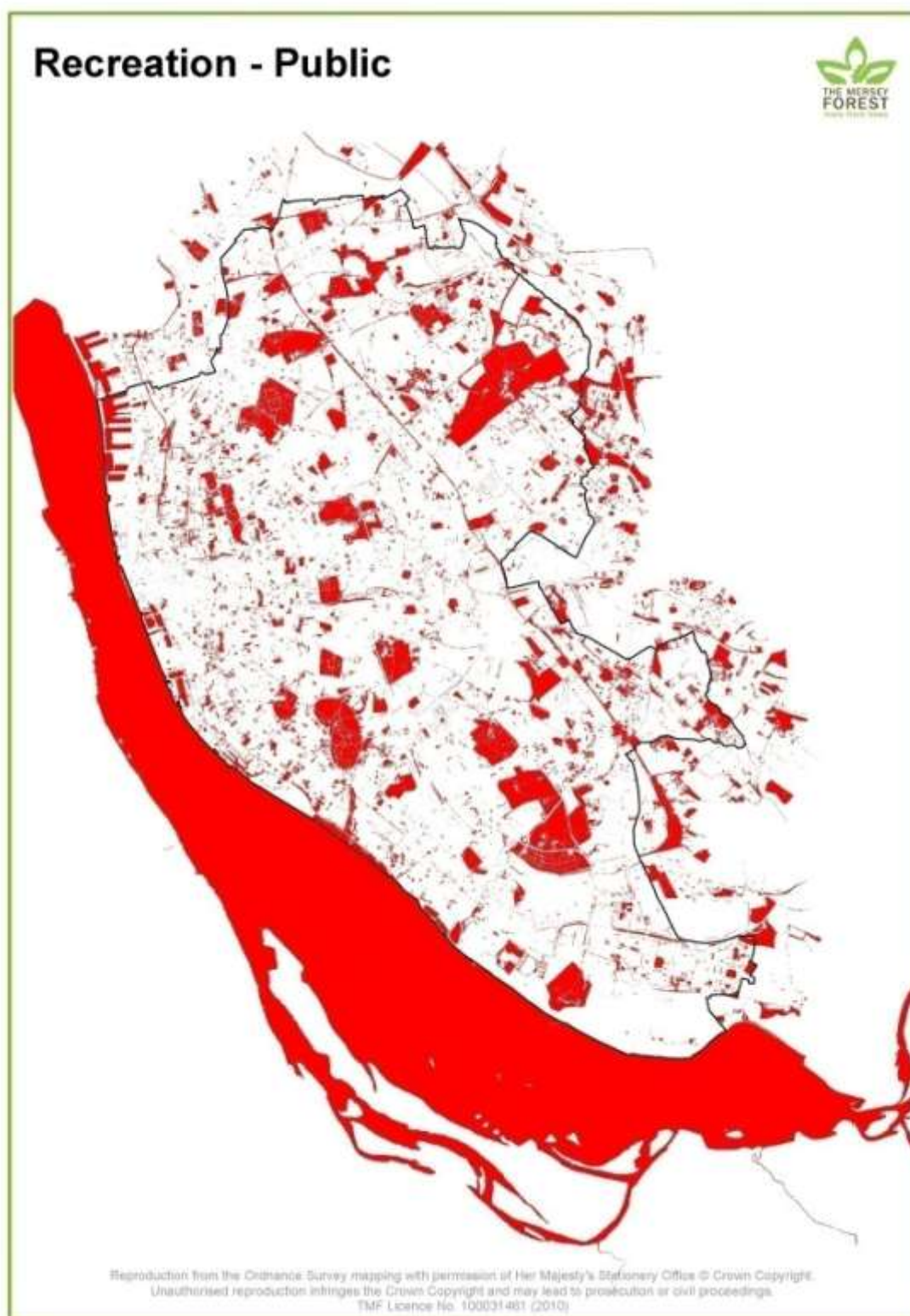
Map 51 Pollutant Removal From Soil/Water Function



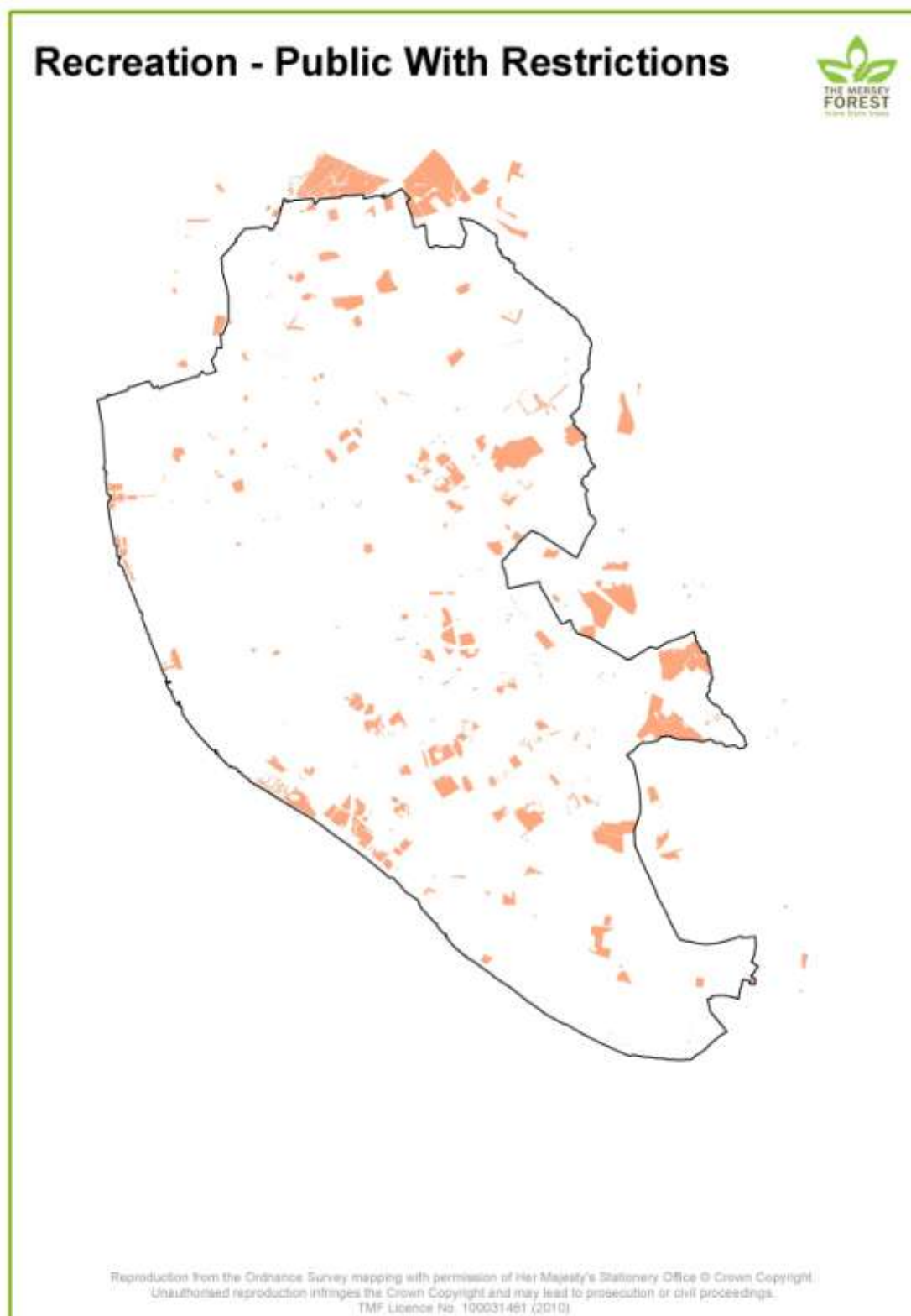
Map 52 Recreation – Private Function



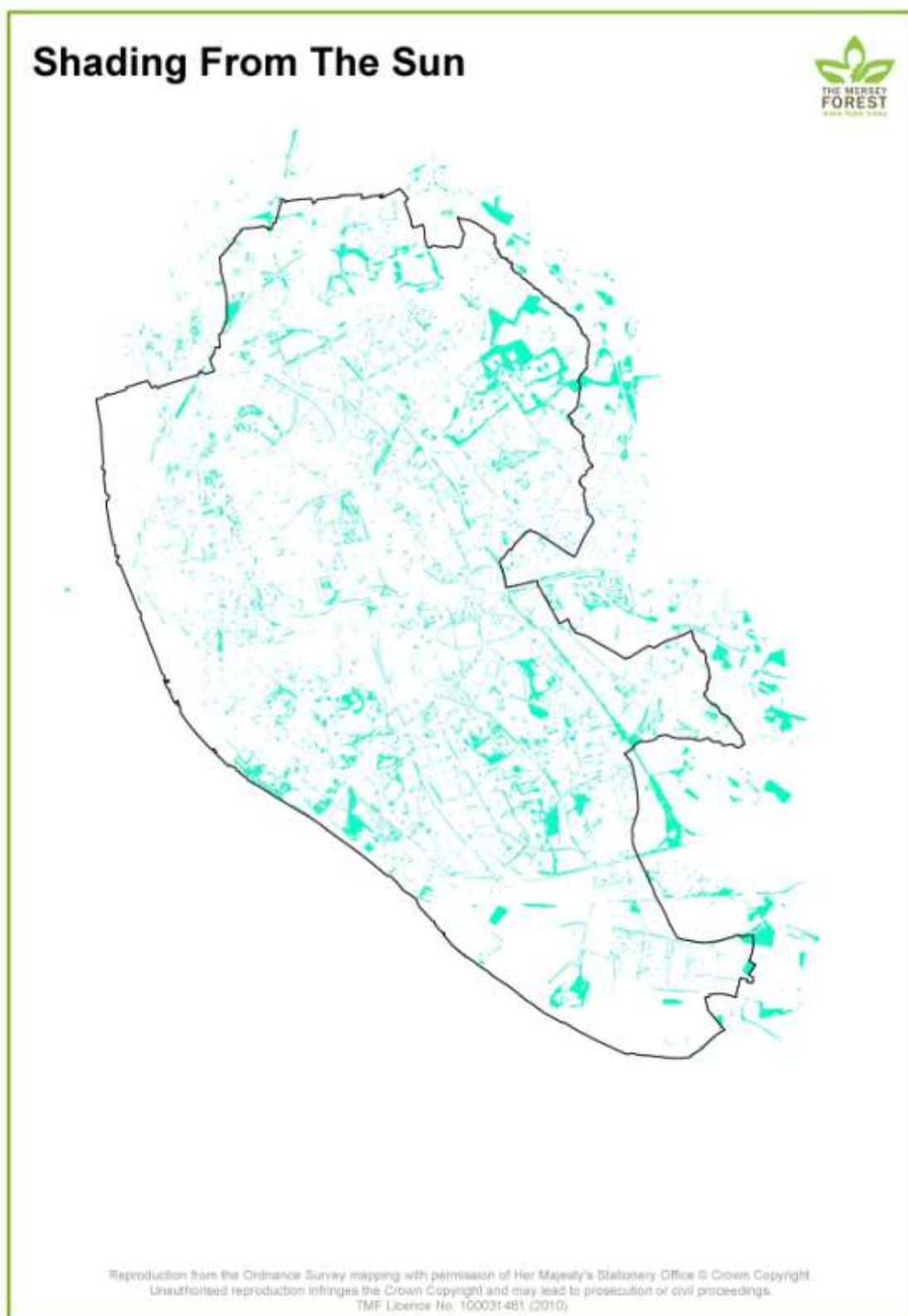
Map 53 Recreation – Public Function



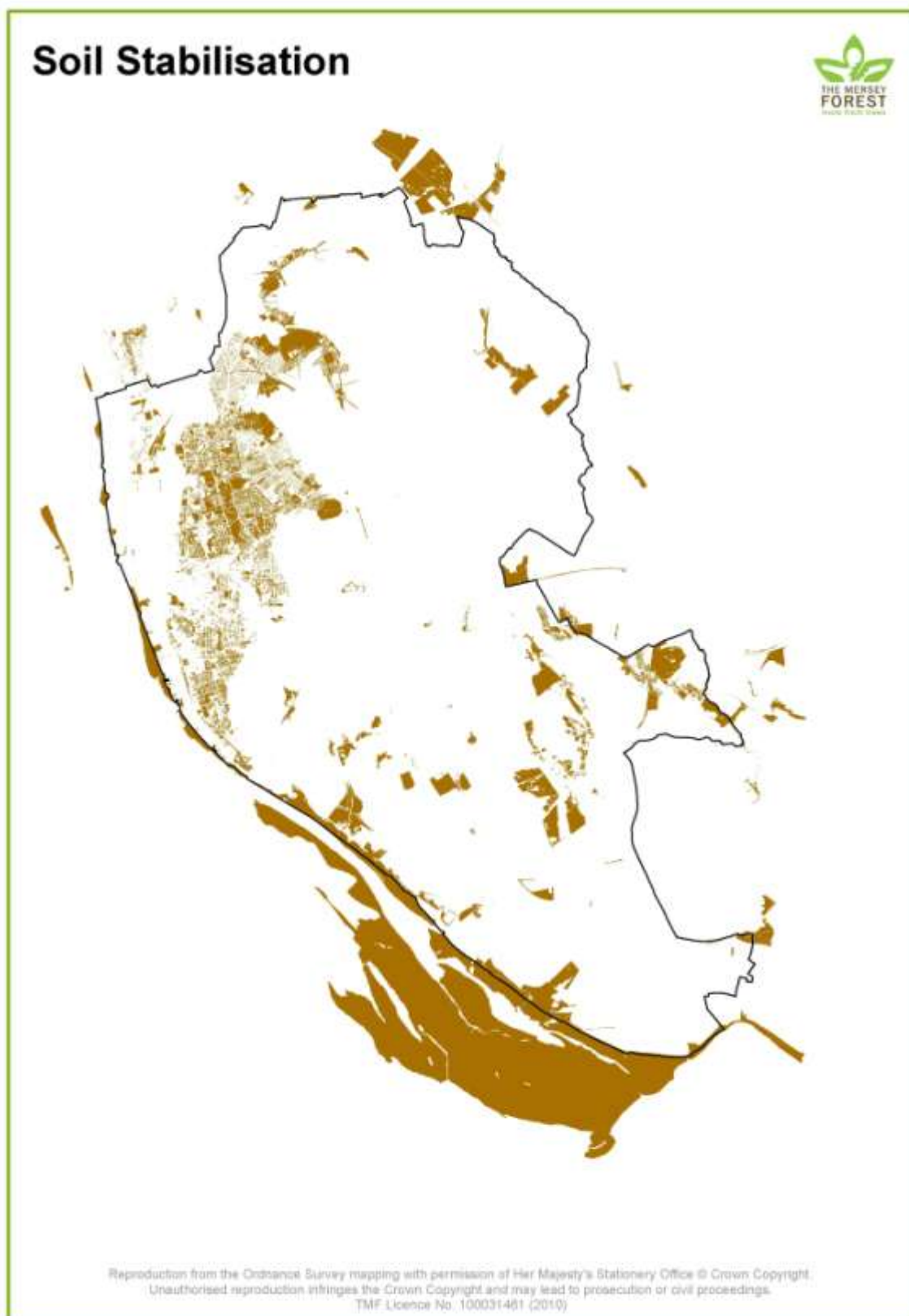
Map 54 Recreation – Public with Restrictions Function



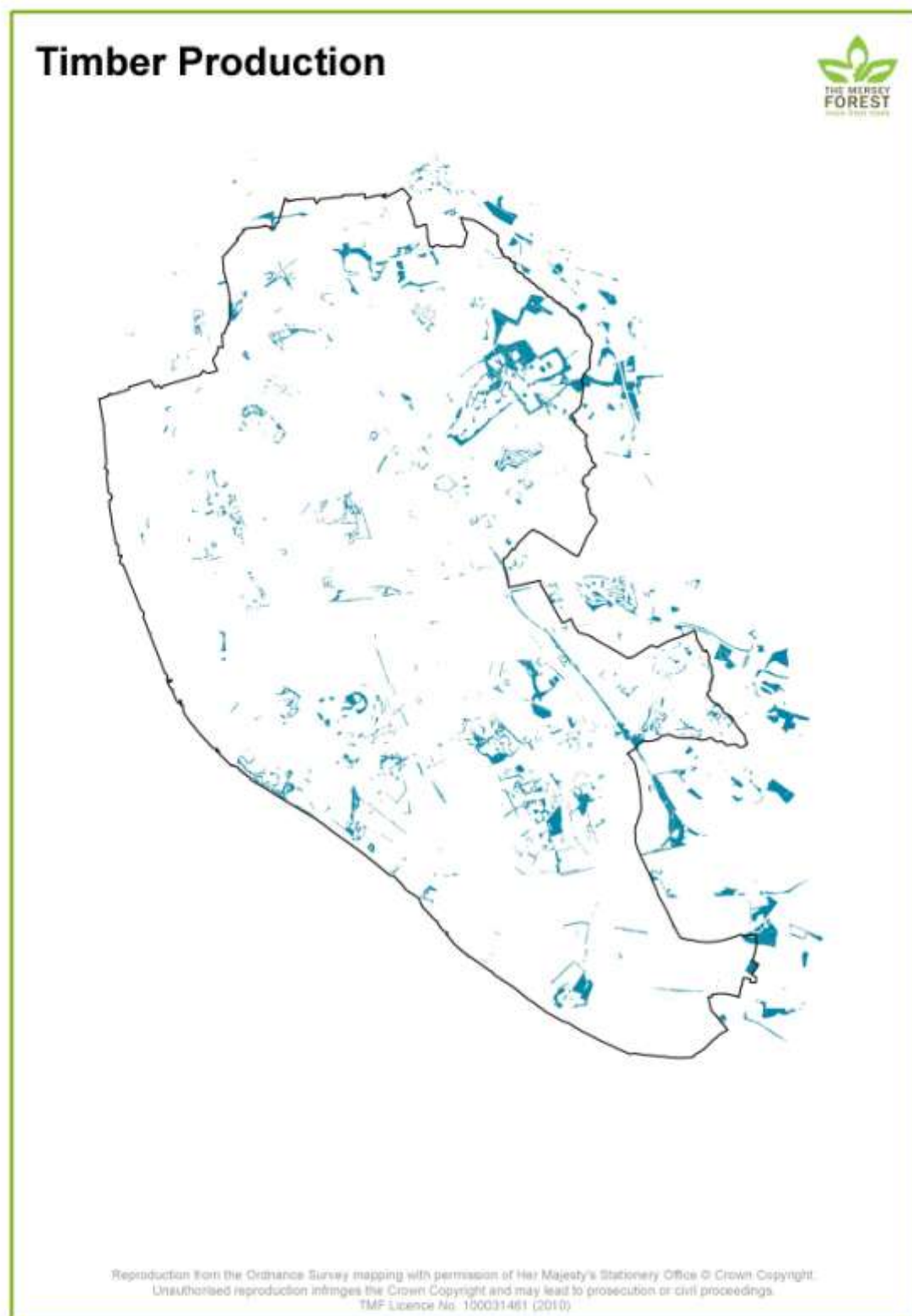
Map 55 Shading from the Sun Function



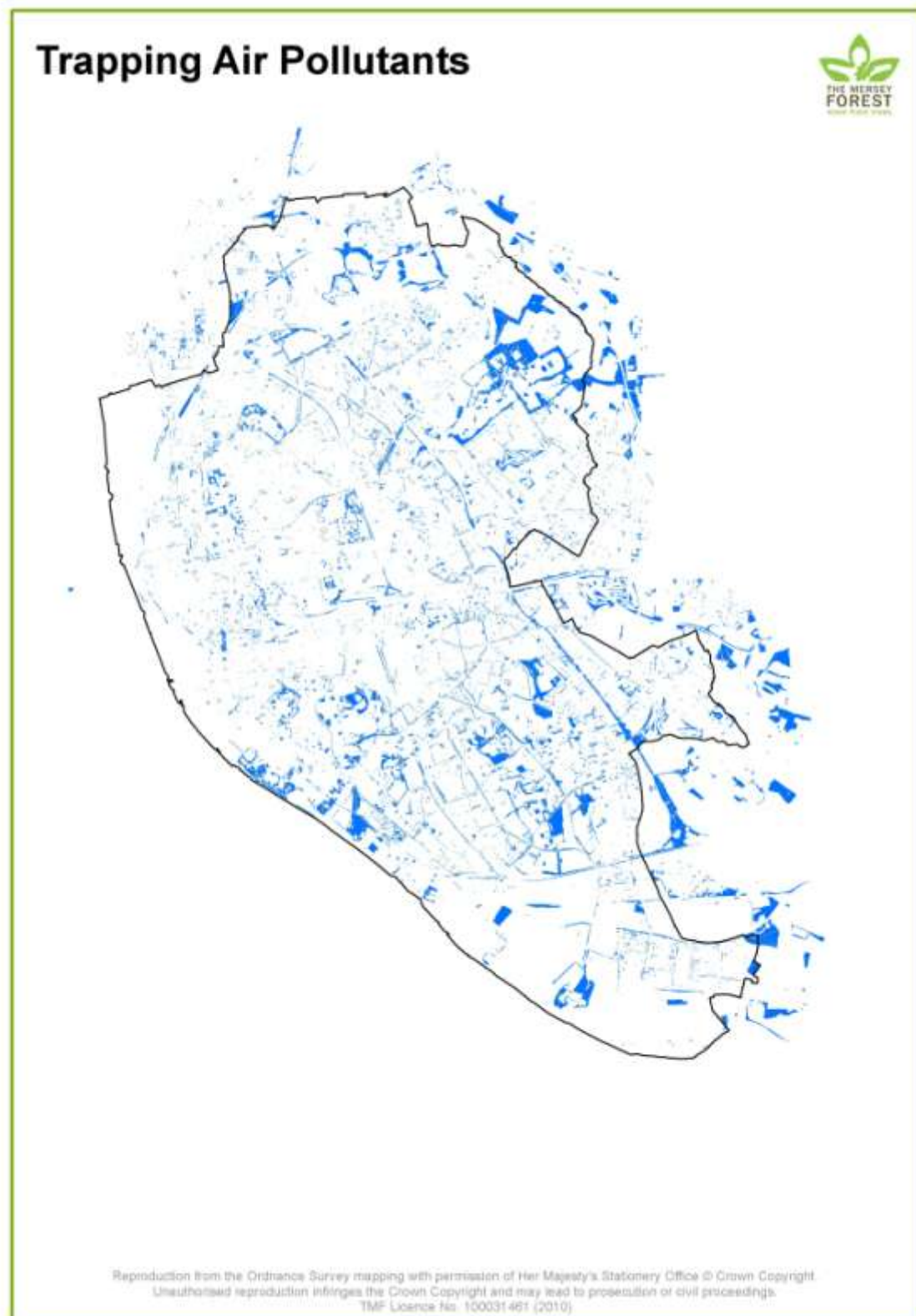
Map 56 Soil Stabilisation Function



Map 57 Timber Production Function



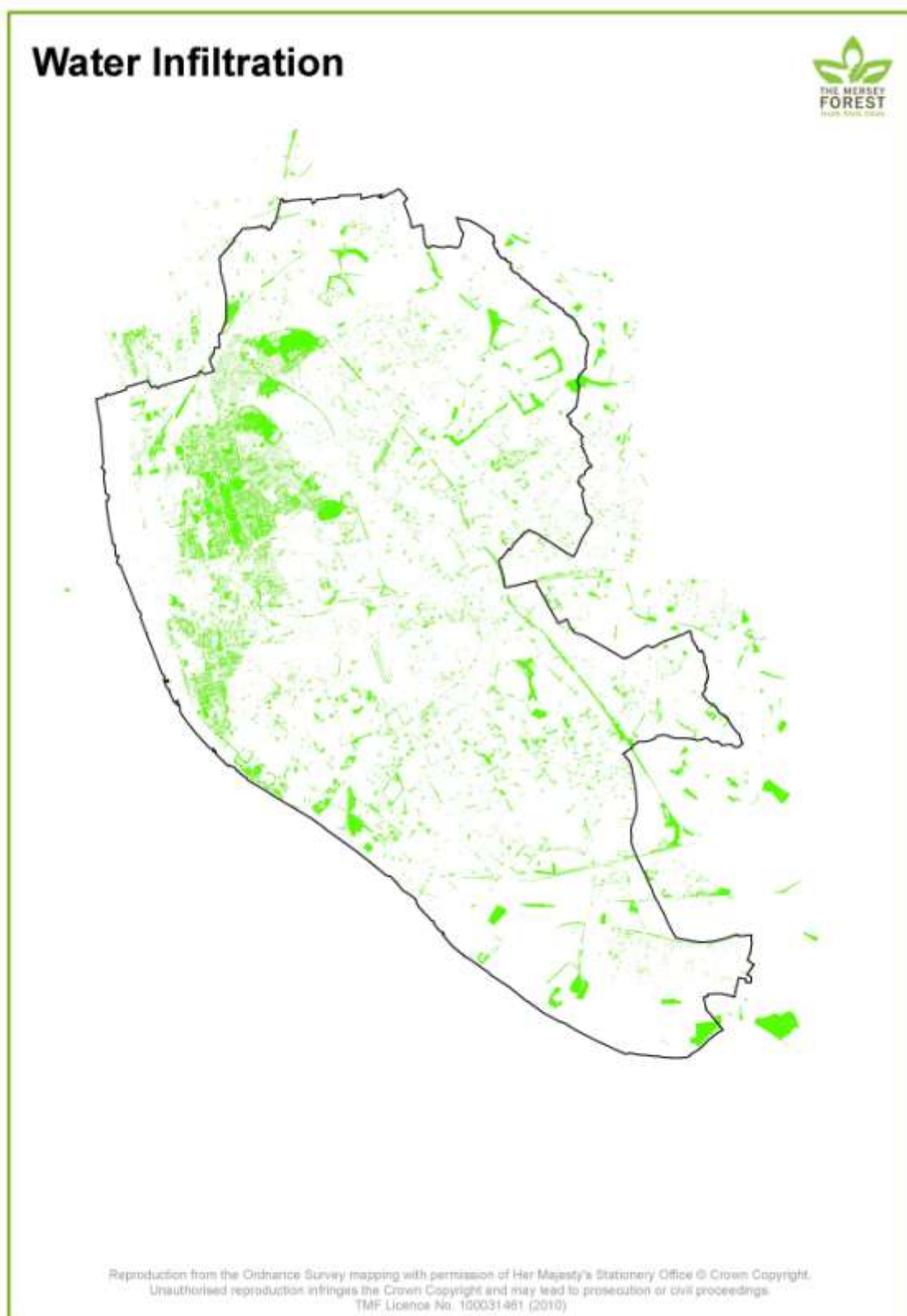
Map 58 Trapping Air Pollutants Function



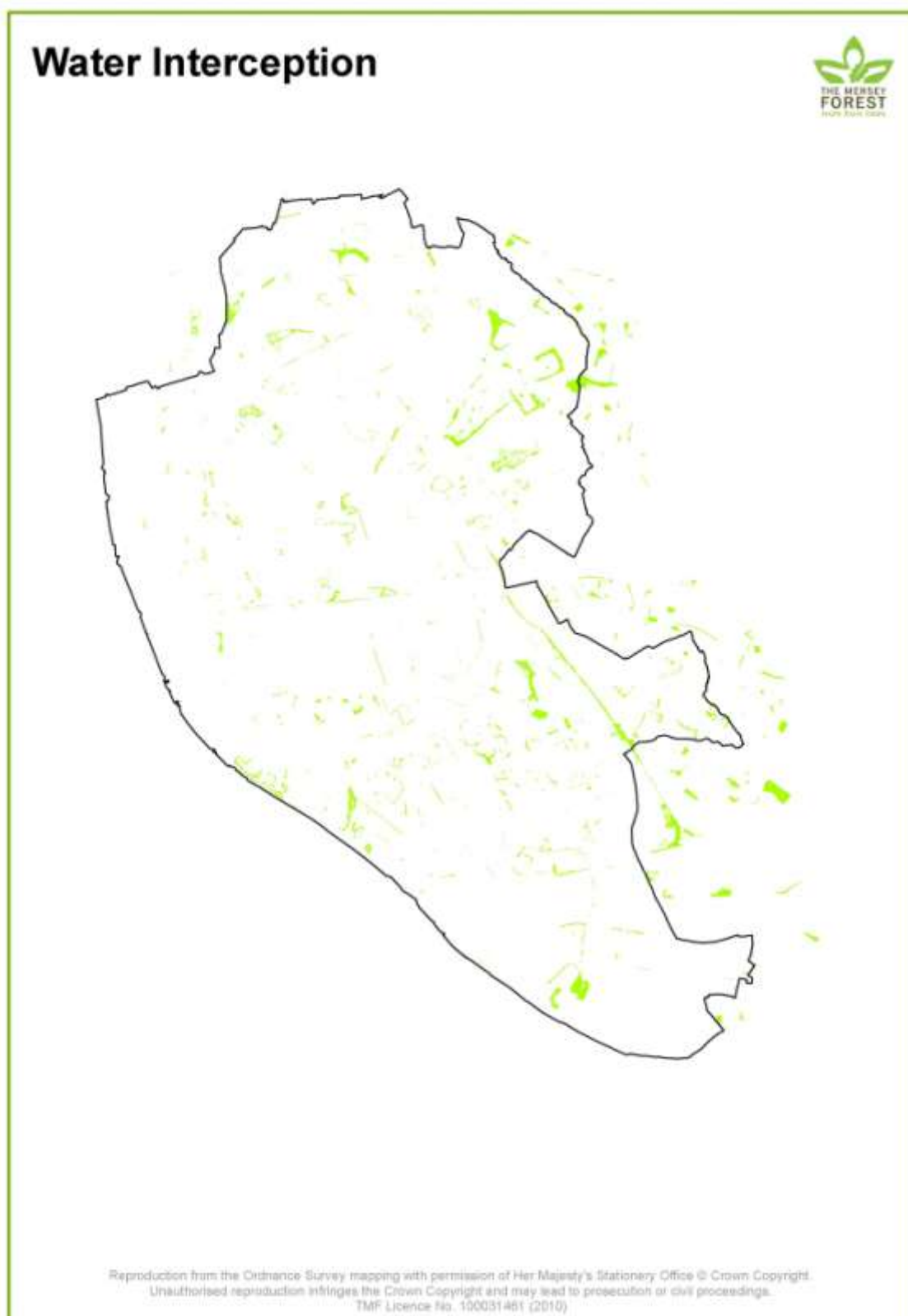
Map 59 Water Conveyance Function



Map 60 Water Infiltration Function



Map 61 Water Interception Function

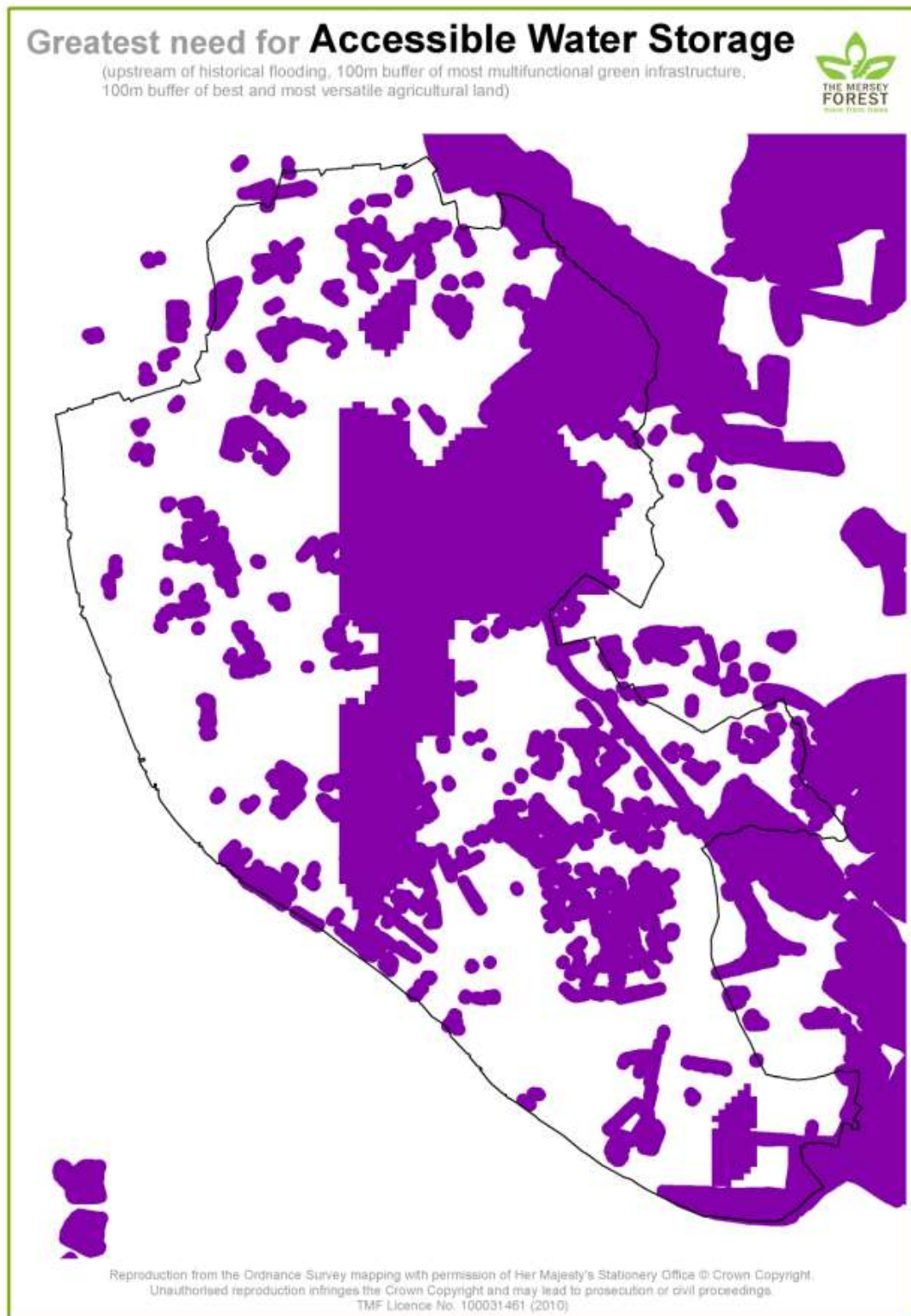


Map 62 Wind Shelter Function

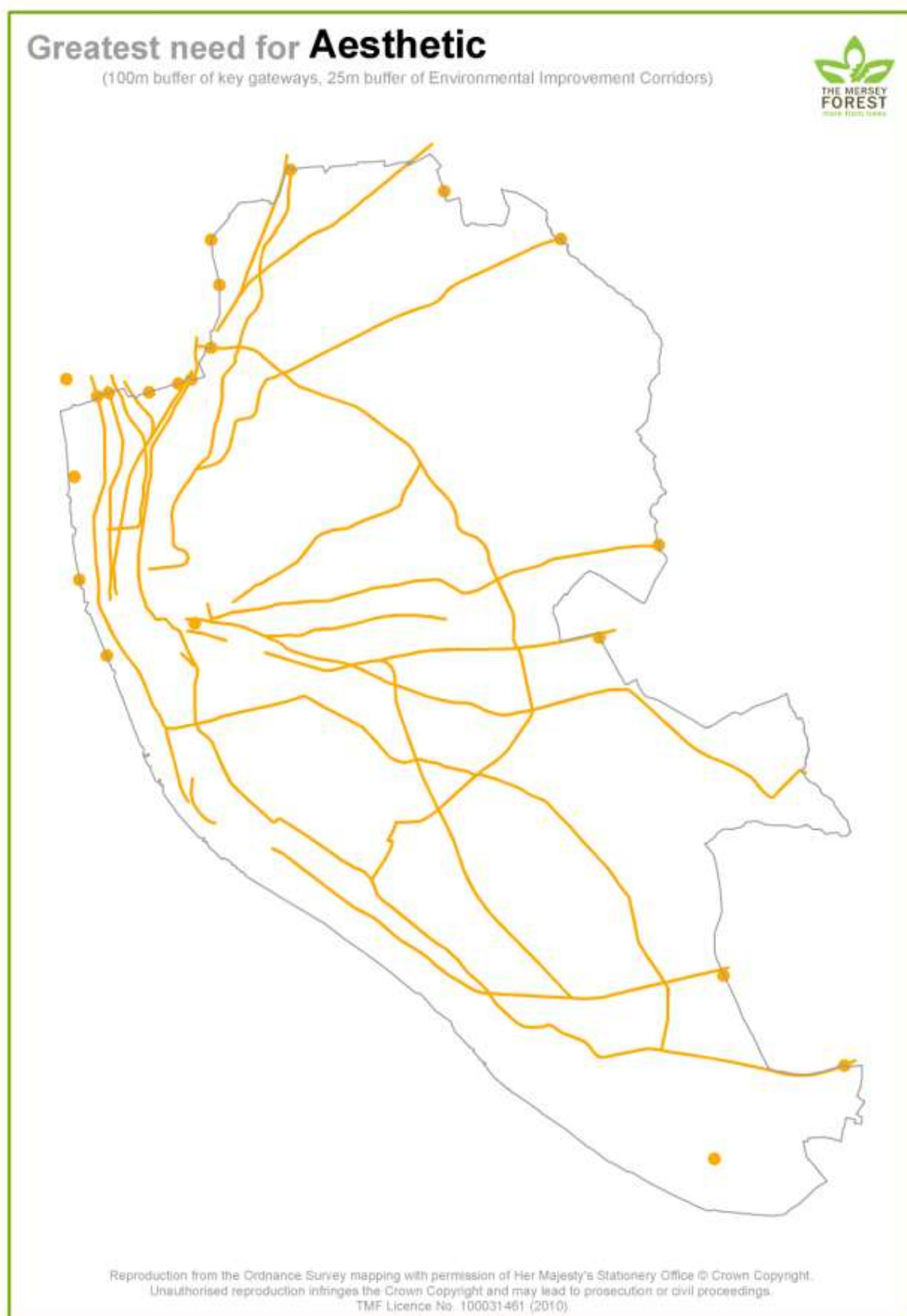


14.9. Needs Maps

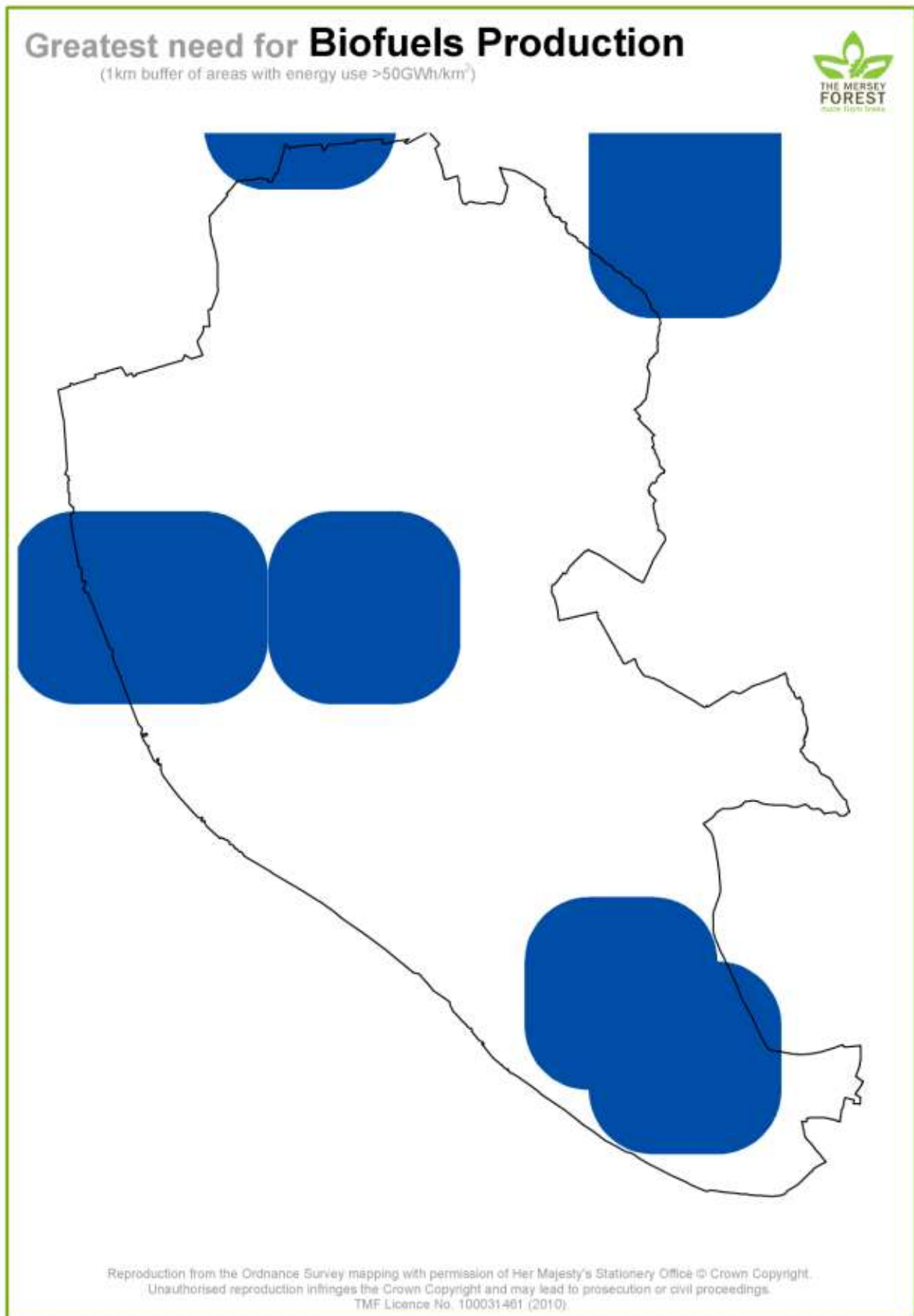
Map 63 Greatest Need for Accessible Water Storage



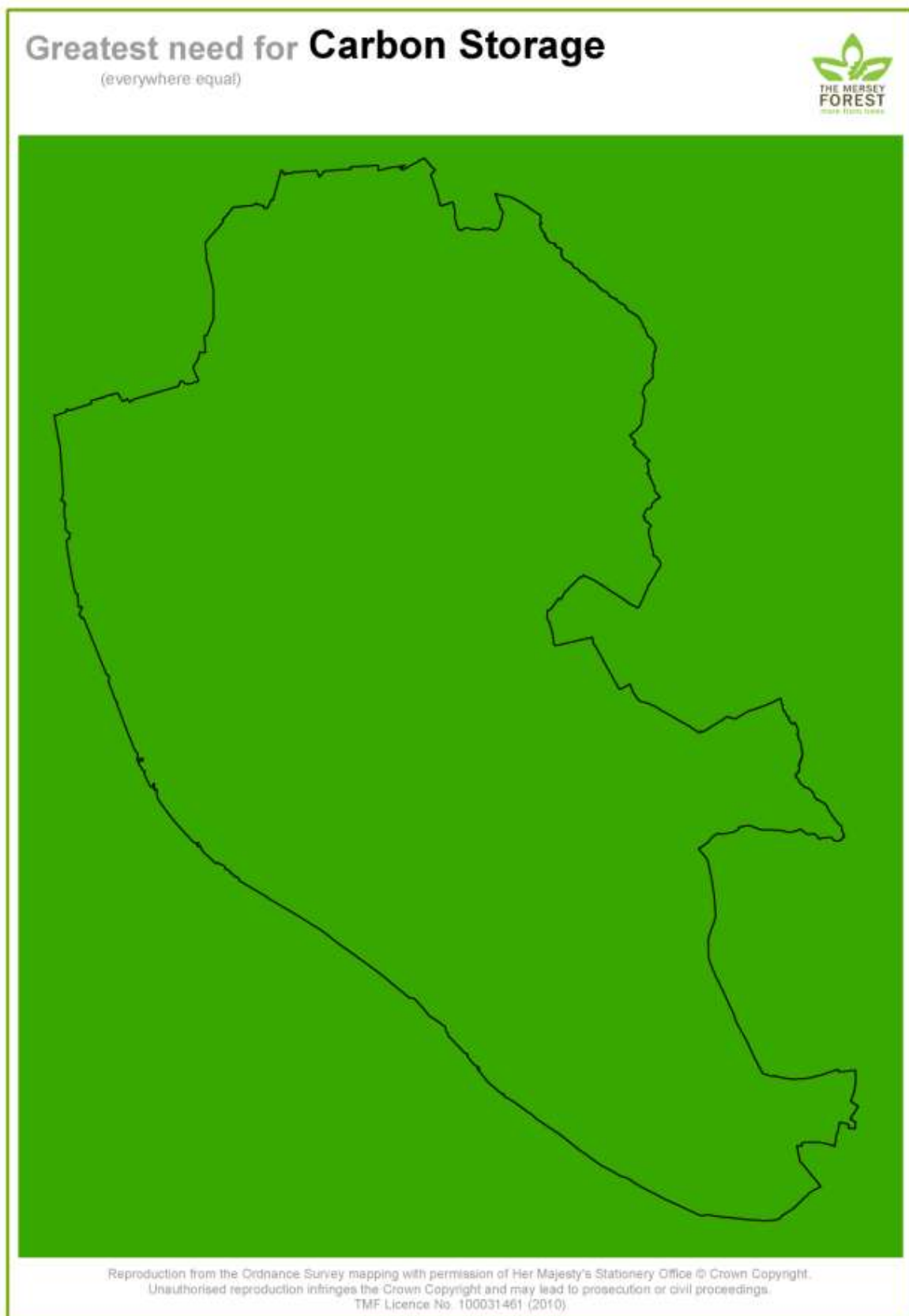
Map 64 Greatest Need for Aesthetic



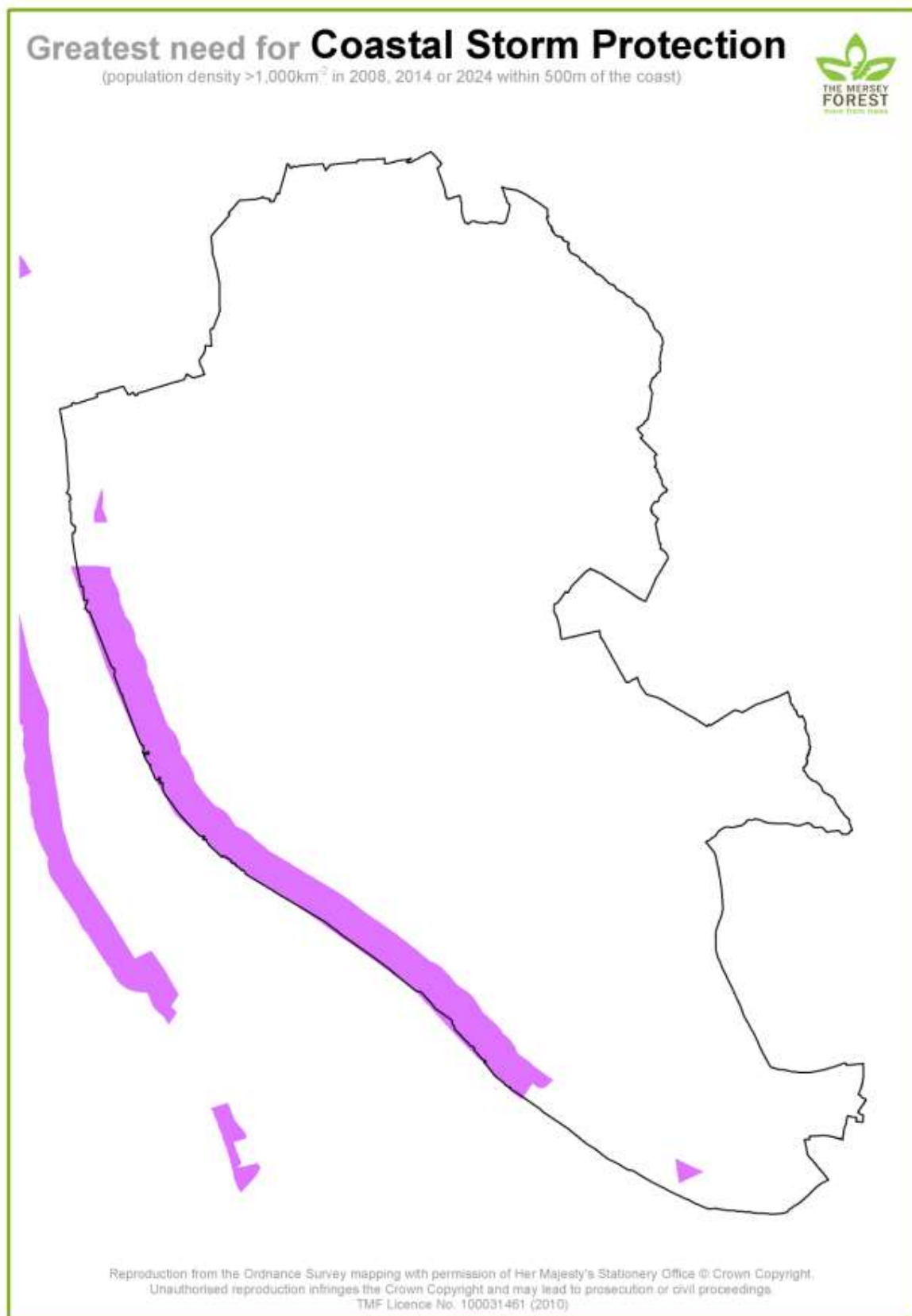
Map 65 Greatest Need for Biofuels Production



Map 66 Greatest Need for Carbon Storage



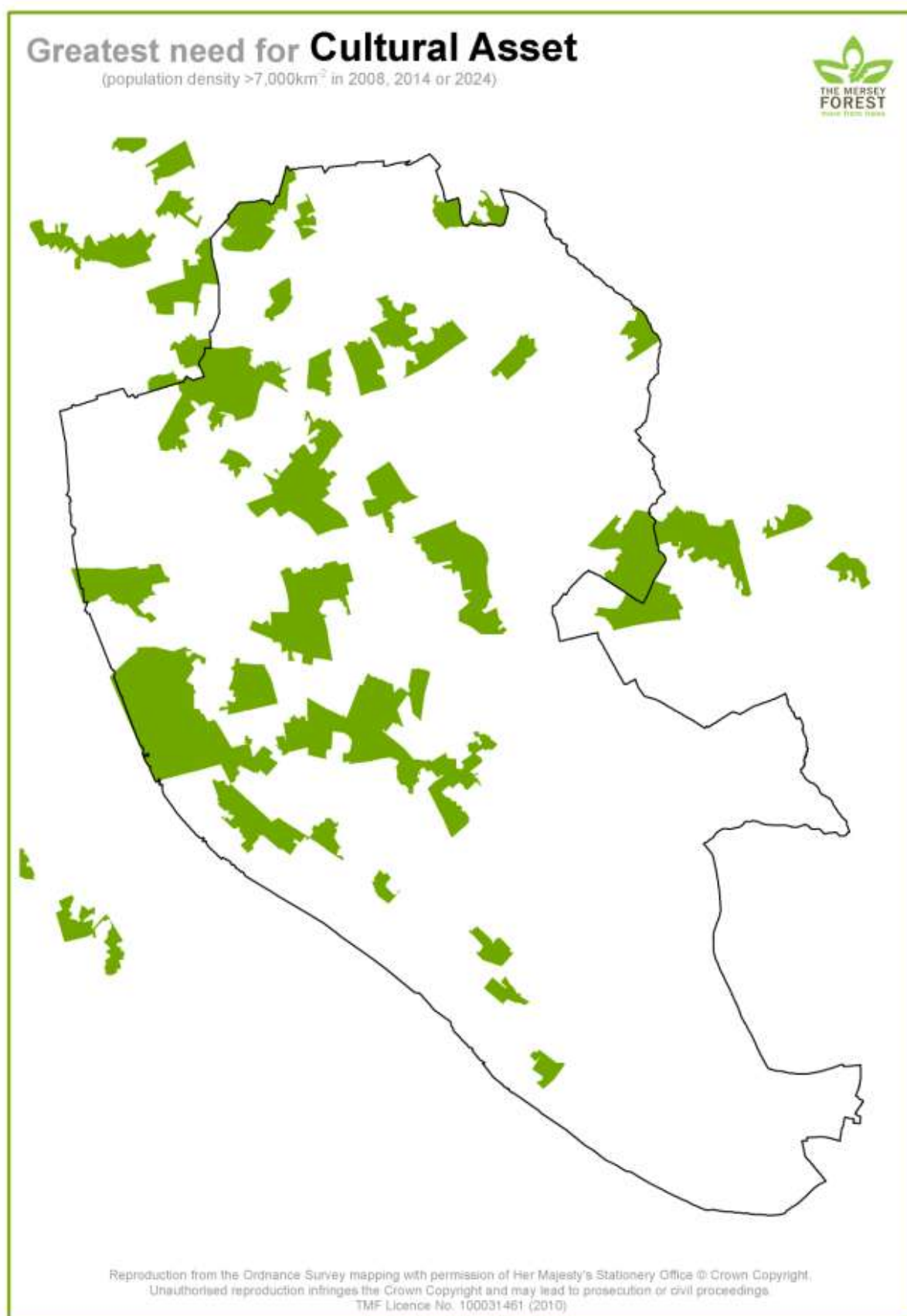
Map 67 Greatest Need for Coastal Storm Protection



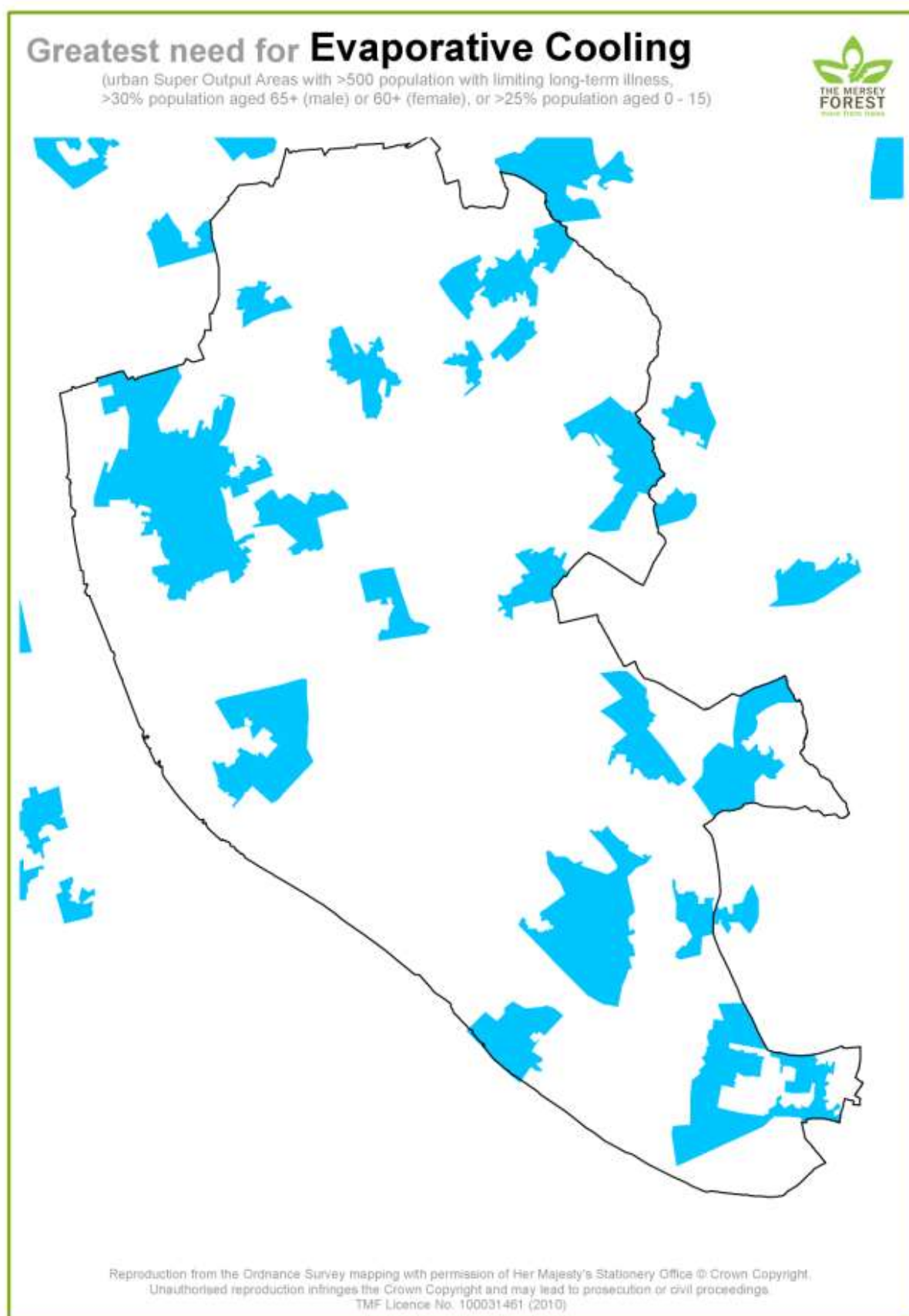
Map 68 Greatest Need for Corridor for Wildlife



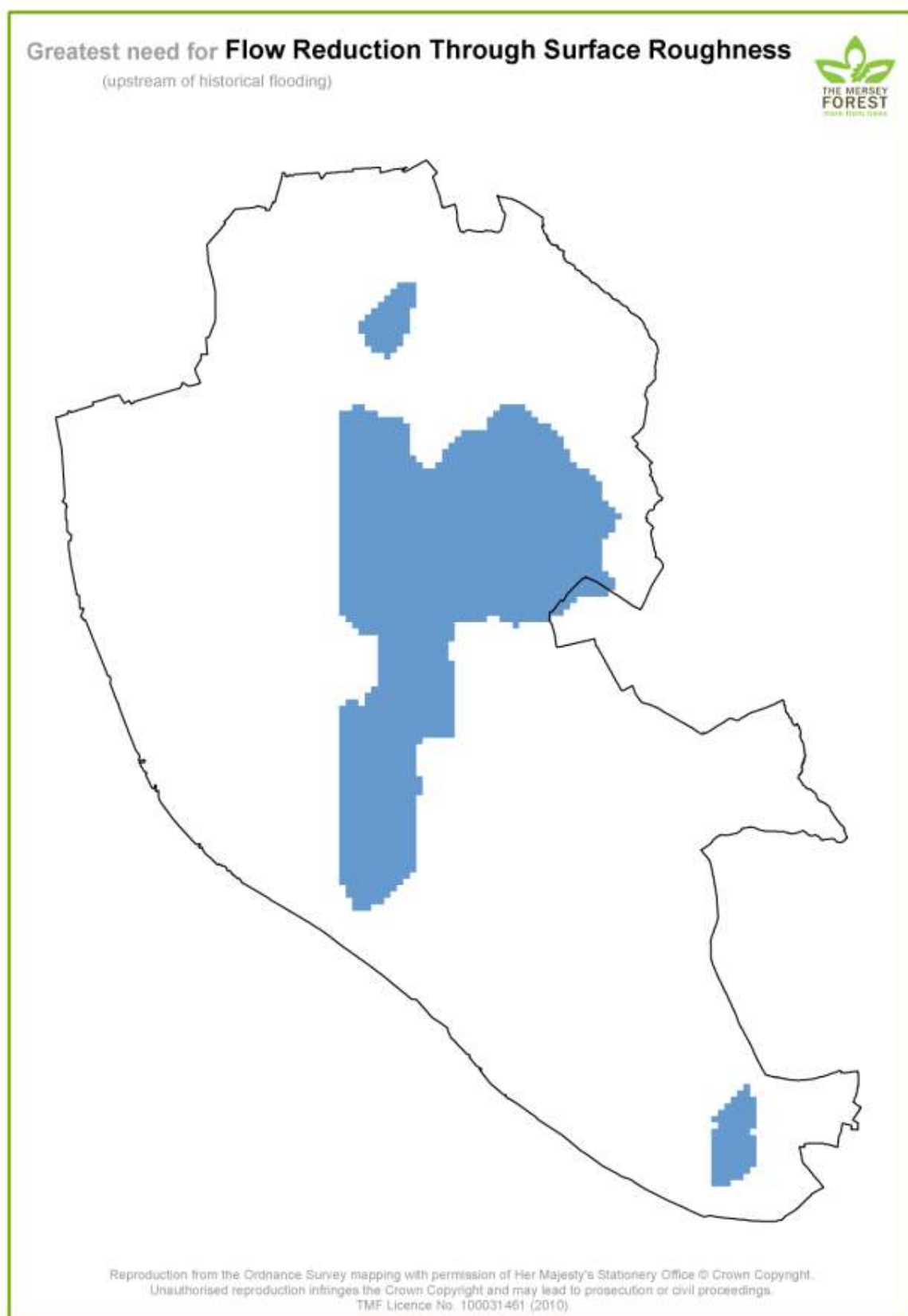
Map 69 Greatest Need for Cultural Asset



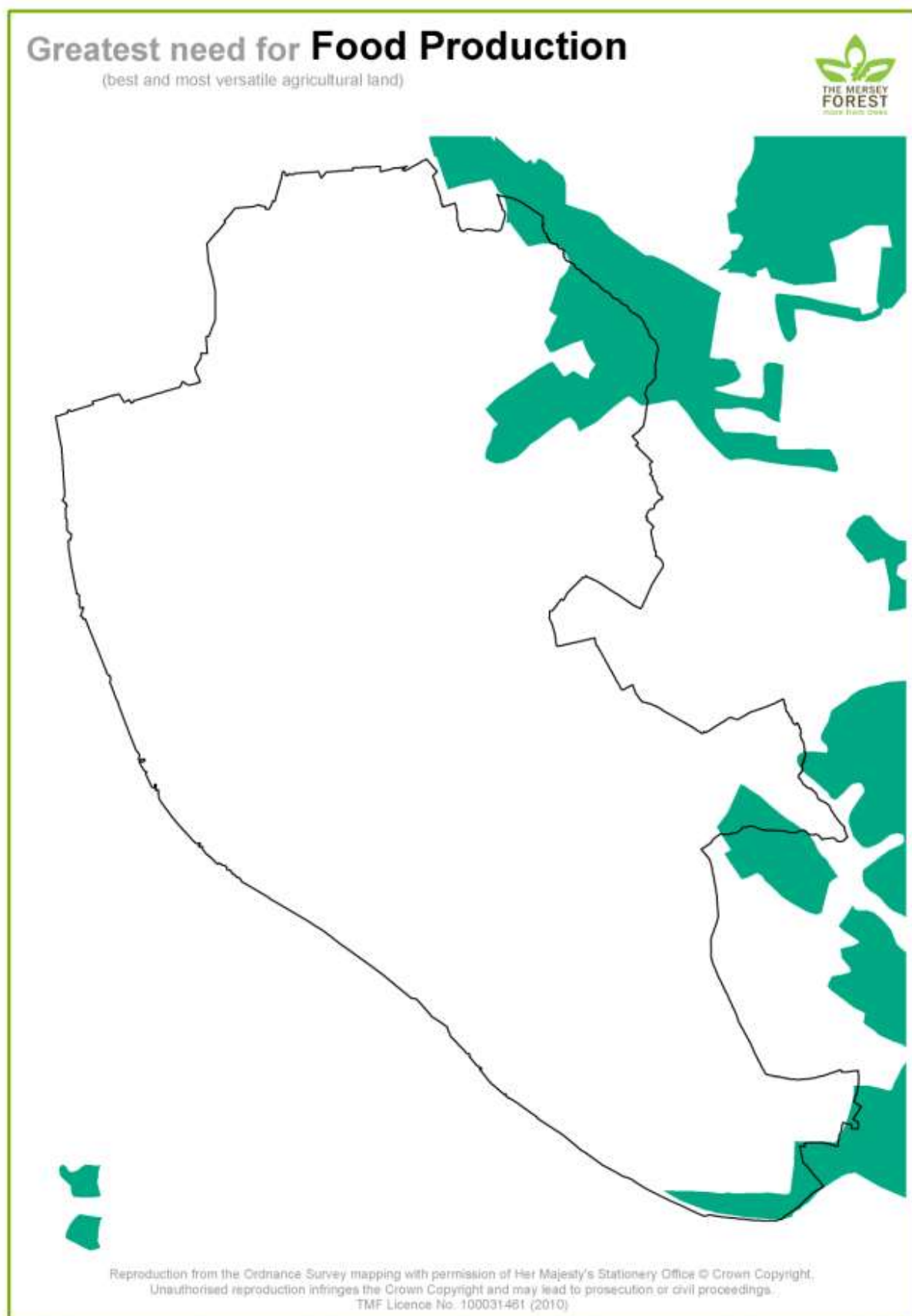
Map 70 Greatest Need for Evaporative Cooling



Map 71 Greatest Need for Flow Reduction Through Surface Roughness



Map 72 Greatest Need for Food Production



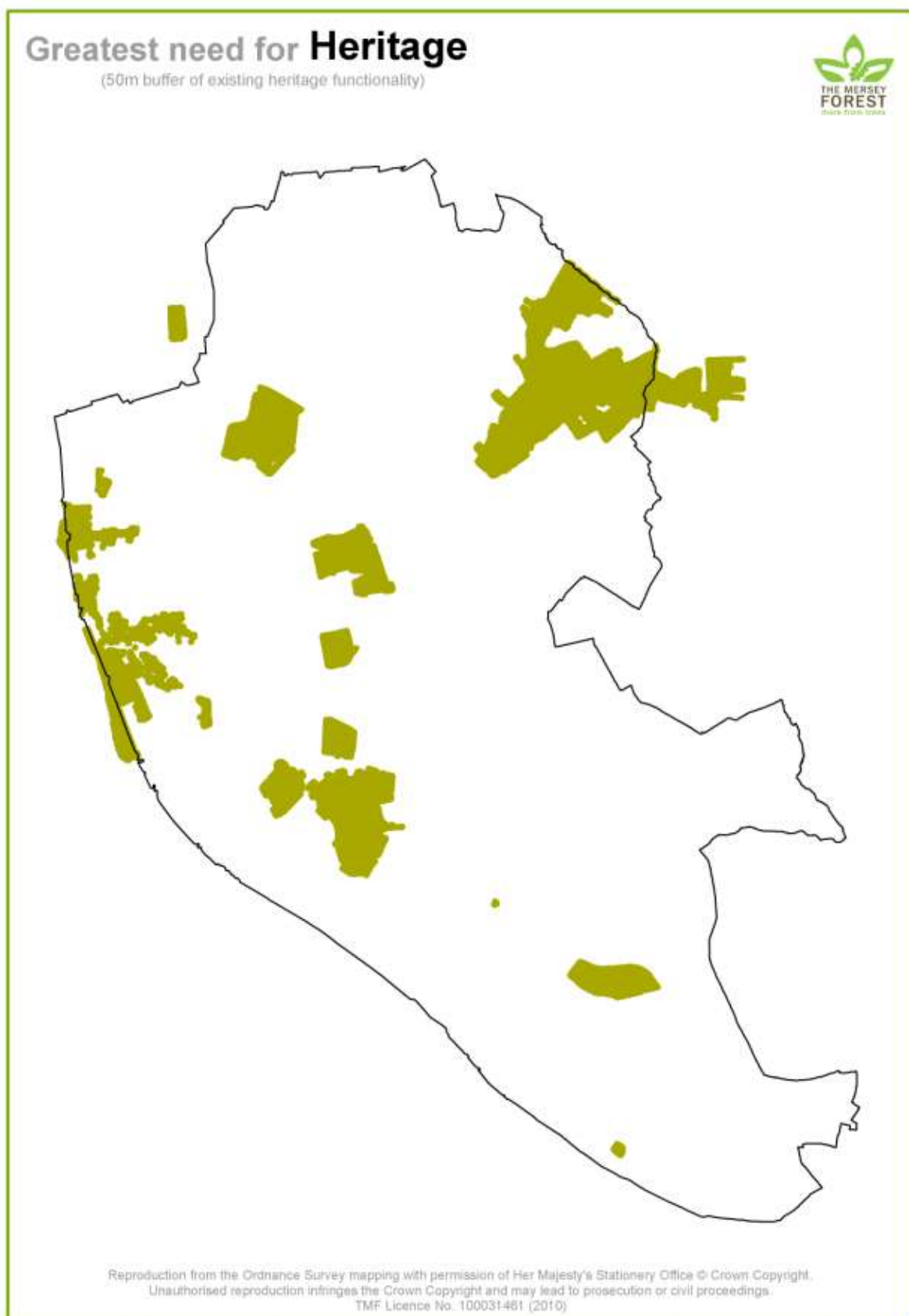
Map 73 Greatest Need for Green Travel Route



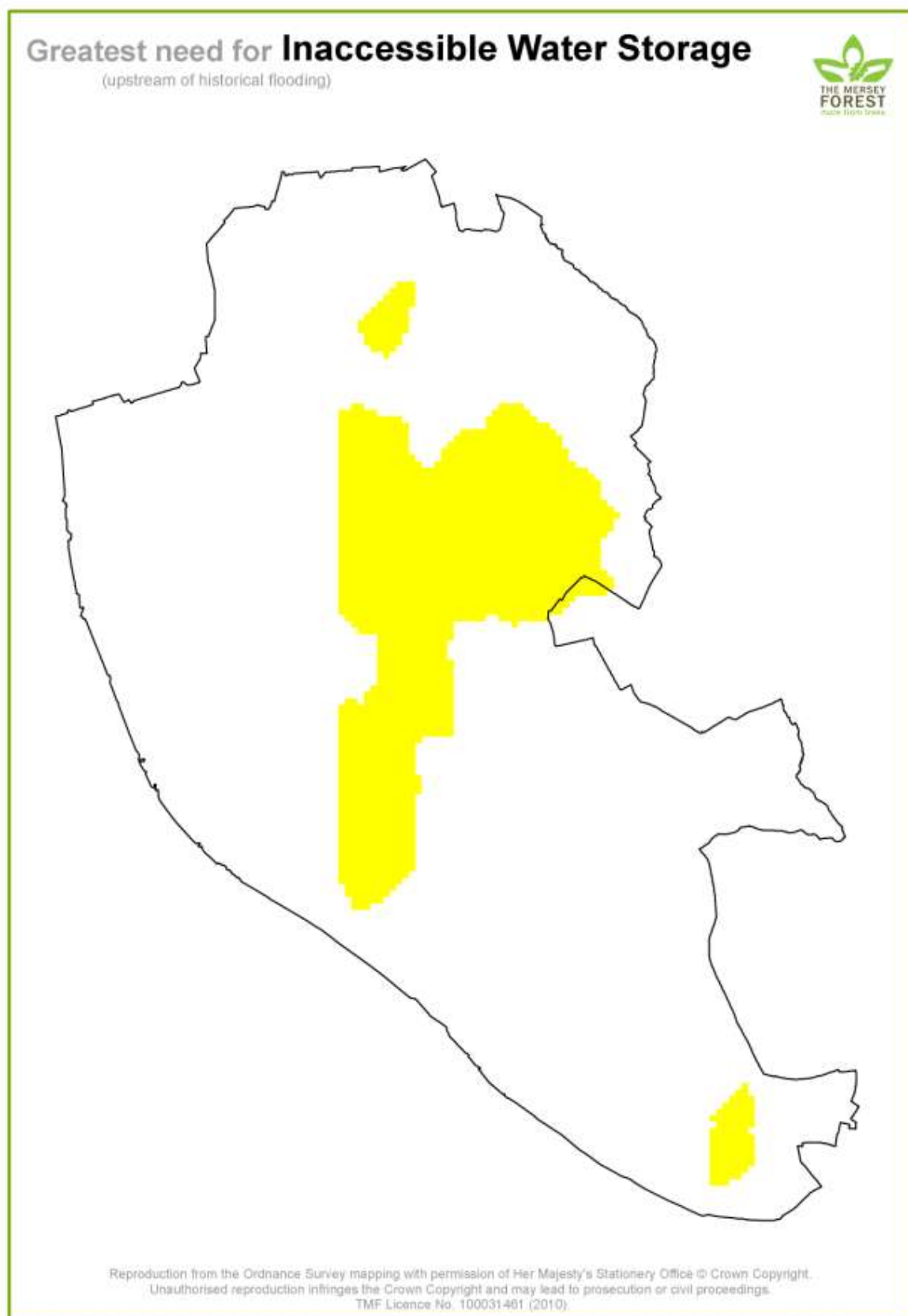
Map 74 Greatest Need for Habitat for Wildlife



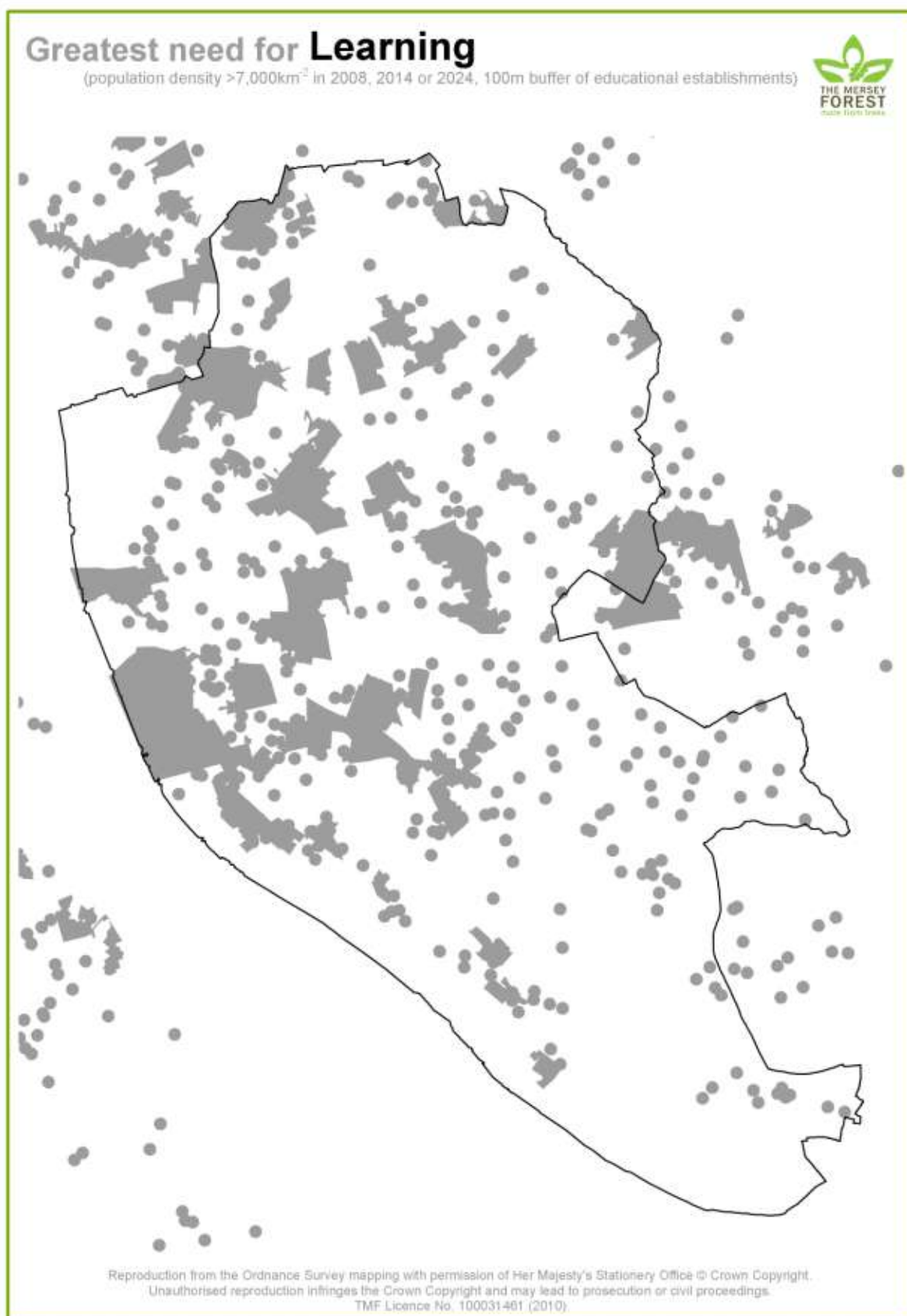
Map 75 Greatest Need for Heritage



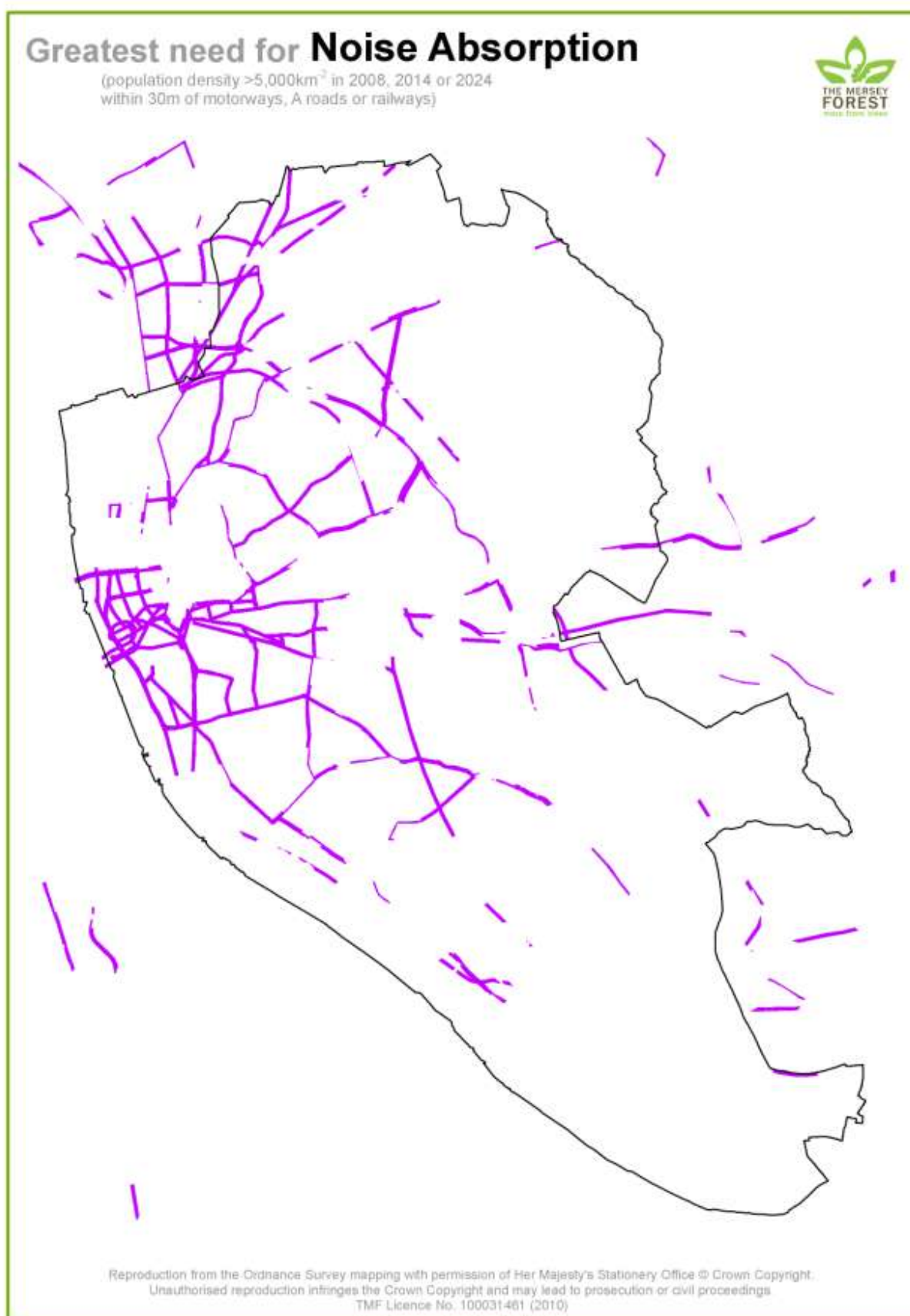
Map 76 Greatest Need for Inaccessible Water Storage



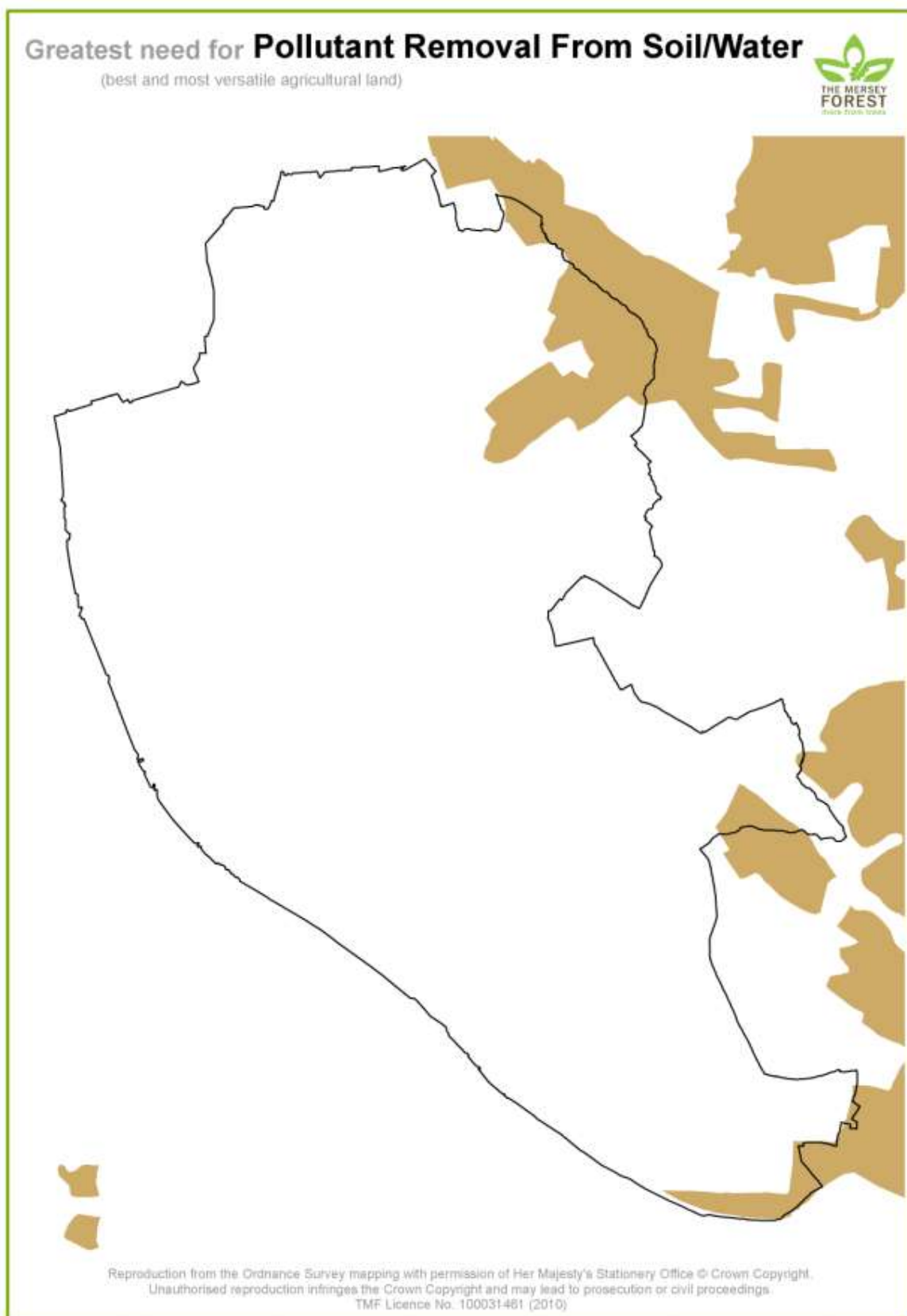
Map 77 Greatest Need for Learning



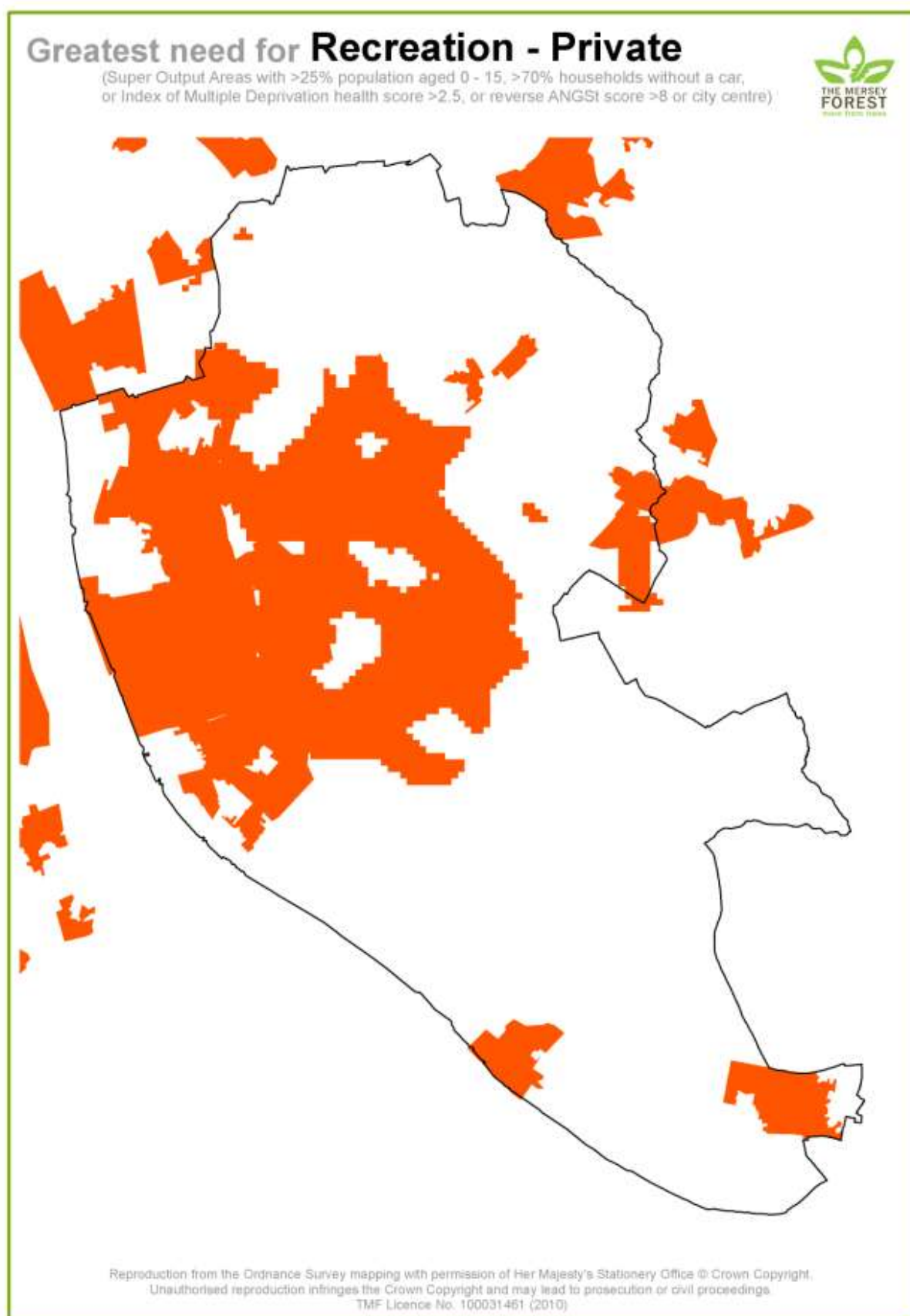
Map 78 Greatest Need for Noise Absorption



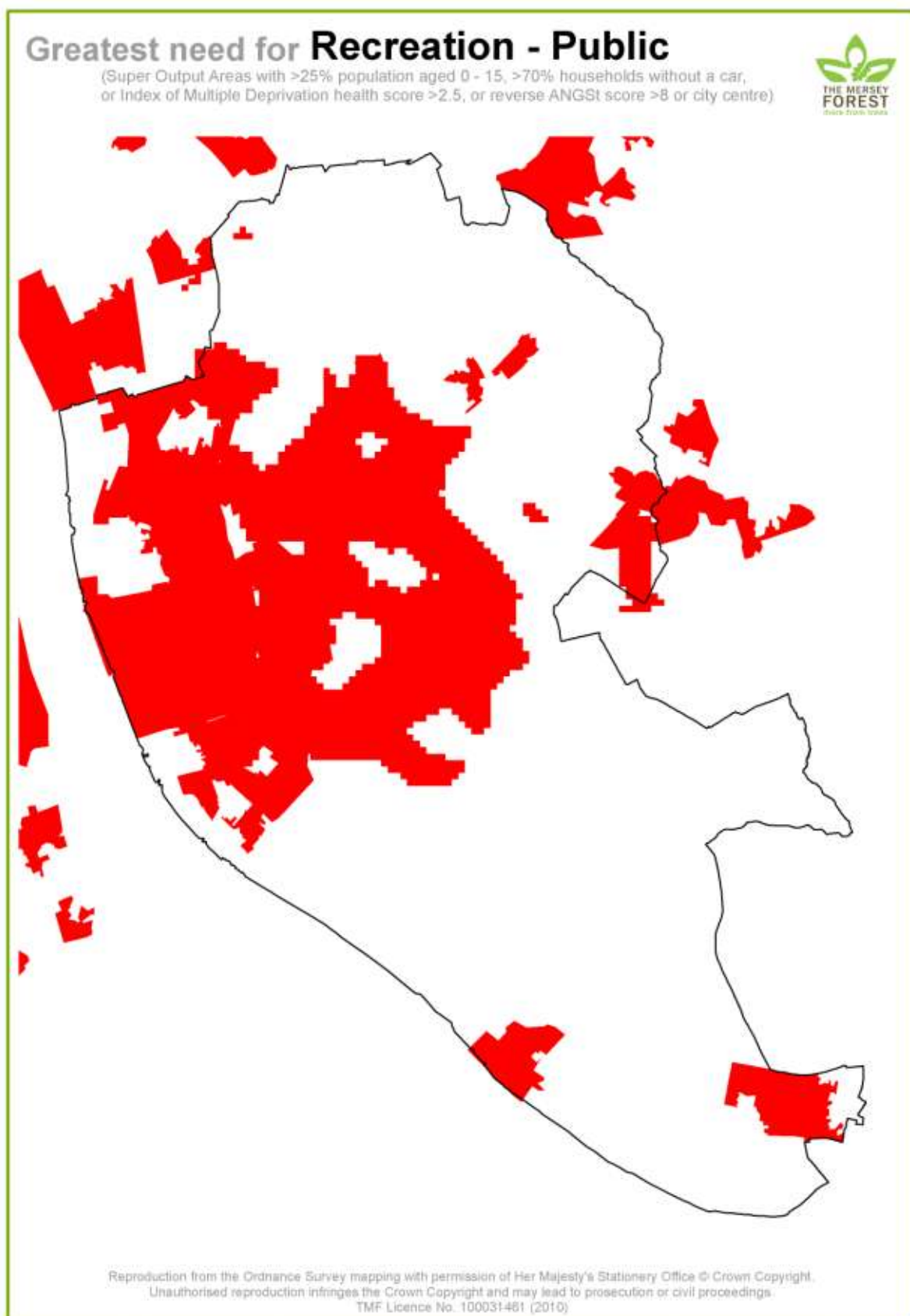
Map 79 Greatest Need for Pollutant Removal from Soil/Water



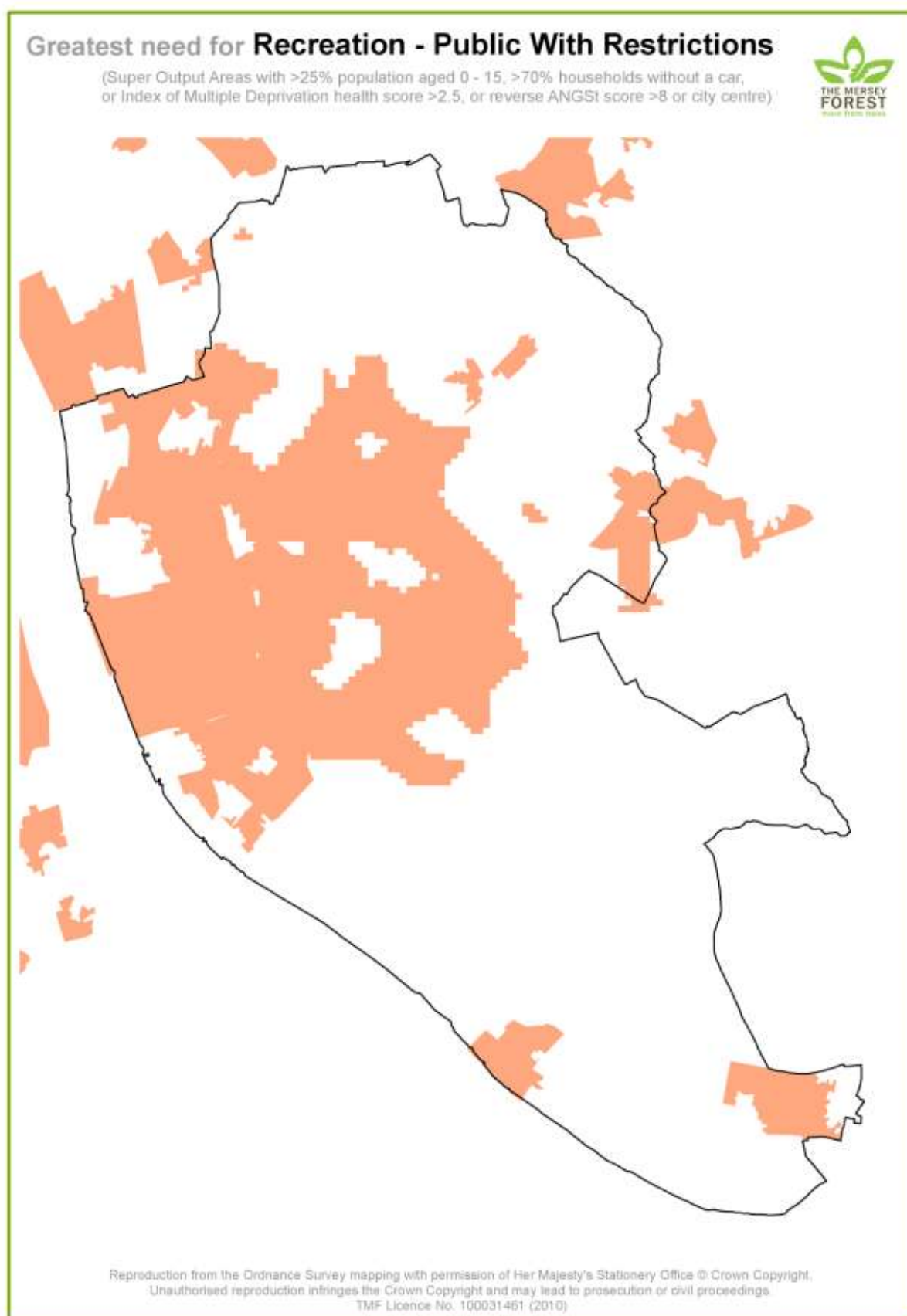
Map 80 Greatest Need for Recreation - Private



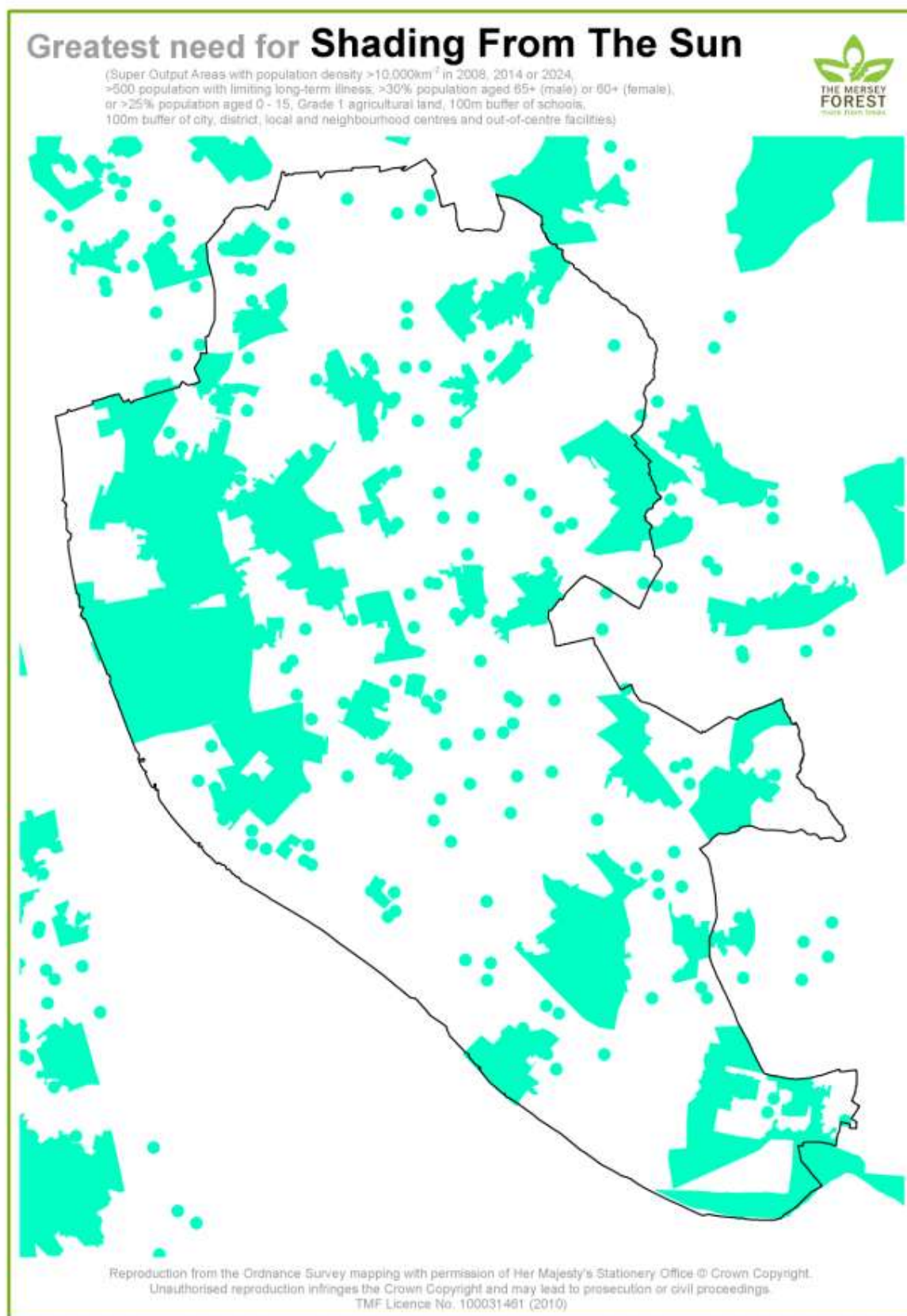
Map 81 Greatest Need for Recreation - Public



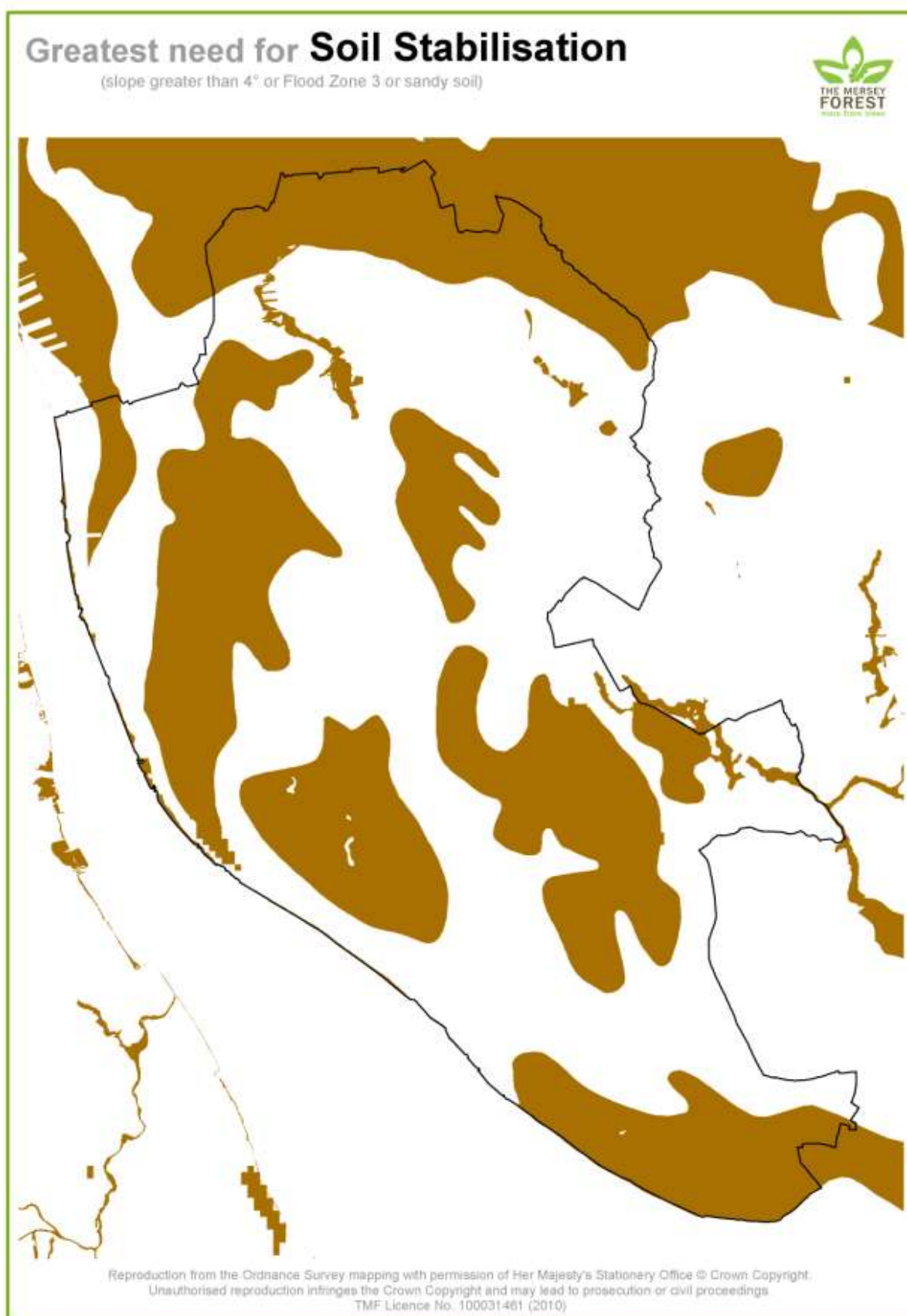
Map 82 Greatest Need for Recreation – Public with Restrictions



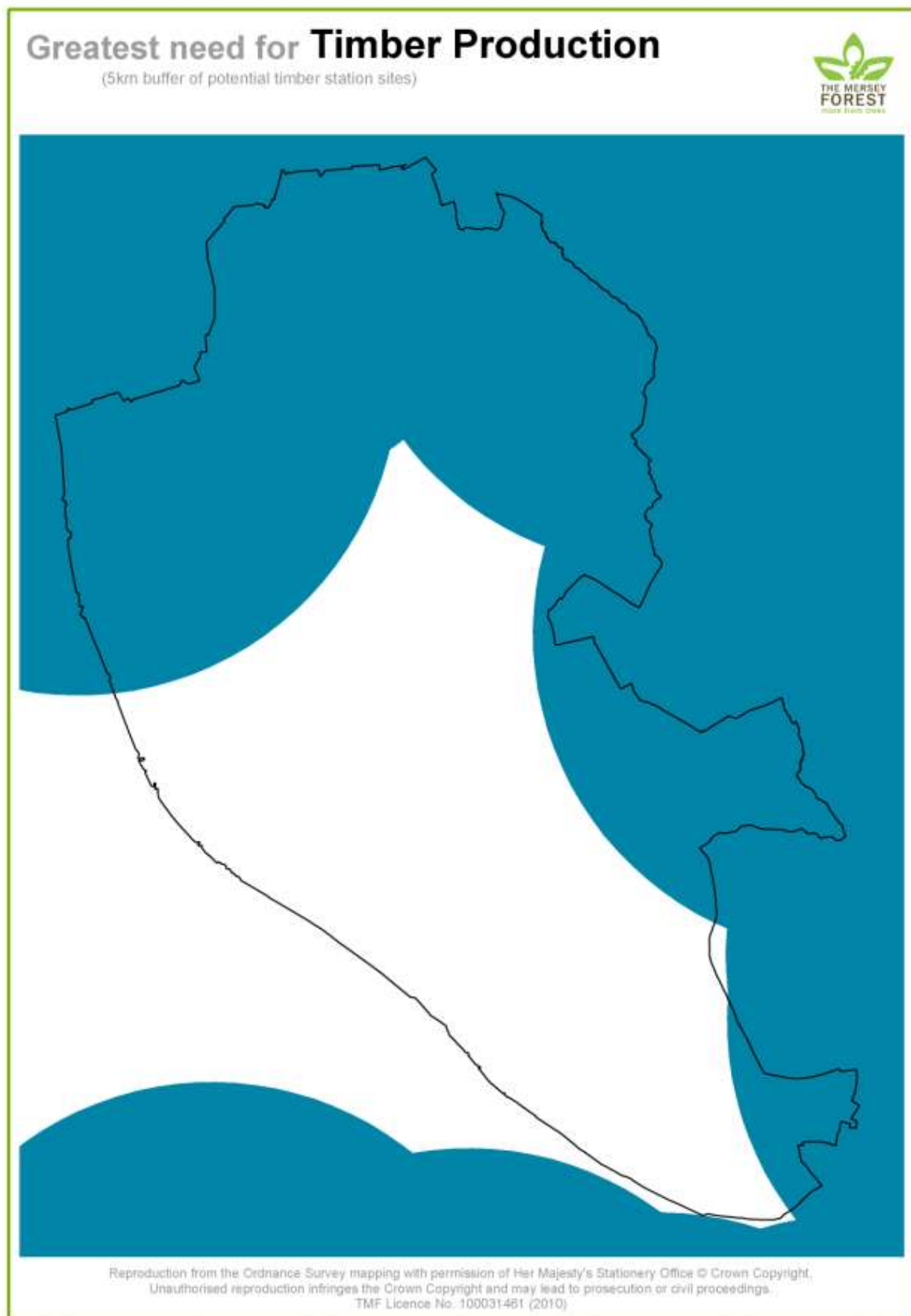
Map 83 Greatest Need for Shading from the Sun



Map 84 Greatest Need for Soil Stabilisation



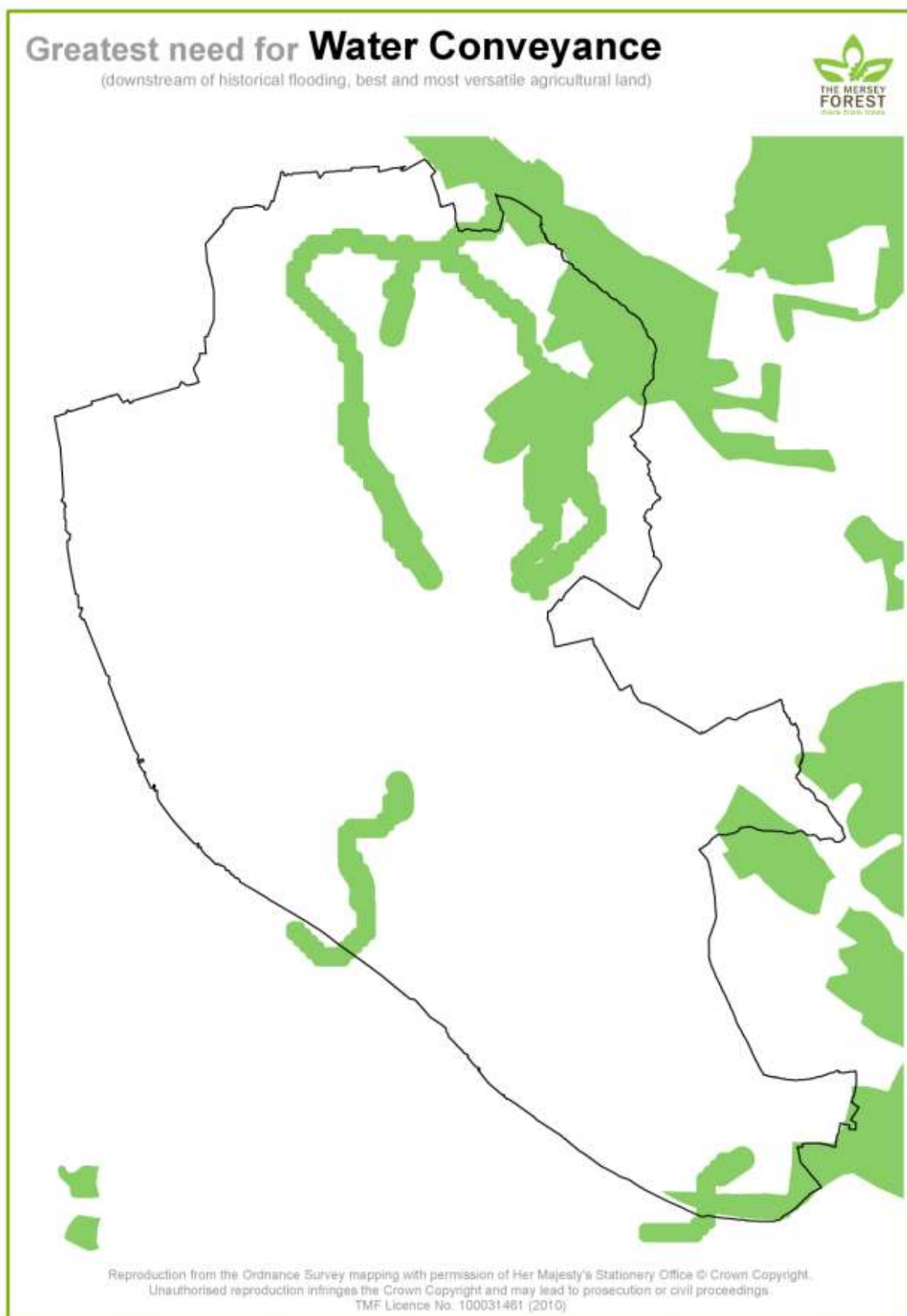
Map 85 Greatest Need for Timber Production



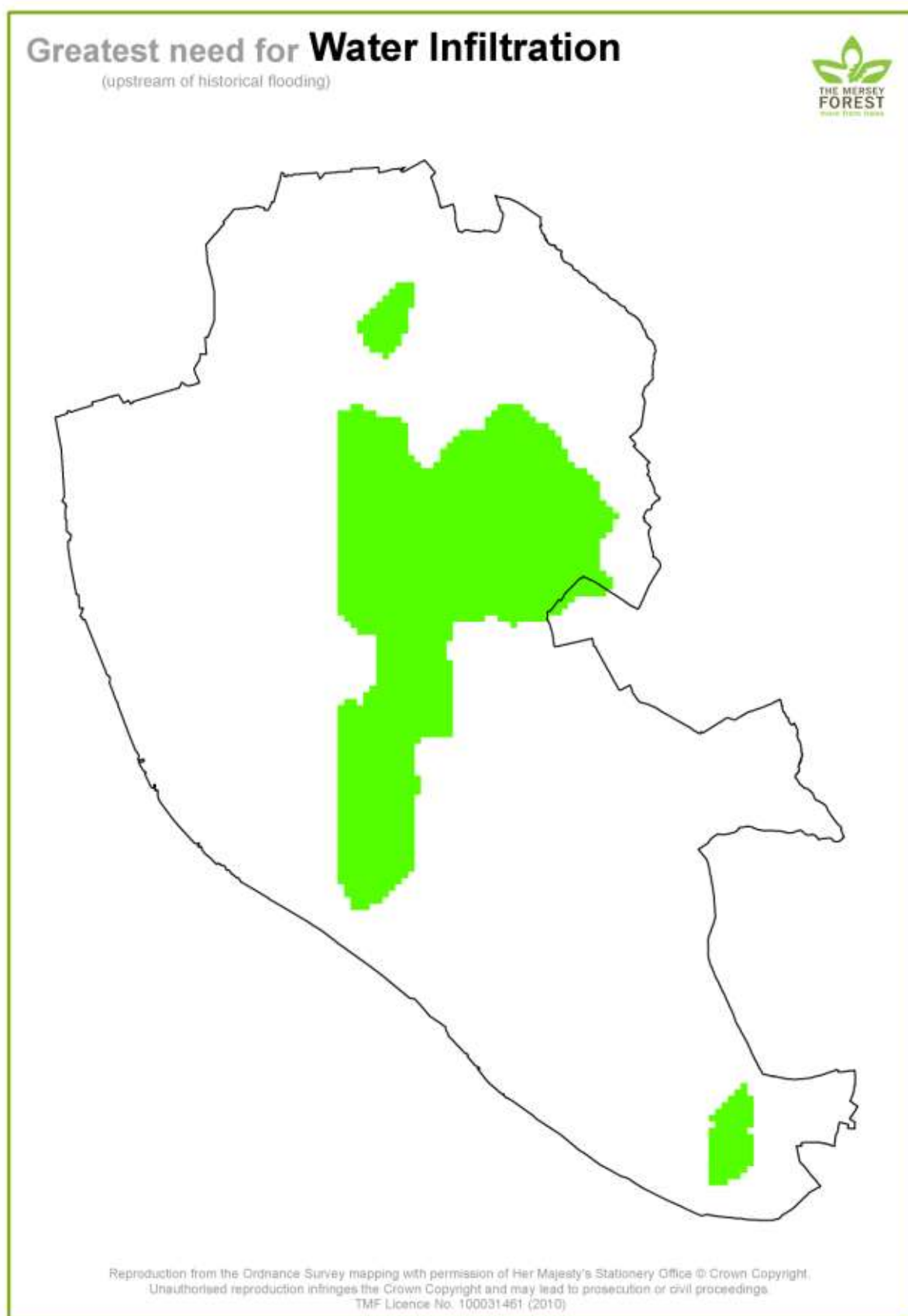
Map 86 Greatest Need for Trapping Air Pollutants



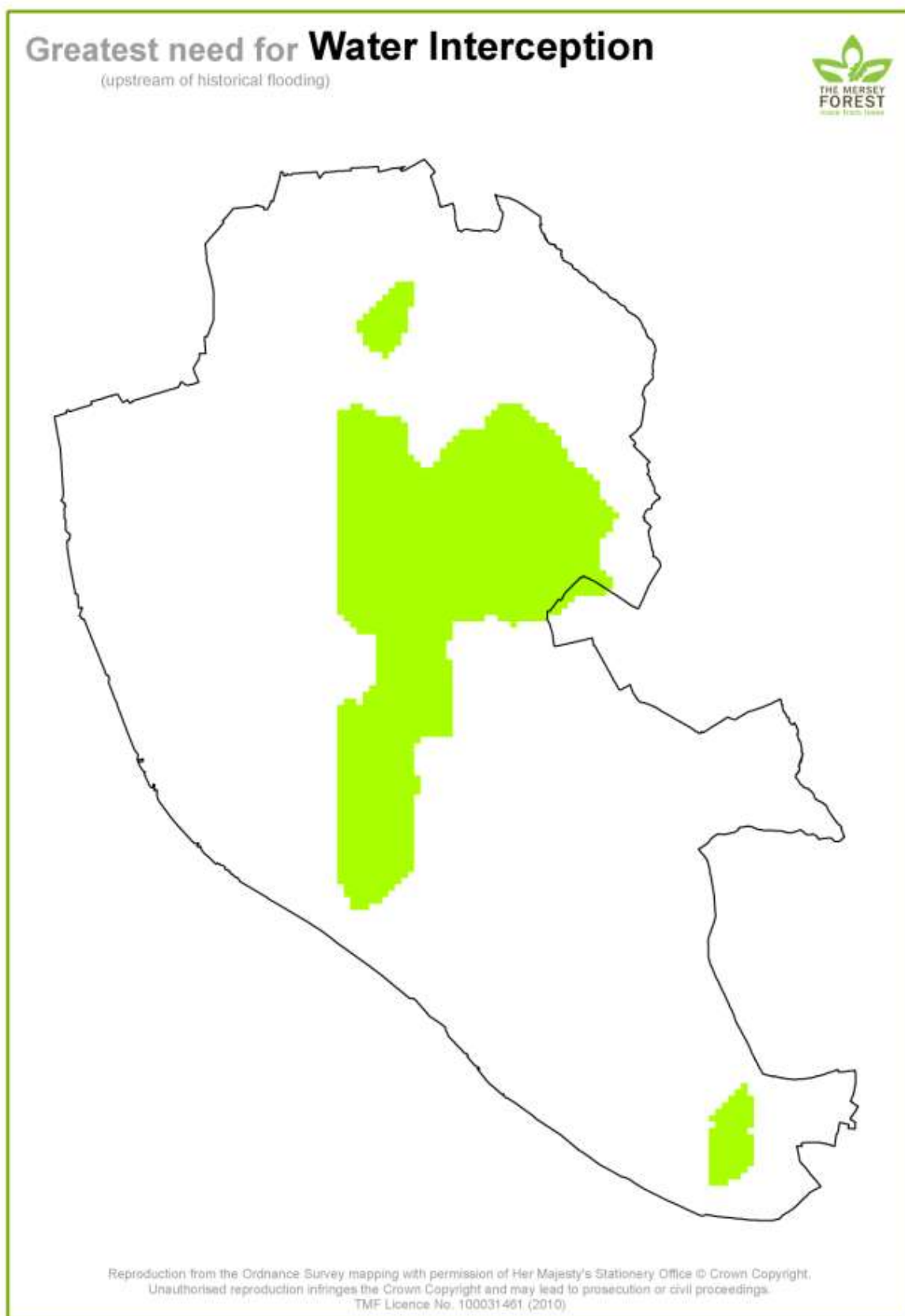
Map 87 Greatest Need for Water Conveyance



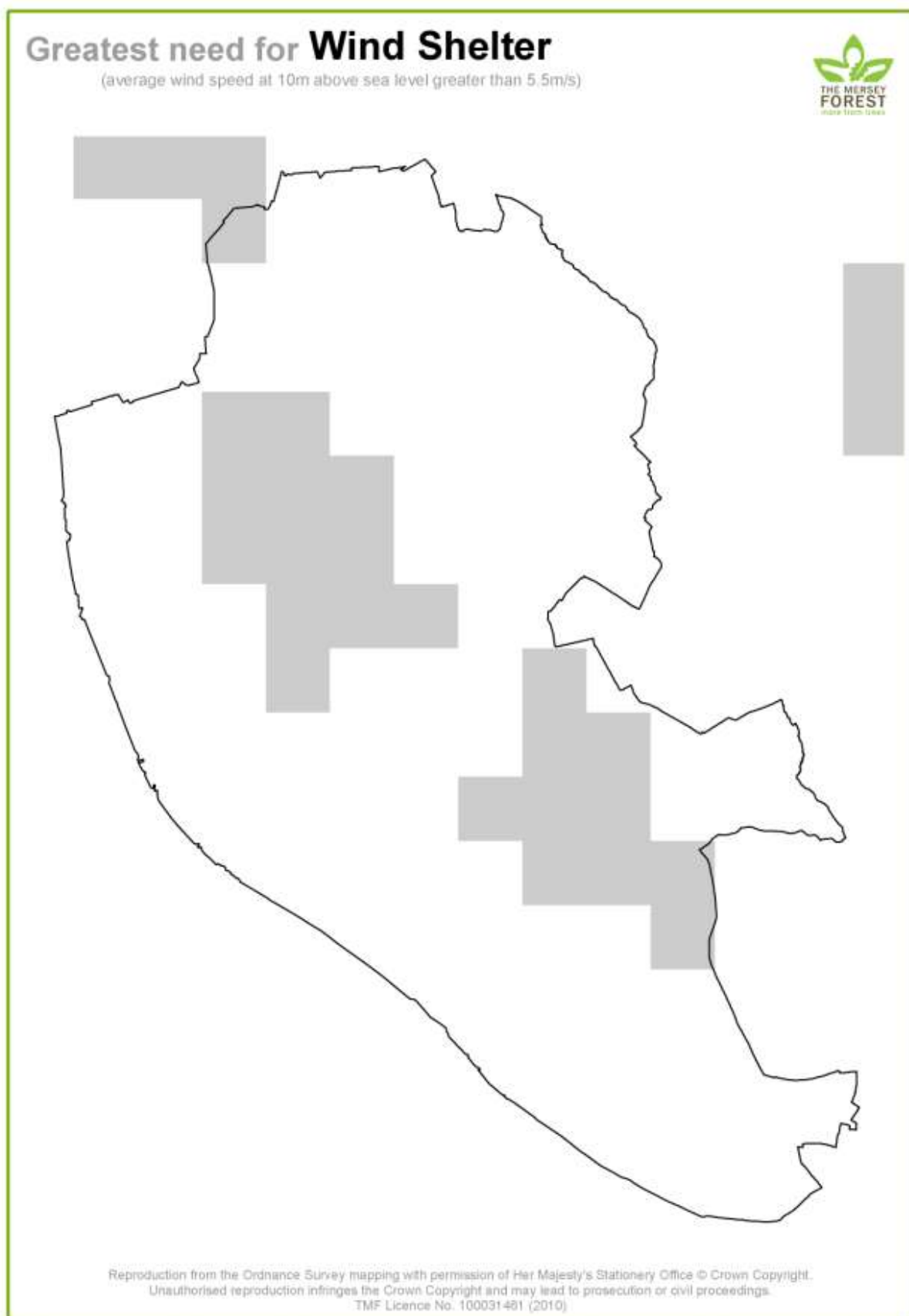
Map 88 Greatest Need for Water Infiltration



Map 89 Greatest Need for Water Interception

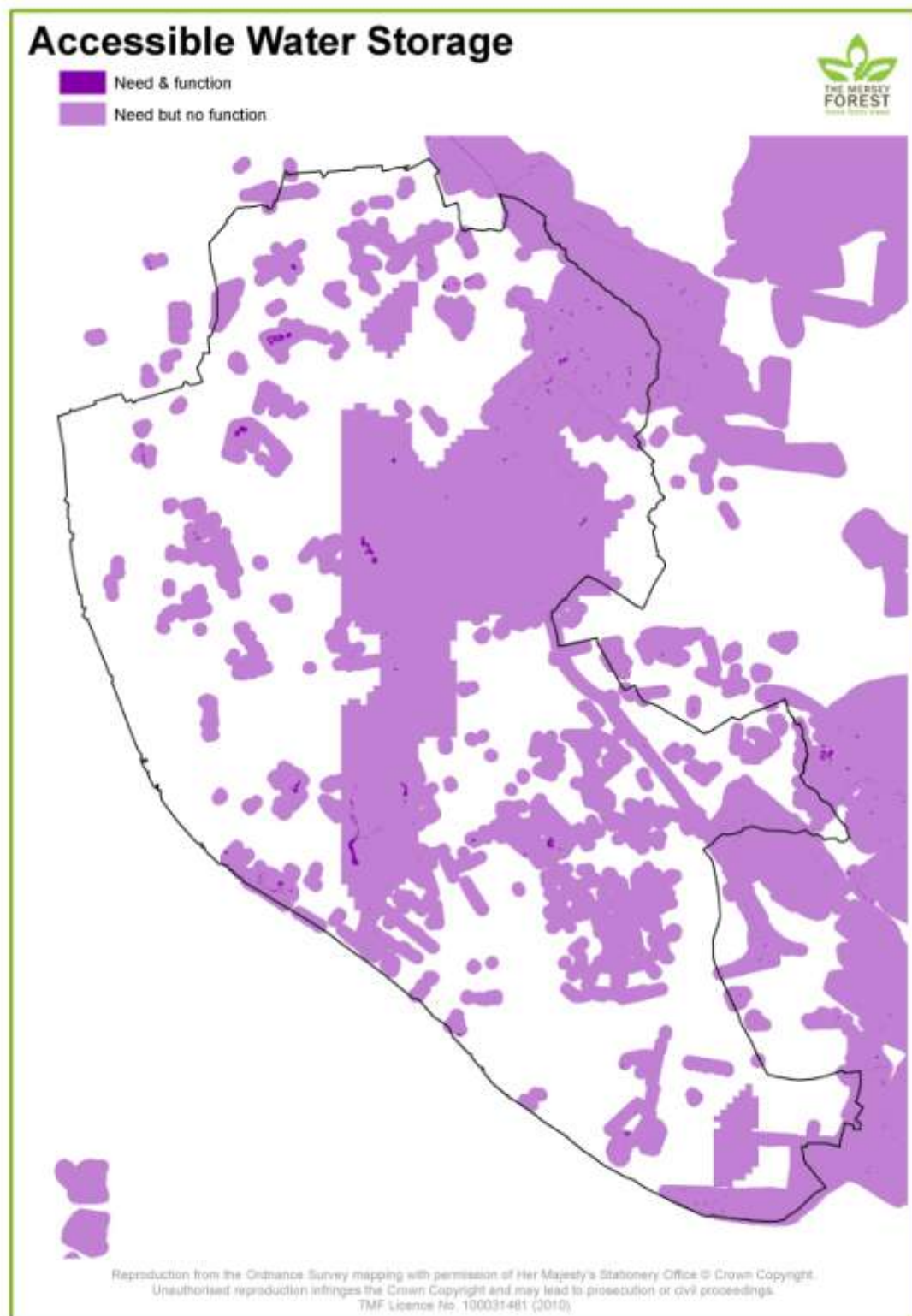


Map 90 Greatest Need for Wind Shelter

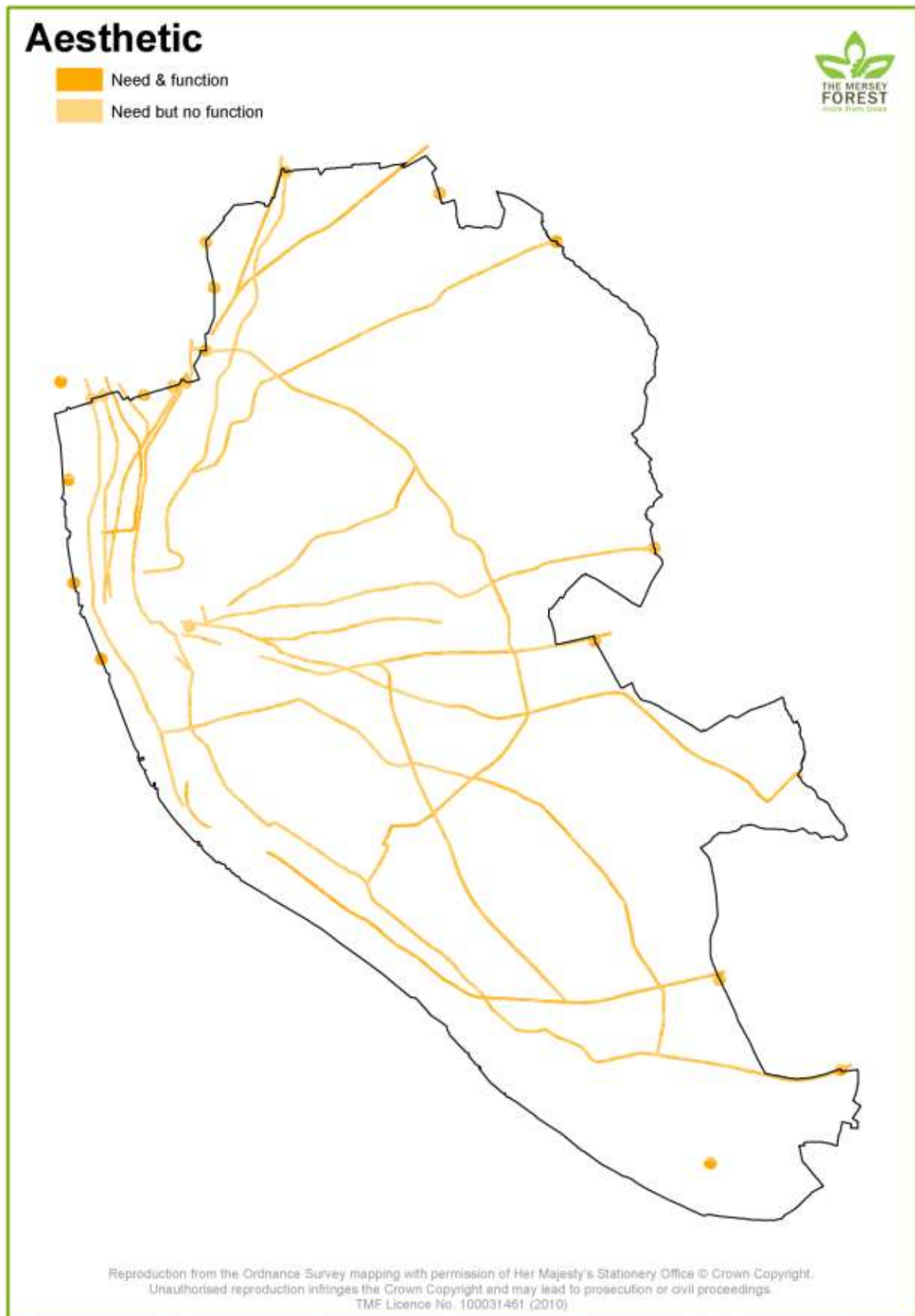


14.10. Assets Maps

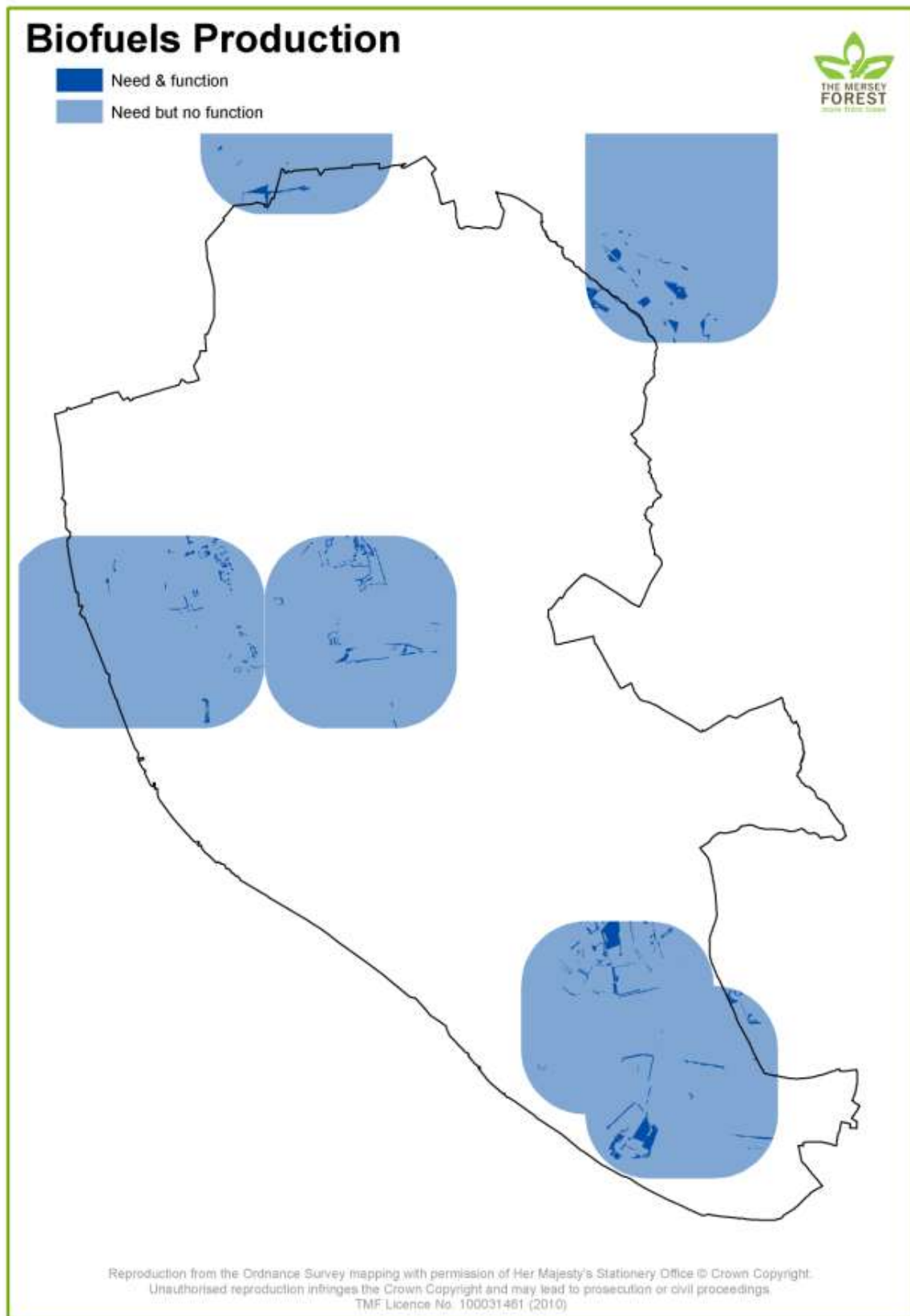
Map 91 Accessible Water Storage Assets



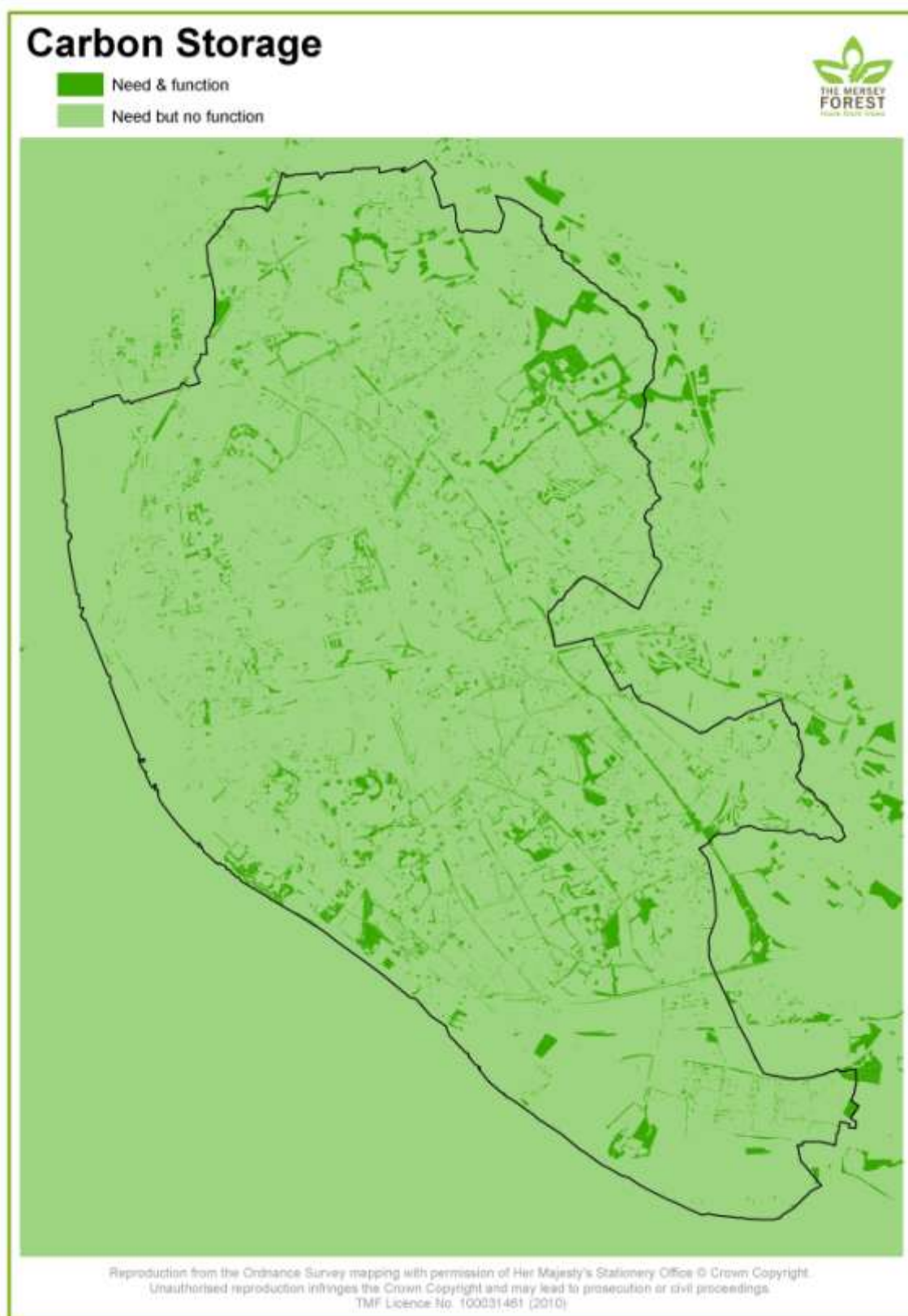
Map 92 Aesthetic Assets



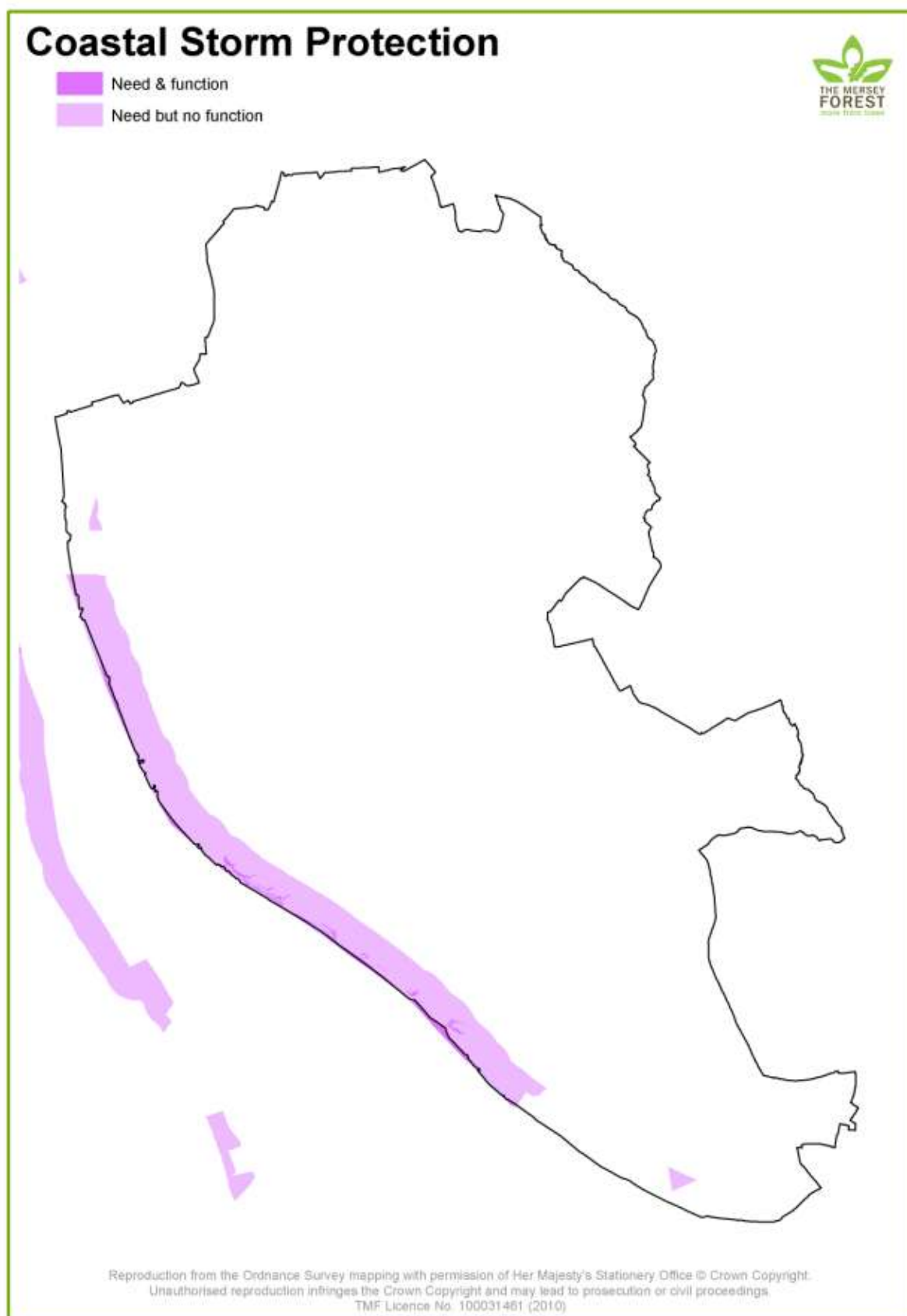
Map 93 Biofuels Production Assets



Map 94 Carbon Storage Assets



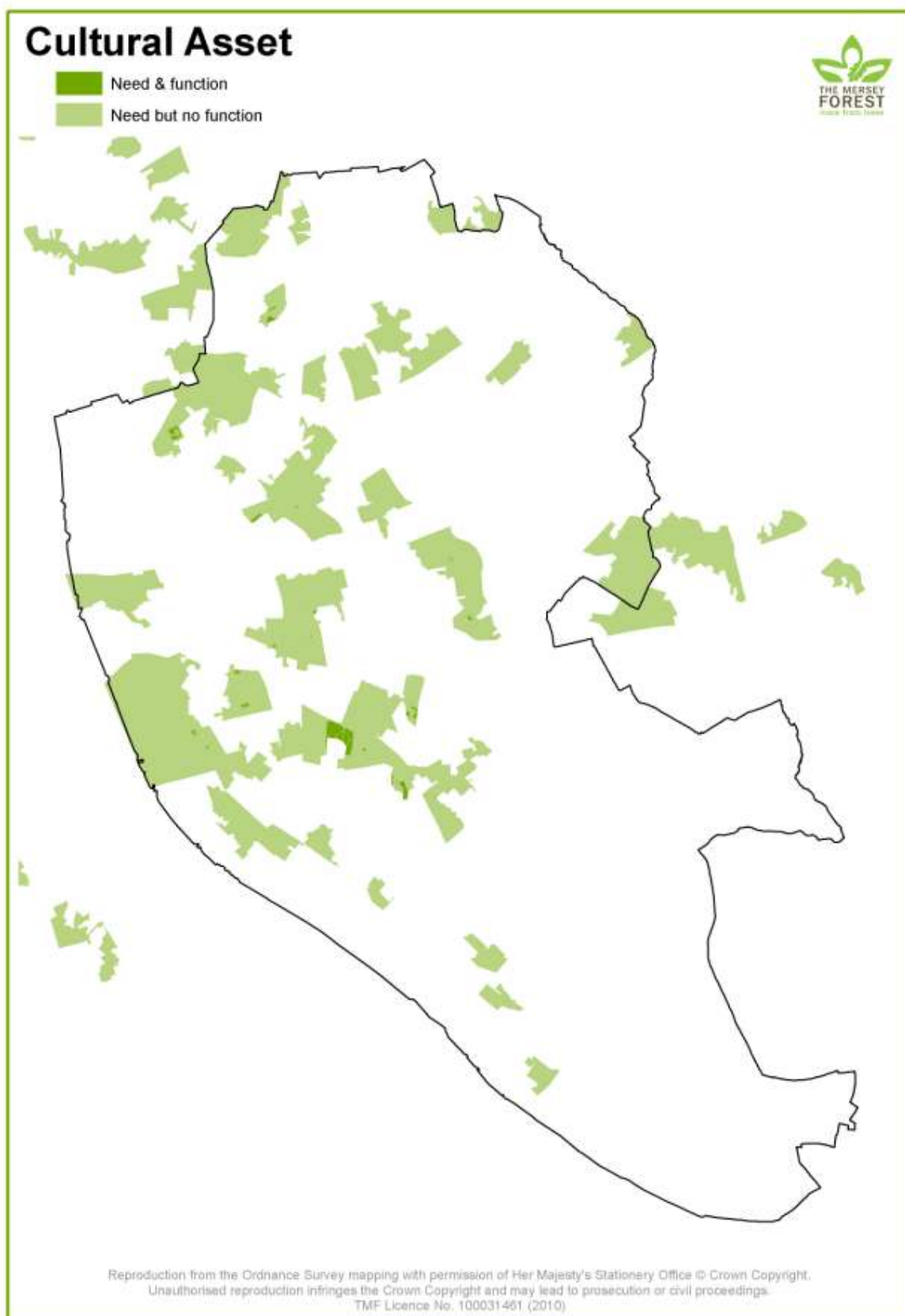
Map 95 Coastal Storm Protection Assets



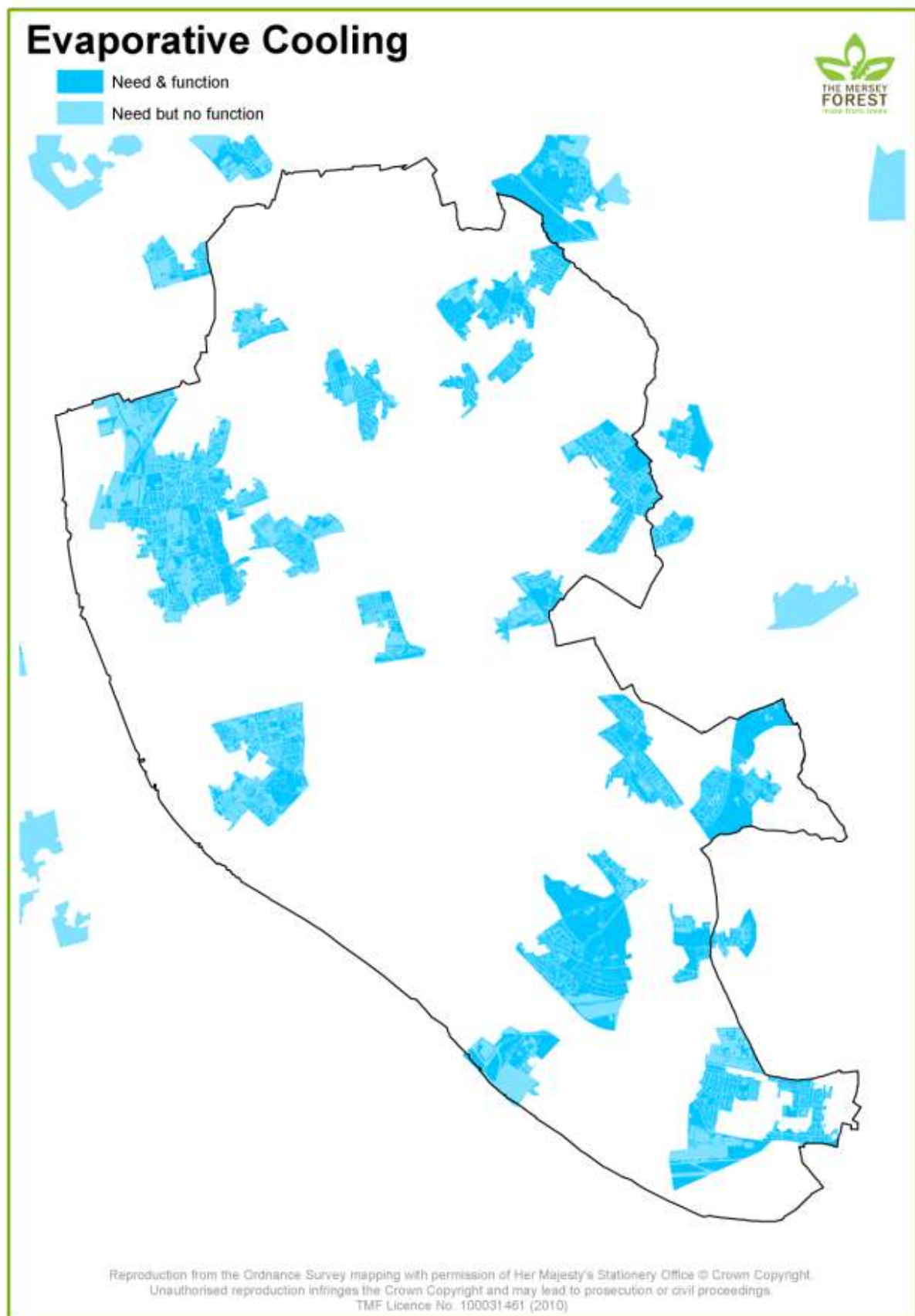
Map 96 Corridor for Wildlife Assets



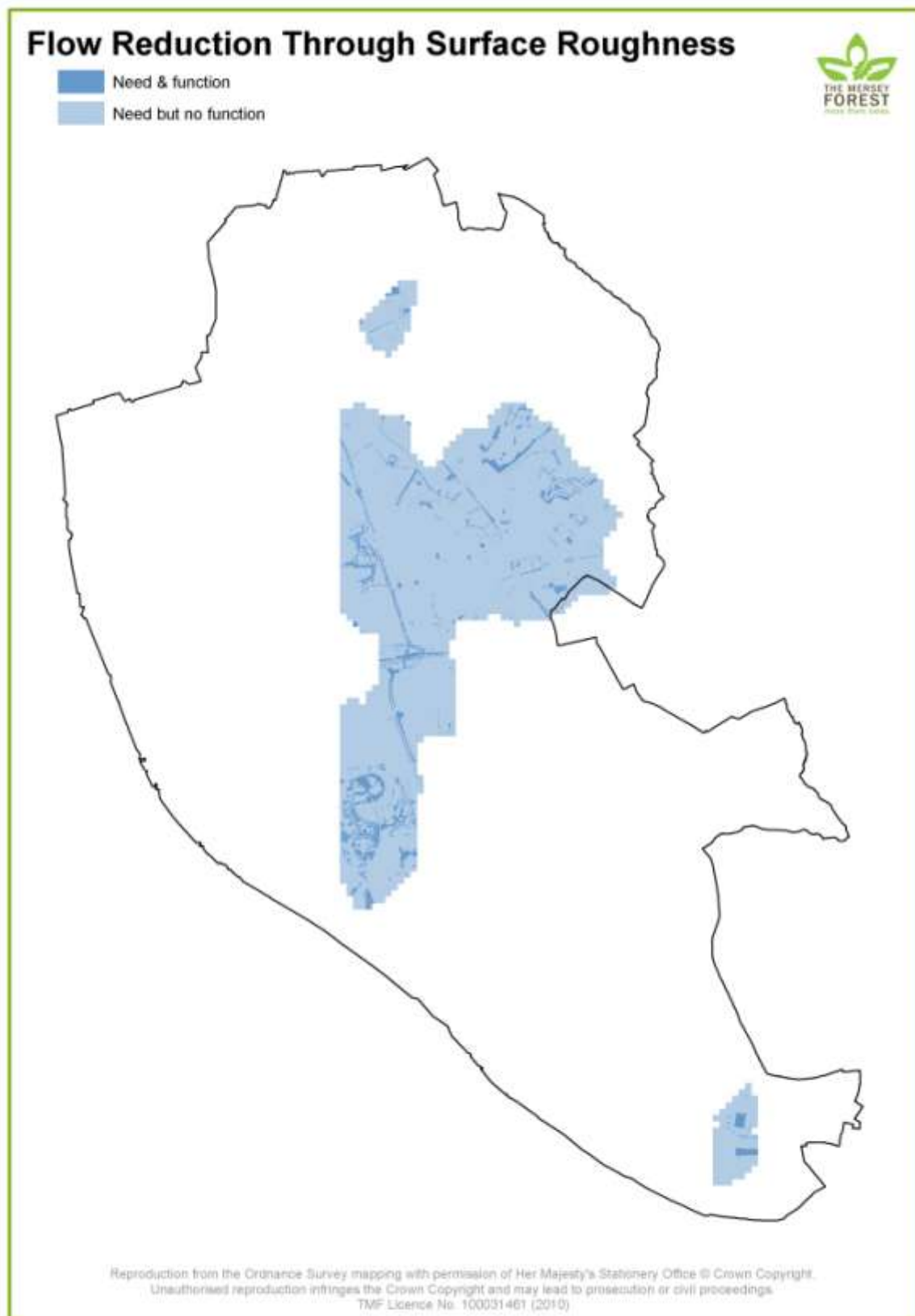
Map 97 Cultural Assets



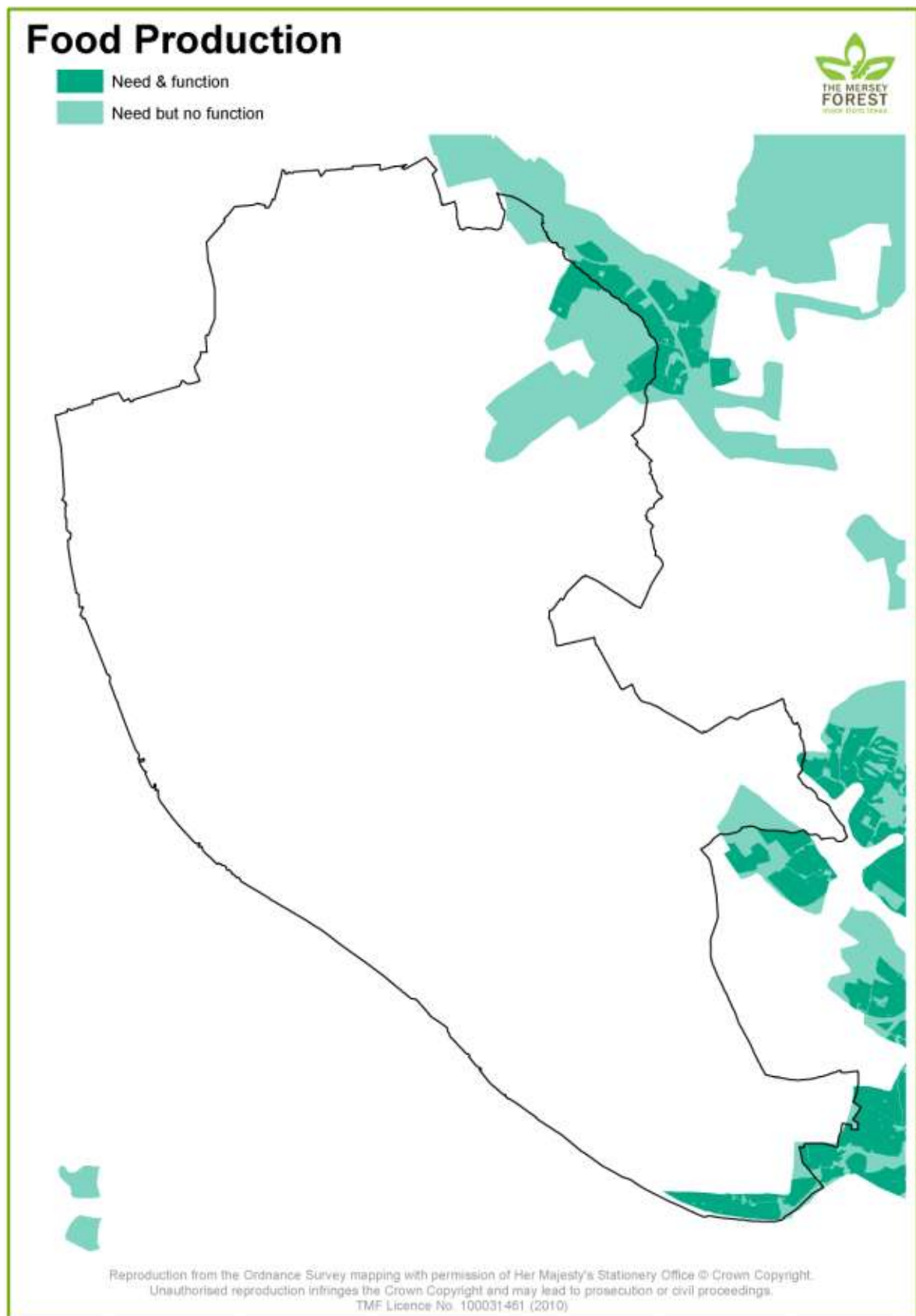
Map 98 Evaporative Cooling Assets



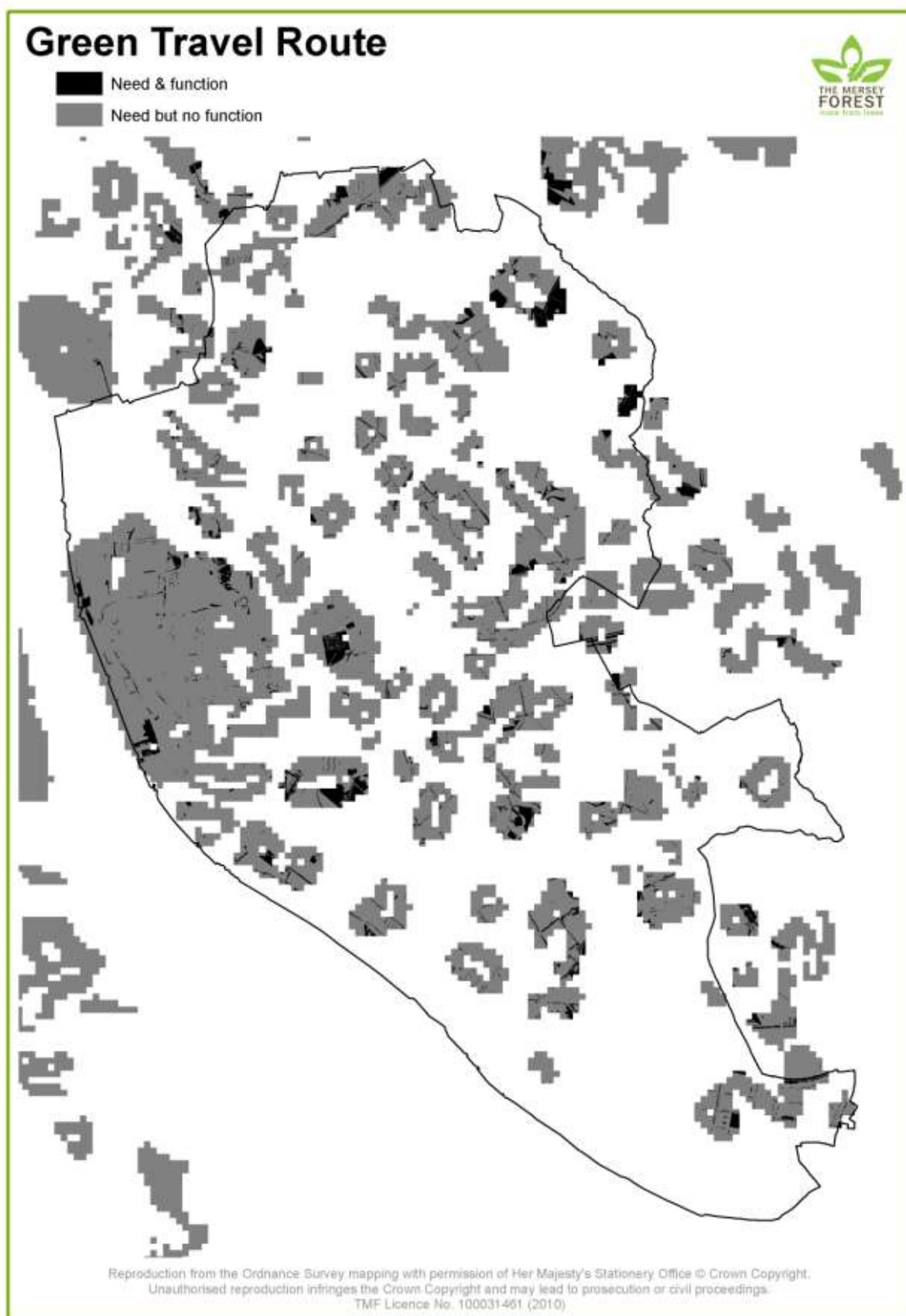
Map 99 Flow Reduction Through Surface Roughness Assets



Map 100 Food Production Assets



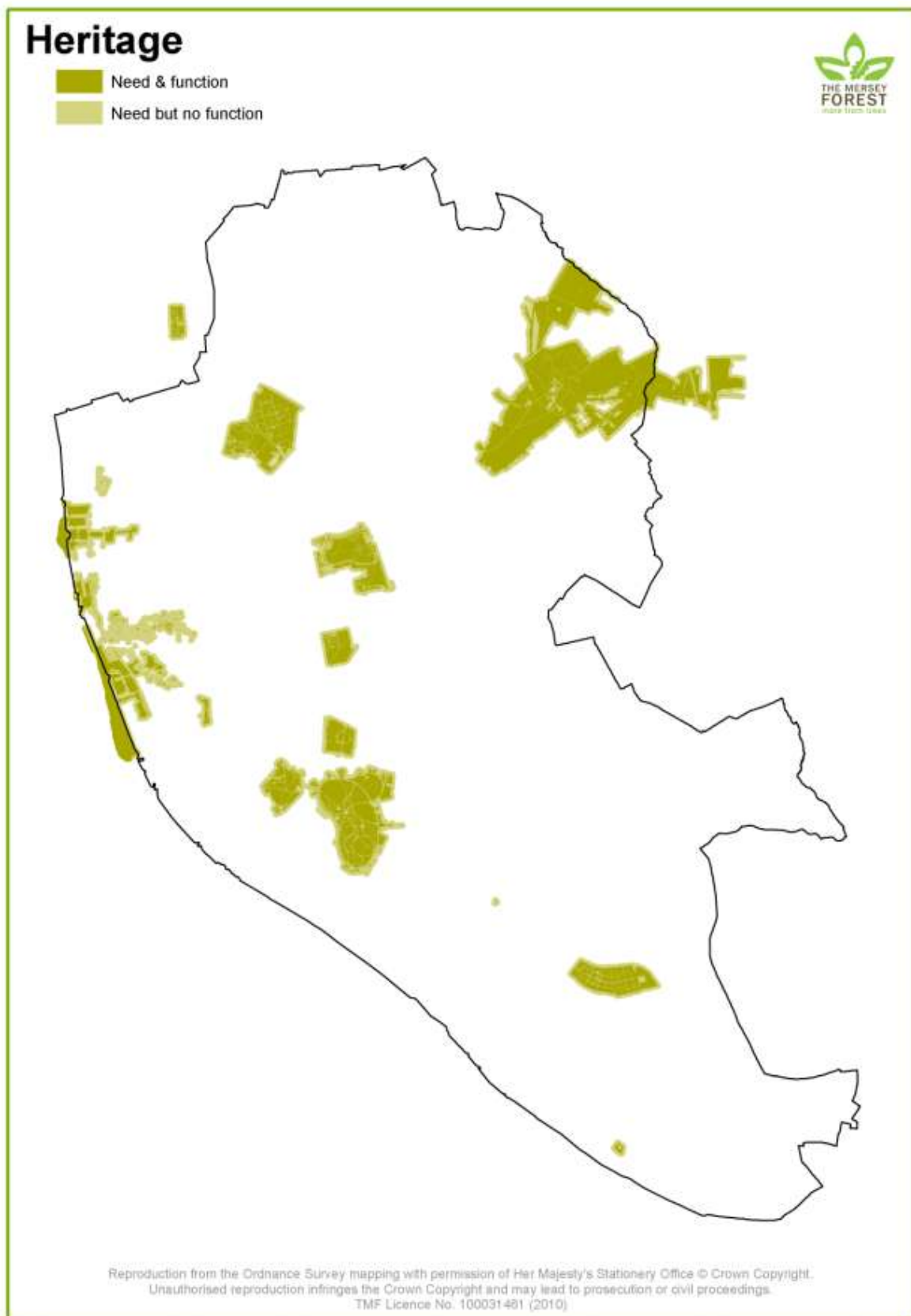
Map 101 Green Travel Route Assets



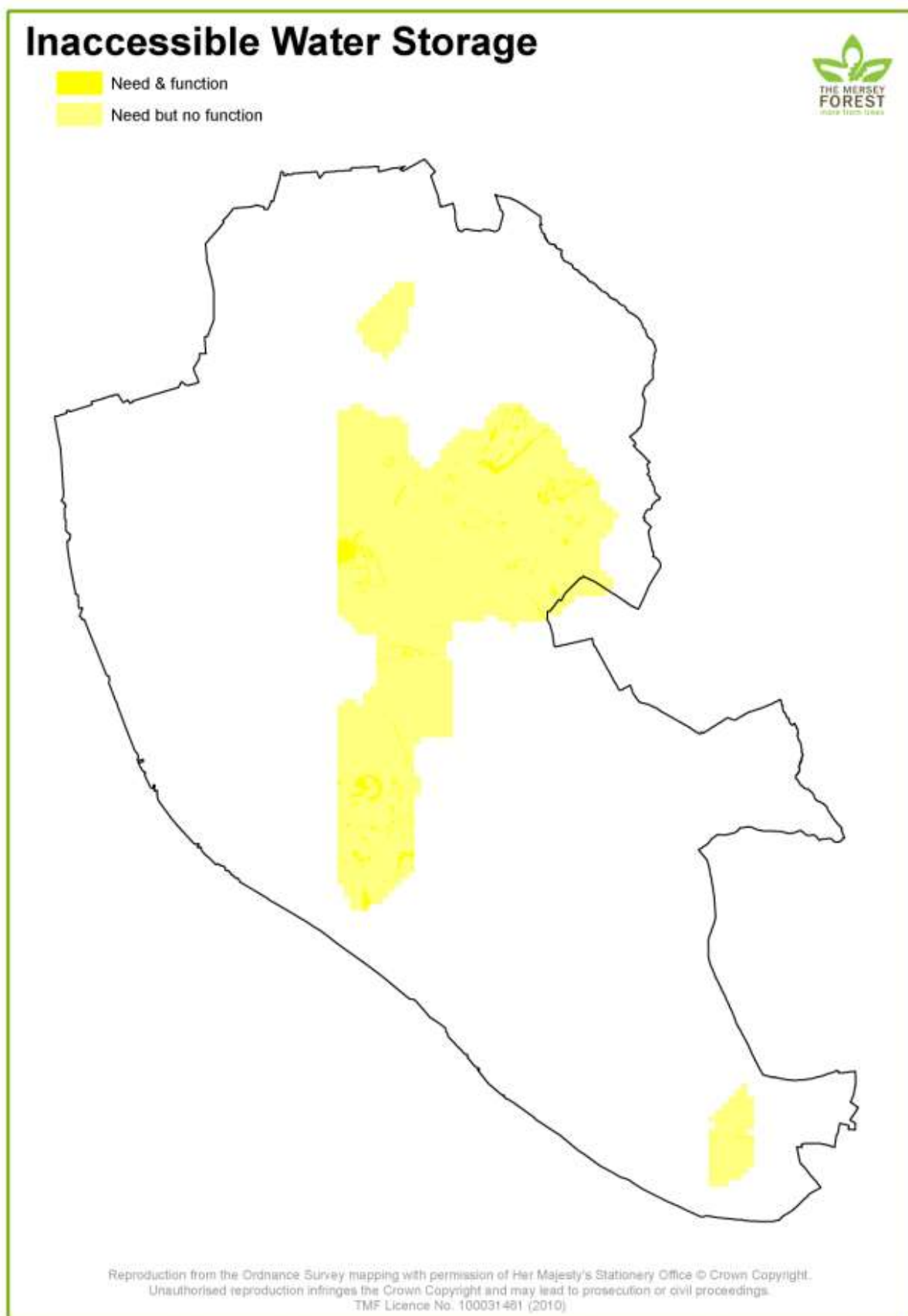
Map 102 Habitat for Wildlife Assets



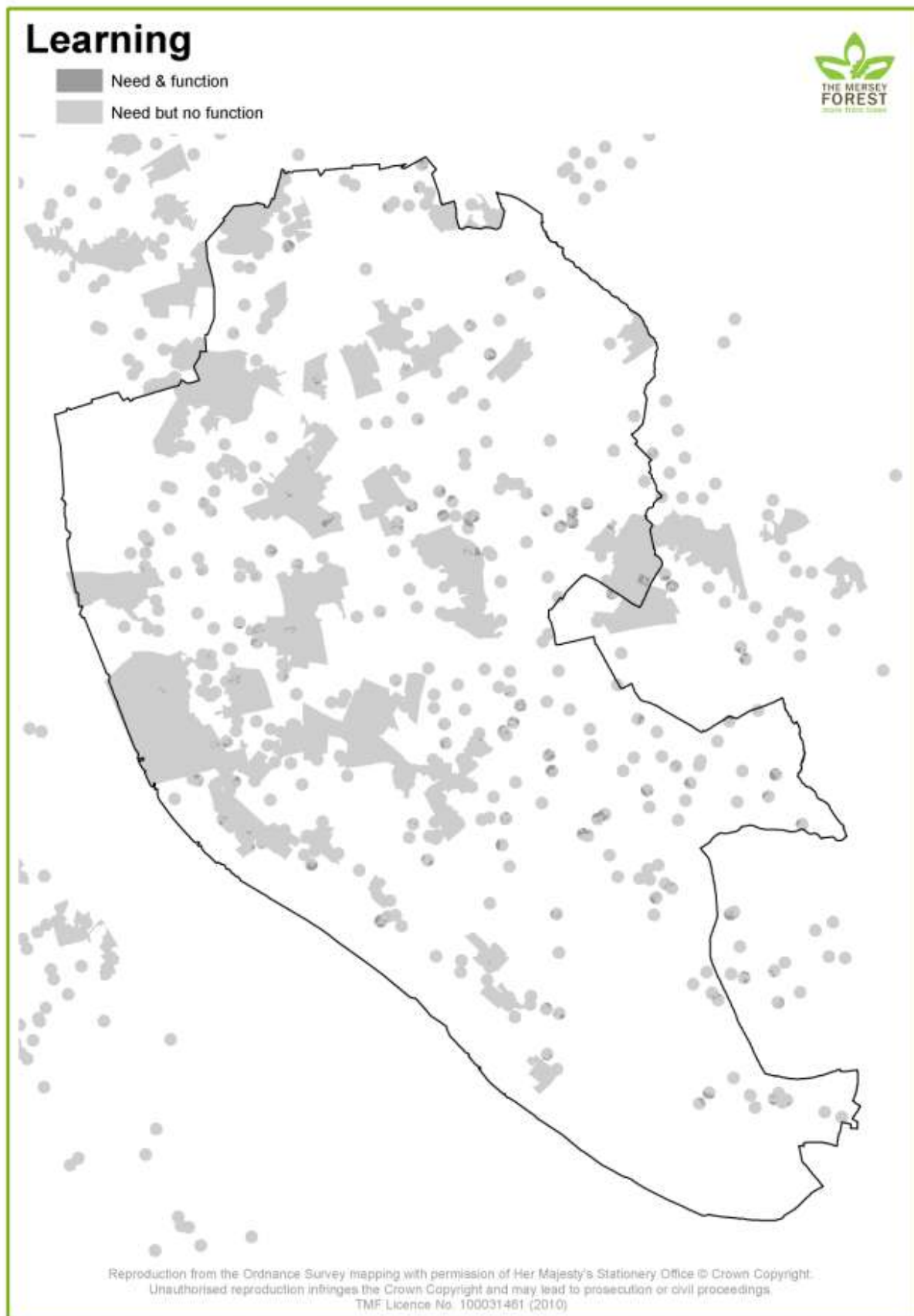
Map 103 Heritage Assets



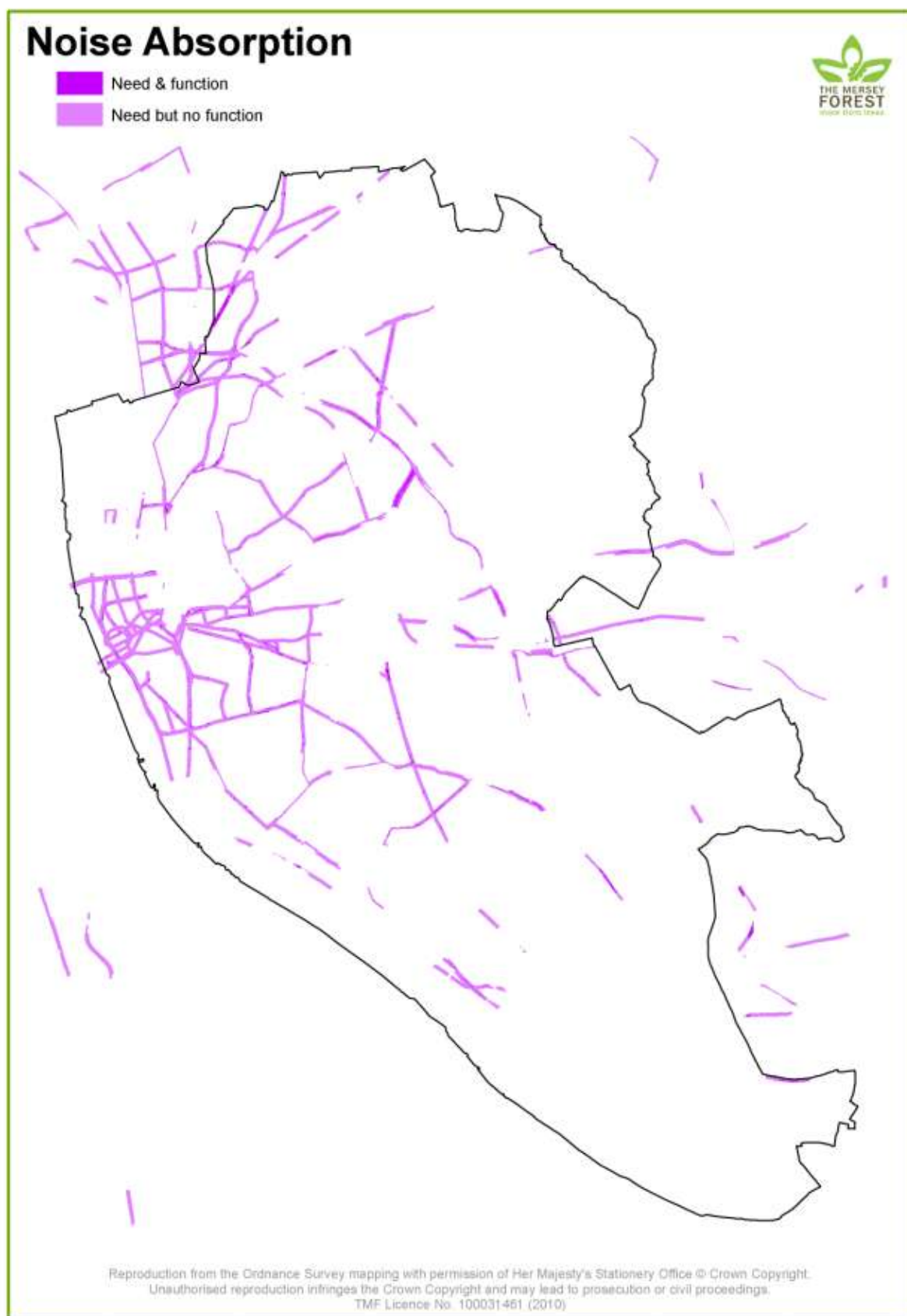
Map 104 Inaccessible Water Storage Assets



Map 105 Learning Assets



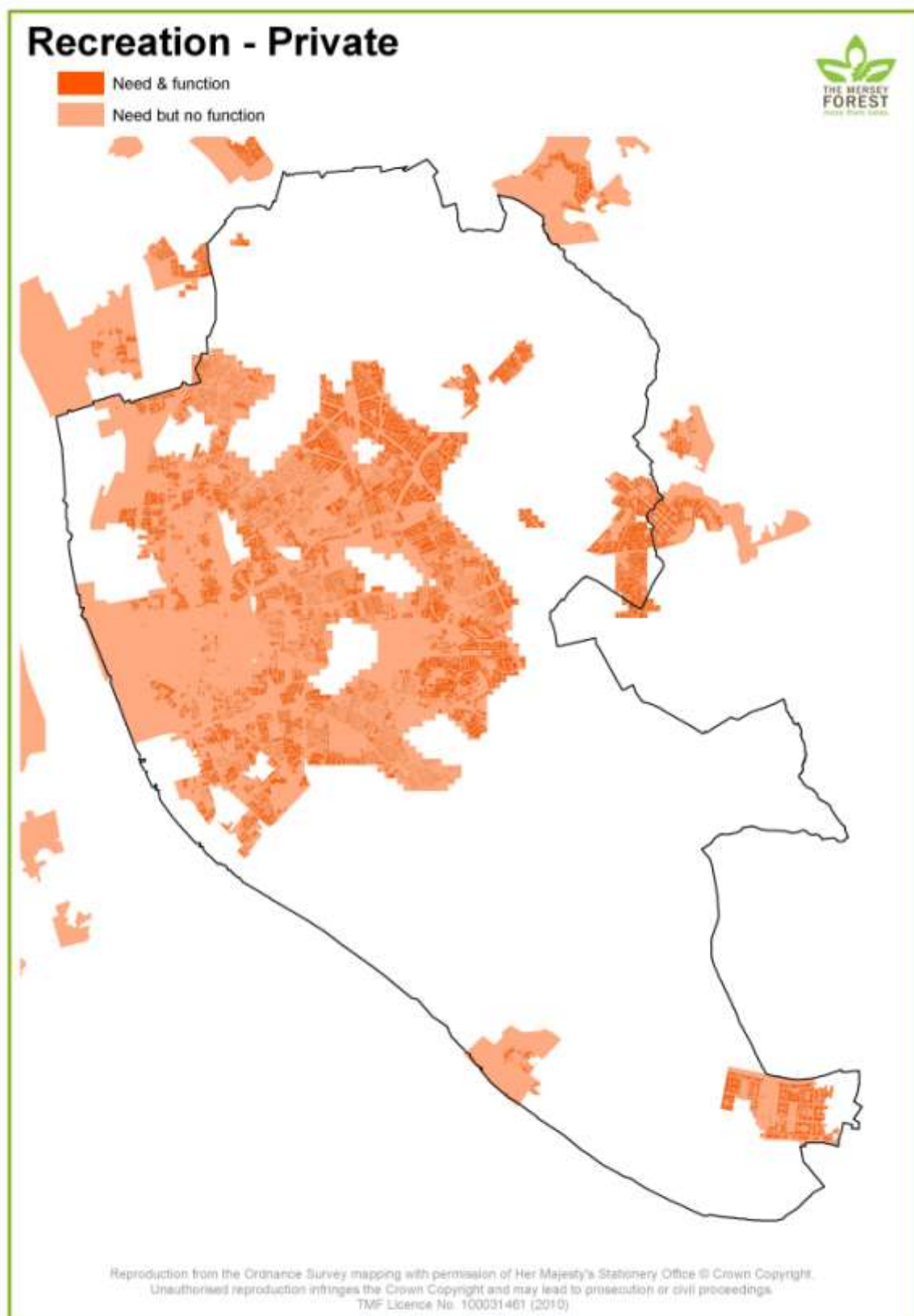
Map 106 Noise Absorption Assets



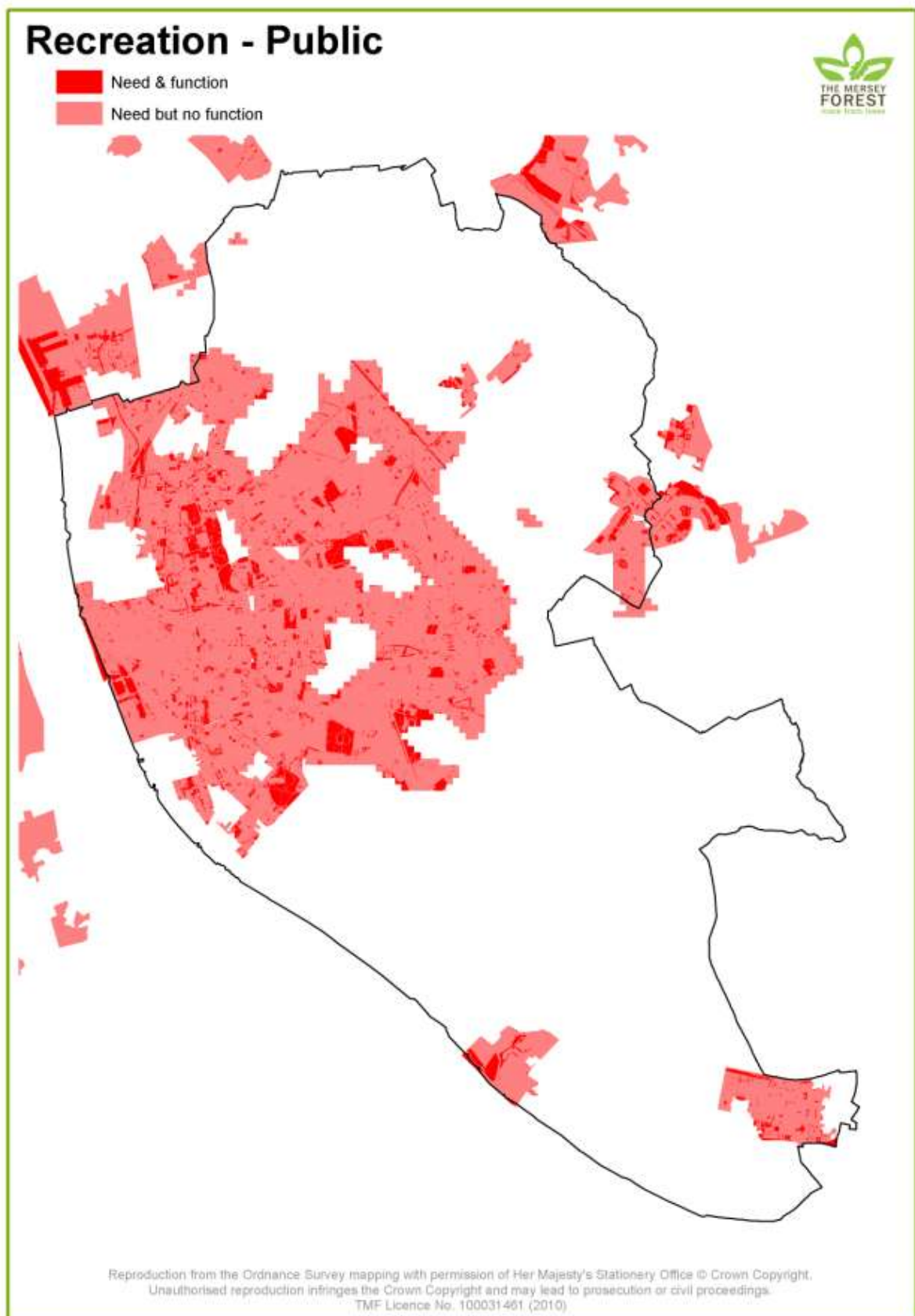
Map 107 Pollutant Removal from Soil/Water Assets



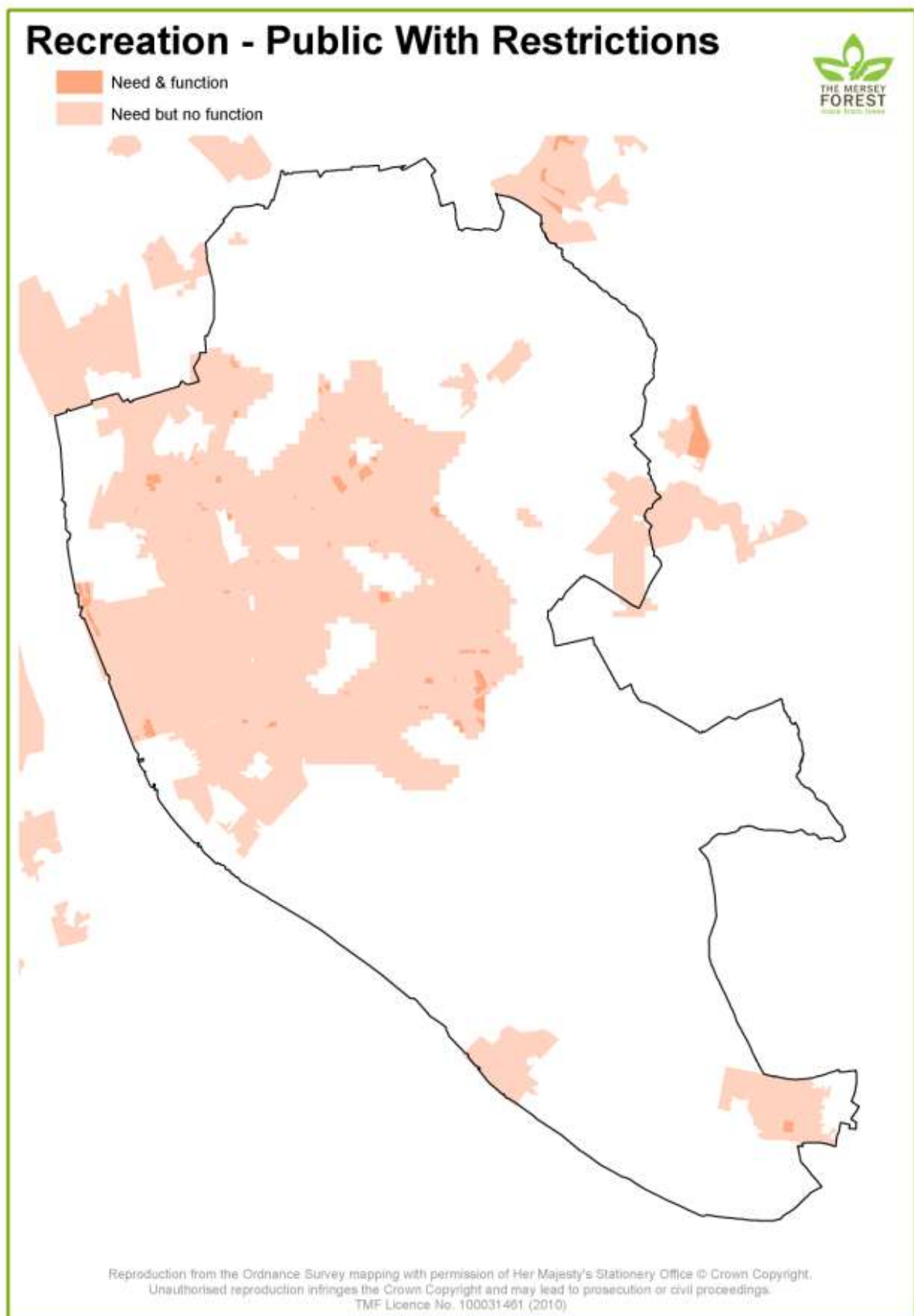
Map 108 Recreation – Private Assets



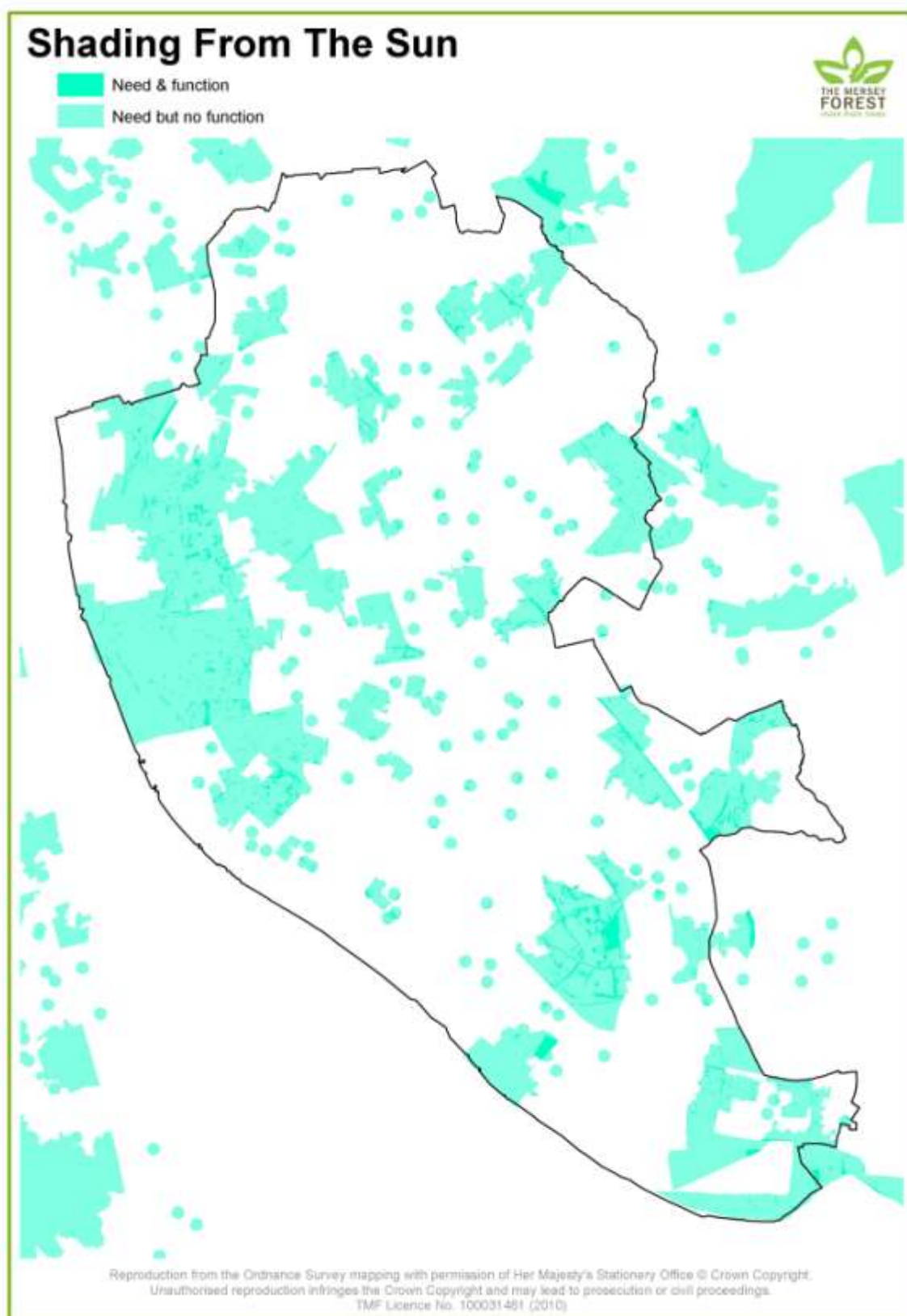
Map 109 Recreation – Public Assets



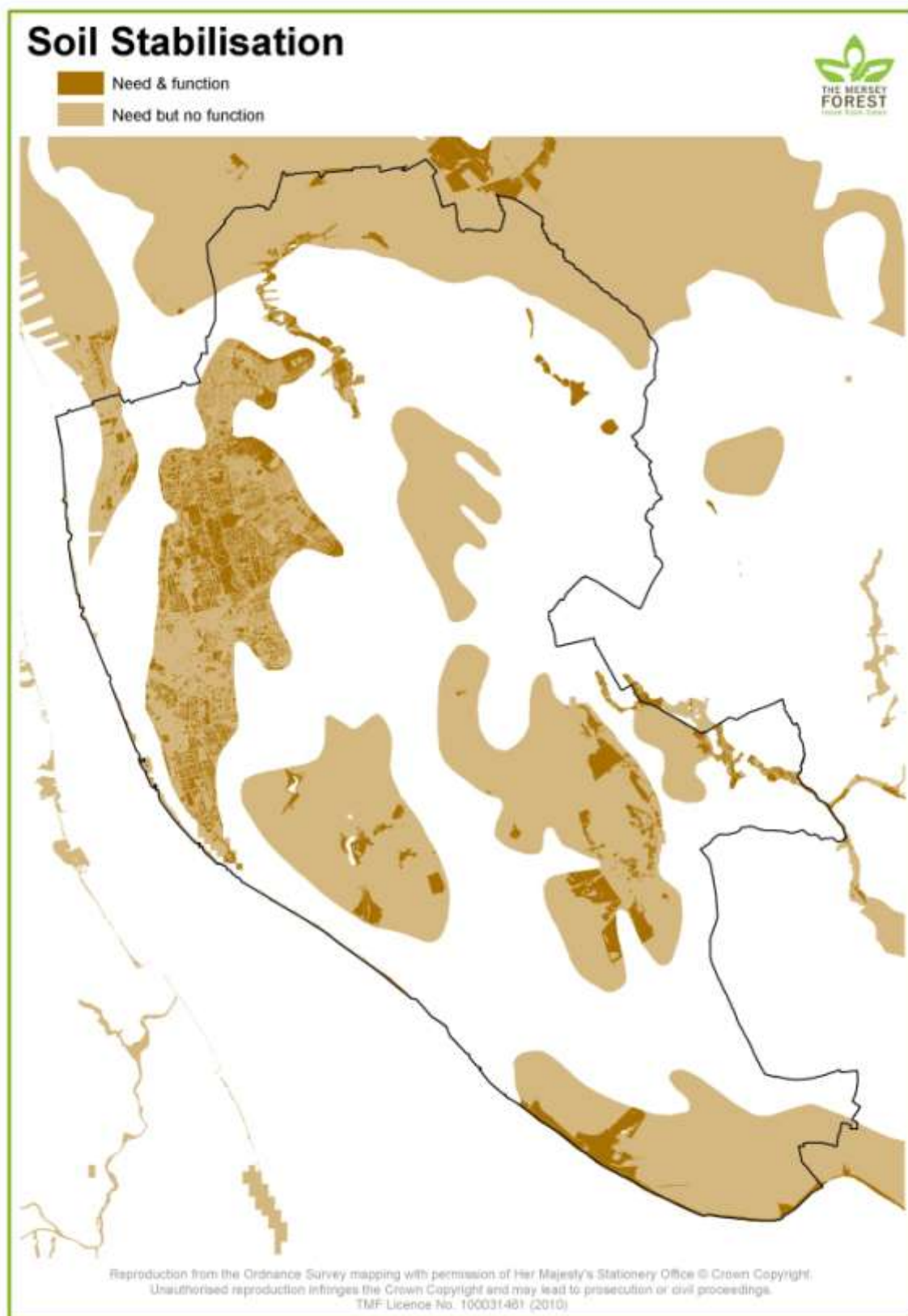
Map 110 Recreation – Public with Restrictions Assets



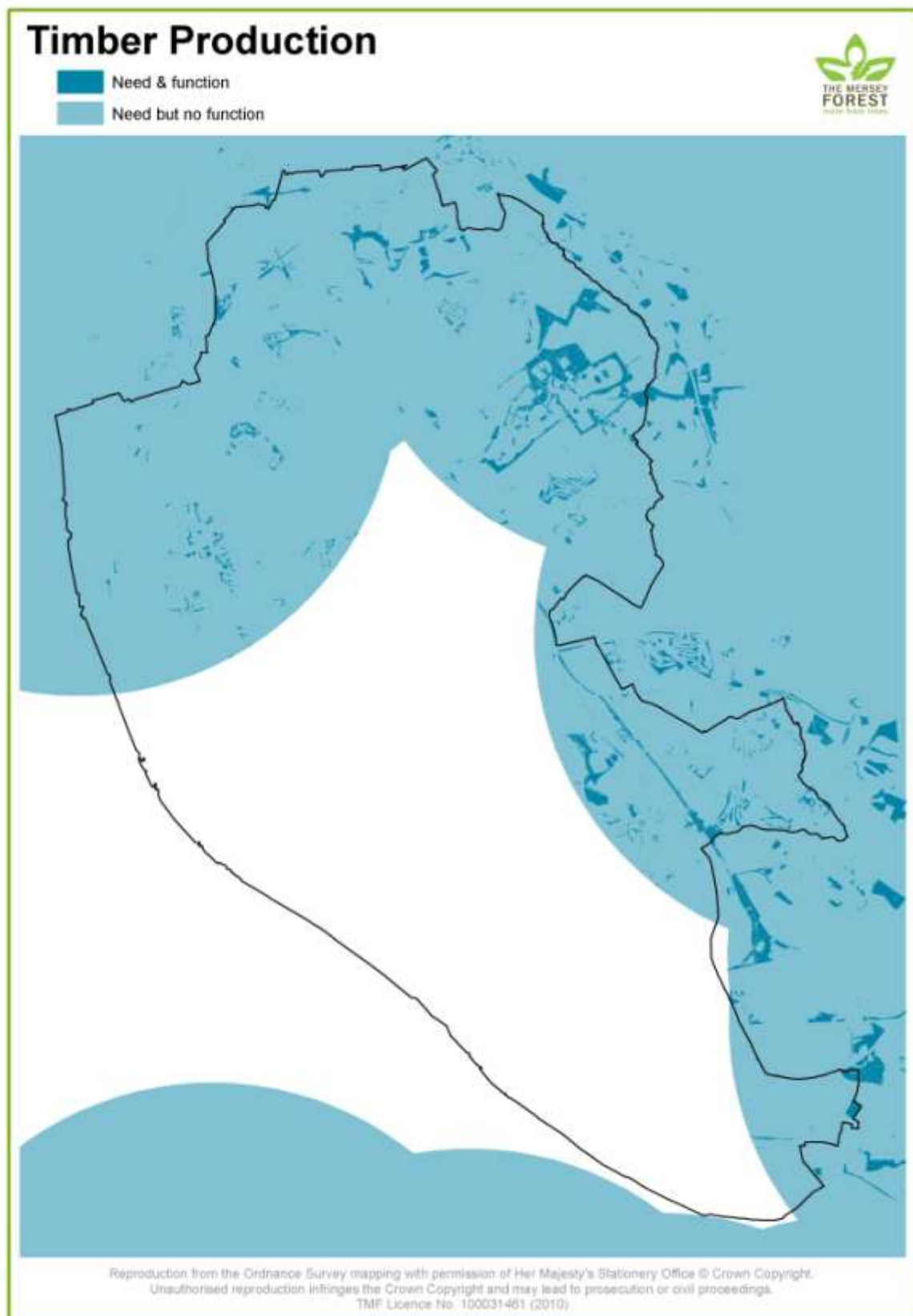
Map 111 Shading from the Sun Assets



Map 112 Soil Stabilisation Assets



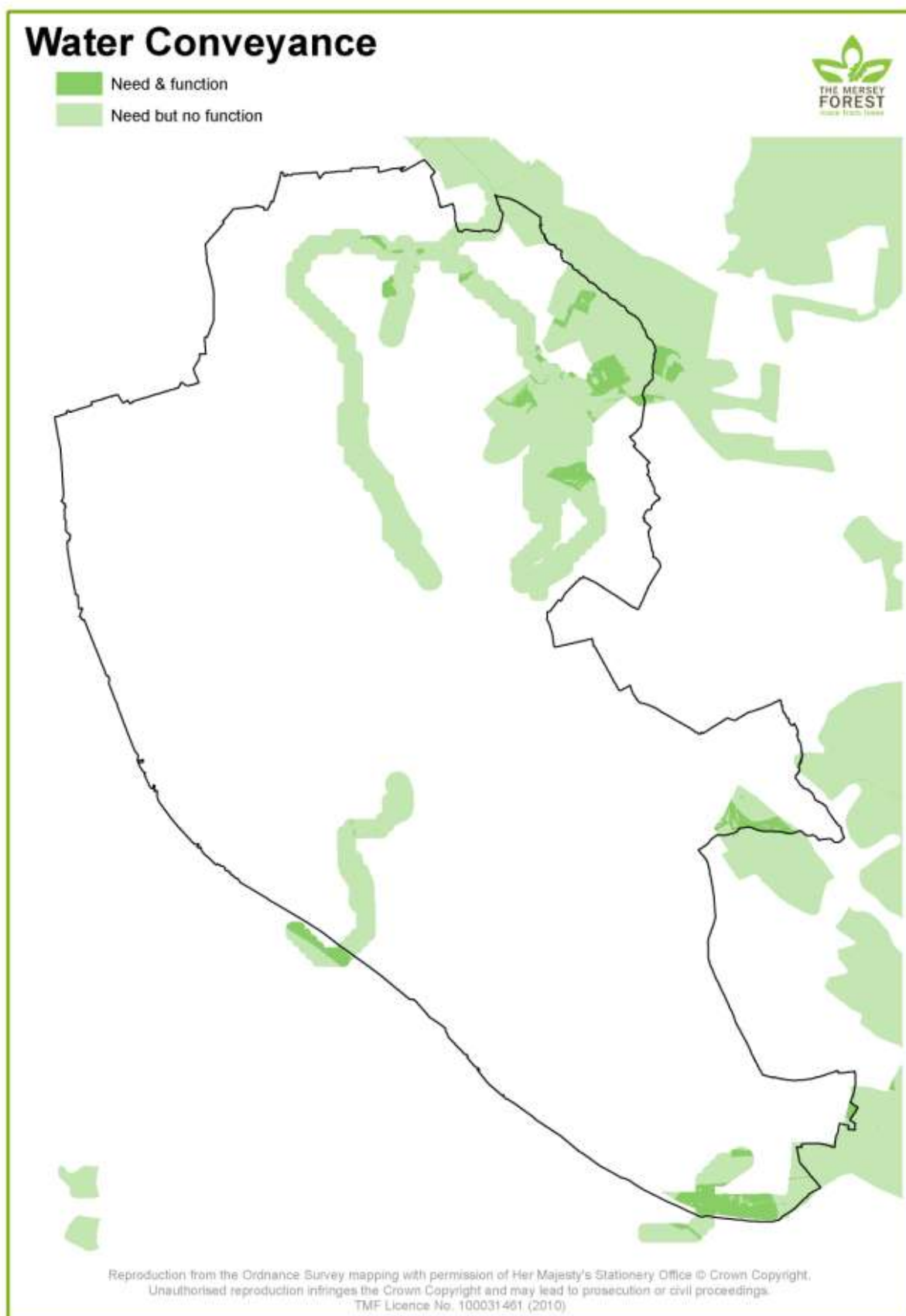
Map 113 Timber Production Assets



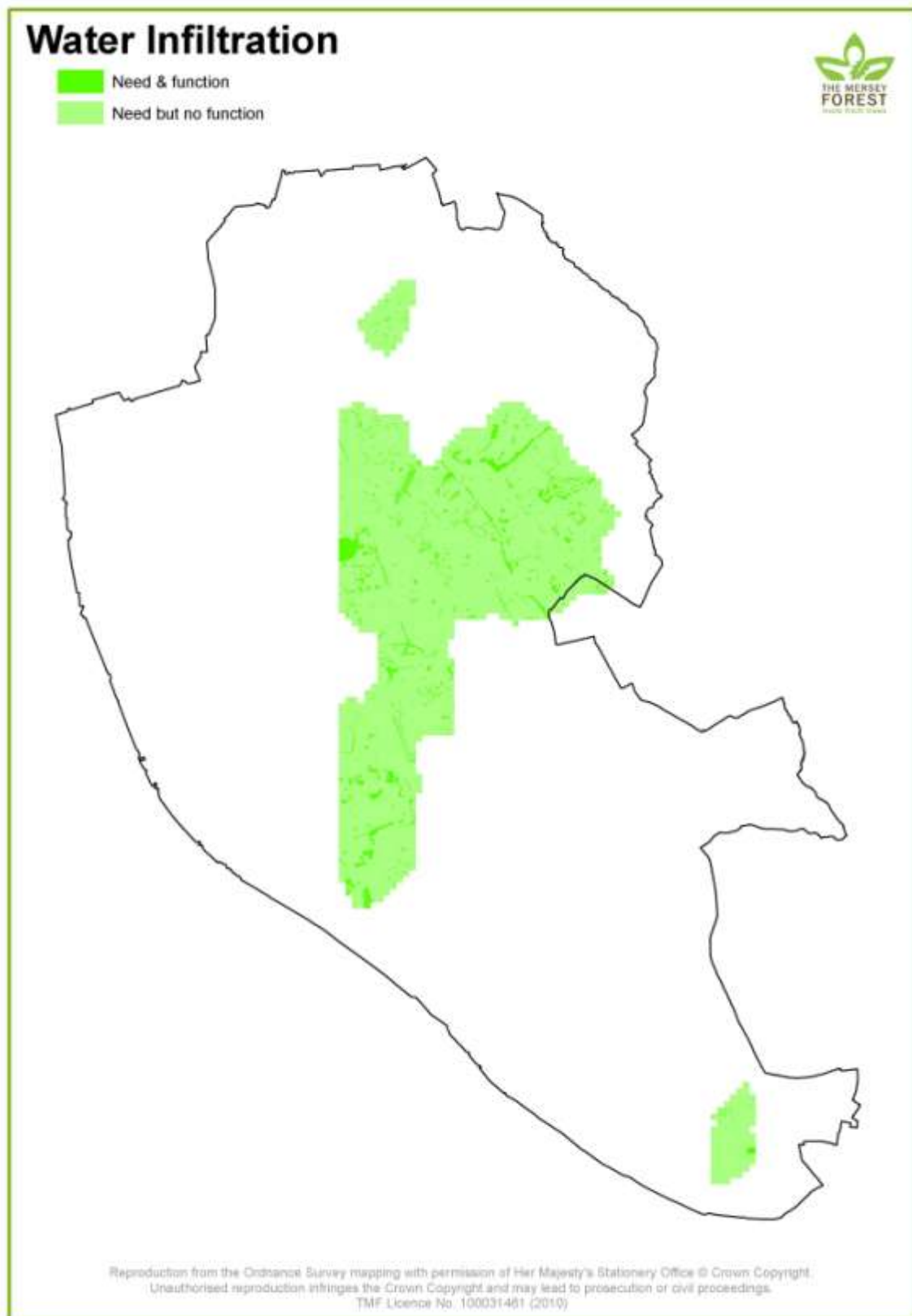
Map 114 Trapping Air Pollutants Assets



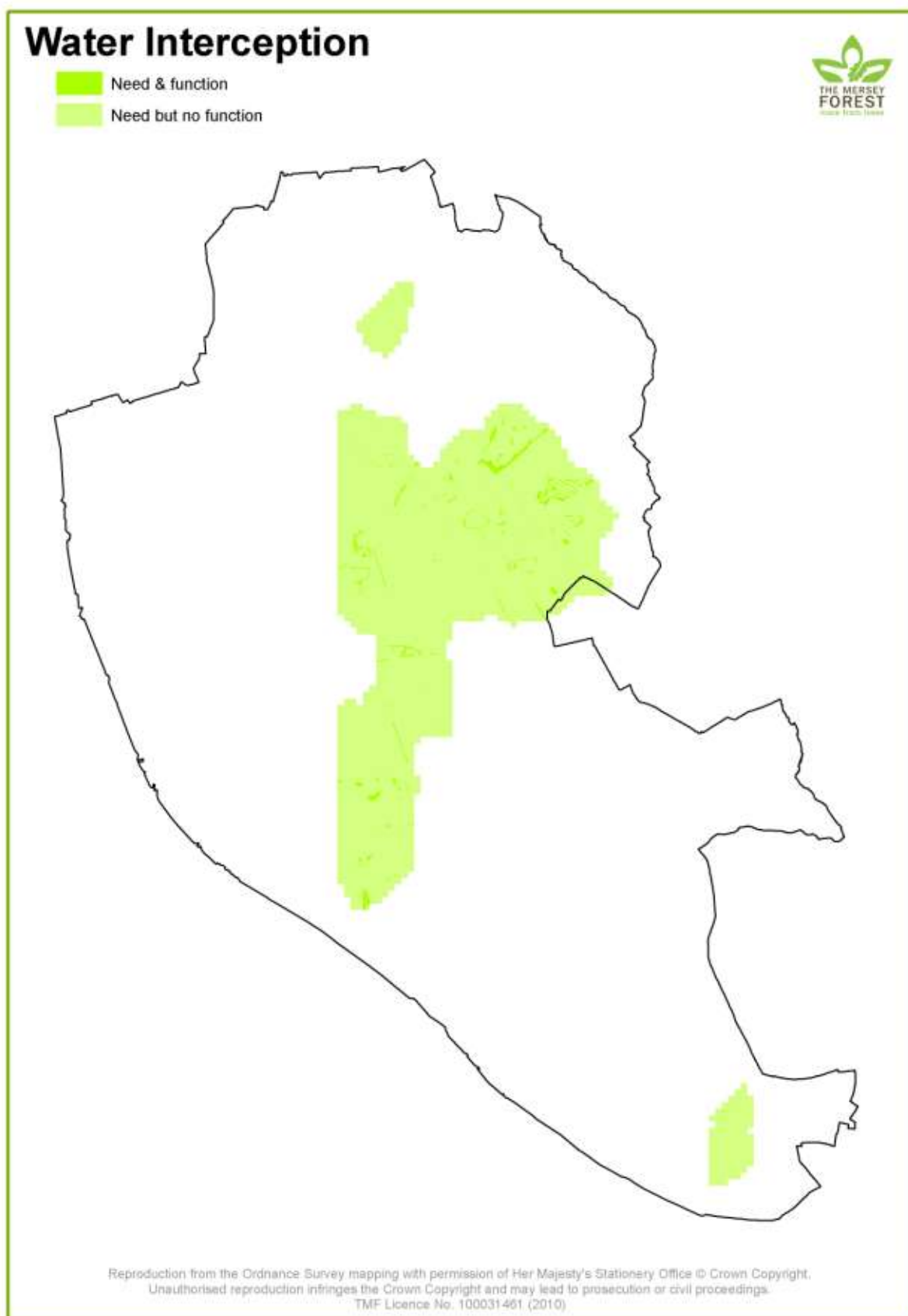
Map 115 Water Conveyance Assets



Map 116 Water Infiltration Assets



Map 117 Water Interception Assets



Map 118 Wind Shelter Assets



15. APPENDIX 2 LIVERPOOL KNOWLEDGE QUARTER PROJECT SUMMARY

15.1. Introduction

15.1.1. Liverpool's Knowledge Quarter lies to the east of the city centre and is recognised to be a key driver in the region's economy. Despite covering only 1% of the city, employment within the Knowledge Quarter equates to 7% of the total FTE jobs in Liverpool and is said to generate an annual income of £1 billion²¹⁷.

15.1.2. This case study sets out how green infrastructure planning can be used at a very fine scale, making use of the type of data and information that has been produced for the Liverpool Green Infrastructure Strategy to inform decisions, maximise benefits and help to achieve the business and environmental objectives for the city.

15.1.3. Liverpool Vision, the city's economic development company, published an Urban Design Framework for the Knowledge Quarter in July 2008. It included a Climax Plan which showed an estimation of how the buildings, streets and open spaces might look within twenty years. The Mersey Forest and Natural Economy Northwest, together with other partners, suggested that a study be undertaken to assess how green infrastructure planning could be incorporated into the plan to further its success.

15.1.4. The result was a change to the original plans to take into account the findings from the green infrastructure assessment and potentially provide additional functionality and value to the Liverpool Knowledge Quarter area.

15.2. Assessment of Typology

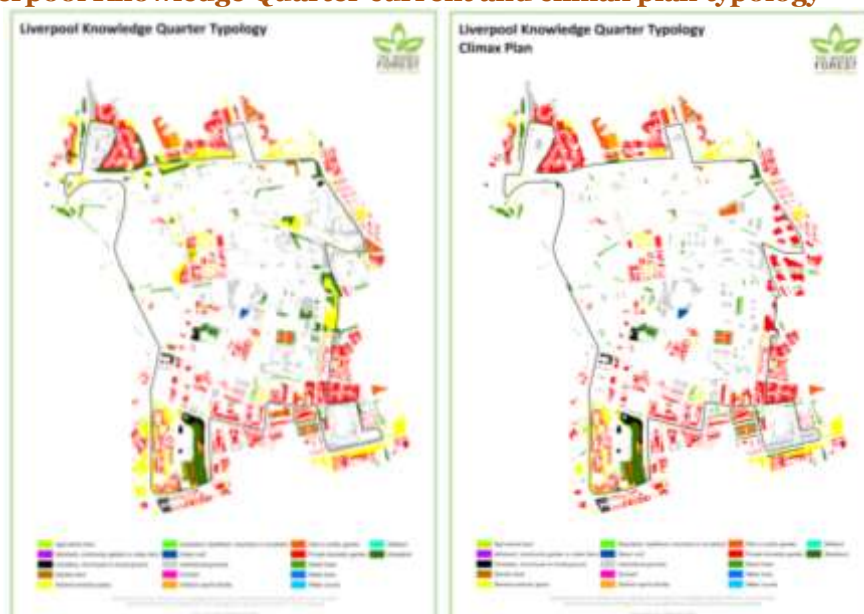
15.2.1. To better understand the potential impact any change in green infrastructure it was first necessary to accurately classify and map the existing green infrastructure. This was undertaken by the use of high resolution aerial photography and highly accurate vector Ordnance Survey data. Each area of green space was systematically classified.

15.3. Climax Plan

15.3.1. Then the process was undertaken once again using the conceptual layout of the Knowledge Quarter as proposed within the Climax Plan.

²¹⁷ http://www.liverpoolvision.co.uk/keydocs/A00322%20-%20Report%20-%20Technical%20Report%20-%20Final%20_091107_.pdf

Map 119 Liverpool Knowledge Quarter current and climax plan typology



15.4. Functionality

15.4.1. Green infrastructure will perform many and in some cases very different functions, which will range from the provision of public recreation to providing a habitat for wildlife. Twenty-eight functions in total were identified. The two datasets, together with many other datasets, were then used to assess where each of the functions were being performed. This was undertaken both at present and within the Climax Plan. It was now possible to see in which areas the loss or gain of multifunctionality could be when comparing the two. This was brought together to produce Map 120. It shows areas of loss of multifunctionality indicated by grey to black and areas of gain of multifunctionality by the light to dark pink colours.

Map 120 Liverpool Knowledge Quarter change in Multifunctionality



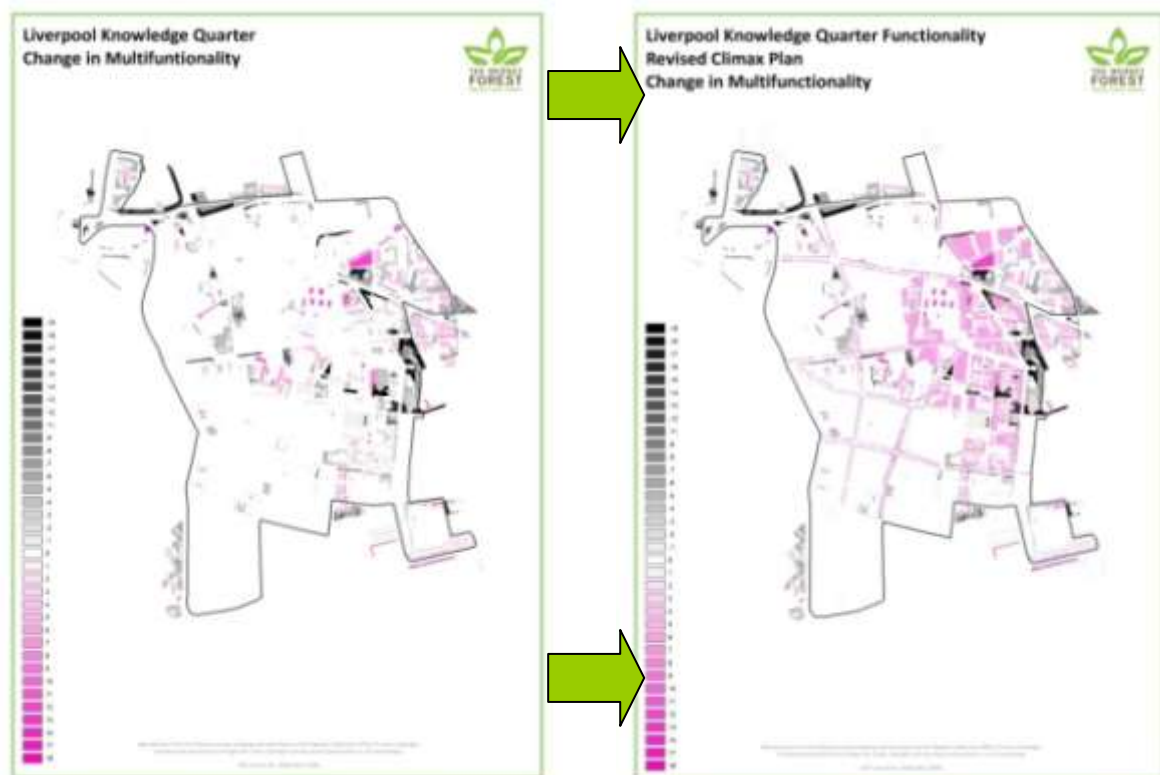
15.4.2. Upon the production of these results it was apparent that in many areas the losses outweighed the gains, which in turn lead to a reassessment of the Climax Plan. Once the Climax Plan had been redesigned it was possible to both reassign the typology as to reassess

potential changes in multi-functionality. In the re designed climax plan it is clear to see that the functionality has been increased.

15.4.3. The key issue now is to embed the increased functionality within the detailed proposals for the area. The large areas of green roof are probably not realistic; it would take a major shift in attitude and policy to enable such a large area to be created. However, we can work with developers and planners to try to encourage some green roofs in the area.

15.4.4. The urban trees are less contentious, they do provide a wide range of benefits, but there are issues to be addressed about the support for long term management of a significant population of new urban trees.

Map 121 Liverpool Knowledge Quarter change in Multifunctionality comparing the old climax plan and revised climax plan



16. APPENDIX 3 GREEN INFRASTRUCTURE INDEX

16.1. What is the Green Infrastructure Index?

16.1.1. The Green Infrastructure Index is a three step process that could be developed for Liverpool to encourage and direct developers to plan and implement green infrastructure as part of their projects. This approach is used in other cities such as Malmo, Berlin and Seattle.

16.1.2. The Index could be adapted to reflect the identified needs for green infrastructure in each of the Core Strategy Priority areas. The index would fit well with the idea set out in the Liverpool Green Infrastructure Strategy Action Plan that each major development should prepare a green infrastructure plan.

16.1.3. Step 1 is to determine a green infrastructure score pre-development and for the planned development. Step 2 is to demonstrate how the design/plan for the site meets green infrastructure needs in the area. Step 3 is to make provisions for the long-term maintenance. N.B. These steps are not sequential; steps 2 and 3 should also inform the design of the site reported on in step 1. Each step and its reporting requirements are set out in turn below.

16.2. Green Infrastructure Score

16.2.1. Each development funded is required to assess the green infrastructure score of the site pre-development and for the planned development. The score pre-development will be compared with the score for the planned development. It will be expected that the planned development score is higher than the pre-development score by at least 0.2. This would demonstrate a reasonable improvement on the amount of green infrastructure present onsite.

16.2.2. The exception is in green field locations where a score of 0.6 should be obtained for the planned development (this will not need to be compared to a pre-development score, as it will almost always be lower if developing a greenfield site. Therefore this score is to see a certain level of green infrastructure in a new development)²¹⁸.

16.2.3. To obtain a score:

- The total area of the site needs to be determined (in m²)
- The area of the site covered by each surface type (a-k, set out in Table 39) needs to be determined (in m²)
- These figures can be added into the spreadsheet to determine the green infrastructure score²¹⁹.

Table 39 Surface type scores

	SURFACE TYPE	SCORE
a	Vegetation, connected to soil below: area where the plant roots have direct contact with deeper soil layers, and water can freely percolate to ground water level.	1.0
b	Open water in ponds, trenches and so on: the area should be under water for at least 6 months/year.	1.0

²¹⁸ A short project is underway to test this approach on existing developments, so scores may be subject to change.

²¹⁹ Score = $\frac{(\text{area of a} \times \text{score of a}) + (\text{area of b} \times \text{score of b}) + \dots + (\text{area of k} \times \text{score of k})}{\text{total area of site}}$

c	Vegetation, unconnected to soil below: area where the plant roots don't have direct contact with deeper soil layers, for example on top of underground car park. Soil depth more than 800 mm.	0.7
d	Green roofs, brown roofs, eco-roofs: calculated for the real area covered by plants, not the area of the roof as projected on the ground surface.	0.7
e	Green walls: climbing plants with or without support. The area of a wall that can be expected to be covered by vegetation within five years. The height, up to 10 m, is taken into account.	0.5
f	Vegetation, unconnected to the soil below: area where the plant roots don't have direct contact with deeper soil layers, for example on top of underground car park. Soil depth less than 600 mm.	0.5
g	Semi-permeable areas: sand, gravel, etc.	0.4
h	Trees with a stem girth of more than 35 cm: calculated for the maximum area of 25 m ² for each tree.	0.4
i	Shrubs higher than 3 m: calculated for the maximum area of 5 m ² for each shrub.	0.2
j	Partially sealed surfaces: paved areas, with joints that water can infiltrate	0.2
k	Sealed surfaces: impermeable areas, including buildings, concrete, asphalt	0.0

16.2.4. Step 1 Reporting Requirements

16.2.4.1. Spreadsheet setting out: pre-development green infrastructure score AND planned development green infrastructure score.

16.2.4.2. This should demonstrate that: the planned development score is 0.2 higher than the pre-development score; OR, in green field locations, the planned development score is 0.6 or higher (with no comparison to pre-development score).

16.2.4.3. Plans for the site showing pre-development and planned development surface types a-k and setting out the area covered by each, and total area of the site.

16.2.5. Step 2 Meeting Green Infrastructure Needs

16.2.5.1. In addition to achieving a green infrastructure score, each development will be expected to research what is needed of the green infrastructure in their area. This will determine the specific design required for the site. For Liverpool the Green Infrastructure Strategy provides this information.

16.2.5.2. Table 40 should be consulted to determine the type of green infrastructure interventions that may be most appropriate to achieve these benefits. The suggested interventions in the table are by no means exhaustive and will be amended over time as new interventions come forward; novel approaches to realise these benefits will also be welcomed. In addition, it should be noted that the interventions suggested are not mutually exclusive of each other. So, for example, the trees and woodlands planted and managed to improve air quality (intervention 27) could also be used as part of sound and visual barriers (intervention 37).

Table 40 Green infrastructure interventions and their associated benefits

GREEN INFRASTRUCTURE	BENEFIT
----------------------	---------

INTERVENTION	Economic growth & investment	Land & property values	Labour productivity	Tourism	Products from the land	Health & well-being	Recreation & leisure	Quality of place	Land & biodiversity	Flood alleviation & management	Climate change adaptation & mitigation
Increase tree cover on site											
i) Select a mixture of native species (to provide food and habitat for wildlife)											
ii) Select species to improve air quality											
iv) Select species to provide shade (e.g. that will have large canopies when mature) and plant in areas where people walk and gather											
v) Select broadleaf species and plant to provide shade to buildings (e.g. on south facing facades)											
vi) Select species with large canopies to capture rainwater											
vii) Select species (e.g. conifers) and plant to provide wind shelter											
ix) Select species and plant for aesthetic quality / image and to provide visual screening											
x) Select species to provide fruit and nuts											
xi) Planted in streets											
xii) Retain existing mature trees on site											
xiii) Planted along streams, rivers and on floodplains											
xiv) Select and manage species to provide carbon sequestration and storage											
xv) Plant trees to stabilise slopes and soils vulnerable to erosion											
xvi) Plant trees as part of a sound barrier											
xvii) Manage trees on site as a timber and/or fuel resource											
Install green roofs											

GREEN INFRASTRUCTURE INTERVENTION	BENEFIT										
	Economic growth & investment	Land & property values	Labour productivity	Tourism	Products from the land	Health & well-being	Recreation & leisure	Quality of place	Land & biodiversity	Flood alleviation & management	Climate change adaptation & mitigation
i) Designed to capture rainwater											
ii) Design green roofs to increase biodiversity (e.g. a using a variety of substrates, differing depths, and selecting species appropriately)											
iii) Design green roofs to allow access by people											
iv) Grow food crops											
v) Install on buildings which are overlooked for aesthetic purposes											
Install green walls											
i) Plant to provide shade to buildings (e.g. on south facing facades); reducing direct solar gain in summer, use species to allow for solar gain in winter											
ii) Plant to increase biodiversity (e.g. species to provide food and habitat)											
iii) Grow food crops											
iv) Plant to improve aesthetic quality or image											
General vegetation-related interventions											
i) Increase green cover on site											
ii) Design green infrastructure on site to provide a variety of micro-climates for users (e.g. access to sun, shade, wind, shelter)											
iii) Plant vegetation to stabilise slopes and soils vulnerable to erosion											
iv) Safeguard wildlife habitats on site, referring to Biodiversity Action Plans											
v) Create new habitats on site, including ponds											

GREEN INFRASTRUCTURE INTERVENTION	BENEFIT										
	Economic growth & investment	Land & property values	Labour productivity	Tourism	Products from the land	Health & well-being	Recreation & leisure	Quality of place	Land & biodiversity	Flood alleviation & management	Climate change adaptation & mitigation
vi) Select vegetation to provide food for wildlife e.g. nectar rich plants											
vii) Plant a diverse mixture of vegetation, using native species											
viii) Install bird and bat boxes											
ix) Minimise use of mown lawns on site											
x) Avoid development in areas of high carbon storage											
xi) Design the green infrastructure to improve the image of the area, taking into account landscape character											
xii) Provide public access to the on-site green infrastructure, including any linear features such as rivers and canals											
xiii) Provide benches on-site, in a variety of microclimates											
xiv) Provide recreation facilities on site different age groups											
xv) Safeguard existing green infrastructure and landforms that act as sound and visual barriers											
xvi) Create new green infrastructure features as part of sound and visual barriers											
xvii) No development on best and most versatile agricultural land											
xvii) Safeguard any allotments on site											
xviii) Create allotments on site											
xix) Use species that provide food, including fruit and nuts											
xx) Compost household and garden waste for use on site											
xxi) Involve the local community in the design, construction and											

GREEN INFRASTRUCTURE INTERVENTION	BENEFIT										
	Economic growth & investment	Land & property values	Labour productivity	Tourism	Products from the land	Health & well-being	Recreation & leisure	Quality of place	Land & biodiversity	Flood alleviation & management	Climate change adaptation & mitigation
management of the site											
xxii) All windows in office developments to have a view over greenery											
xxiii)In office developments, provision of accessible outdoor green space for office workers											
Water-related interventions											
i) Avoid development in river and coastal flood zones											
ii) Use river and coastal flood zones as multifunctional green spaces, including combining recreation and biodiversity with flood water storage											
iii) De-culvert water courses											
iv) Re-create natural floodplain vegetation											
v) Create or enhance green infrastructure upstream to store flood waters											
vi) Use Sustainable Urban Drainage Systems (SUDS) as part of the on-site green infrastructure so there is no increase in runoff post-development and water quality is improved											
vii) Use permeable surfacing within the design of any green infrastructure areas											
viii) Where soils have a high water infiltration rate, keep surfaces unsealed											
ix) Harvest, store and use rainwater on-site to irrigate green infrastructure (so that it provides urban cooling)											

GREEN INFRASTRUCTURE INTERVENTION	BENEFIT										
	Economic growth & investment	Land & property values	Labour productivity	Tourism	Products from the land	Health & well-being	Recreation & leisure	Quality of place	Land & biodiversity	Flood alleviation & management	Climate change adaptation & mitigation
x) Increase of blue cover and features on site for its role in urban cooling											
xi) Irrigate green infrastructure on site, preferably from a sustainable source (e.g. grey water or harvested rainwater)											
Linear features and connectivity											
i) Use green infrastructure on site to connect up nearby habitats off site											
ii) Make linear features such as canals, rivers, railway lines, and road verges friendly to wildlife											
iii) Create new wildlife friendly linear features (e.g. hedgerows)											
iv) Safeguard existing rights of way on the site											
v) Connect public access routes in on-site green infrastructure to existing access routes in the surrounding area (e.g. public rights of way)											
vi) Provide sign-posting to connect up green infrastructure routes											

16.2.5.3. It is not expected that all economic benefits are realised on a given site. Those linked to the identified needs should be prioritised. However, demonstrating how multiple benefits are achieved will be considered favourably.

16.2.6. Step 2 Reporting Requirements

16.2.6.1. (2.1) Report on needs identified for the area and where this need was identified from (e.g. from the Strategic Flood Risk Assessment).

Each need should be related to one or more of the eleven economic benefits set out by Natural Economy Northwest.

(2.2) Report listing the economic benefits achieved as a result of the green infrastructure on the site; setting them out in relation to specific interventions used on the site (from those listed in the table as well as novel approaches).

16.2.7. Step 3 Provision for Long-term Maintenance

16.2.7.1. Provision needs to be made to ensure the long-term maintenance of the site. This could be by a variety of mechanisms, including community involvement.

16.2.8. Step 3 Reporting Requirements

16.2.8.1. (3.1) Report setting out how the site will be maintained in the long term.

17. APPENDIX 4 POLICY SUPPORT

17.1. Policy Review

17.1.1. A wide range of policy documents have been reviewed to assess their support for green infrastructure and this green infrastructure strategy. This data is all held in the online evidence base; accessible at www.ginw.org.uk/liverpool.

- Reviews of the following documents are available in the online database:
- Liverpool City Region Multi Area Agreement
- Merseyside Local Transport Plan
- A Parks Strategy for Liverpool
- Climate Change Strategic Framework: A Prospectus for Action
- Health Weight, Healthy Liverpool: Healthy Weight Strategy for Liverpool
- Action Plan for the Liverpool City Region: Merseyside Sub-Regional Partnership
- Liverpool Open Space Study
- Liverpool 2024: A Thriving International city: Local Area Agreement 2008/2011
- Liverpool Vision: Strategic Regeneration Framework
- Liverpool Air Quality Action Plan
- Liverpool LDF Core Strategy: Revised Core Strategy Report
- Better Together: Joint Strategic Needs Assessment
- Liverpool Strategic Flood Risk Assessment
- Liverpool John Lennon Airport Masterplan
- Children's and Young People's Plan 'Liverpool – where every child matters' Key Priorities and Actions 2007 - 2008
- Management Plan for Liverpool Maritime Mercantile city
- Supplementary Planning Document: Liverpool Maritime Mercantile city: World Heritage Site (Consultation Draft)
- Liverpool: Active city 2005-2010
- Liverpool City Region – Development Programme Report
- Housing Strategy Statement
- Joint Merseyside Joint Waste Development Plan Document - Issues & Options Report
- Liverpool City Council Draft Play Strategy
- Liverpool Older People's Housing Strategy Draft Report
- Accessibility Strategy Summary and 2006/2007 Action Plan
- Joint Municipal Waste Strategy for Merseyside: Headline Strategy
- North Merseyside Biodiversity Action Plan: Urban Green Infrastructure
- The Economic Impact of EU and UK Climate Change Legislation on Liverpool and the Liverpool City Region
- Northwest Regional Spatial Strategy
- Investment for health: a plan for the Northwest of England
- "Action for Sustainability" Regional Sustainable Development Framework
- Regional Economic Strategy
- Draft RS2010
- Liverpool City Region Ecological Framework
- Rising to the Challenge: A Climate Change Action Plan for England's Northwest
- Liverpool City Region Visitor Economy Strategy to 2020
- Planning Policy Statement 1: Delivering Sustainable Development
- Planning Policy Statement: Planning and Climate Change - Supplement to Planning Policy Statement 1

- The Planning White Paper: Planning for a Sustainable Future
- PPS25: Development and Flood Risk
- Securing the future - delivering UK sustainable development strategy
- PPS3 Housing
- Climate change: Taking Action: Delivering the Low Carbon Transition Plan and Preparing for a changing climate
- HM Government World Class Places
- Liverpool Corporate Plan
- PPG17
- Consultation on a Planning Policy Statement: Planning for a Low Carbon Future in a Changing Climate
- Planning Policy Consultation Paper on a New Planning Policy Statement: Planning for a Natural and Healthy Environment
- Agenda for Growth: Regional Forestry Framework for England's Northwest
- Adapting the Landscape
- Sustainable Communities: People, Places, Prosperity: A 5 year plan from ODPM
- PPS9: Biodiversity and Geological Conservation
- PPS7: Sustainable Development in Rural Areas
- Planning Policy Statement Consultation: Planning a Natural and Healthy Environment
- Planning Policy Statement Consultation: Planning for a Low Carbon Future in a Changing Climate
- Liverpool City Council Parks and Green spaces Improvement Plan
- The Mersey Forest Plan for Liverpool
- Liverpool Community Cohesion Action Plan
- Mersey Heartlands New Growth Point Partnership, Programme of Development
- Liverpool City Centre Movement Strategy
- Liverpool Strategic Flood Risk Assessment
- Mersey Estuary Catchment Flood Management Plan
- HMR Pathfinder: New Heartlands
- Mersey Waterfront Regional Park – Strategic Framework – Final Report
- Code for Sustainable Homes
- Planning Policy Statement 12: Local Spatial Planning
- Merseyside Rights of Way Improvement Plan
- Liverpool Bay Shoreline Management Plan: SUB-CELL 11a : Great Ormes Head to Formby Point
- Landscape Character Area 58: Merseyside Conurbation
- River Basin Management Plan Northwest River Basin

17.1.2. In the database a range of information has been captured about each document:

- The name of the document, author, date of publication and review date.
- An overview of the document – providing an explanation of the nature of the document and any key aims
- The 'level' and geographic coverage of the document – whether it is European, national, regional, city regional or local in its extent of influence.
- The status of the document – whether it is statutory, council, government, or regional policy (adopted and draft) or committed non-government policy or advisory.
- The type of document – whether it is a statutory document, a strategy, a case study, a report, research or an anecdote.
- Whether there are any funding streams attached.
- Whether 'green infrastructure' is specifically mentioned, and
- A link to the full document
-

- A more in depth analysis was carried out for each document to establish:
- The key relevant policies and findings
- The green infrastructure benefits the document is in support of
- The green infrastructure functions the document is in support of
- If the document makes specific mention of a certain type of green infrastructure and if this is intrinsic to the nature of the document it has been noted
- The influence scale of the document – how influential the document is (either ‘high’, ‘medium’ or ‘low’)
- How supportive of green infrastructure the document is – the options being ‘no mention’, ‘general green space reference – mentioned’, ‘general green space reference – very supportive’, ‘specific green infrastructure reference – mentioned’, ‘specific green infrastructure reference – very supportive’.

17.1.3. Please note: The information within the evidence base is the reviewers' interpretation of the original document. Please refer to the original document for further clarification.

17.1.4. The following sections and charts give an overview of policy support for

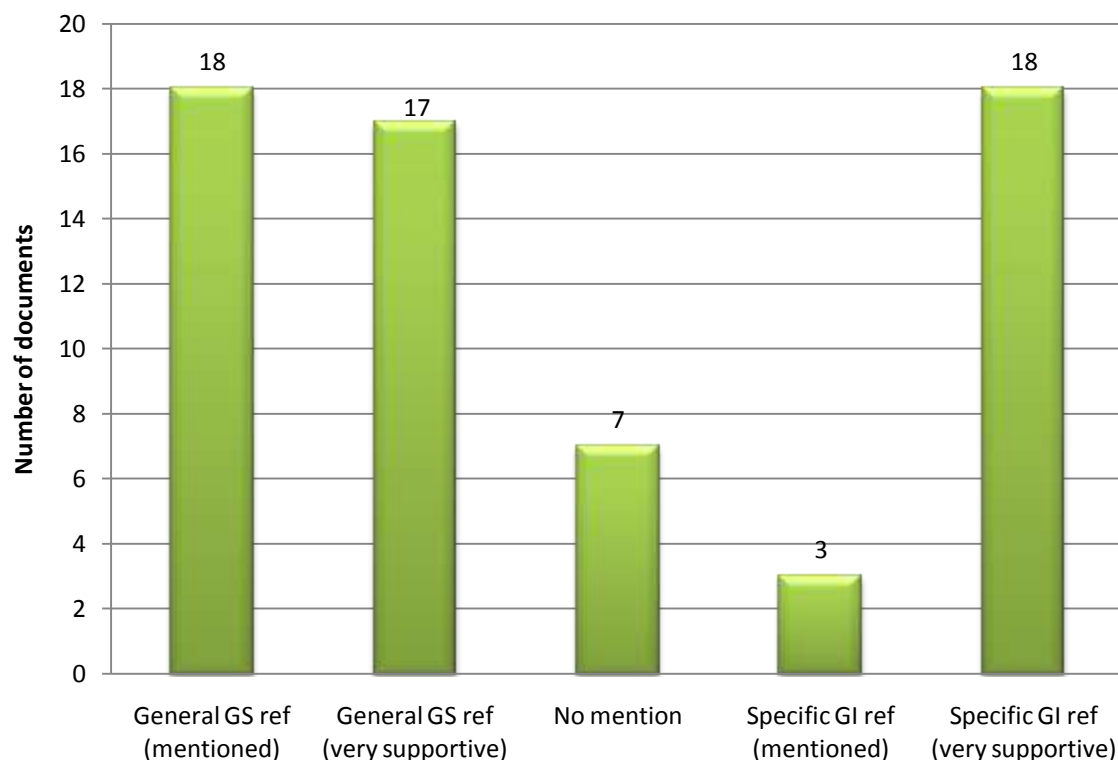
- Green infrastructure and green space in general
- Green infrastructure functions
- Green Infrastructure benefits

17.2. Support for Green Infrastructure

17.2.1. The terminology ‘green infrastructure’ is relatively new in terms of policy making. Therefore many policies do not contain the exact term ‘green infrastructure’.

17.2.2. Often of the reviewed documents did not specifically mention ‘green infrastructure’, but referred to green space or open space instead. Documents which did not specifically mention ‘green infrastructure’ but implied that ‘greenery’ was providing functions and benefits are still seen as supportive of this strategy.

Figure 43 Supportive documents

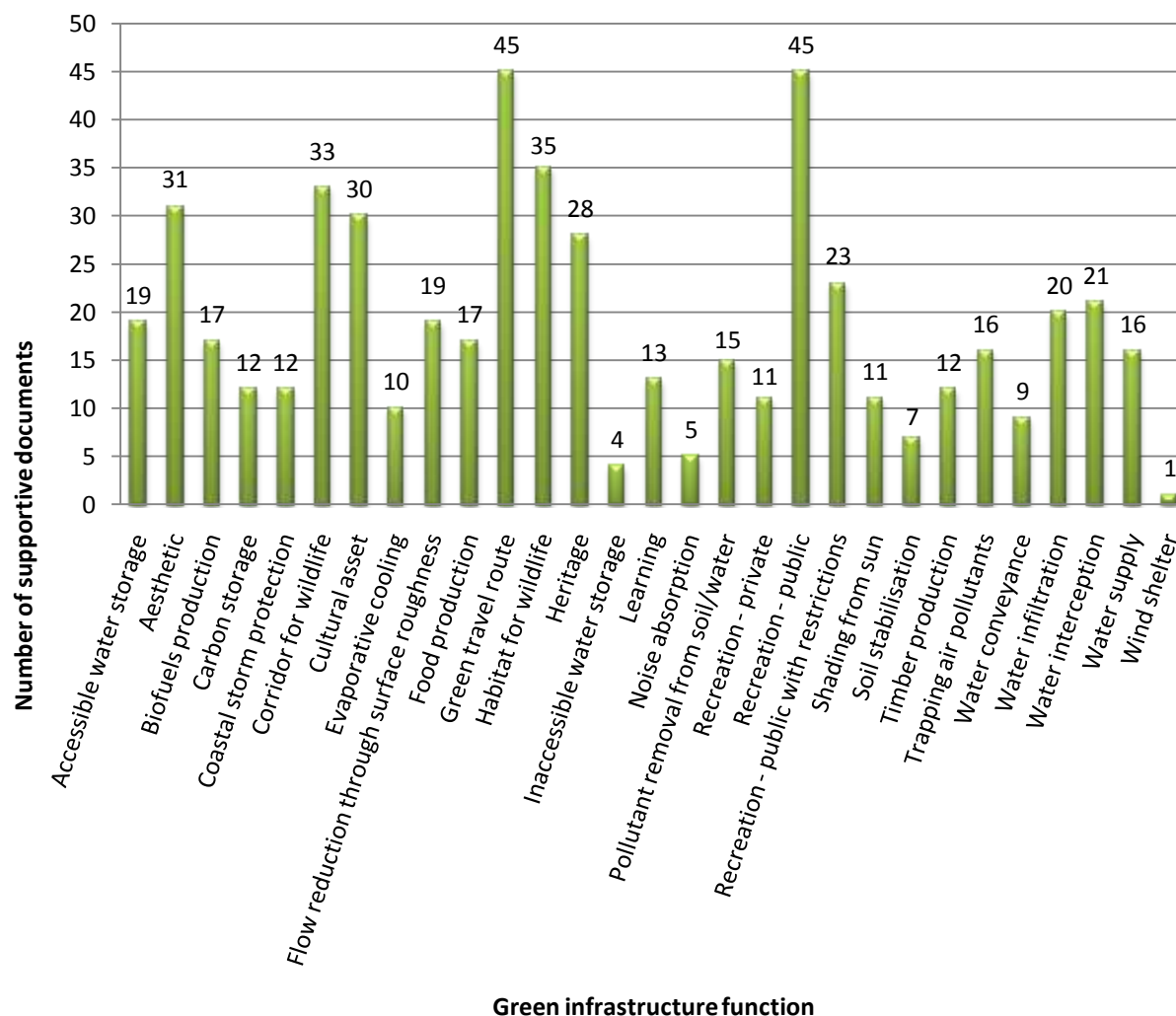


17.2.3. Out of the documents reviewed 36 are ‘very supportive’ of green infrastructure and green space in general.

17.3. Support for Green Infrastructure Functions

17.3.1. All the identified green infrastructure functions are supported in the evidence base (Figure 44). The most supported functions are public recreation and green travel route. These functions are easily understandable and it is well accepted that green infrastructure provides these functions. The most supported functions are common with a well established evidence base. Whereas the functions with less support such as for soil stabilisation, wind shelter and water conveyance are not as common or as well accepted. This is reflected in the policy.

Figure 44 Documents per green infrastructure function



17.3.2. Functions which support the green infrastructure policies identified in this strategy.

17.3.3. Green infrastructure functions which support a sustainable city: Aesthetic (31), public recreation (45), food production (17), cultural (30)

17.3.4. Green infrastructure functions which support a cool city: Shading from sun (11), evaporative cooling (10), water infiltration (20), water interception (21), flow reduction through surface roughness (19)

17.3.5. Green infrastructure functions which support natural choices for health: Green travel route (45), public recreation (45)

17.3.6. Green infrastructure functions which support a green and biodiverse city: Habitat for wildlife (35), corridor for wildlife (33)

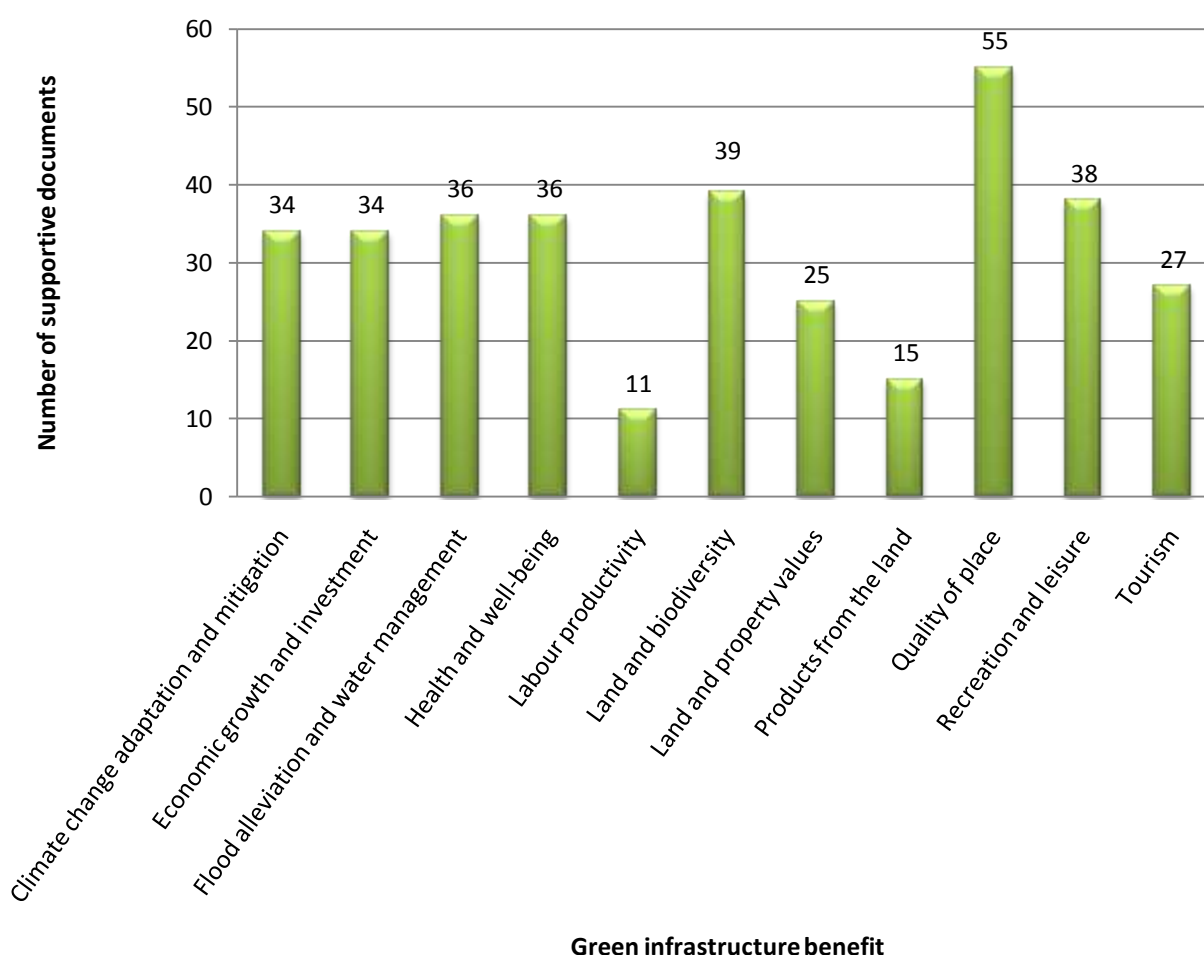
17.4. Support for Green Infrastructure Benefits

17.4.1. Policy analysis has shown that all the green infrastructure benefits are supported, to varying degrees. Figure 45 shows that the most supported benefits are quality of place, land and biodiversity, and recreation and leisure.

17.4.2. Some documents were clear in stating that green infrastructure was providing a benefit, whereas others did not specifically state that green infrastructure was providing the benefit but alluded to the fact that this benefit was present. Some documents were related to a single benefit, whilst others were more holistic.

17.4.3. It is interesting that labour productivity was not as well supported as other benefits; this could be due to the fact that many documents referred to green infrastructure ensuring people's health, rather than stating that it ensured they were capable and more prepared to work.

Figure 45 Number of documents supportive of each green infrastructure benefit



18. APPENDIX 5 ANALYSIS & ACTIONS

18.1. Introduction

18.1.1. The following sections contain the maps referred to by the individual actions.

18.1.2. Each section contains:

- An overview map – The overview maps show the areas where there are “issues” that need action to increase green infrastructure to meet an identified need. They also indicate that the green infrastructure functions in the other areas needs to be managed and safeguarded.
- Specific maps for the actions that have been set out in the main document. The maps are provided for the land change actions. The supporting and guiding actions are not area specific. These identify the areas across the city where the action is most needed. An explanation of the reasoning for the targeting of these areas is provided in section 14.6.

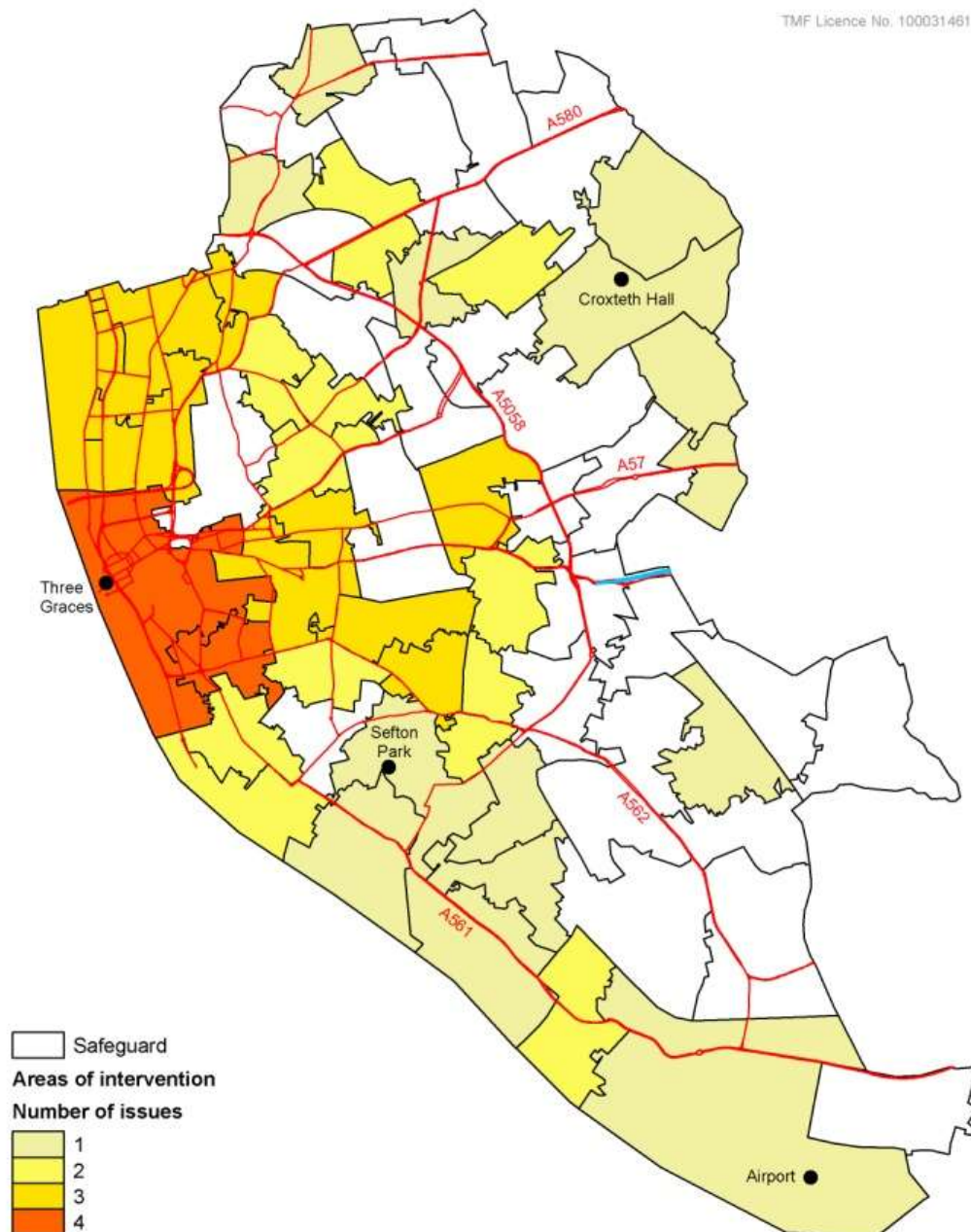
18.2. PRIORITY 1: A Sustainable City

Map 122 Priority 1 Overview Map

A Sustainable City

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Issues

- Super Output Areas with <50% green infrastructure cover that intersect Strategic Investment Areas, Growth Point wards, HMR areas or Housing SPD Fringe Areas
- Super Output Areas with <30% green infrastructure cover in Environmental Improvement Corridors and near key gateways
- Super Output Areas with <5% green travel route functionality cover that intersect Growth Point wards, HMR areas or Housing SPD Fringe Areas
- Super Output Areas where five or more ANGSt or Space for People standards are not completely fulfilled

18.2.1. Overview

18.2.1.1. The overview map for supporting sustainable housing growth and regeneration highlights the western areas of Liverpool and the City Centre and North Liverpool Neighbourhood Management Areas in particular as the key areas for intervention. This area is targeted for the next phase of regeneration, with Housing Market Renewal, Growth Points and strategic investment plans in place. The growth point areas to the north of the city centre feature amongst the areas with most issues to address.

18.2.1.2. Everton Park has been highlighted as an anomalous area, an area of green infrastructure that should be providing significant benefit, but due to issues of design etc. it is not²²⁰. The information in this strategy can help to inform decisions about restructuring of this area and similar areas across the City.

18.2.1.3. Green infrastructure planning and delivery can help to provide the basis for sustainable development in these areas, helping to enhance quality of place. High quality green infrastructure can underpin the City's economy and supports sustainable development in other areas of the city where safeguarding of functionality will be important.

18.2.2. Action 1.1 Green infrastructure in areas of housing growth and regeneration

18.2.2.1. Map 123 overlays the key areas for housing growth and development as indicated in the Liverpool Core Strategy document. This helps to show the proportion of green infrastructure in each area. These maps indicate the areas of the city where housing growth and regeneration and development are envisaged, but where there is low provision of green infrastructure. Areas to target to increase green infrastructure have been identified by assessing the Super Output Areas with less than 50% green infrastructure cover. (Liverpool average is 62%) which intersect one of the housing growth or strategic investment areas. These are shown on Map 124.

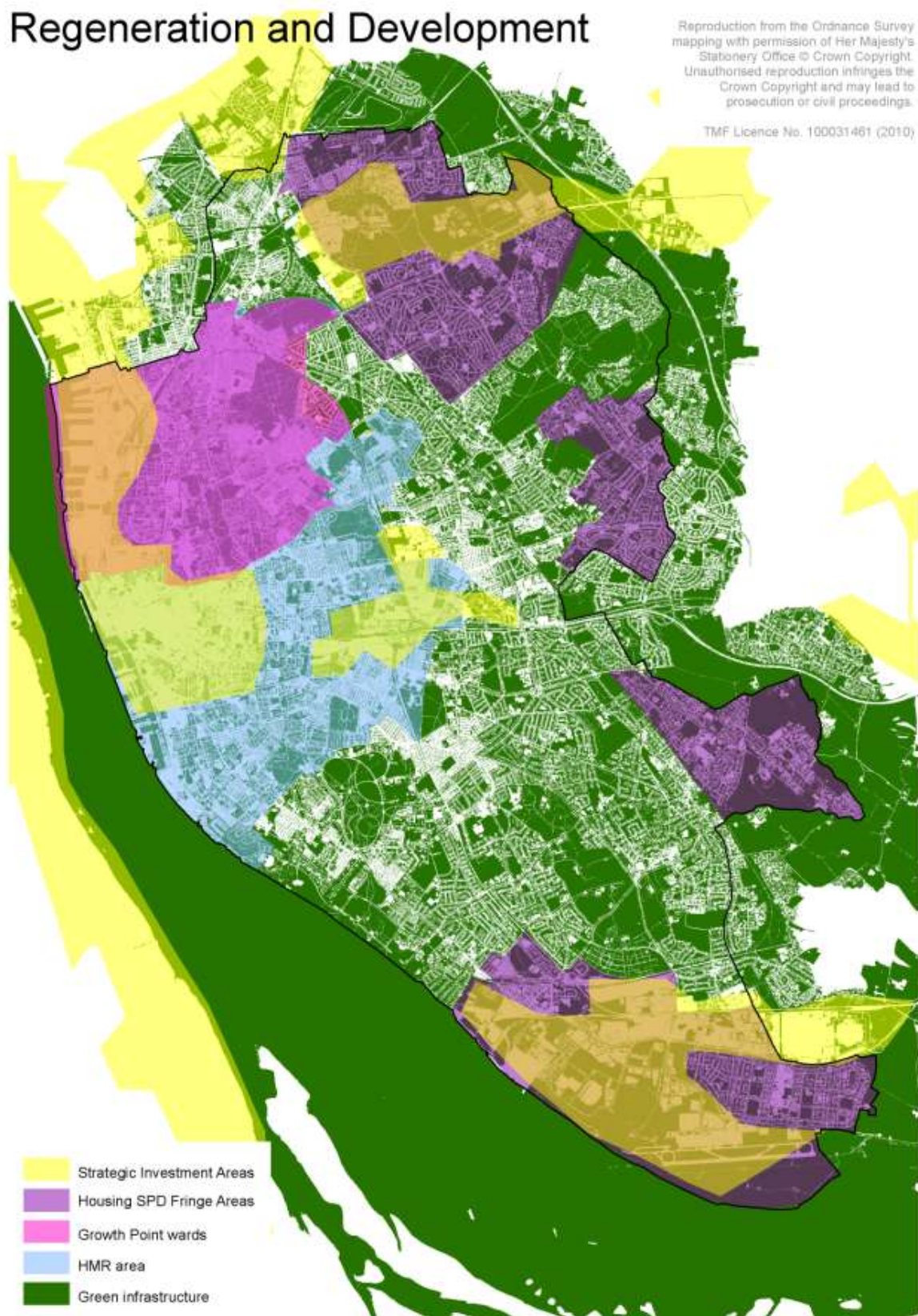
²²⁰ A task group has been set up to look at the design and future use of Everton Park - the data from this strategy can help to inform future plans for the area

Map 123 Green Infrastructure in development and investment areas

Regeneration and Development

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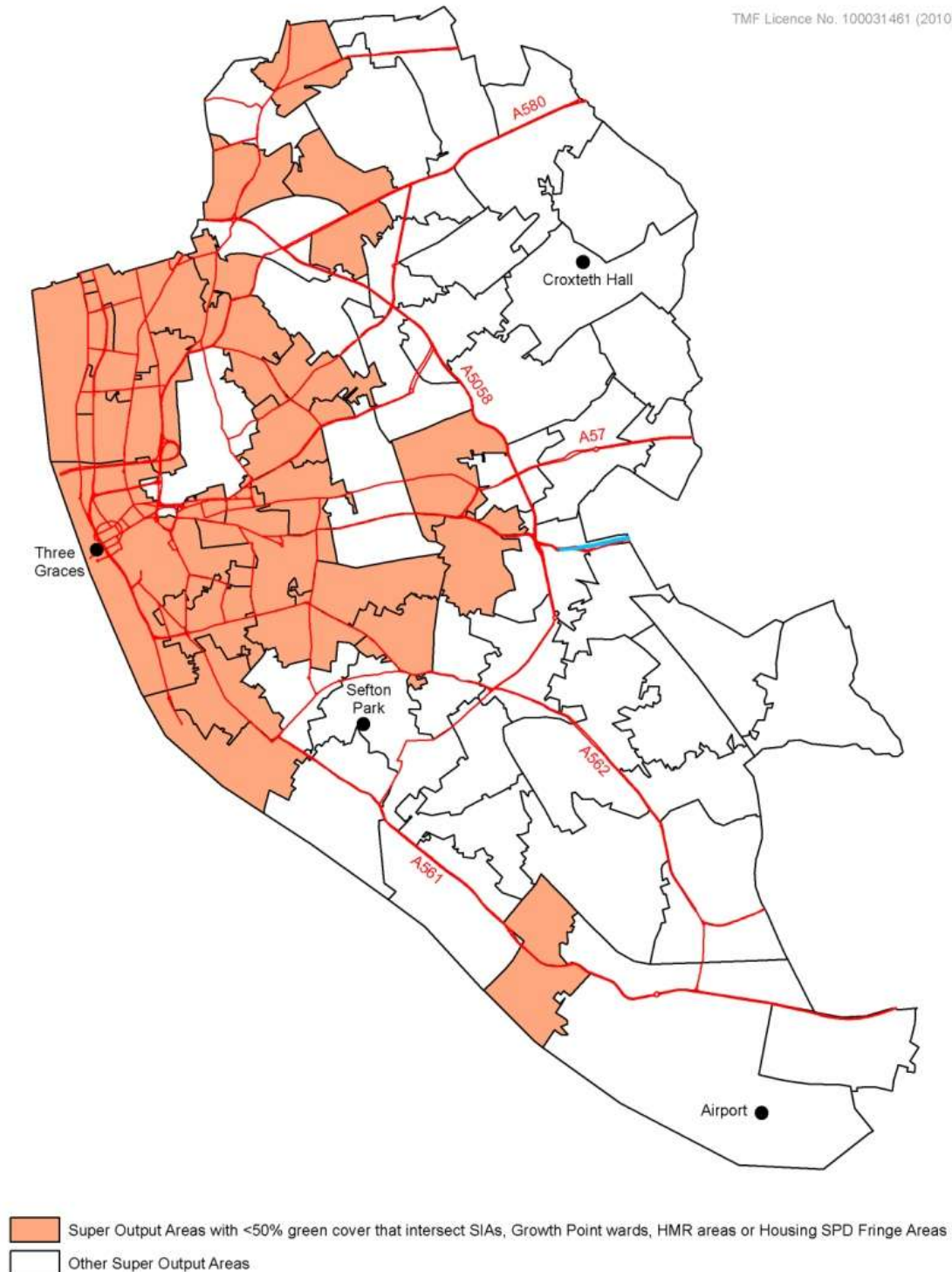


Map 124 Action 1.1 Targeting

A Sustainable City Action 1.1

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18.2.3. Action 1.2 Green Infrastructure targets around key gateways and routes into the City.

18.2.3.1. Improving the image of Liverpool is key to attracting new investment, retaining graduates and helping to meet the aspirations for planned population growth. Under this priority, the key gateways such as the port, airport and major rail stations have been identified as areas where it is important to improve the aesthetic quality so as to enhance the image. Green infrastructure can help to provide a high quality of place, providing a positive image for a world-class city. The main transport routes and gateways for the city are important as they provide a first impression for visitors and are the main routes used most frequently by people living and working in the city.

18.2.3.2. Map 125 shows the corridors for environmental improvement that have previously been identified as areas for action by Liverpool City Council in relation to existing green infrastructure. Map 126 provides a more detailed assessment of the Gateways and environmental corridors, indicating where the need for the aesthetic function is already being provided and where it is not.

18.2.3.3. Map 127 indicates the areas within the proposed investment areas of the city where there are low levels of green infrastructure providing the aesthetic function along these environmental improvement corridors and where therefore actions are needed.

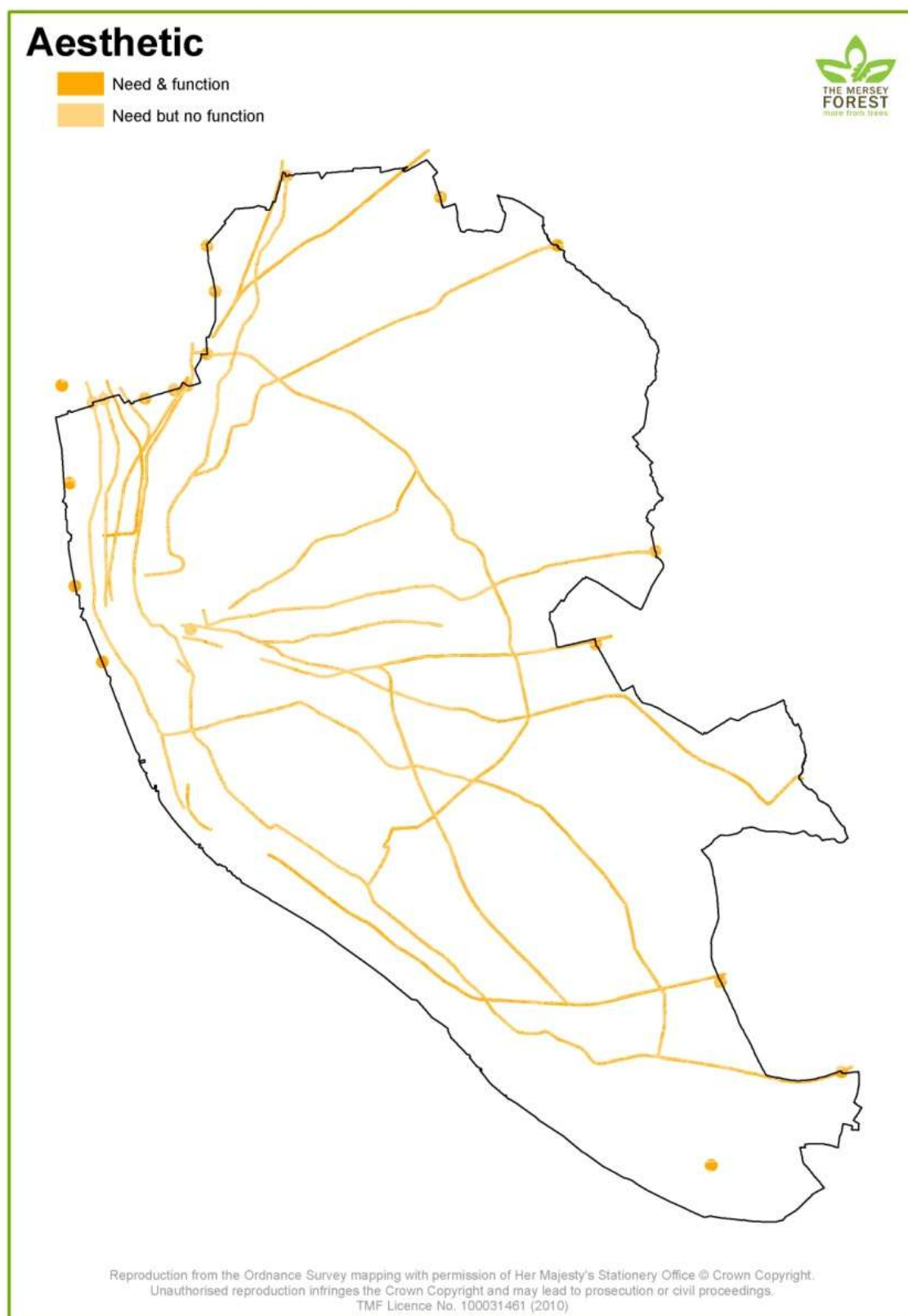
Gateways and Routes

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Map 126 Need and function for the Aesthetic function related to the environmental improvement corridors and key gateways in Liverpool

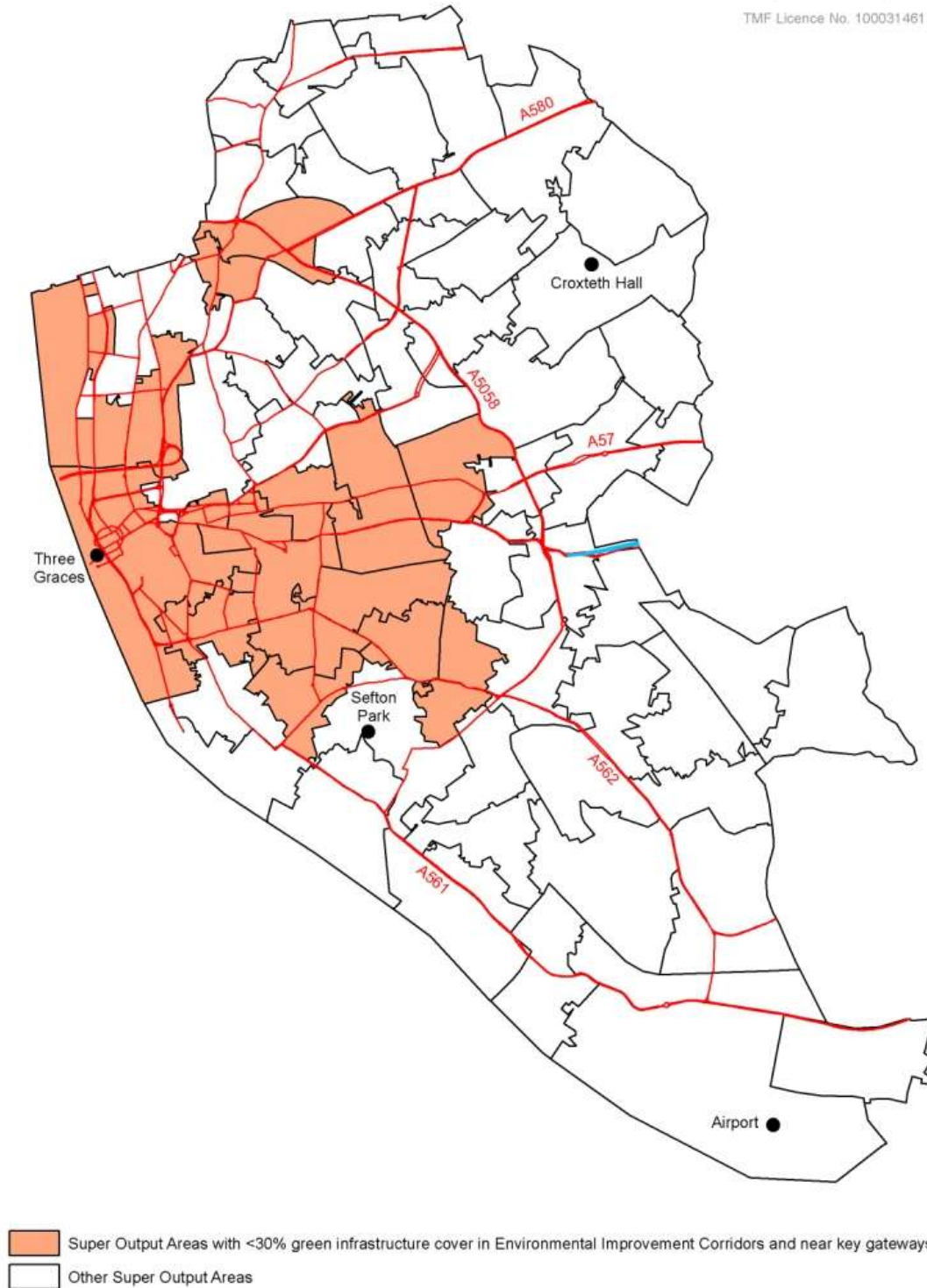


Map 127 Action 1.2 Targeting

A Sustainable City Action 1.2

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18.2.4. Action 1.3 Supporting “walkable” neighbourhoods

18.2.4.1. Creating walkable neighbourhoods is one way in which emissions of green house gases can be reduced. Encouraging walking and cycling by connecting where people live to places they need travel to such as schools, health centres, places of work and shops can reduce car use. The opportunities to create “walkable” neighbourhoods are perhaps greatest where there is restructuring through housing renewal or major redevelopment, but opportunities everywhere should be taken. Green infrastructure can help to create “walkable” neighbourhoods when it is connected to the wider public realm, other open spaces and pavements, and well managed to provide part of a safe network of routes. Map 128 shows the current provision of green travel route functionality. Map 129 indicates the areas where housing growth or development is planned and there is little green travel route functionality currently provided. These are the areas to target for action.

18.2.4.2. We would suggest that further work on “walkable” neighbourhoods is needed to build on and improve the methodology developed for this strategy. Quality and “legibility” of access are issues that have not been addressed in this strategy but which are fundamental to encouraging walking and cycling.

18.2.4.3. Whilst this issue has been included in the Sustainable housing growth and regeneration priority it also has implications for health, promoting more active lifestyles and climate change (reduced car use is a climate change mitigation measure).

Map 128 Green travel route functionality

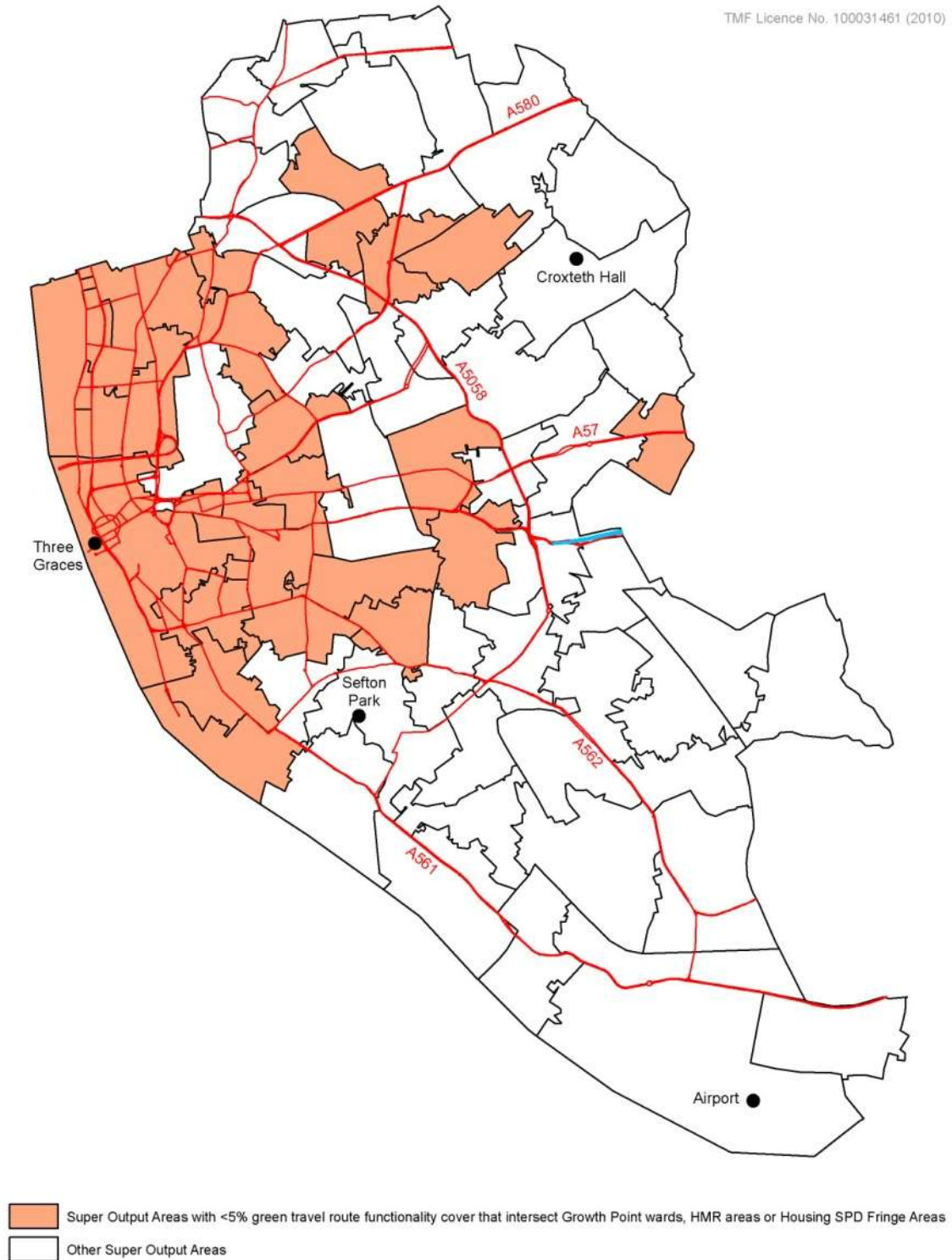


Map 129 Action 1.3 Targeting

A Sustainable City Action 1.3

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18.2.5. Action 1.4 Access to open spaces

18.2.5.1. Providing accessible high quality green spaces is an important element of quality of place and life. This strategy does not assess quality and uses two standards to assess provision and access across the city. Firstly ANGSt is used to assess overall access to green infrastructure; we have broadened the definition of “natural” green spaces that is normally used for ANGSt, to include all accessible green spaces. Secondly the Woodland Trust Space for People standards have been used. These standards aim to ensure a good level of access to woodlands for all communities.

18.2.5.2. Neither of these standards has been officially agreed or adopted by Liverpool and both are aspirational, but in the absence of other standards we have used these as a means to target activity to increase the availability of accessible green infrastructure to help address issues related to Sustainable Housing growth and regeneration priority. The issue is also important for the health and climate change priorities.

18.2.5.3. Map 130 provides information on the ANGSt delivery across the city. ANGSt sets standards for the proximity of different areas (size) of open space. Mapping has therefore involved buffering accessible green infrastructure both in and outside the city by the ANGSt, e.g. creating a 300m buffer around all open green spaces that are above 2ha (the pink buffer on Map 130). If the target were to be fully achieved, the whole city would be covered by all of the buffers. The places where one of the standards is not achieved will not be covered by that buffer. Again for example, the pink buffer referred to above covers around 50% of the city. The areas not covered by the pink buffer are areas that do not meet the ANGSt.

18.2.5.4. Map 131 provides a similar analysis, but this time for woodland only based on the Space for People standard. The absence of a buffer indicates that the standard is not being achieved.

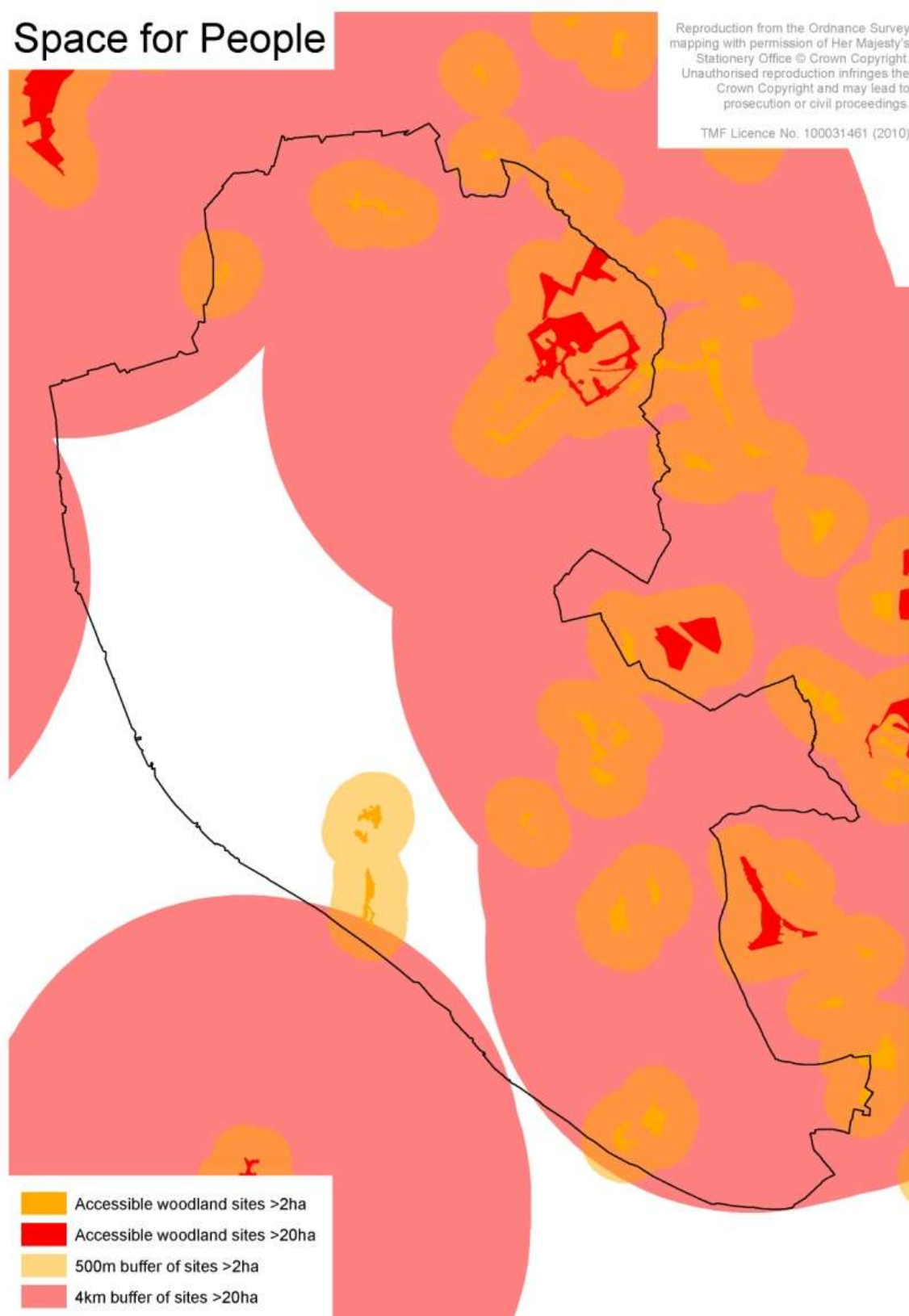
18.2.5.5. In both assessments we have not included The River Mersey, which does obviously provide visual access, but not physical access by those without boats or canoes.

18.2.5.6. Map 132 shows the areas of the city where accessibility standards are considered poor. These are Super Output Areas where 5 or more ANGSt or Space for People standards are not completely fulfilled. Interventions should be targeted in these areas.

Map 130 ANGSt provision



Map 131 Space for People provision

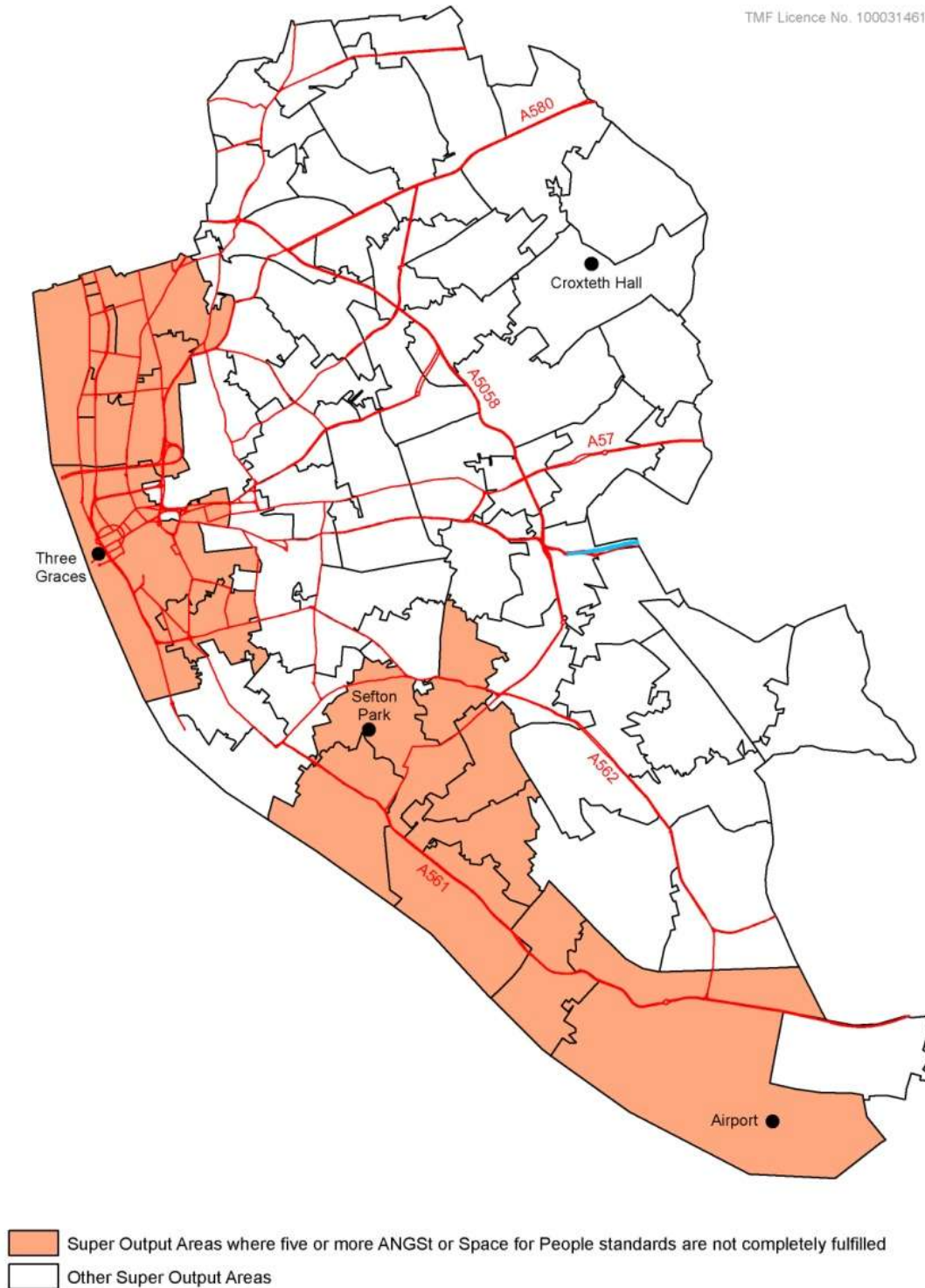


Map 132 Action 1.4 Targeting

A Sustainable City Action 1.4

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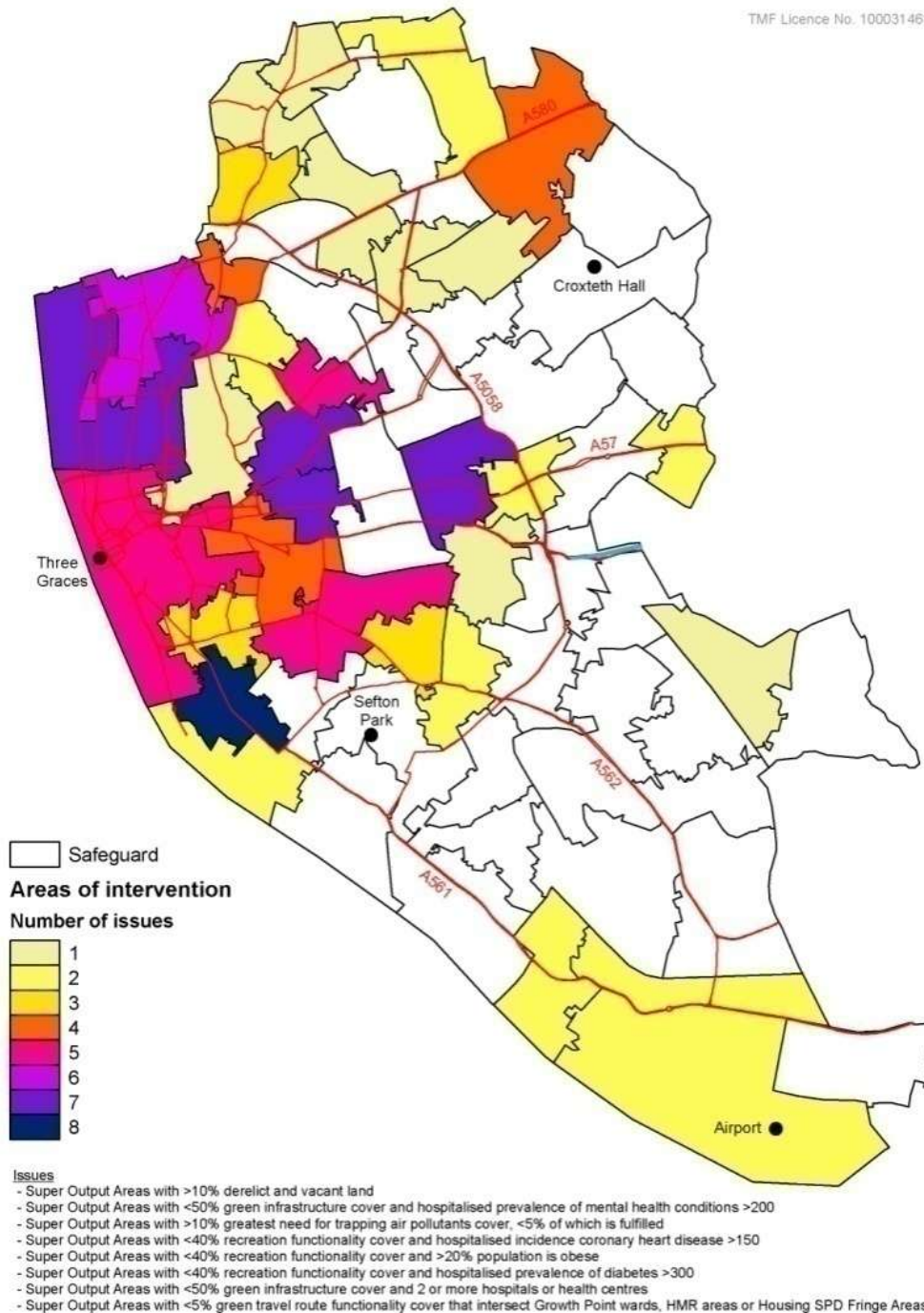
18.3. PRIORITY 2: A City Providing Natural Choices for Health

Map 133 Priority 2 Overview Map

A City Providing Natural Choices for Health

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18.3.1. Overview

18.3.1.1. The overview map for a city providing natural choices for health identifies areas of the city where there are numerous issues related to health. The white areas identify the parts of the city where “safeguarding” and improving function for health benefits will be important. This could be through maintaining local parks and green travel routes. The darker colours indicate areas for potential interventions to improve green infrastructure provision. The highest number of issues is present in the North and West of the city, particularly along the waterfront. The outer areas of the city tend to have fewer if any health issues present.

18.3.1.2. Providing accessible, high quality green infrastructure in the city can improve public health, through increased physical activity and improved mental well being.

18.3.2. Action 2.1 Areas of vacant land that could be targeted for productive uses

18.3.2.1. Liverpool City Council has developed a “Greening the City” programme that looks to involve communities in the management and stewardship of vacant and derelict land. Whilst not all vacant land is suitable for community use, possibly due to ground conditions or existing planning designations, there are areas that could be investigated. The community use of vacant and derelict land has been taken forward elsewhere in the country and these programmes are discussed in the SQW report on Greening the City.

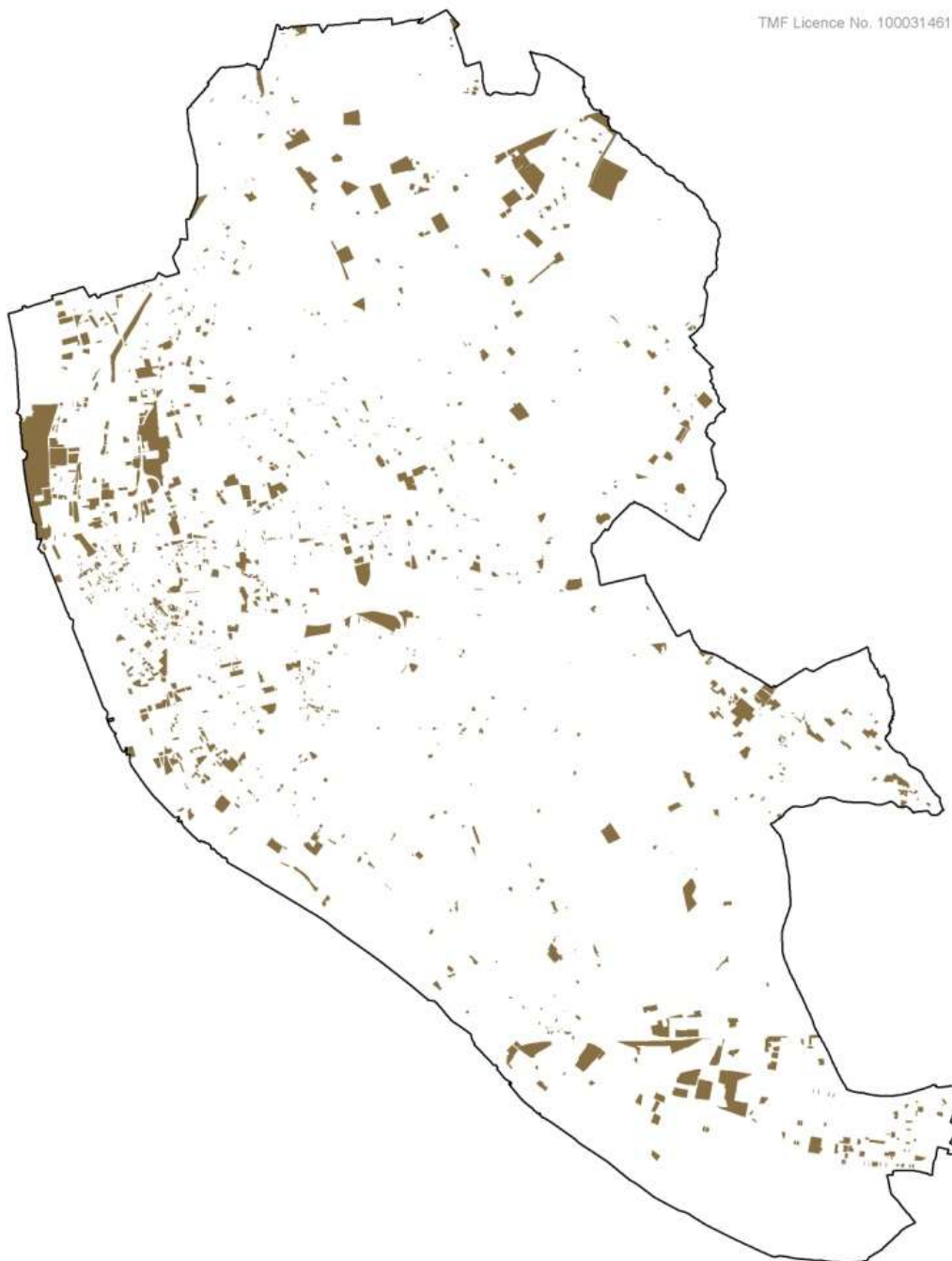
18.3.2.2. Map 134 shows the areas of vacant and derelict land across the city which have not been identified as areas for potential housing growth. Map 135 shows areas of the city with higher levels of derelict land – these areas should be targeted for temporary uses.

Map 134 Vacant and derelict land which could be targeted for productive uses

Derelict and Vacant Land

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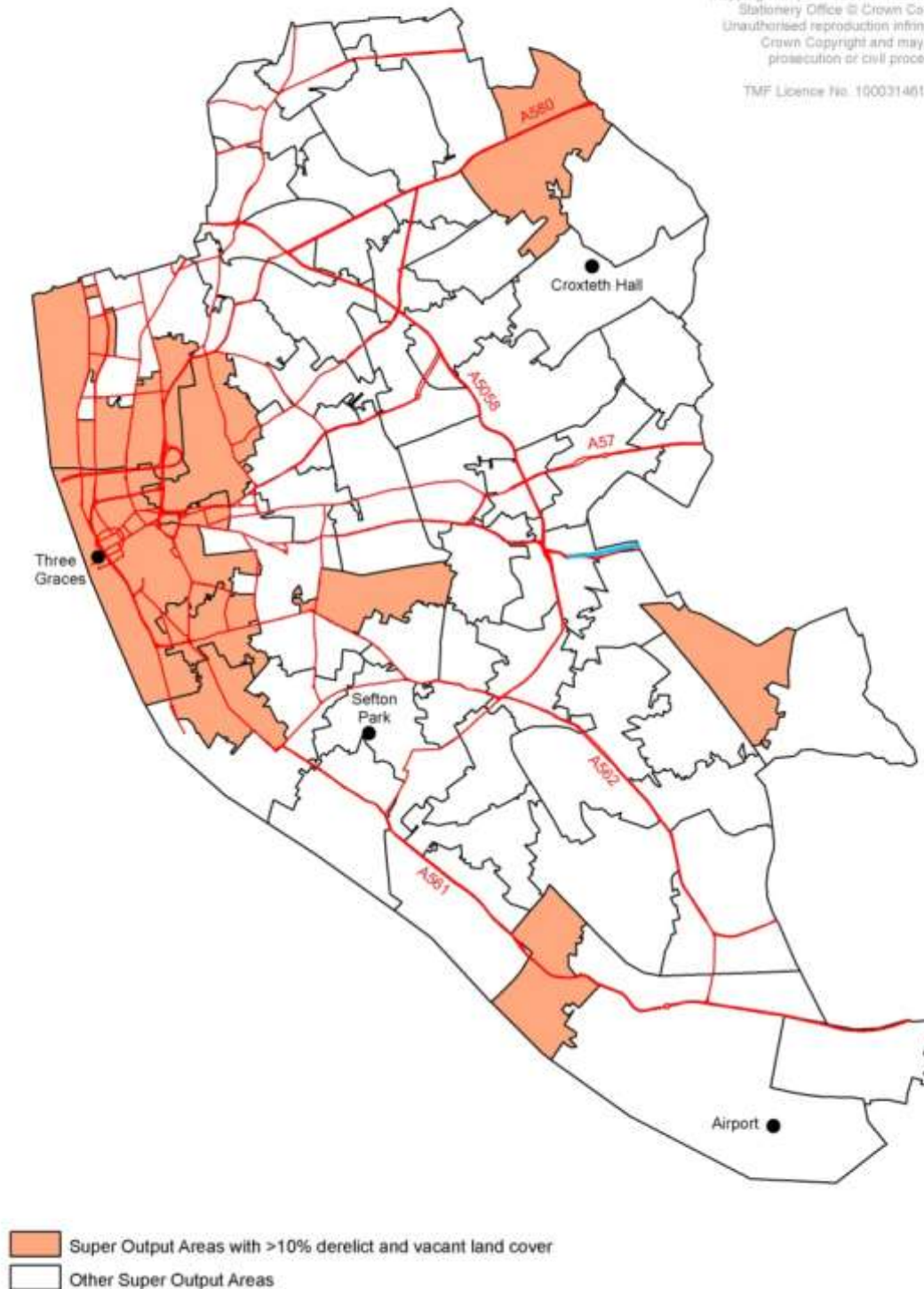


Map 135 Action 2.1 Targeting

A City Providing Natural Choices for Health Action 2.1

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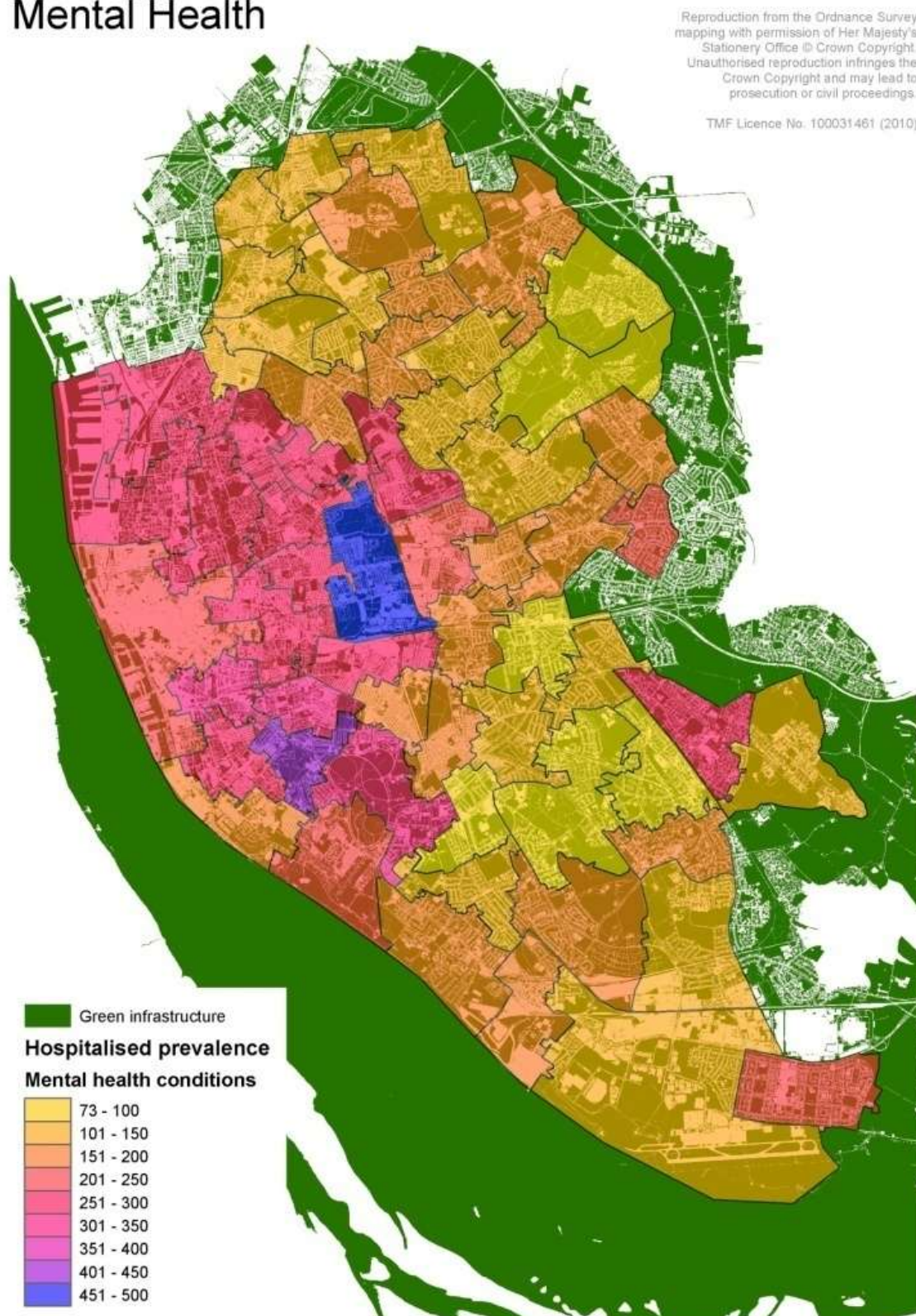
18.3.3. Action 2.2 Green Infrastructure supporting improved mental health

18.3.3.1. There is good evidence to show that good quality green infrastructure can improve mental health. Map 136 shows the hospitalised prevalence of mental health conditions across the city against green infrastructure. The central and westerly areas of the city appear to have higher rates of mental health issues and less green infrastructure provision than the outer easterly areas.

18.3.3.2. Map 137 identifies the wards where incidence is highest and green infrastructure lowest. This is the Northern and Western areas of the city. These are areas to focus activity. However, it is also the case that a general city wide improvement can also support the wider community mental health.

Map 136 Mental health and green infrastructure

Mental Health

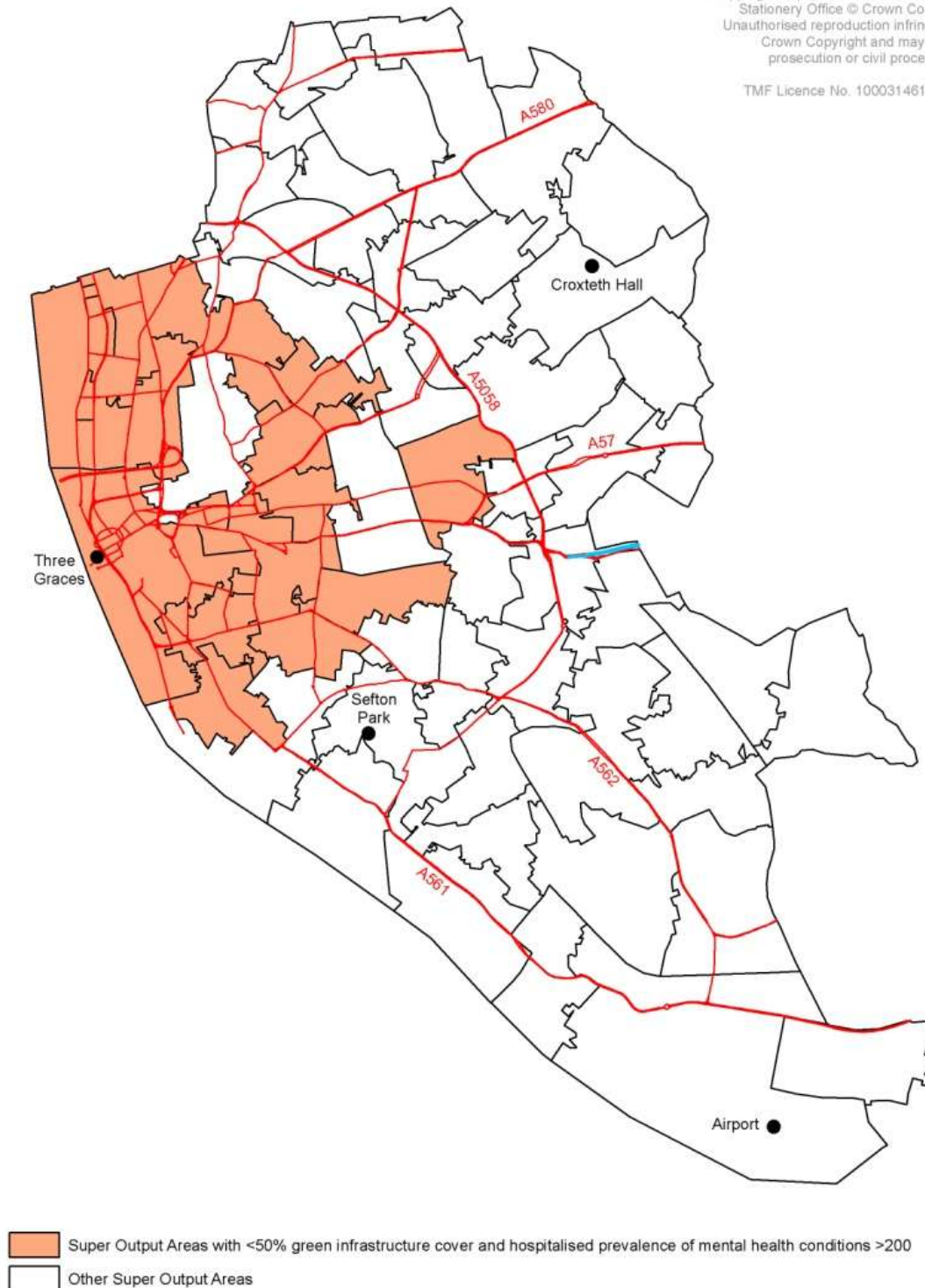


Map 137 Action 2.2 Targeting

A City Providing Natural Choices for Health Action 2.2

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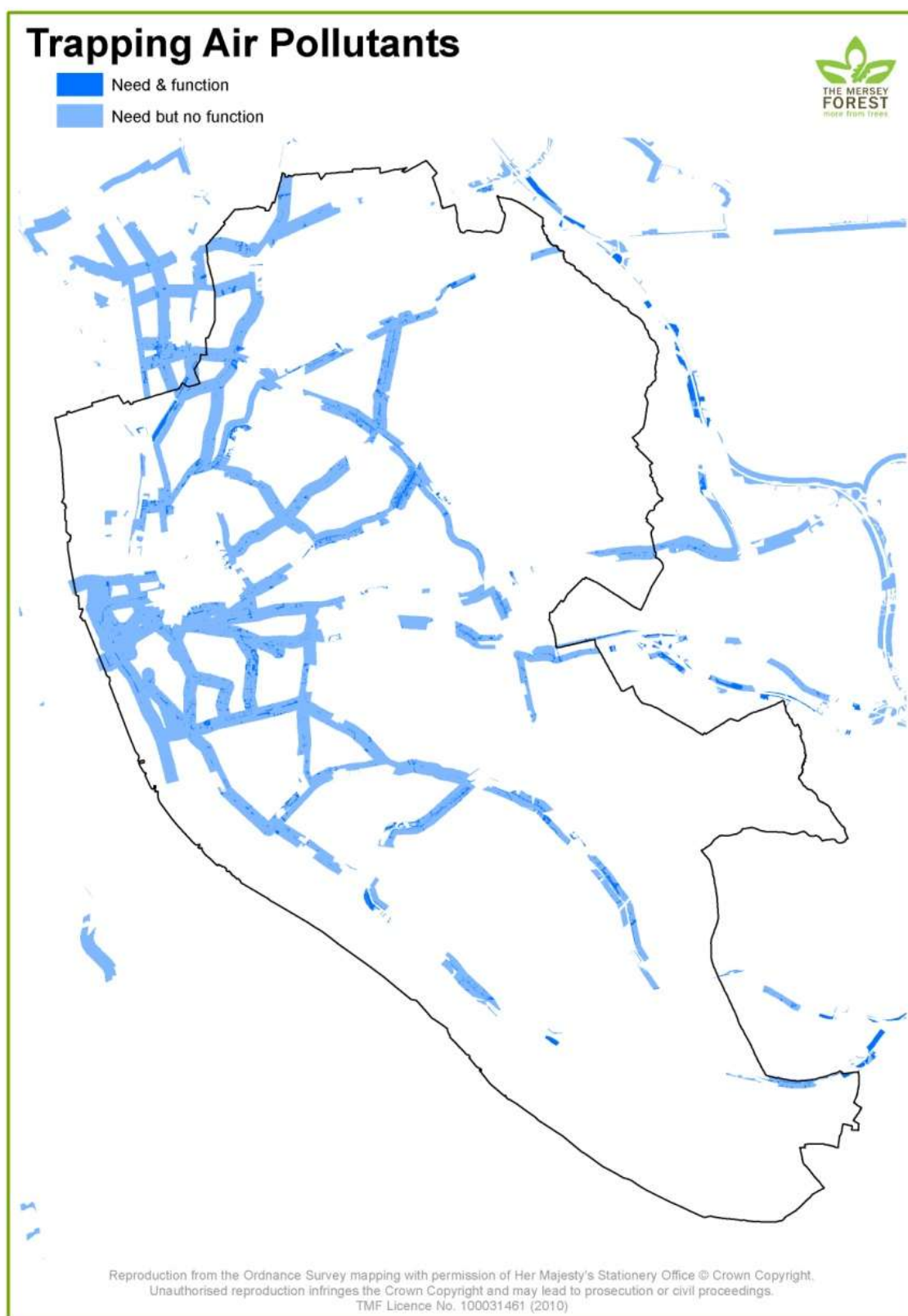
18.3.4. Action 2.3 Green infrastructure to reduce air pollution

18.3.4.1. Trees and woodlands can help to reduce air pollution, in particular particulates. The main routes into the city are the main areas where green infrastructure could play a role in helping to improve air quality across the city.

18.3.4.2. Map 138 indicates many areas across the city where green infrastructure is providing the function of trapping pollutants; however, there are still areas that require action to tackle air pollution.

18.3.4.3. Trees are one of the main types of green infrastructure that can perform the function of trapping air pollutants. Map 139 shows the tree density along the main road corridors throughout the city. Map 140 shows the areas of the city where there is the greatest need for trapping air pollutants but the lowest levels of green infrastructure providing this function. These areas are where action should be targeted.

Map 138 Trapping air pollutant functionality

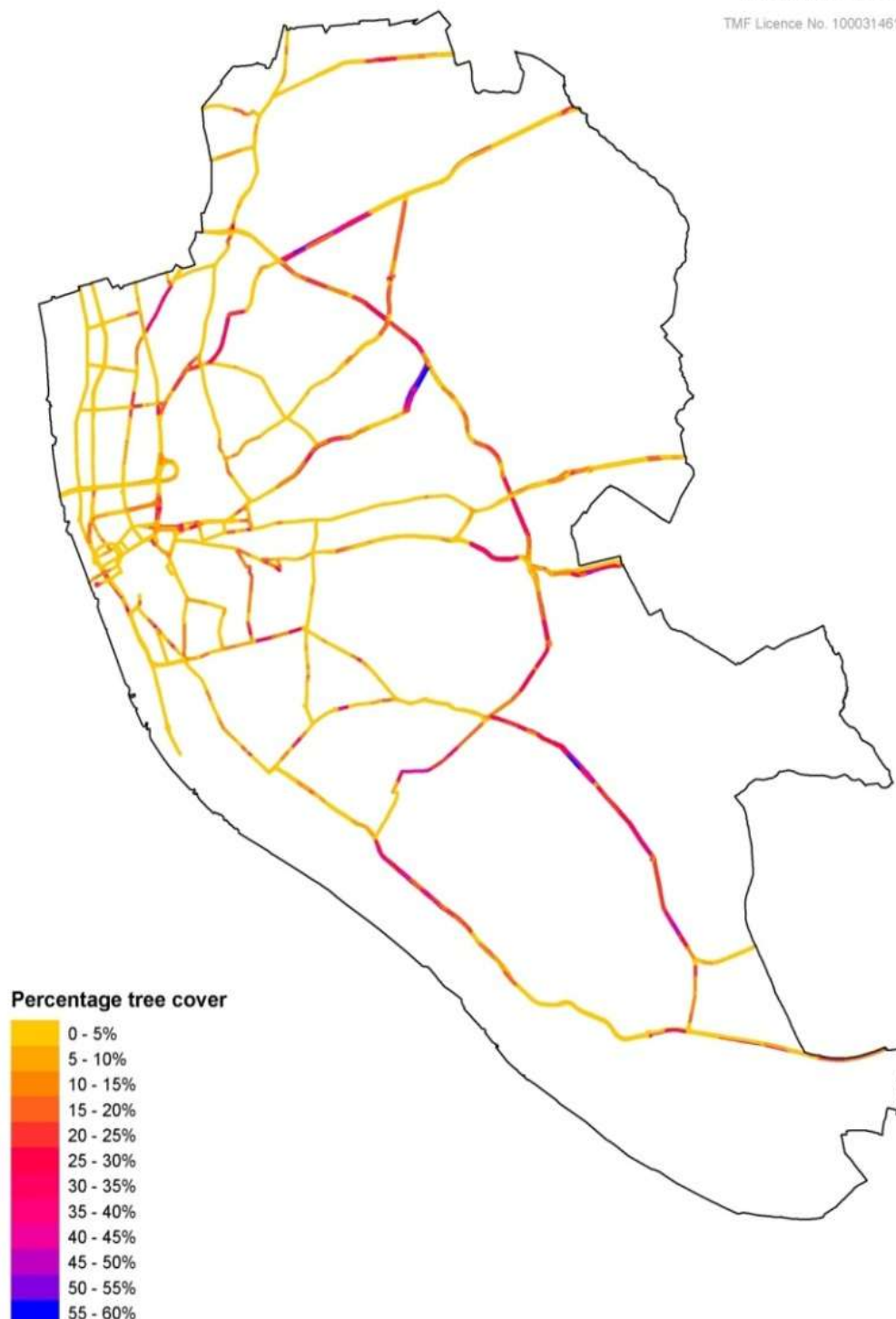


Map 139 Tree density in main road corridors

Tree Density in Main Road Corridors

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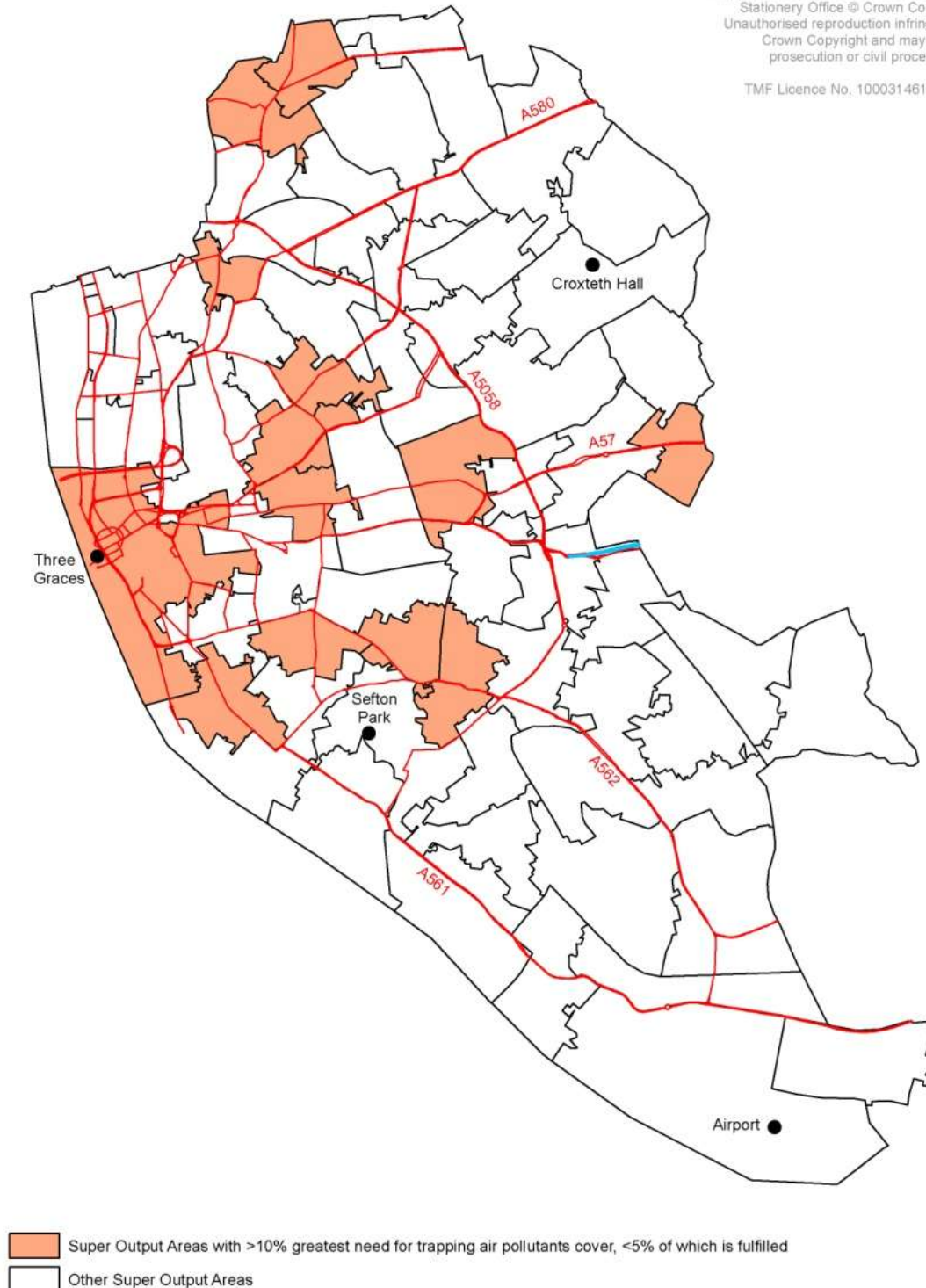


Map 140 Action 2.3 Targeting

A City Providing Natural Choices for Health Action 2.3

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18.3.5. Action 2.4 Providing local green infrastructure to improve health

18.3.5.1. There is clear guidance from NICE showing that more active lifestyles developed through close proximity of green infrastructure can help combat Coronary Heart Disease, Obesity and Diabetes. The incidence of each of these illnesses has been mapped in relation to the availability of accessible green infrastructure to determine the areas where there is high incidence of illness, but low provision of accessible spaces. Appendix 1 sets out how the thresholds have been set.

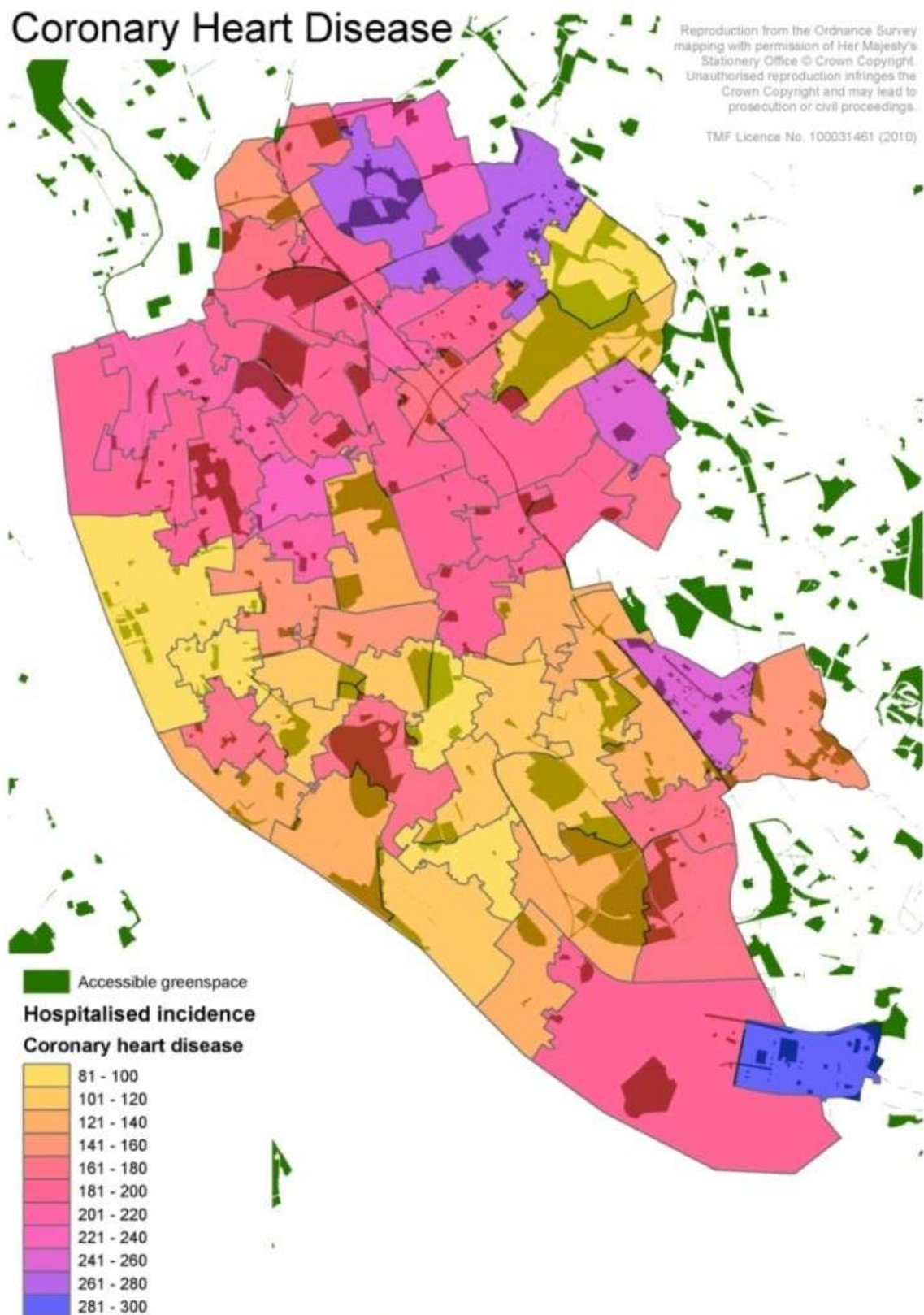
18.3.5.2. Map 141 shows the incidence of Coronary Heart Disease in relation to green infrastructure provision. Map 142 highlights target areas with <40% recreation functionality cover and >150 hospitalised incidences of Coronary Heart Disease.

18.3.5.3. Map 143 shows the incidence of Obesity in relation to green infrastructure provision. Map 144 highlights target areas with <40% recreation functionality cover where >20% of the population are obese.

18.3.5.4. Map 145 shows the incidence of Diabetes in relation to green infrastructure provision. Map 146 highlights target areas with <40% recreation functionality cover where the hospitalized prevalence of Diabetes is >300.

18.3.5.5. The focus for action tends to be in Inner Area North, as well as the areas to the north of Speke. There is extensive analysis of information related to this action in the main section of this document under the rationale for Priority 2 (section 13.6.4).

Map 141 Green infrastructure provision and incidence of Coronary Heart Disease

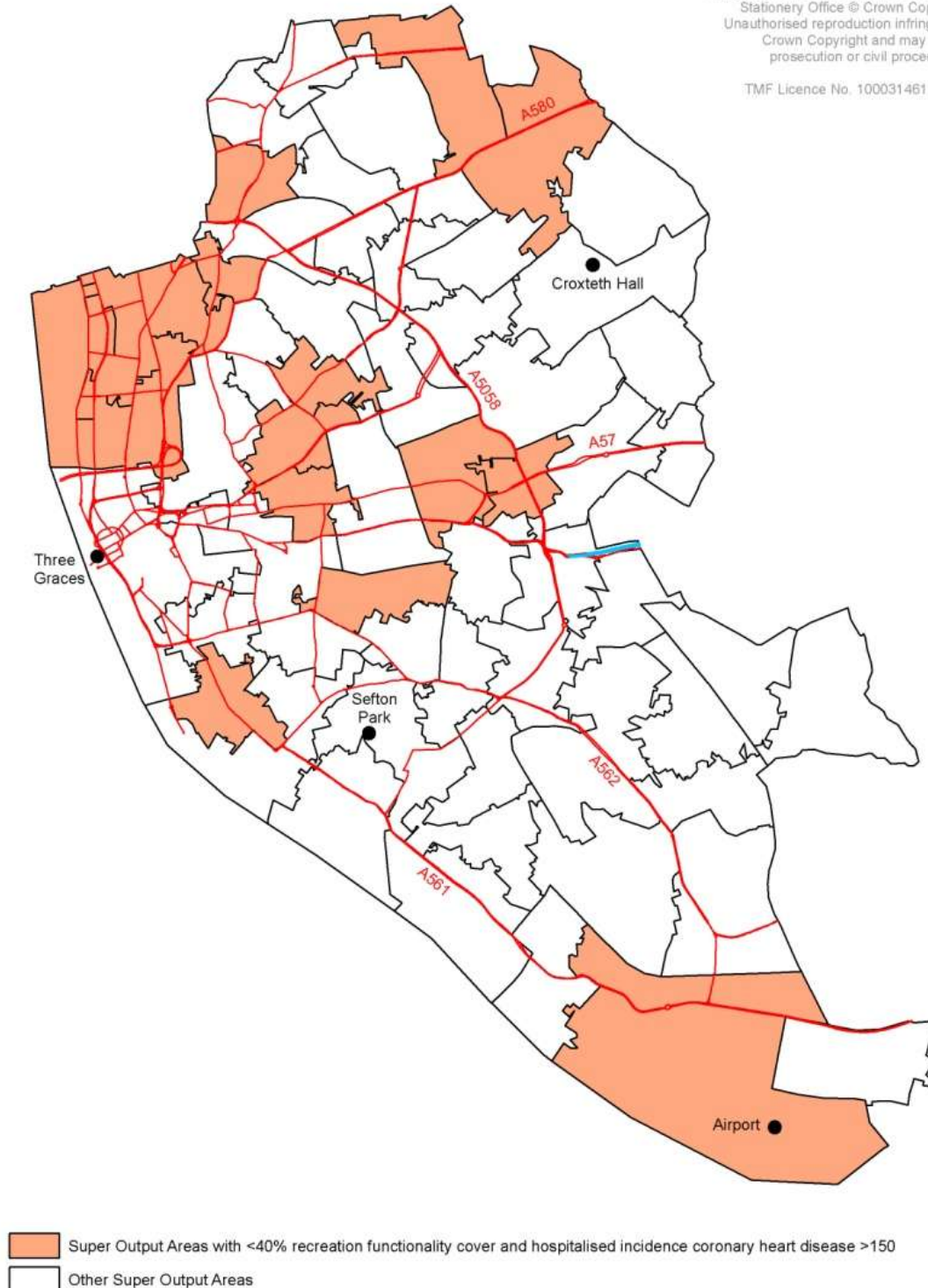


Map 142 Action 2.4 Targeting in relation to Coronary Heart Disease

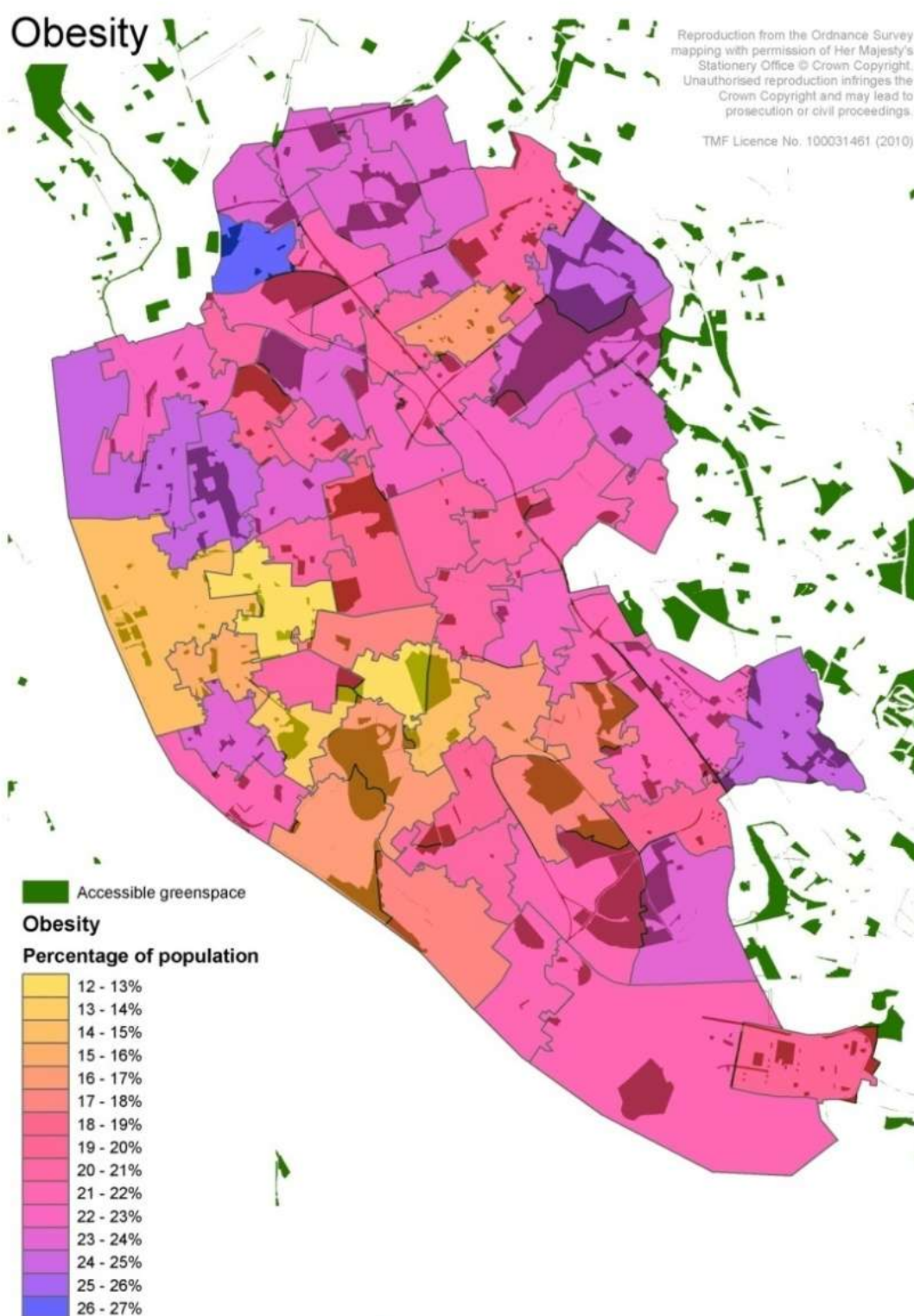
A City Providing Natural Choices for Health Action 2.4

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Map 143 Green infrastructure provision and incidence of Obesity

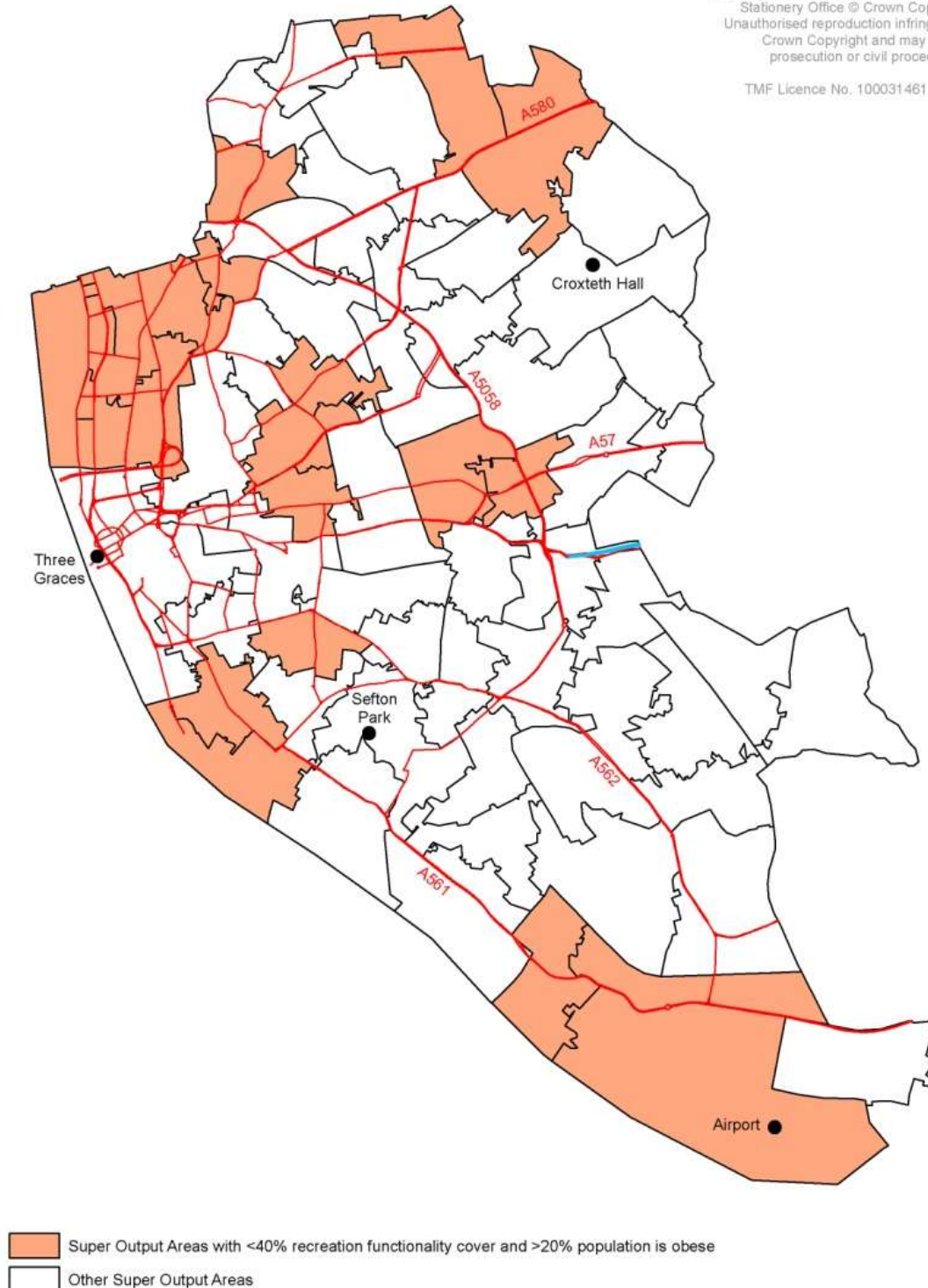


Map 144 Action 2.4 Targeting in relation to Obesity

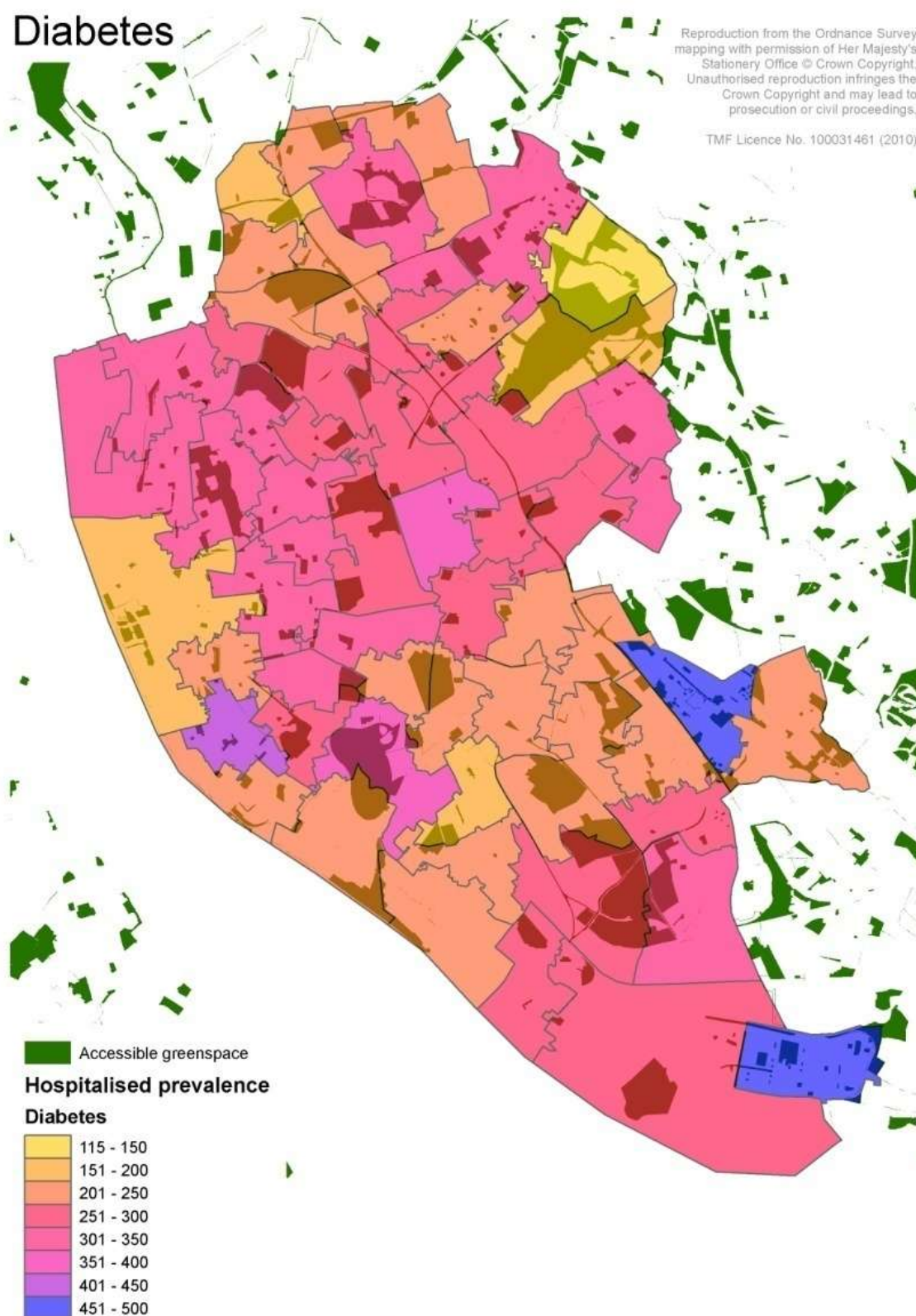
A City Providing Natural Choices for Health Action 2.4

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Map 145 Green infrastructure provision and incidence of Diabetes

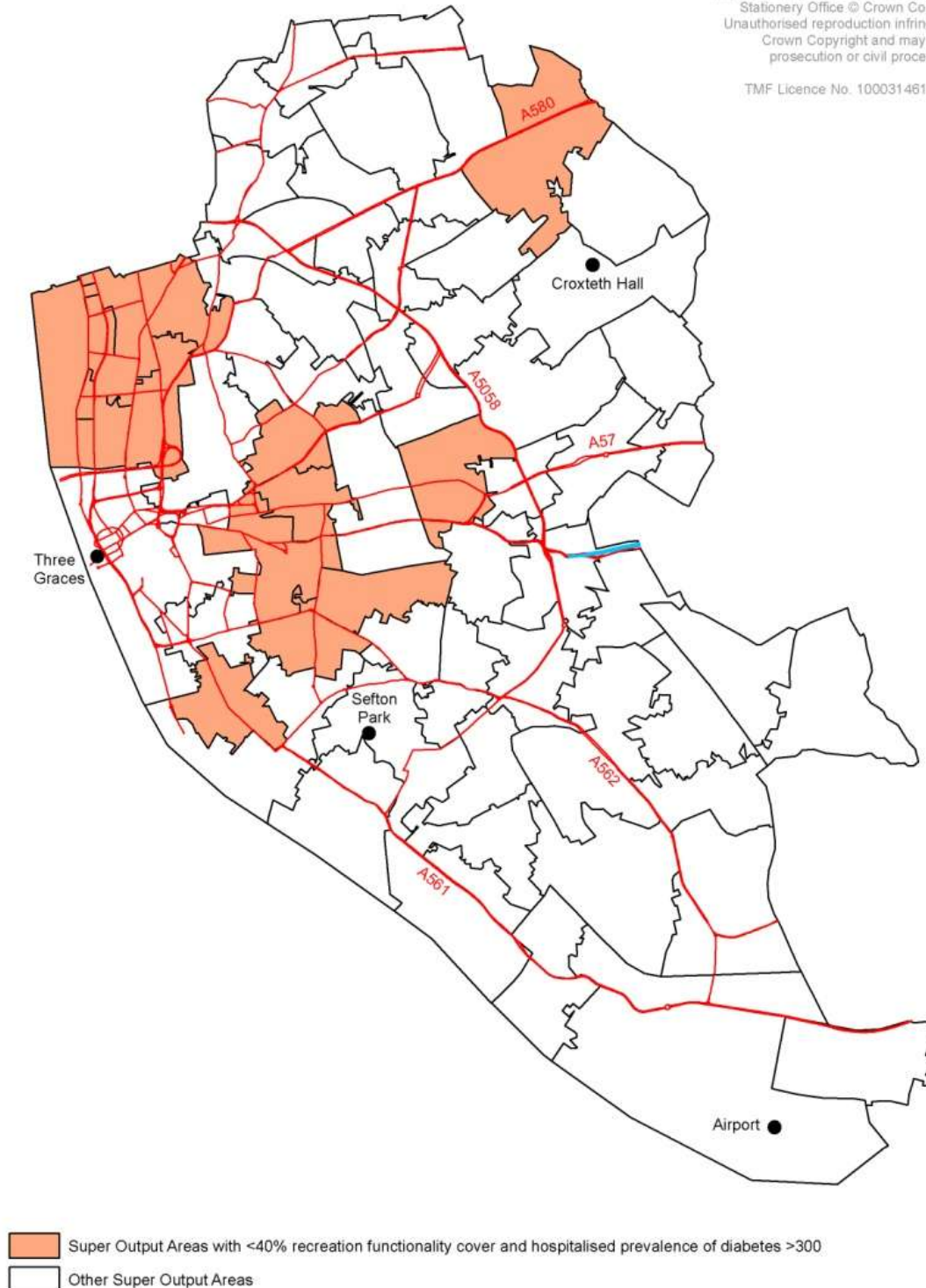


Map 146 Action 2.4 Targeting in relation to Diabetes

A City Providing Natural Choices for Health Action 2.4

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18.3.6. Action 2.5 Incorporating green infrastructure into hospital and health centre redevelopment to improve recovery rates

18.3.6.1. As hospitals and health centres are redeveloped a larger amount of green infrastructure can be incorporated than was previously present. Providing a natural and green setting in and around hospitals and health centres will improve the aesthetic of the area, aid recovery rates and inspire healthier lifestyles.

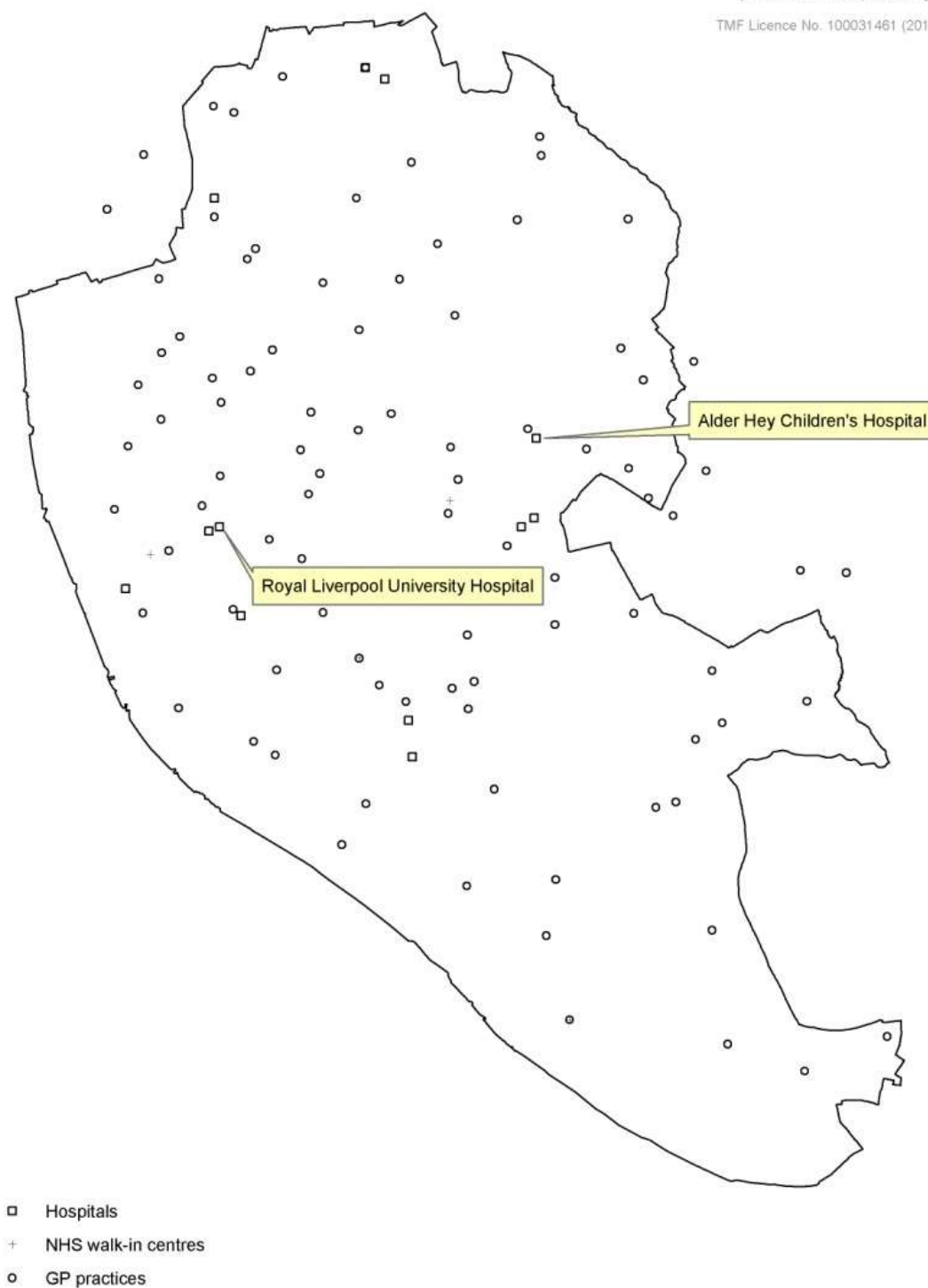
18.3.6.2. Map 147 shows the distribution of hospitals and health centres across the city. Any improvements in green infrastructure near these areas will help deliver this action. Map 148 shows the areas with relatively low levels of green infrastructure cover and more than two hospitals or health centres. These areas should be targeted for green infrastructure improvements associated with hospitals and health centres.

Map 147 Hospital and health centre locations

Hospitals and Health Centres

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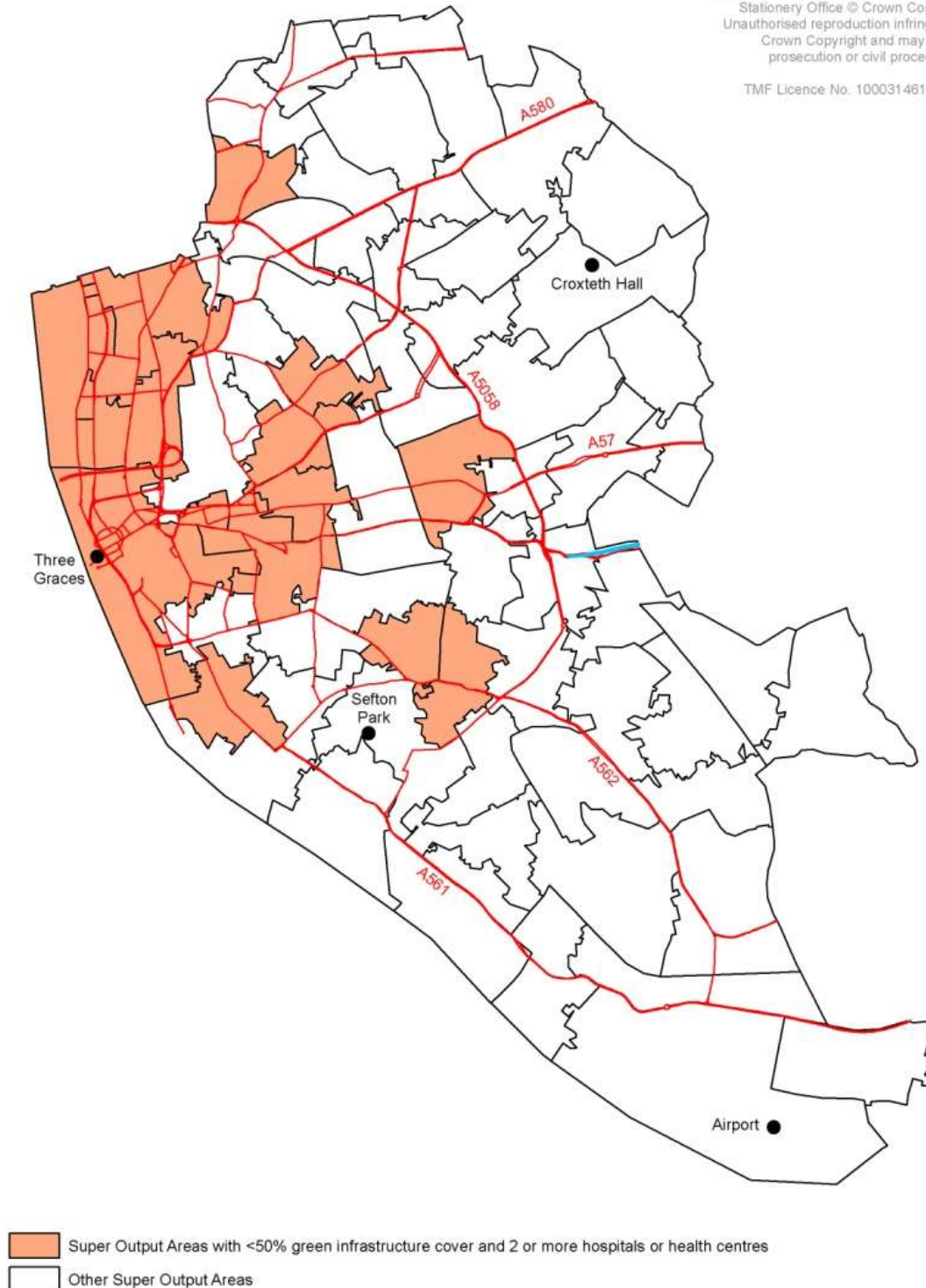


Map 148 Action 2.5 Targeting

A City Providing Natural Choices for Health Action 2.5

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18.3.7. Action 2.7 Encouraging daily physical activity by providing local green infrastructure

18.3.7.1. This action is strongly related to the walkability action above. This action focuses on encouraging the use of green infrastructure in and around where people live and work. Providing alternative travel routes to local services and facilities can encourage people to travel more sustainably – thus improving health and reducing carbon emissions. The proximity of green travel routes to where people live also provides the opportunity for doctors and health practitioners to promote healthy walking locally.

18.3.7.2. There is now significant evidence linking the use of green infrastructure for recreation, commuting, transport and leisure with improved health. It also has a therapeutic effect on patient recovery from illness. Linking green infrastructure to the “health infrastructure” can help to reinforce this message.

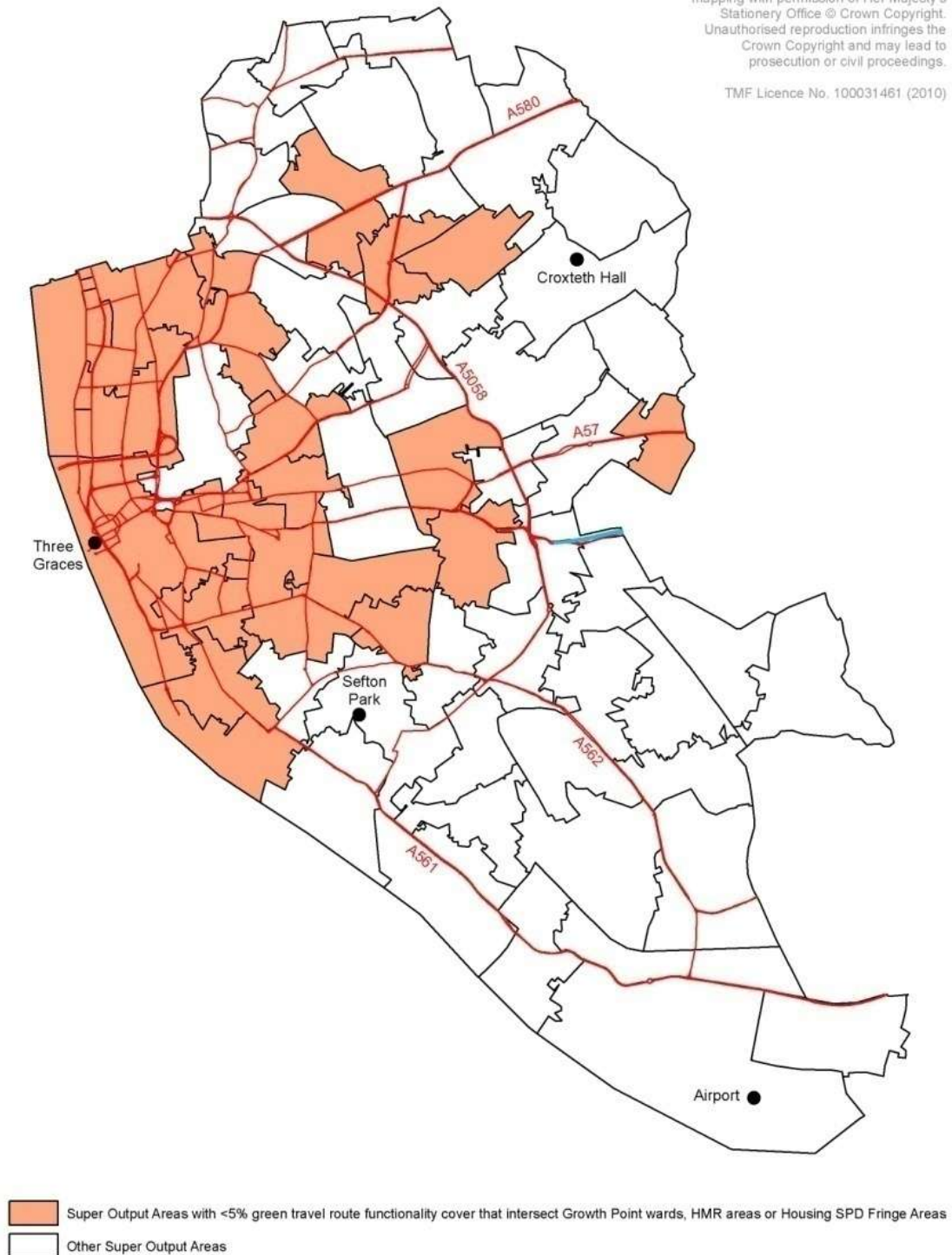
18.3.7.3. Map 149 shows areas of the city with <5% green travel route functionality that intersect growth point wards, HMR areas, or housing SPD fringe areas in pink – these areas should be targeted for action in relation to action 2.7. In the areas shown in white on the map the existing green infrastructure should be maintained to ensure its continued effectiveness with regards to action 2.7

Map 149 Action 2.7 Targeting

A City Providing Natural Choices for Health Action 2.7

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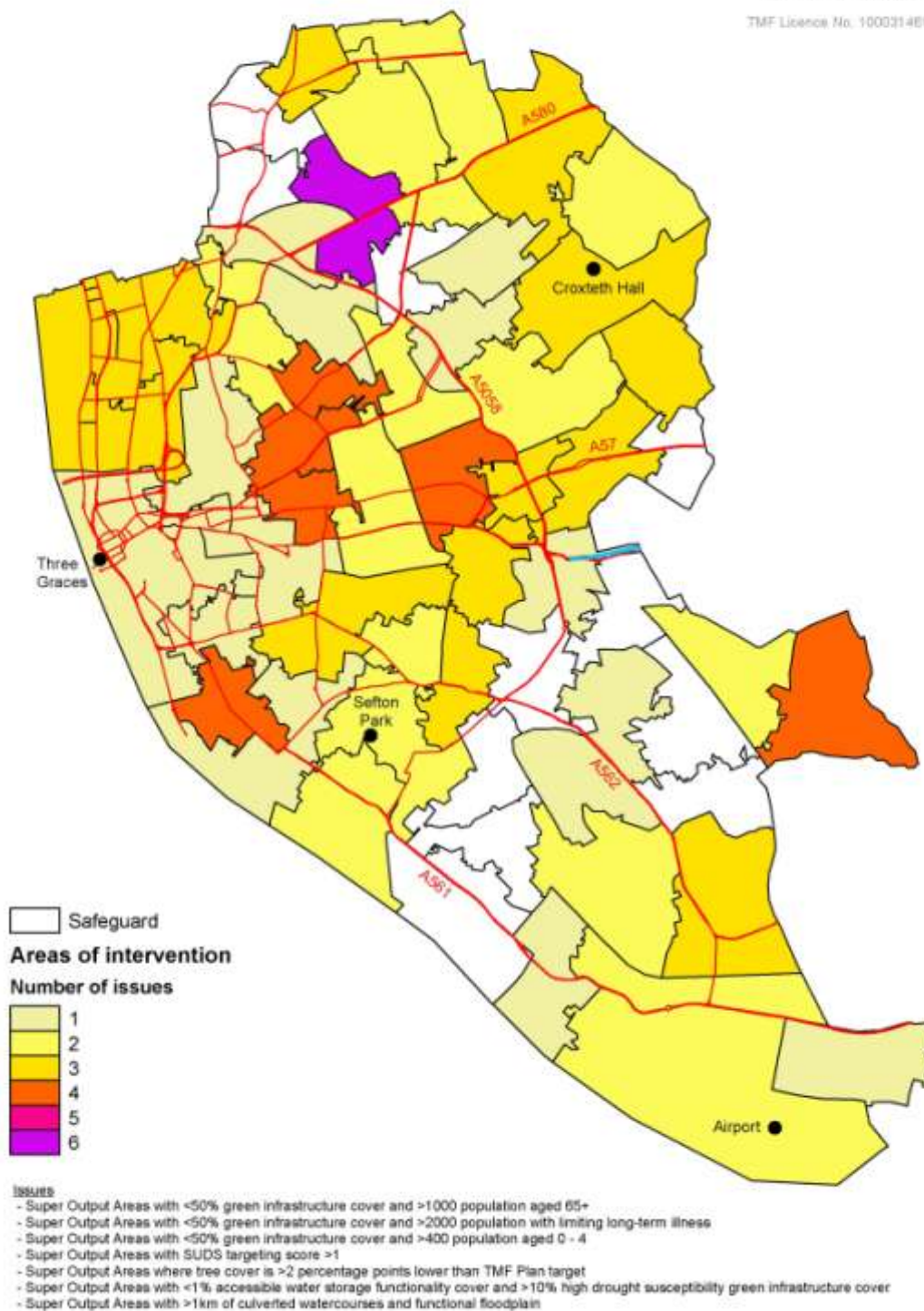
18.4. PRIORITY 3: A Cool City

Map 150 Priority 3 Overview Map

A Cool City

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18.4.1. Overview

18.4.1.1. The overview map for a cool city highlights the central and the northern extremities of the city as being most in need of intervention. There is a distinctive section through the middle of the city where the main action should be to safeguard and enhance the existing green infrastructure. Whilst the South of the city has some issues the Northern parts of the city appear to be in greater need of intervention.

18.4.1.2. Green infrastructure is a key way to tackle climate change, helping to both adapt to the changing climate but also to prevent further climate change.

18.4.2. Action 3.1 Reduce urban heat island effect in areas of most vulnerable communities

18.4.2.1. Whilst the existing green infrastructure and in particular The River Mersey provide cooling that can help to reduce the impacts of the urban heat island effect through convective cooling and evapotranspiration, there are communities that are vulnerable to the increased temperatures that are experienced in heatwaves, or that may become more common later this century given projected climate change. The following maps show where the vulnerable populations, as identified in the NHS Heatwave Plan, are in Liverpool and the distribution of the green infrastructure cooling function.

18.4.2.2. Older people at risk from the urban heat island effect.

Map 151 shows the distribution of people aged 65+ across the city against the cooling function. Map 152 shows the areas of the city with less than 50% green infrastructure providing the cooling function and where there are more than 1000 people in the Super Output Area aged 65 or over. These areas should be targeted for increasing green infrastructure for cooling and for ensuring that the existing green infrastructure that is vulnerable to drought is managed to extend its cooling function in times of drought by irrigating.

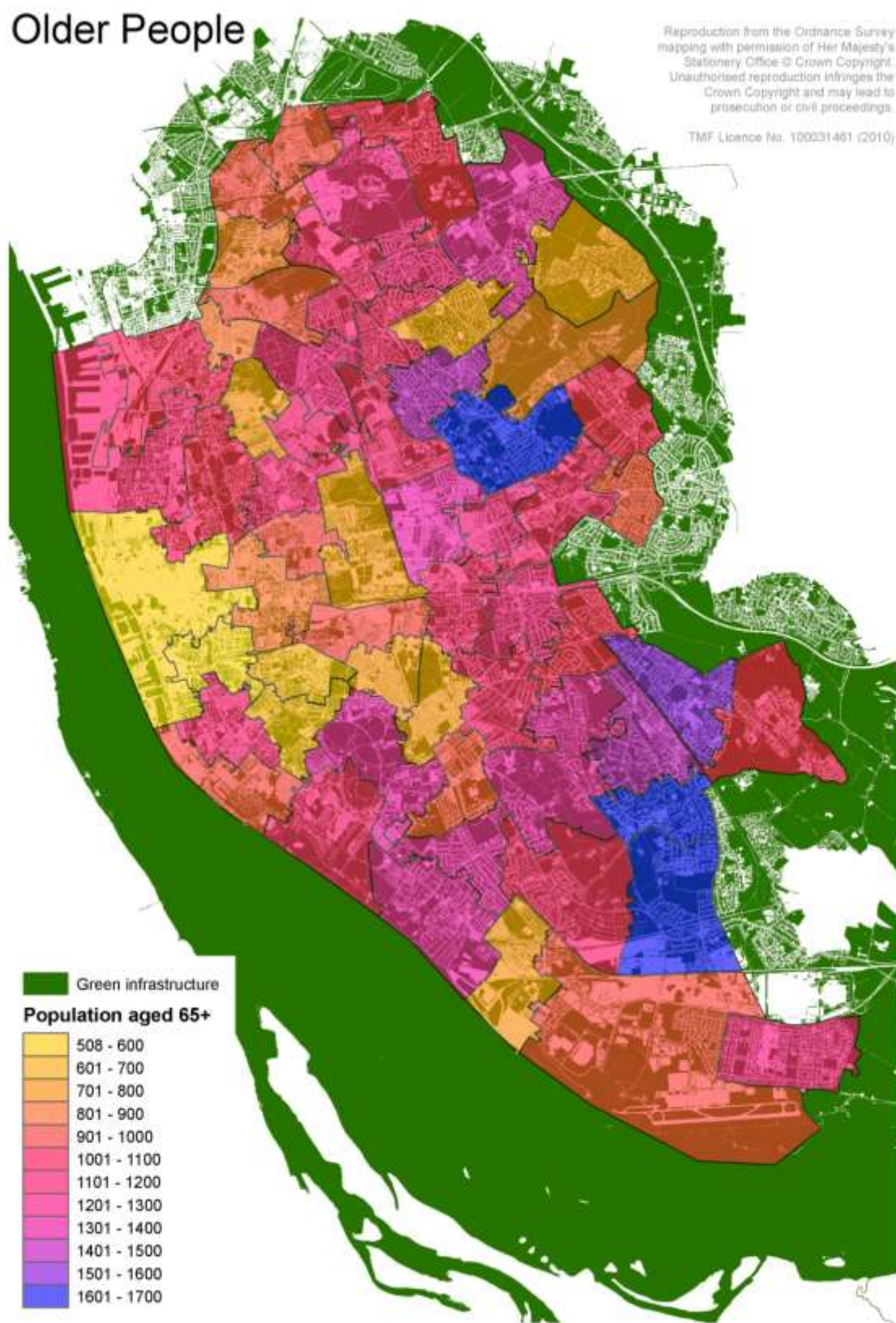
18.4.2.3. People with limiting long term illness at risk from urban heat island.

Map 153 shows the distribution of people with limiting long term illness across the city superimposed on the areas of green infrastructure that are providing the cooling function. Map 154 shows the areas of the city with less than 50% green infrastructure providing the cooling function and where there are more than 2000 people in the Super Output Area with limiting long term illness. These areas should be targeted for increasing green infrastructure to provide cooling and for ensuring that the existing green infrastructure that is vulnerable to drought is managed to extend its cooling function in times of drought by irrigating.

18.4.2.4. People less able to adapt behaviour at risk from urban heat island – young children

Young children are also at risk from the urban heat island effect. Map 155 shows the distribution of young children (under four) across the city against the cooling function. Map 156 shows the areas of the city with less than 50% green infrastructure providing the cooling function and where there are more than 400 children under four years of age in the Super Output Area. These areas should be targeted for increasing green infrastructure to provide cooling and for ensuring that the existing green infrastructure that is vulnerable to drought is managed to extend its cooling function in times of drought by irrigating.

Map 151 Location of older people in relation to green infrastructure

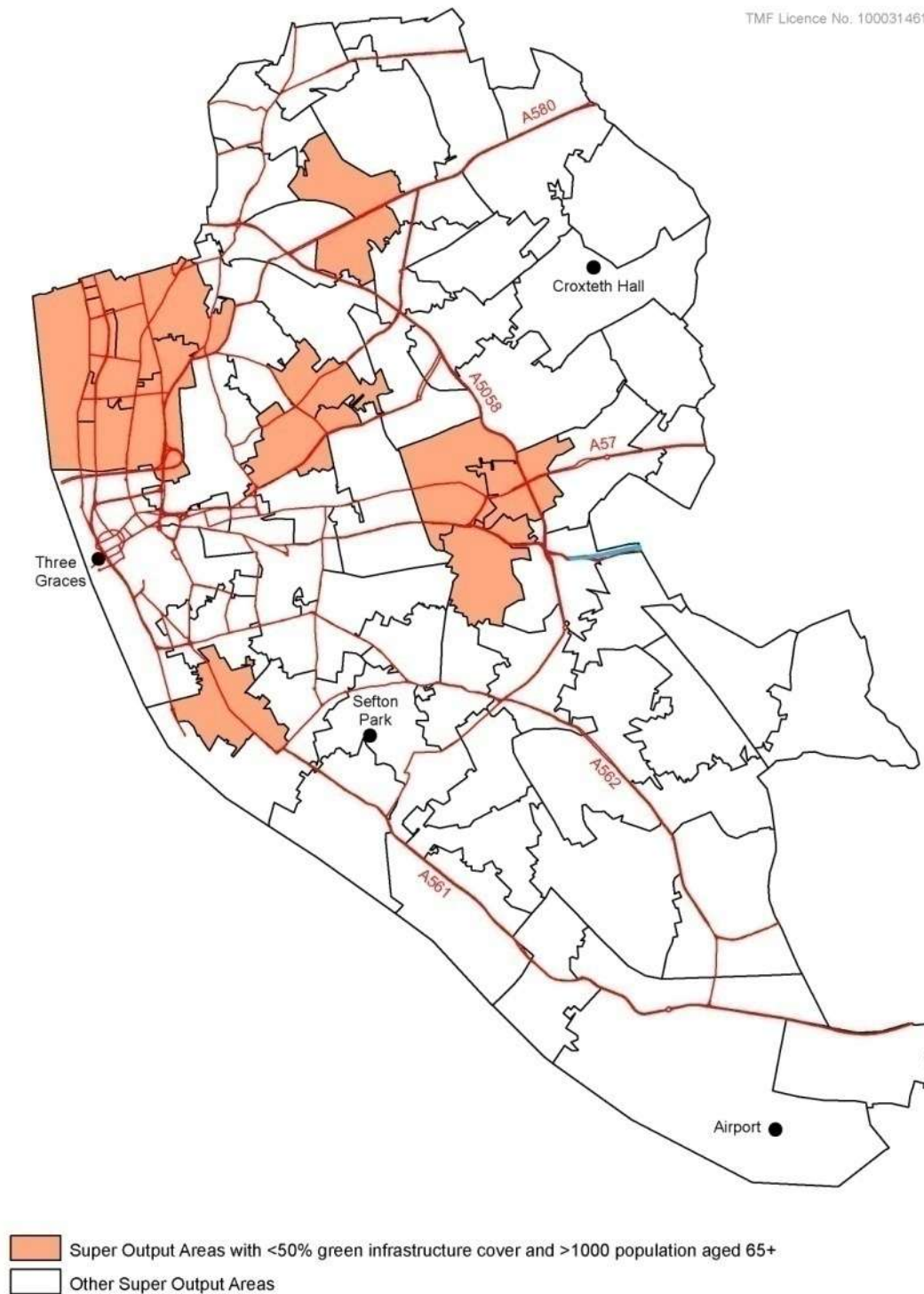


Map 152 Action 3.1 Targeting in relation to older people

A Cool City Action 3.1

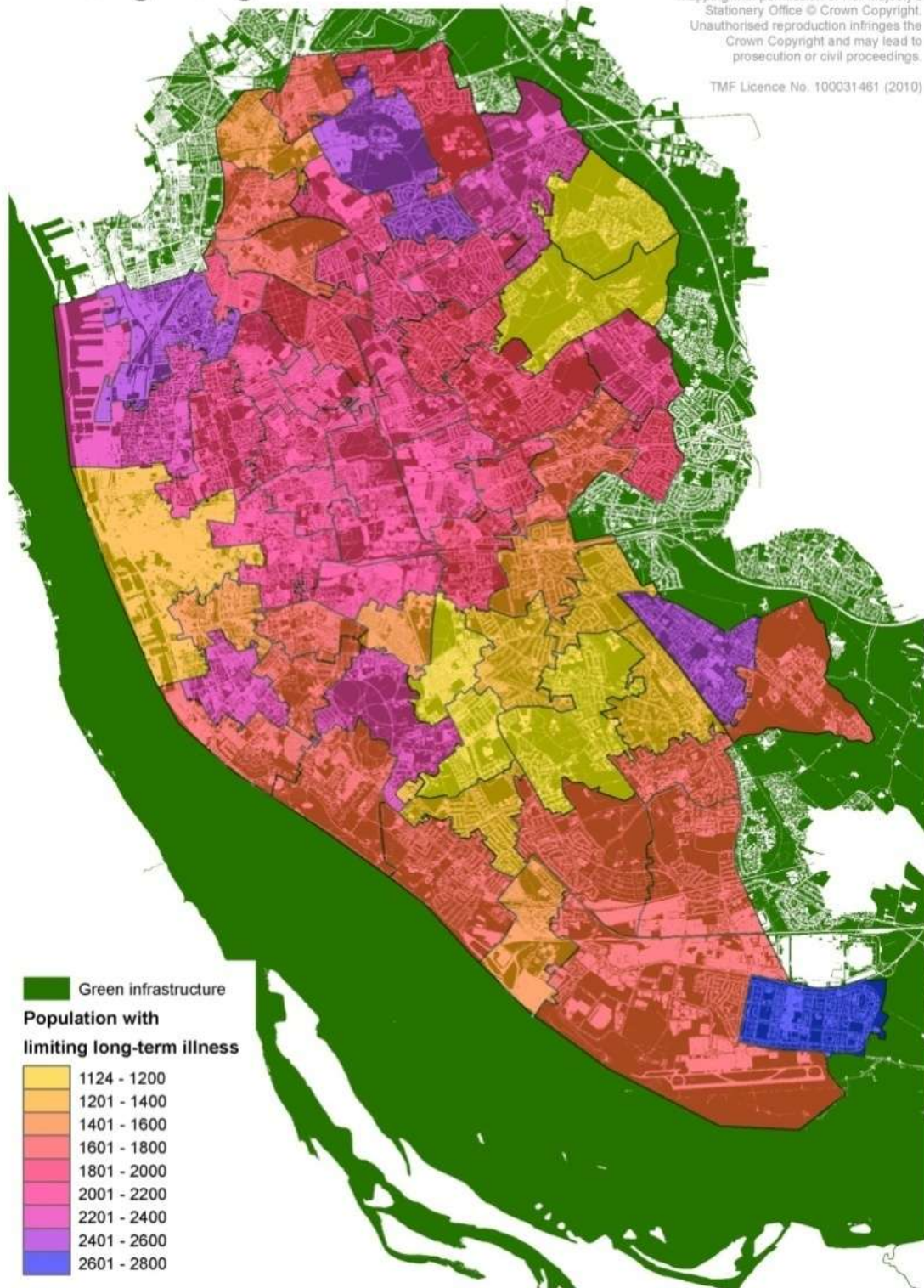
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Map 153 Urban heat island effect and people with limiting long term illness in relation to green infrastructure

Limiting Long-Term Illness

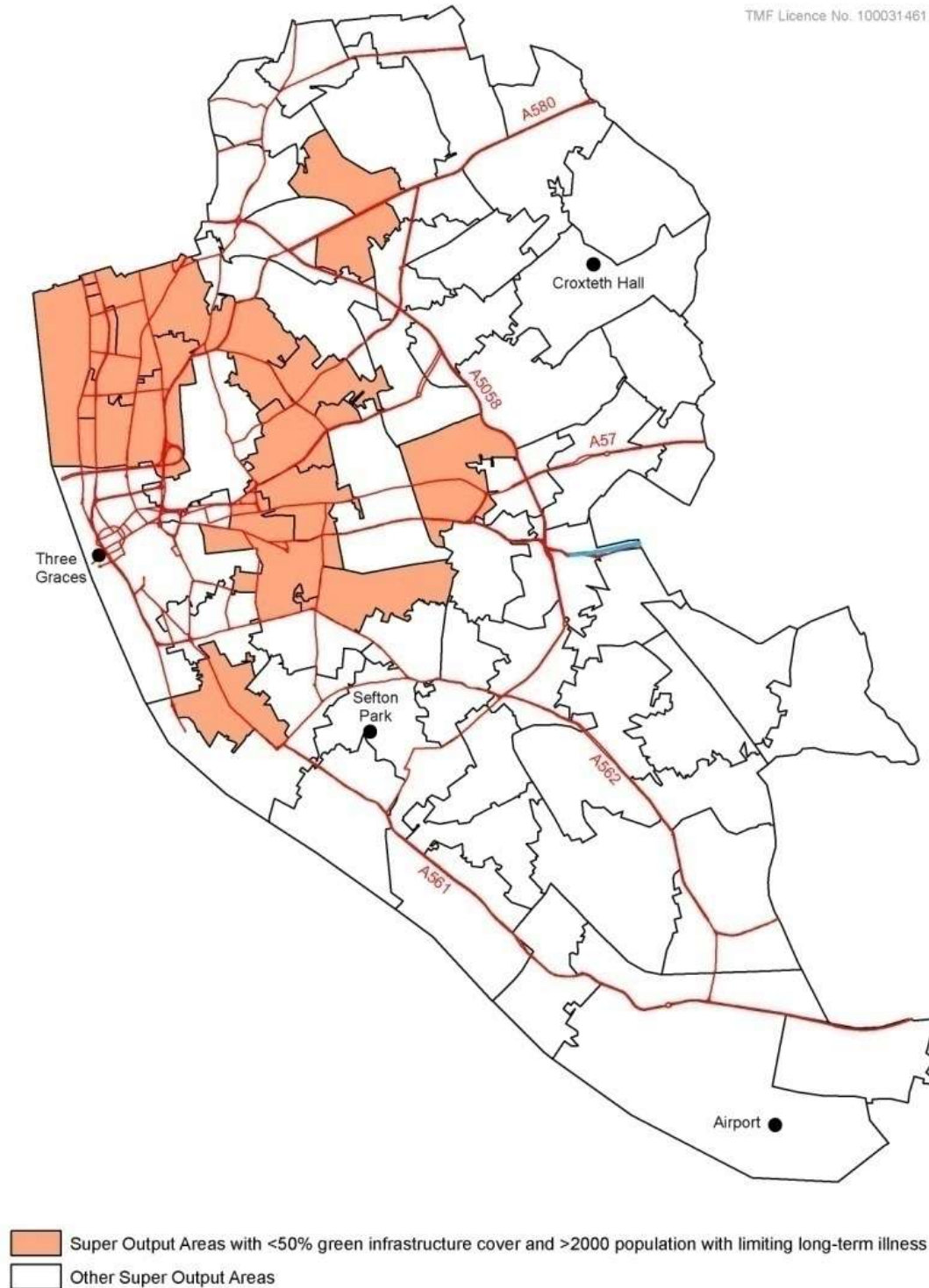


Map 154 Action 3.1 Targeting in relation to limiting long term illness

A Cool City Action 3.1

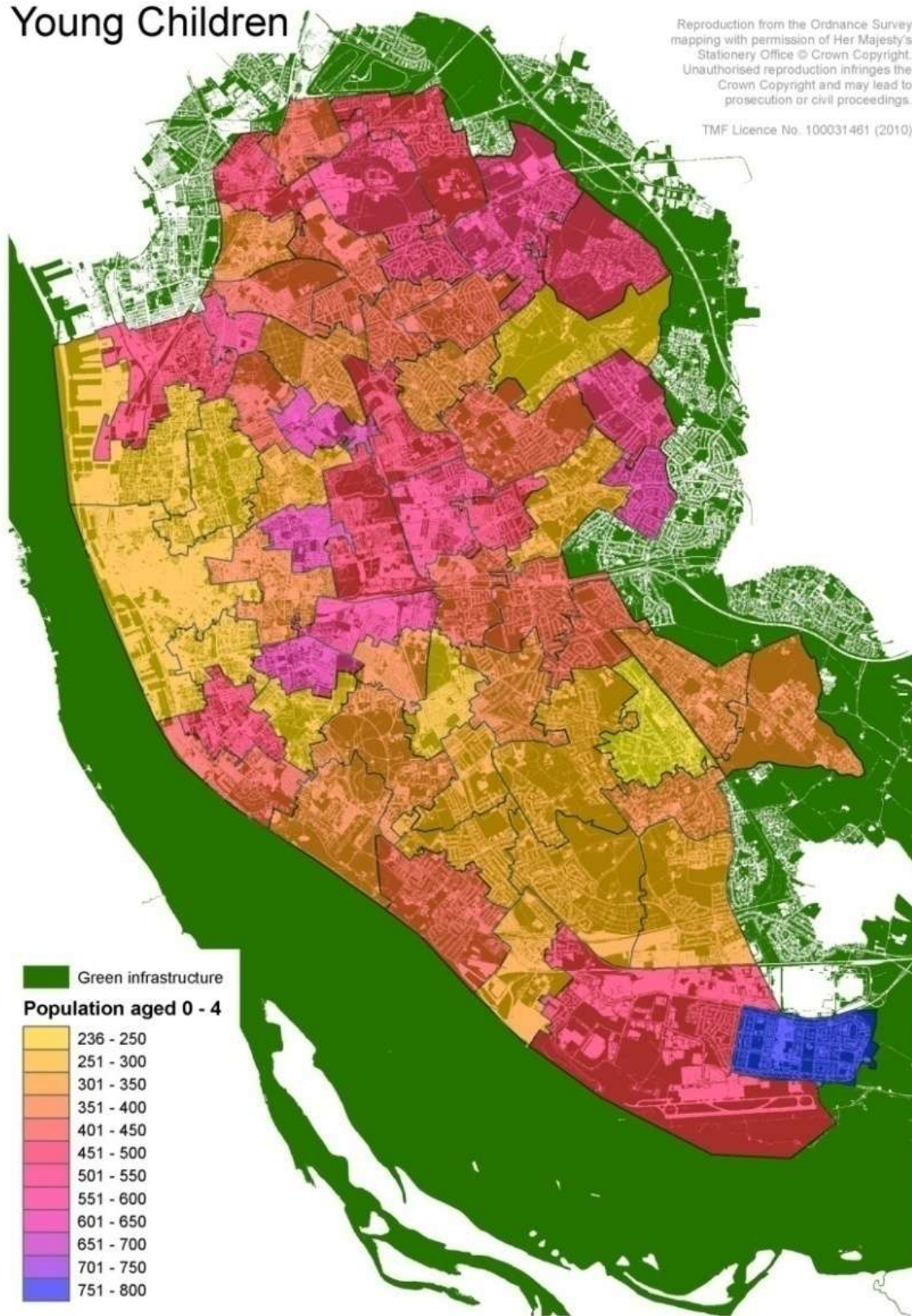
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Map 155 Location of young children in relation to green infrastructure

Young Children

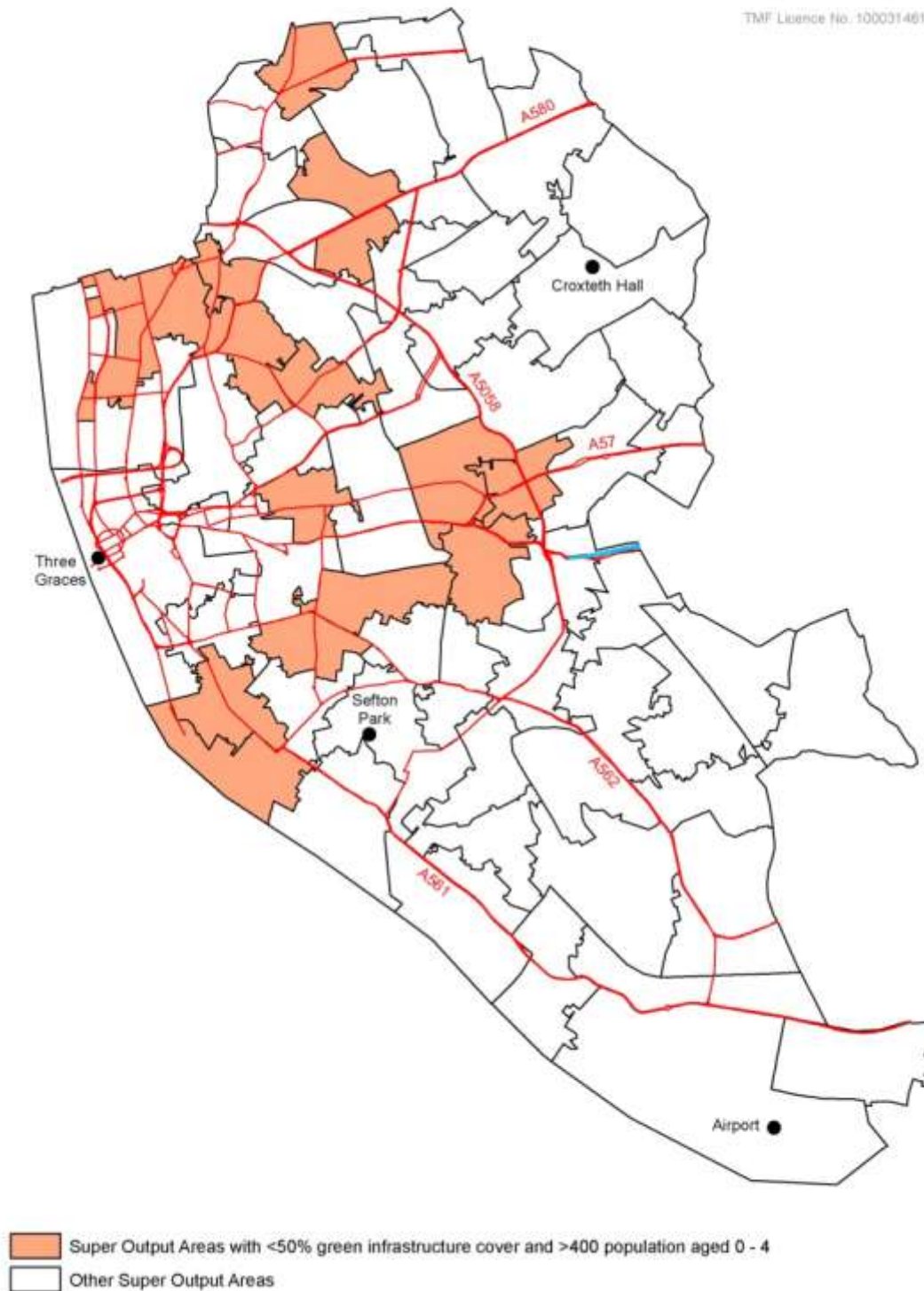


Map 156 Action 3.1 Targeting in relation to young children

A Cool City Action 3.1

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18.4.3. Action 3.2 Sustainable Urban Drainage Systems

18.4.3.1. Research carried out through the ASCCUE project has indicated that green infrastructure on permeable soils offers a good opportunity to assist with water management. The water management functions of green infrastructure such as water interception and storage are augmented by permeable soils that allow the flow of water through the soil profile to be stored or moved at depth. This function is particularly important in the light of projected climate change scenarios that indicate that Liverpool will experience wetter winters and more intense summer rainfall episodes. Map 157 identifies the target area for increasing the water management functionality of green infrastructure. It identifies wards with less than 50% green infrastructure, on permeable soils that intersect with flood zone 2.

18.4.3.2. Appendix 1 sets out the methodology for determining the SUDS targeting score.

18.4.3.3. Map 157 shows a clear band through the centre of the city where SUDS would be most beneficial. However, it is also the case that SUDS can play a role in reducing pressure on the water infrastructure across the city and should be encouraged wherever possible, with perhaps firmer policy in the areas where it has been identified that they could be most beneficial.

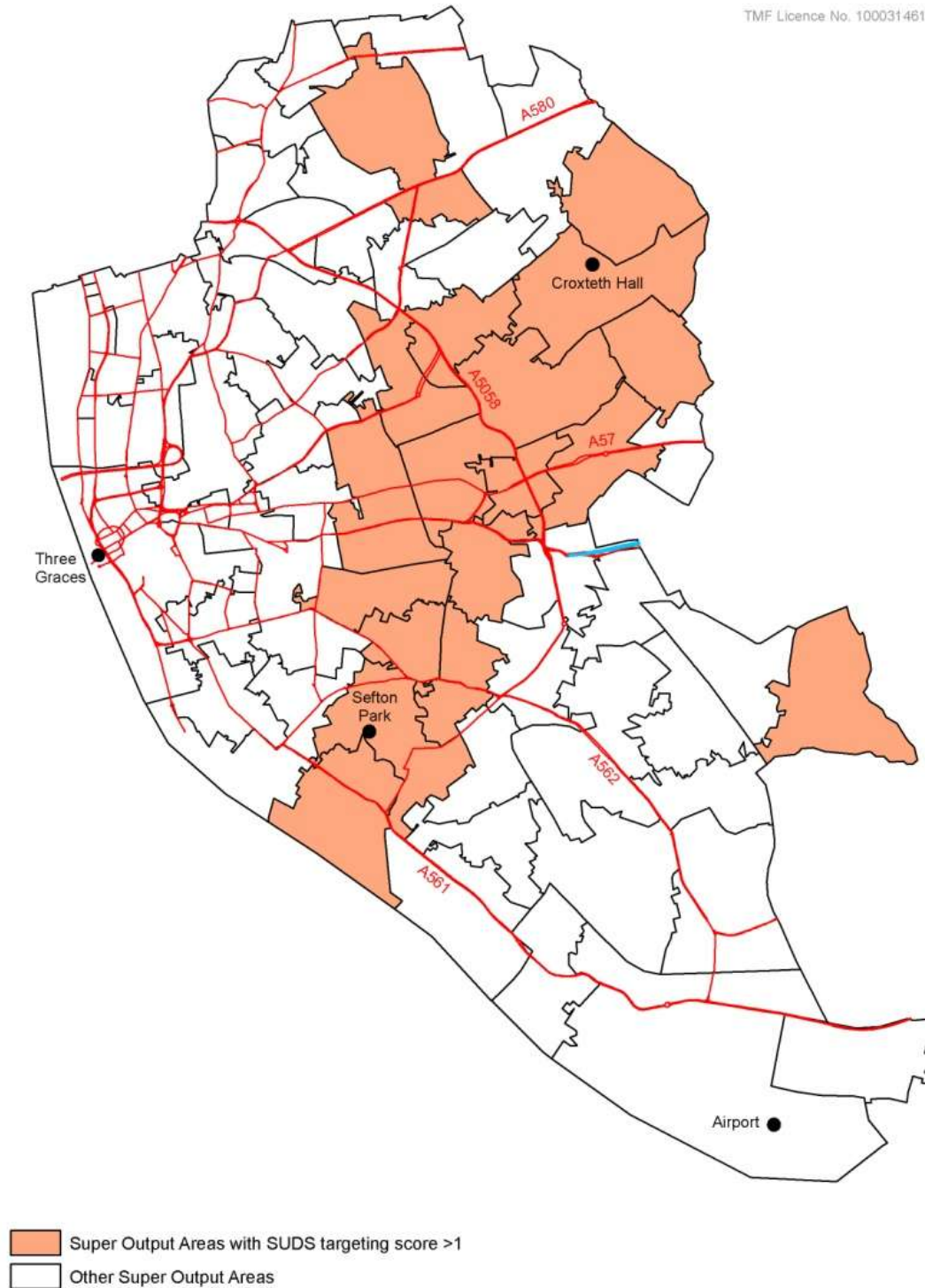
18.4.3.4. The adoption of SUDS is one the key barriers to their creation, and whilst outside the scope of this strategy, it is a key issue to address in order to deliver more SUDS.

Map 157 Action 3.2 Targeting

A Cool City Action 3.2

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18.4.4. Action 3.4 Providing urban cooling and shade

18.4.4.1. Trees and in particular street trees are vital for providing urban cooling and shade in towns and cities. Trees and woodland are the most multifunctional of all the green infrastructure typologies. In Liverpool street tree planting should be targeted in the areas of current lowest density where possible. Tree density in other areas needs to be safeguarded. Map 158 shows the density of trees across the city. The low density areas are mainly in the north of the city, with the south benefiting from the foresight shown in planting large trees as part of the development of the historic parks, the Brodie avenues and also the safeguarding of larger areas of family estates in the early 1900's that now form a series of smaller parks.

18.4.4.2. Trees can be planted as part of the creation of new small woodlands in the outer areas of the city or as urban trees in the heart of the city and in areas such as schools and institutional grounds to provide a wide range of benefits. The issue of planning and management is crucial to the successful delivery of this action.

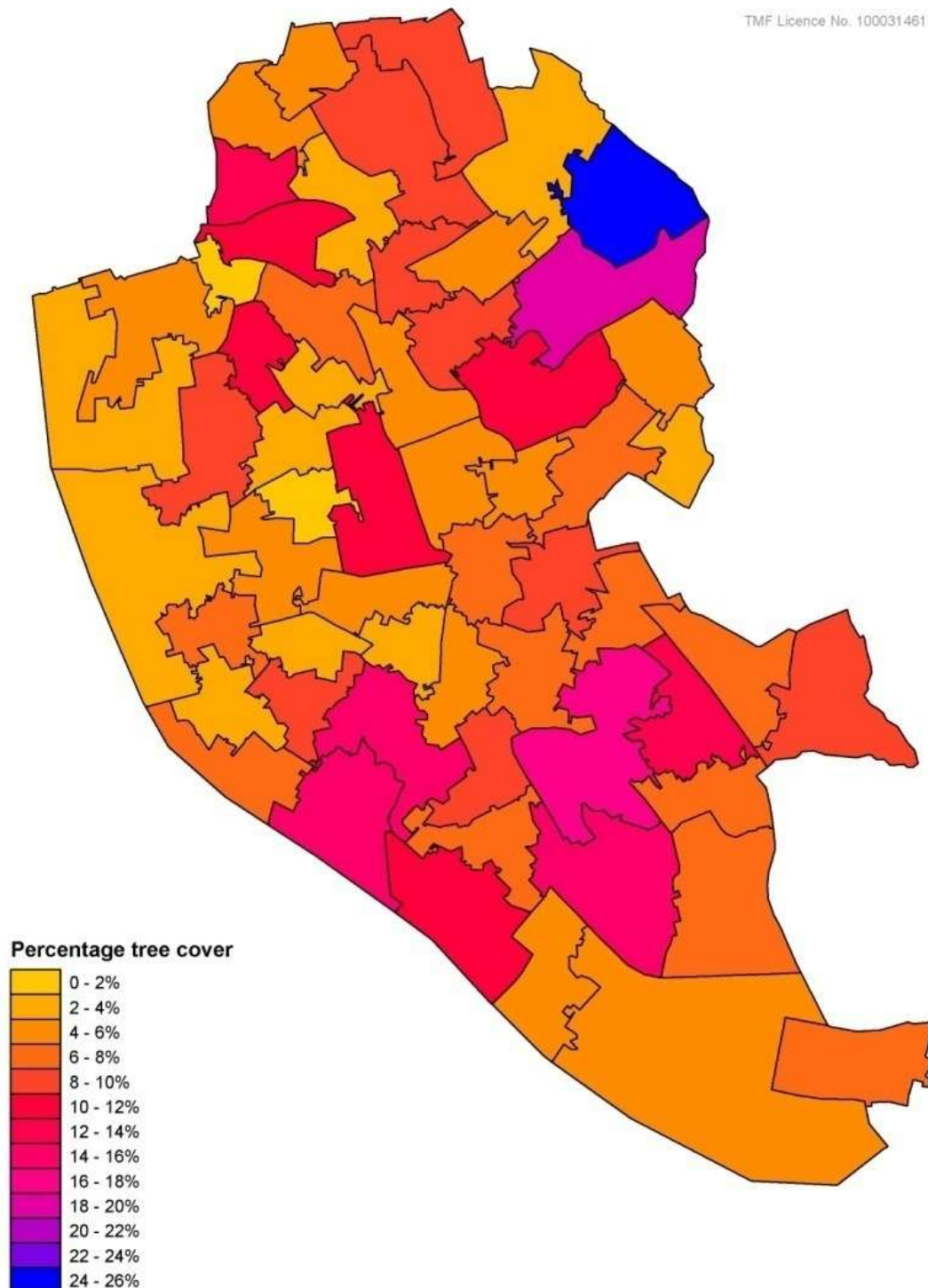
18.4.4.3. Map 159 shows areas where tree cover is >2 percentage points lower than The Mersey Forest Plan planting target, these areas should be targeted for action 3.4.

Map 158 Tree density

Tree Density

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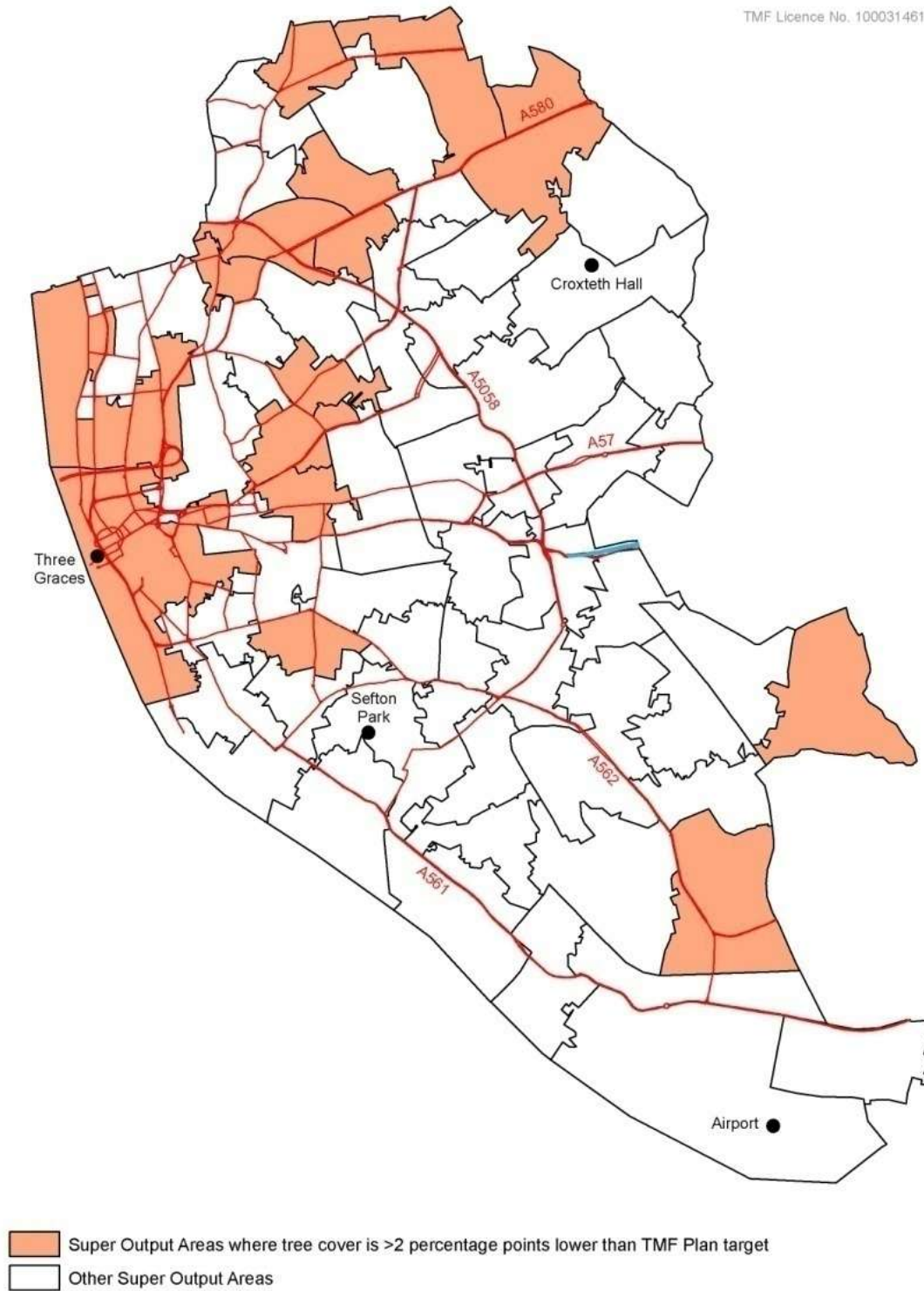


Map 159 Action 3.4 Targeting

A Cool City Action 3.4

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18.4.5. Action 3.5 Irrigation of green infrastructure

18.4.5.1. As mentioned in section 8.2.5 irrigation of green infrastructure is vital for it to perform functions such as evaporative cooling in urban areas. This function is particularly important in the light of projected climate change scenarios that indicate that Liverpool will experience hotter, drier summers.

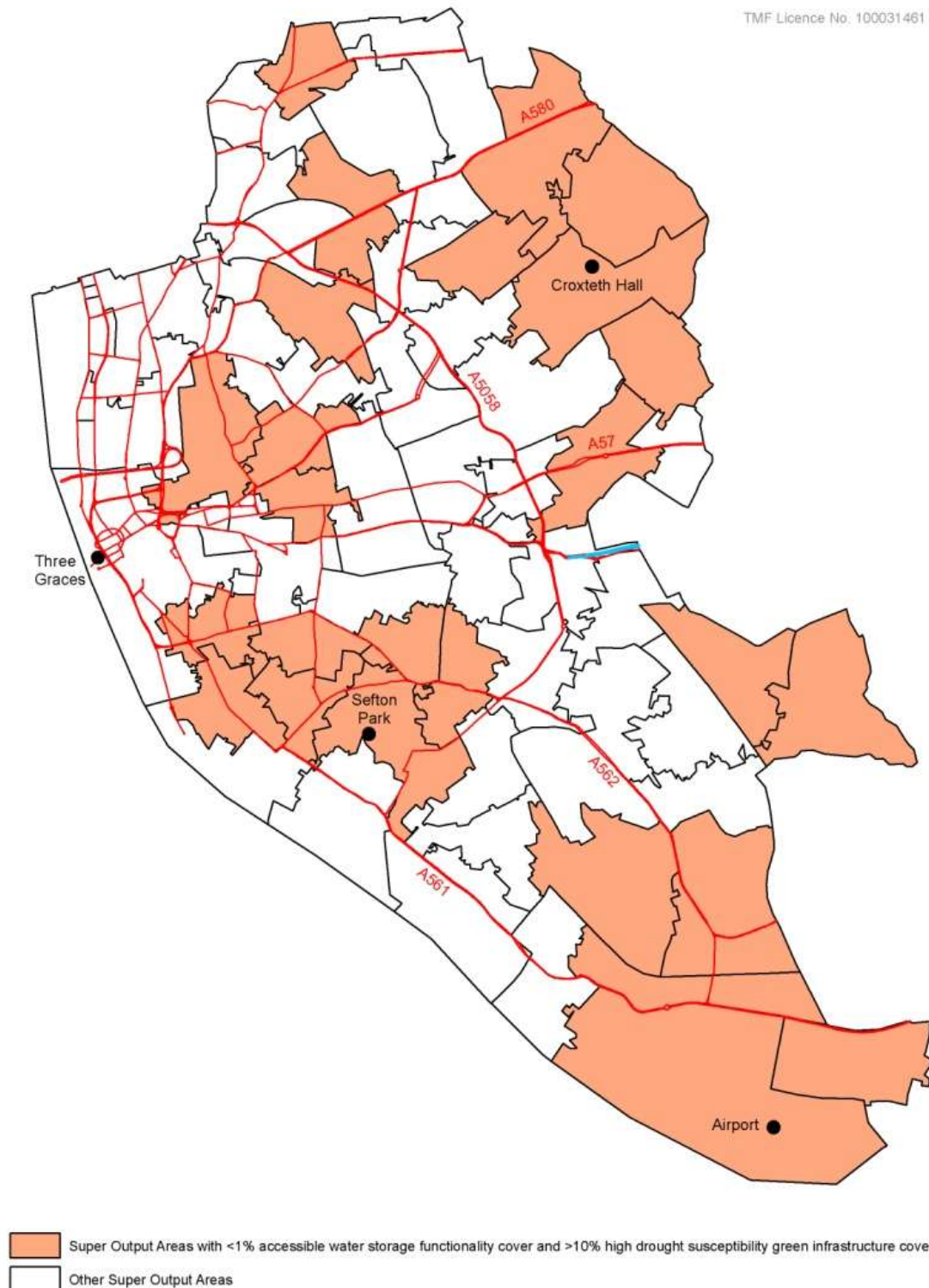
18.4.5.2. Map 160 shows areas that have <1% accessible water storage functionality cover and >10% high drought susceptibility green infrastructure cover. These areas should be targeted for action to improve the irrigation of the green infrastructure. The spread of areas for targeting is relatively equal across the city.

Map 160 Action 3.5 Targeting

A Cool City Action 3.5

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18.4.6. Action 3.10 De-culverting water courses and re-naturalising flood plains

18.4.6.1. This action aims to change the way water is managed in the city. Water can be better controlled through de-culverting water courses and re-naturalising flood plains. A more natural relationship with water can help prevent urban flooding. This action is important as riverine flooding is projected to increase under future climate change scenarios.

18.4.6.2. Map 161 shows the location of culverted water course and functional flood plains within the city. There are several culverted water courses in the inner area of the city and many functional floodplains in the outer areas.

18.4.6.3. Map 162 shows the super output areas which are >1km of culverted watercourses and functional floodplains. The super output areas highlighted in pink should be targeted for this action. These areas are concentrated in the outer area of the city. These areas are more likely to have space to re-naturalise floodplains and opportunities to do this should be exploited. In the inner areas where rivers are culverted redevelopment of areas around the culverted rivers should be seen as an opportunity to de-culvert and re-naturalise the river in association with the new development.

Map 161 Culverted watercourses and functional floodplain

Culverted Watercourses and Functional Floodplain

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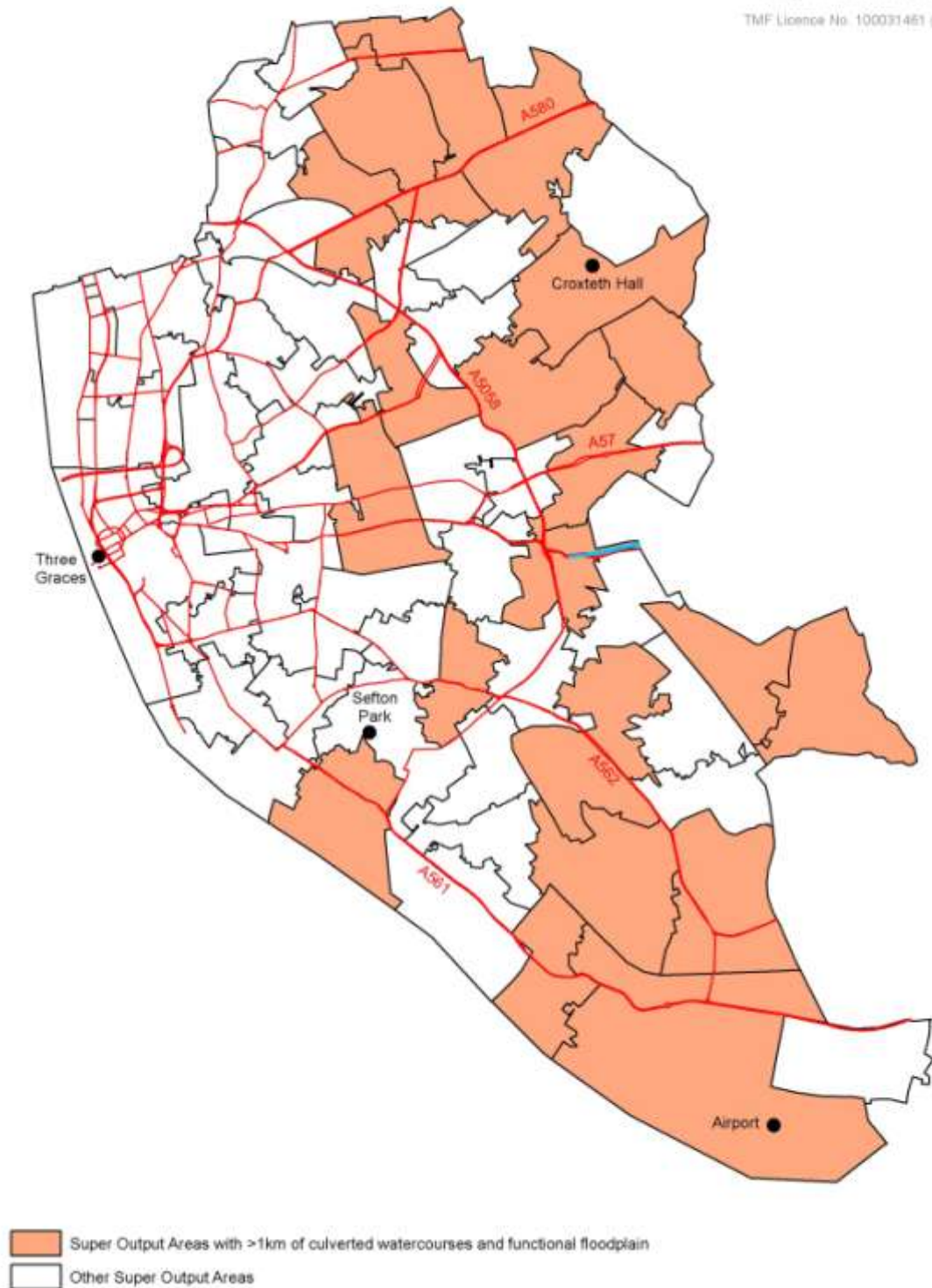


Map 162 Action 3.10 Targeting

A Cool City Action 3.10

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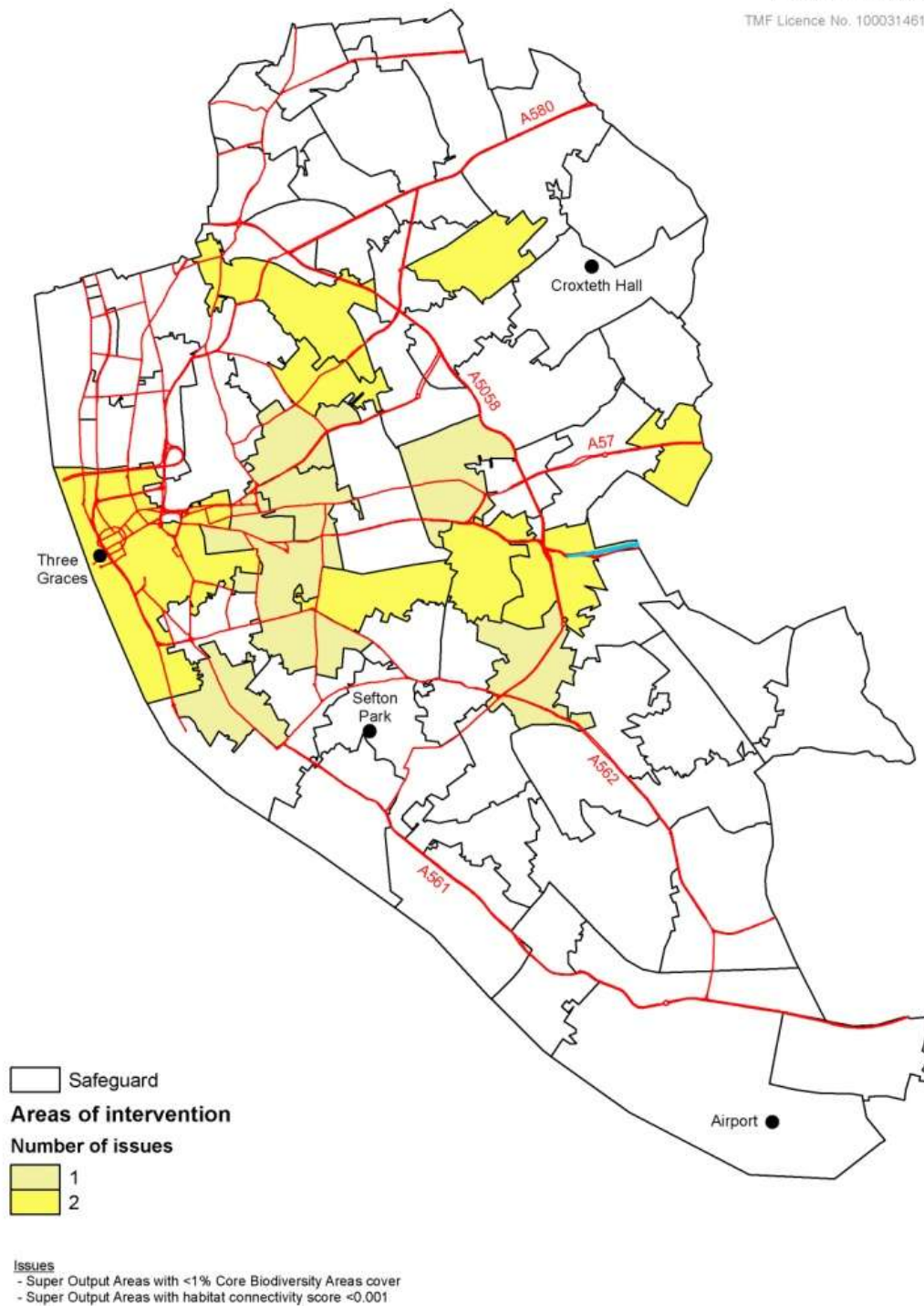
18.5. PRIORITY 4: A Green and Biodiverse City

Map 163 Priority 4 Overview Map

A Green and Biodiverse City

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18.5.1. Overview

18.5.1.1. The overview maps for a green and biodiverse city shows that for the majority of the city, particularly the extreme southern and northern parts, is to safeguard and enhance the existing green infrastructure. In the central and westerly parts of the city however action should be taken to tackle the issues present. These parts of the city have poor habitat connectivity and should be targeted for green infrastructure improvements. Habitat connectivity is especially important in a changing climate as species will be trying to move to new climate spaces.

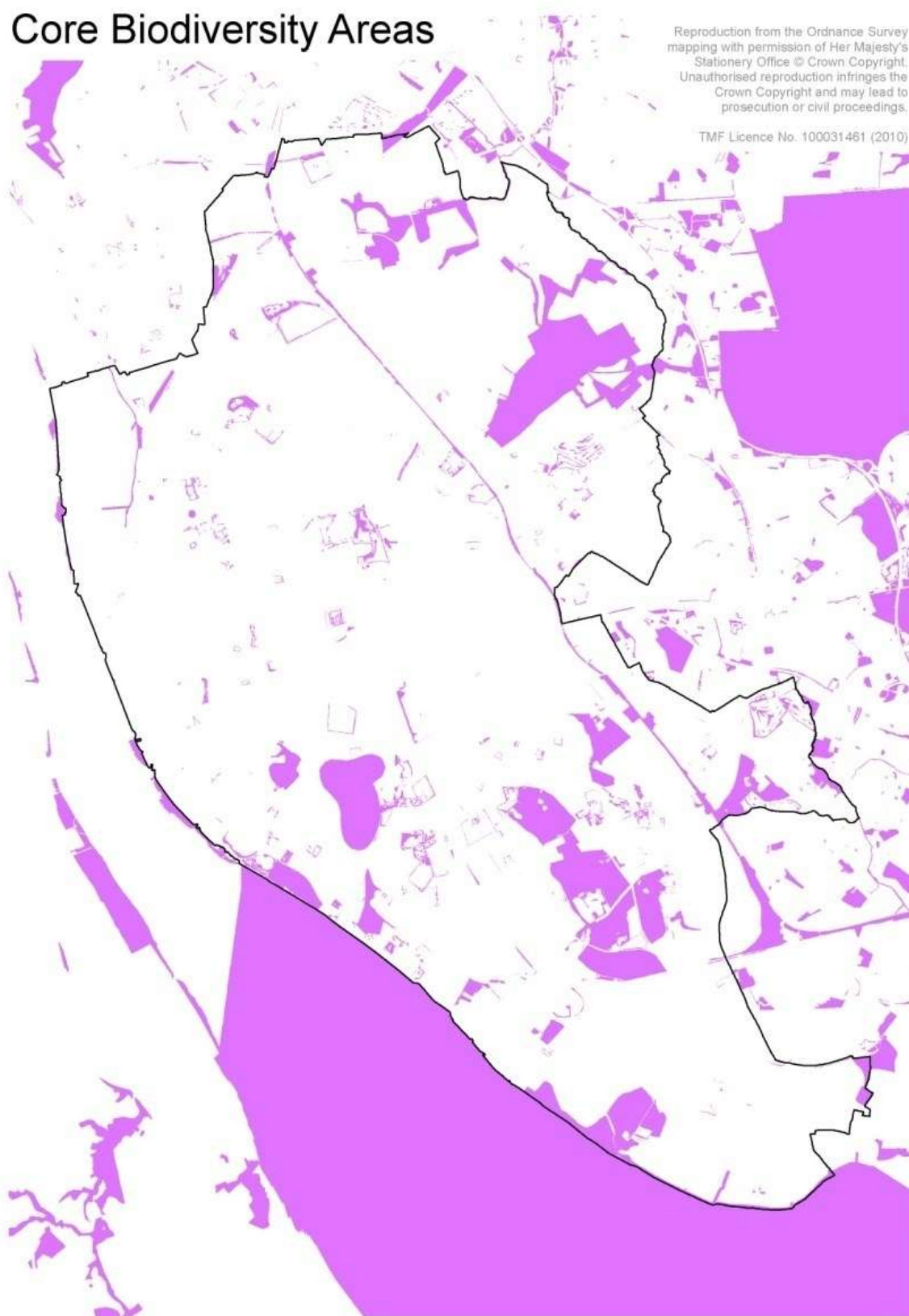
18.5.2. Action 4.1 Safeguarding existing ecological framework

18.5.2.1. Map 164 shows the core biodiversity areas in the city. The importance of the River Mersey and the Loopline as North-South corridors can be seen. In terms of large expanses of habitat Croxteth Park, Sefton Park and Calderstones School and golf course stand out.

18.5.2.2. Targeting for Action 4.1 involved identifying the areas of the city with <1% of the city's core biodiversity areas cover. This is shown in Map 165. Map 165 shows that the areas of targeting are located in the central and easterly Super Output Areas. These areas should be targeted to improve the city wide ecological framework; green infrastructure in the other areas, where the core biodiversity areas are concentrated should be safeguarded.

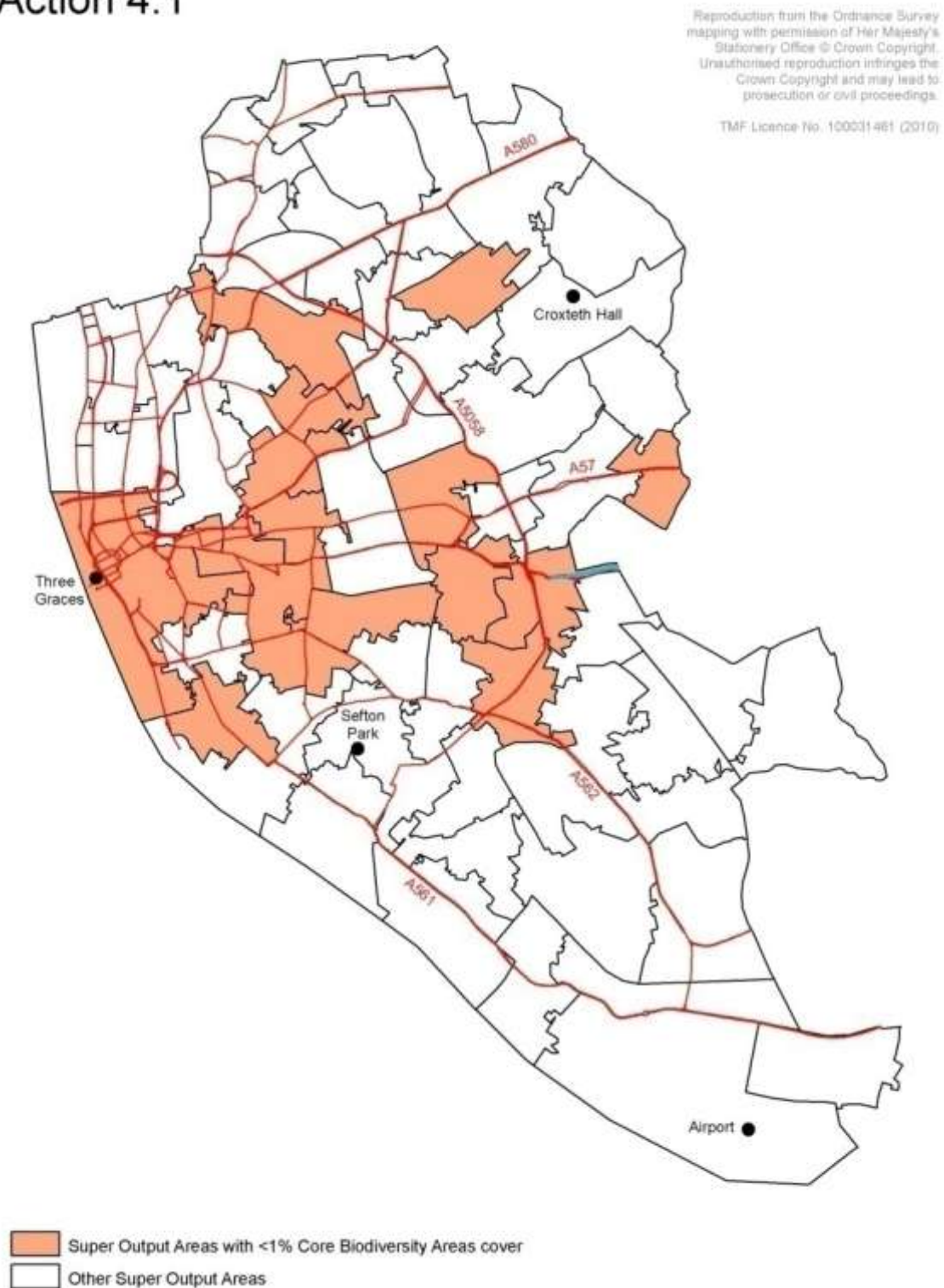
Map 164 Core biodiversity areas

Core Biodiversity Areas



Map 165 Action 4.1 Targeting

A Green and Biodiverse City Action 4.1



18.5.3. Action 4.2 Increasing and maintaining connectivity

18.5.3.1. Map 166 was produced from analysing aerial photography; it shows the importance of parks and trees for connectivity across the city. It is clear to see the network of street trees permeating the city. This type of green infrastructure is very important for connecting up the larger areas of habitat. Private gardens can also be seen scattered across the city; this green infrastructure type can be used by other species as stepping stones to move through the city.

18.5.3.2. Map 167 shows areas of the city with a habitat connectivity score of <0.001 . (See section 14.6.5 for how this is derived). These areas of the city should be targeted for enhancement of green infrastructure to improve connectivity. Map 166 can assist in identifying areas of habitat which need better stepping stones between them. Green infrastructure in areas of the city not identified for enhancement should be safeguarded.

Map 166 Connectivity of parks and urban trees

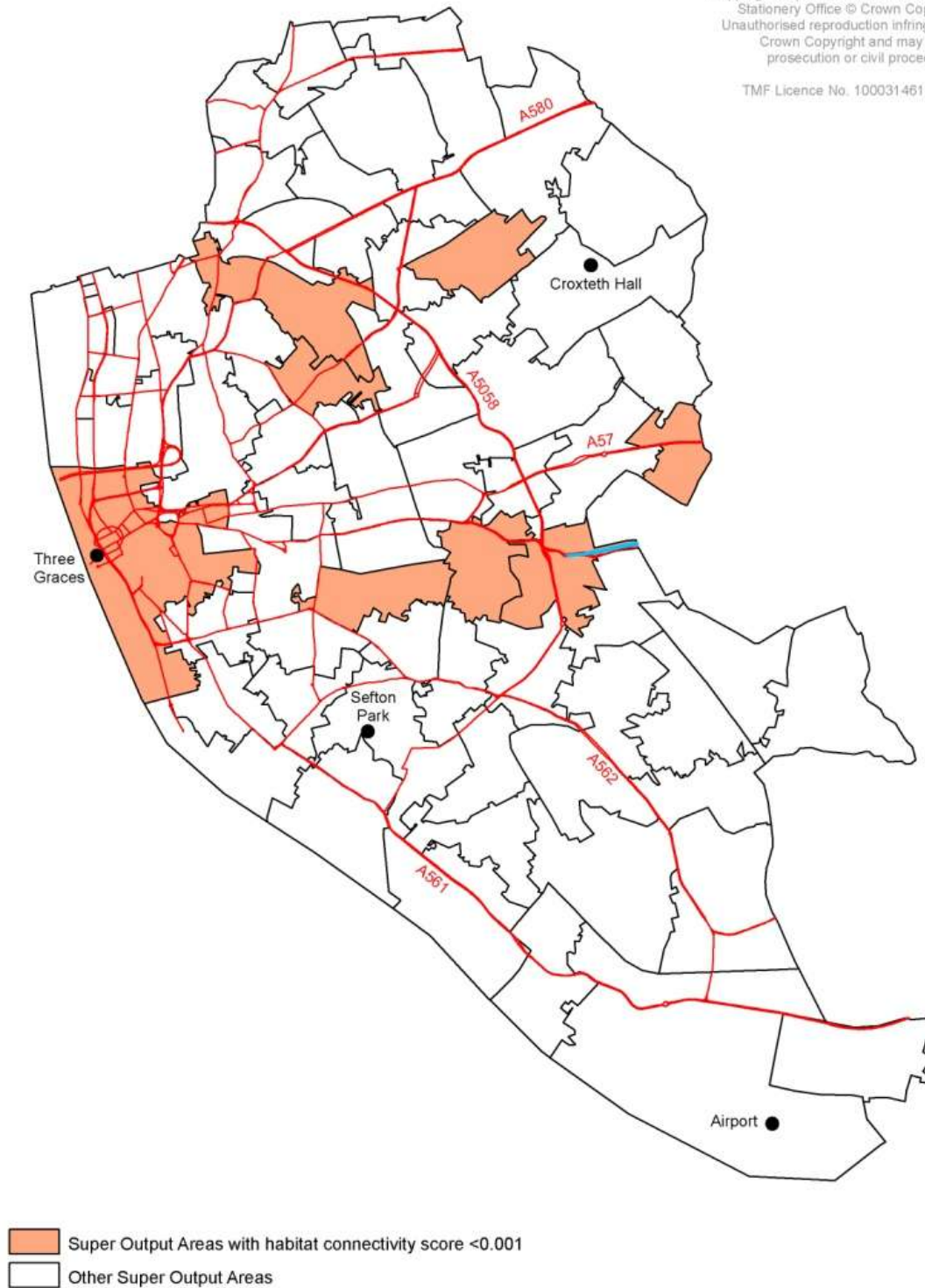


Map 167 Action 4.2 Targeting

A Green and Biodiverse City Action 4.2

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19. APPENDIX 6 LOGIC CHAIN

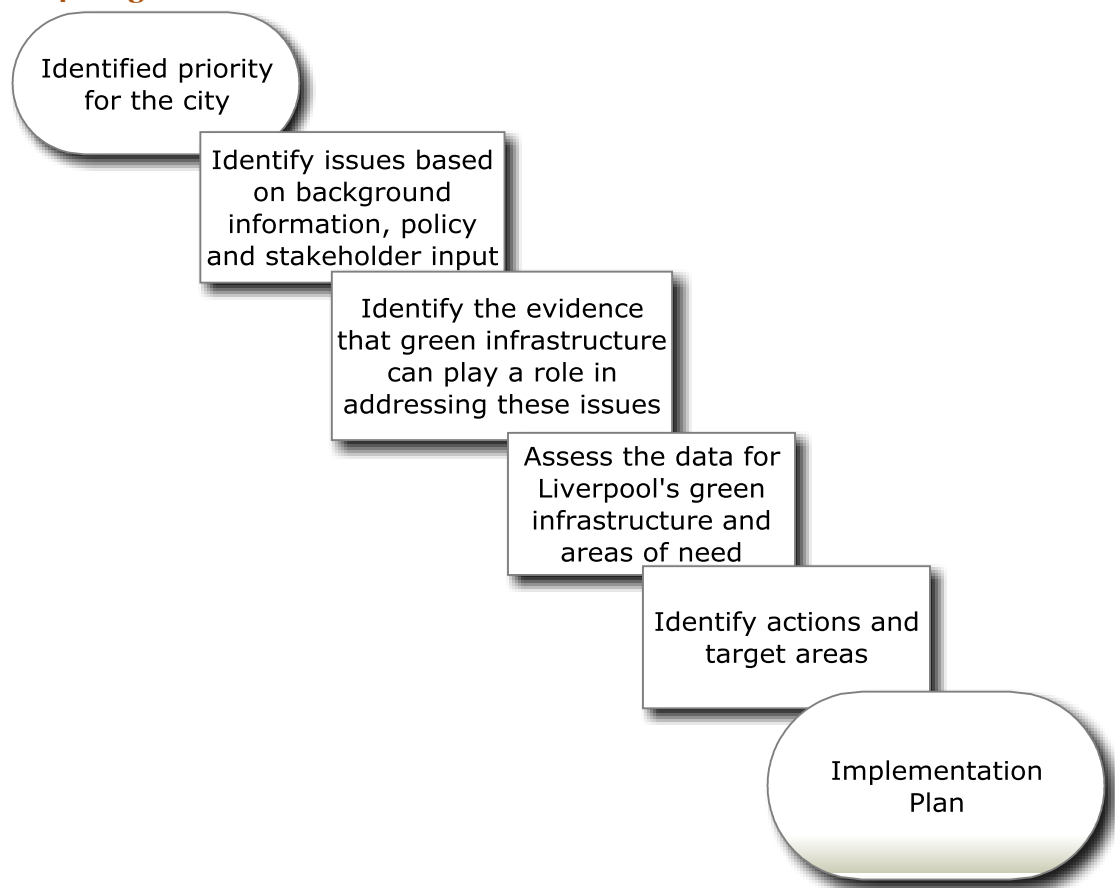
19.1. Logic Chain Development

19.1.1. The action plan has been developed so that it helps to address the issues that have been raised for each priority through the assessment of the background information and with input from stakeholders.

19.1.2. In order to identify specific actions evidence that green infrastructure can play a role in addressing the key issues for the city has been looked at in detail and then in conjunction with the data analysis that was carried out for Steps 2-4 of the strategy (detailed in Appendix 5) identified appropriate actions and the key areas across the city to implement either actions to safeguard functions or to improve functionality to address the issues.

19.1.3. This forms the logic chain.

Figure 46 Logic chain



19.1.4. The spreadsheet with the chain developed in full is available on request from Mersey Forest team.

20. APPENDIX 7 GREEN ROOFS STUDY FOR LIVERPOOL

20.1. Green Roof Study Overview

20.1.1. Executive Summary from the report

20.1.1.1. The installation of green roofs is often considered, at best, an optional extra, or at worst, somewhat outlandish or part of a niche market. However, an examination of current experience suggests that this perception does a disservice to the potential benefits that green roofs can bring to a building owner and to wider society. Green roofs, in all situations, can provide a wide range of benefits and in many situations would hold up well in an analysis of costs against benefits.

20.1.1.2. Benefits range from improving building insulation (winter and summer) and reducing storm water runoff, to contributing to a reduced 'heat-island' effect and improving city-centre biodiversity. By using extensive or biodiverse green roof systems it is possible to keep costs down in retro-fit installation and to a negligible level in new-build projects.

20.1.1.3. Although there are few explicit drivers to installing green roofs in British cities, a number of national and regional policies, within their green infrastructure guidelines, implicitly support the use of such technologies. This is especially so when considering sustainable city living and Sustainable Drainage Systems (SUDS). In countries and cities where policy requires that green roofing is considered in building design (for example Germany), then significant areas of green roof have been installed (more than 100,000m² in Stuttgart).

20.1.1.4. Happily there are several green roofs in Liverpool, but the City is still relatively new to the idea, so there is enormous potential, especially given the degree of inner-city regeneration that is planned over the next few years. The key to ensuring that green roofs are used as a tool to meet government objectives hinges on the way that development control and building regulations are interpreted within the framework of national and regional development.

20.1.1.5. There are a number of actions that should be taken to embed roof greening in project design and building in the City, among which would include: an awareness raising campaign to inform the sceptics and the uninitiated; the establishment of a green roof network that would include champions promoting their use among developers, builders, architects, project managers and in local government. Finally, as a further catalyst, funding should be found to help organisations and project managers install green roofs (specifically biodiverse roofs) that can then be used to demonstrate the benefits to others.

20.1.1.6. The full report is available from www.ginw.org.uk.

21.1.3. The Strategic Housing Land Allocation Assessment (SHLAA) carried out by Roger Tym and Partners looked at over 1100 brown and greenfield sites as well as sites that already had planning permission for housing at the study base date (2008). In the Growth Point area a total of 139ha of land has been assessed. These areas will be the main target for new housing. The Programme of Development also suggests the housing mix that may be anticipated for these areas.

21.1.4. In Liverpool, City Centre North and Stanley Park:

- A focus on family housing
- Affordable housing focused on low-cost home ownership and rent to mortgage products²²²

In Liverpool, Waterfront:

- An appropriate mix of family orientated social renting on the waterfront

21.1.5. Table 41 sets out how green infrastructure planning can help to achieve some of the high level aspirations for the Growth Point that are set out in the Programme of Development.

Table 41 Growth point challenges and opportunities and potential green infrastructure contributions

CHALLENGES AND OPPORTUNITIES	POTENTIAL GREEN INFRASTRUCTURE CONTRIBUTION
Increase the population	Improving quality of place and life to provide attractive areas to live
Attracting the market (both developers and new residents) to inner urban areas,	Providing elements of critical infrastructure that can will help to provide viable and attractive opportunities for development
Complementing the City Centre	Providing linkage and attractive gateways and routes to the City Centre
Improving Town, District and Local Centres,	Improving quality of place and life to provide attractive areas to live and work
Improve the health and safety of local communities,	Providing opportunities for walkable communities, improving mental health, opportunities for more active communities and improving air quality
Inspiring and Involving Communities	Engaging people in decisions about green infrastructure and encouraging their involvement in management.
Protect and enhance the quality of the environment,	Green infrastructure treated as a critical infrastructure.

²²² ibid

CHALLENGES AND OPPORTUNITIES	POTENTIAL GREEN INFRASTRUCTURE CONTRIBUTION
<p>Improve the quality of infrastructure across Mersey Heartlands, through investing in physical improvements to the:</p> <ul style="list-style-type: none"> • Transport infrastructure • Water infrastructure and • Community Infrastructure <p>thus stimulating confidence in renewal and growth in the Growth Point and complimenting our asks for Growth Point Funding</p>	<p>Green infrastructure is a critical infrastructure. Liverpool's Green Infrastructure Strategy sets out the improvements that need to be made in the Growth Point area.</p>
<p>Deliver sustainable development of the utmost design quality,</p> <p>Partnership working, Regional strategies and LDF's can deliver NGP's.</p>	<p>Green infrastructure can help to underpin the sustainable development of the city.</p> <p>Building green infrastructure into a range of strategic documents and developing a forum that focuses on this issue</p>

21.1.6. The background information and details of the methodology used to assess Liverpool's green infrastructure are provided in Appendix 1.

21.1.7. The North Liverpool area, which contains the most sites for new housing as part of the Growth Point, is the area of the city that requires the most significant green infrastructure action across all 4 of the identified priorities for Liverpool (see section 13).

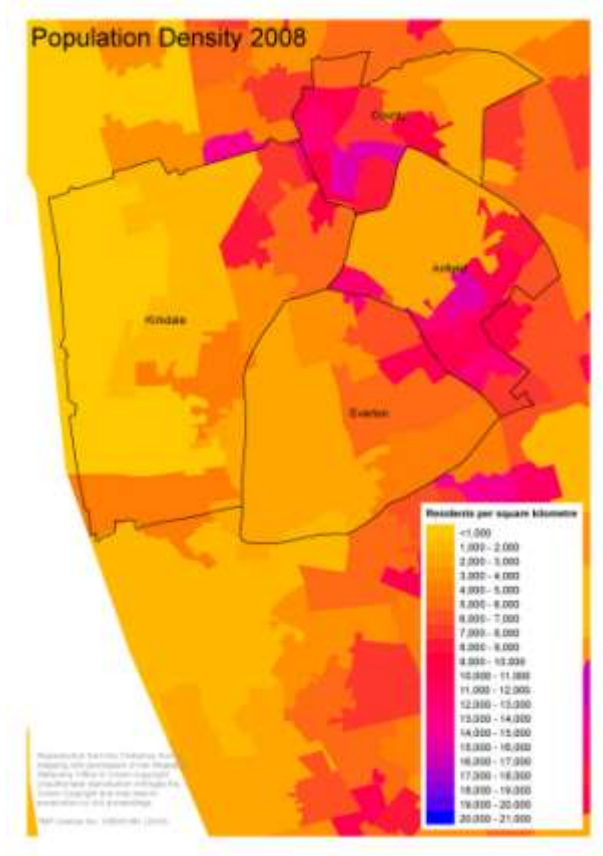
21.1.8. The following sections look at the areas that have been identified by the SHLAA in the Growth Point in order to highlight:

- Current green infrastructure functionality of the SHLAA sites
- Existing green infrastructure assets
- The need for additional functionality around the SHLAA sites

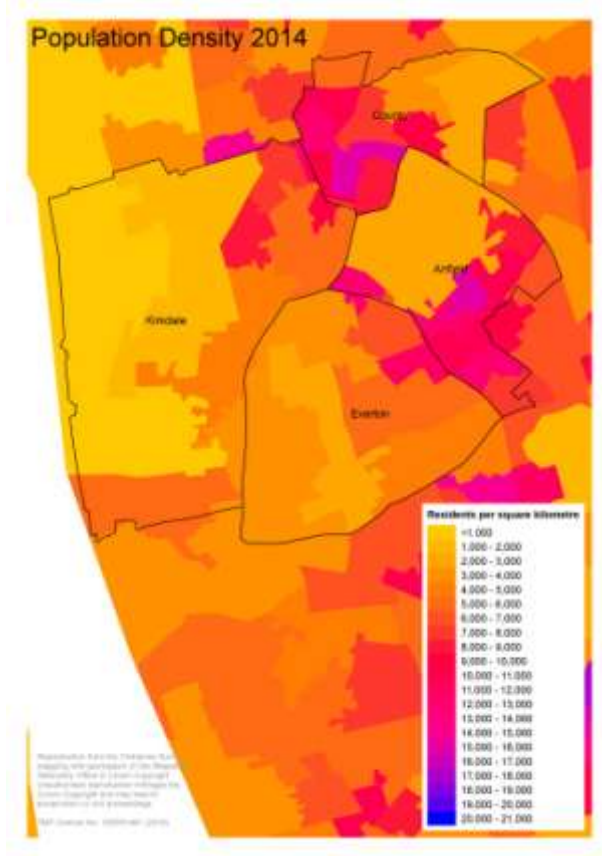
21.2. Population Growth in the Growth Point Areas

21.2.1. The population of the Growth Point wards is anticipated to grow by 11% based on the number and type of housing that is projected for the area. Map 169, Map 170 and Map 171 shows the current and projected distribution of population.

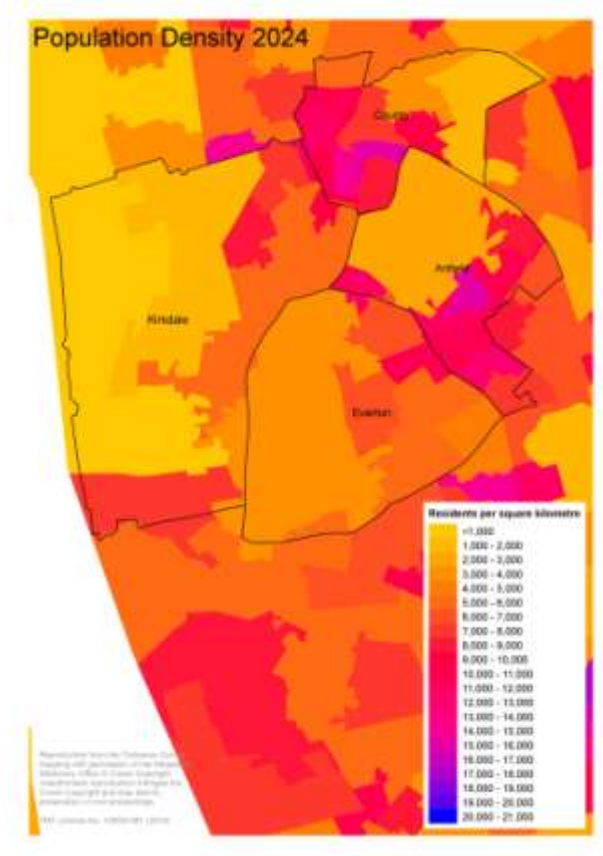
Map 169 Growth point population density 2008



Map 170 Growth point population density 2014



Map 171 Growth point population density 2024



21.2.2. Table 42 shows the projected growth by ward. The assessment of need and the identified actions all take account of this projected population growth.

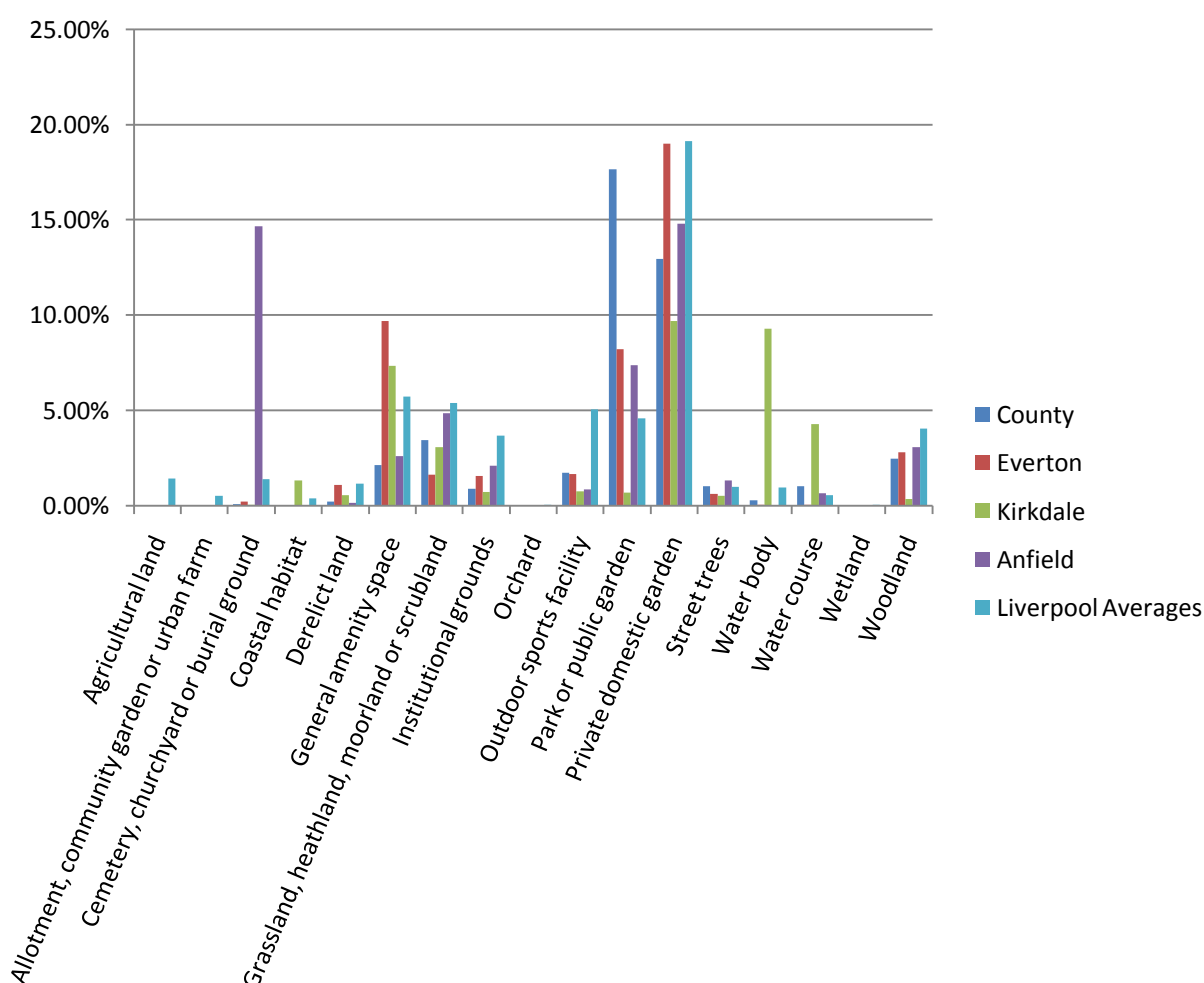
Table 42 Growth point ward population projections

WARD	AREA (M ²)	POPULATION	POPULATION	POPULATION
		2008	2014	2024
Everton	3582883	13820	15611	17272
Anfield	2334671	14444	14369	14121
County	1902366	13159	13038	12790
Kirkdale	6098163	15672	17225	19355
Total	13918083	57096	60243	63539
Percentage of 2008 population		100.00%	105.51%	111.28%

21.3. Current Green Infrastructure of the Growth Point area and SHLAA sites

21.3.1. The typology of the four growth point wards is set out in Figure 47 with the average values for Liverpool City also included as a comparison.

Figure 47 Typology of the growth point wards



21.3.2. Across all 4 wards there are low levels of typology directly associated with food growing, agricultural land, allotments and orchards. The large cemetery in Anfield ward is one of the major green infrastructure areas, putting Anfield well above the city average for this type.

21.3.3. Everton and Kirkdale have relatively high percentage cover of general amenity space and all wards have low levels of both institutional land and outdoor sports facility. However, County and Everton have higher percentage cover of Parks than the city average, whilst Kirkdale has very low percentage of this type.

21.3.4. The value for private domestic garden is lower than the city average in all wards, with Kirkdale again having a particularly low value. Kirkdale does however have the only areas of coastal habitat and a large percentage of water body typology due to the River Mersey.

21.3.5. All wards have low woodland cover except Anfield, but even Anfield is below the city average. Street tree cover is low in Kirkdale and Everton.

21.3.6. Focussing on the SHLAA sites within the Growth Point wards Table 43 shows the typology of the SHLAA sites compared to the Liverpool Average, Map 172 illustrates the typology distribution.

21.3.7. The SHLAA sites are distributed across the 4 Growth Point wards and make up 8.8% of the area. Nearly 50% of the total area of the SHLAA sites assessed is not green infrastructure, likely to be old buildings, foundations, paving or concreted over areas.

21.3.8. The area of derelict land is low in this typology assessment, but as explained in the technical document this is due to the fact that where a derelict site has started to scrub over or to become covered in grass, then the green infrastructure assessment will assign a green infrastructure type to describe the vegetation on the site. This enables us to identify the functions that the site is performing. (see section 12.4.7.9)

21.3.9. Compared to the average values for Liverpool the SHLAA sites collectively have 10% less green infrastructure than the Liverpool average. General amenity space typology makes up the largest single typology at 27.6%. As discussed elsewhere in this document, this typology is often “left-over” land, often close mown grassland that is expensive to manage because of its fragmented nature, scattered in relatively small areas across the city and often of relatively low functionality. There is a much lower level of domestic gardens (2.06% compared to the 16.12% Liverpool average). There are lower levels of both woodland and street trees in the SHLAA areas and no typologies associated directly with food growing; allotments, orchards or agricultural land. The areas of park are above the city average as is the area of water body, due to the River Mersey adjacent to the Kirkdale ward

Table 43 Green Infrastructure typology of the SHLAA sites in the growth point wards

TYPOLOGY	PERCENTAGE OF TOTAL	LIVERPOOL CITY
	AREA OF THE SHLAA SITES	AVERAGE PERCENTAGES of GI
Not GI	48.75	38.12
General amenity space	27.62	4.81
Grassland	6.85	4.61
Park or public garden	4.95	3.87
Water body	2.78	0.79

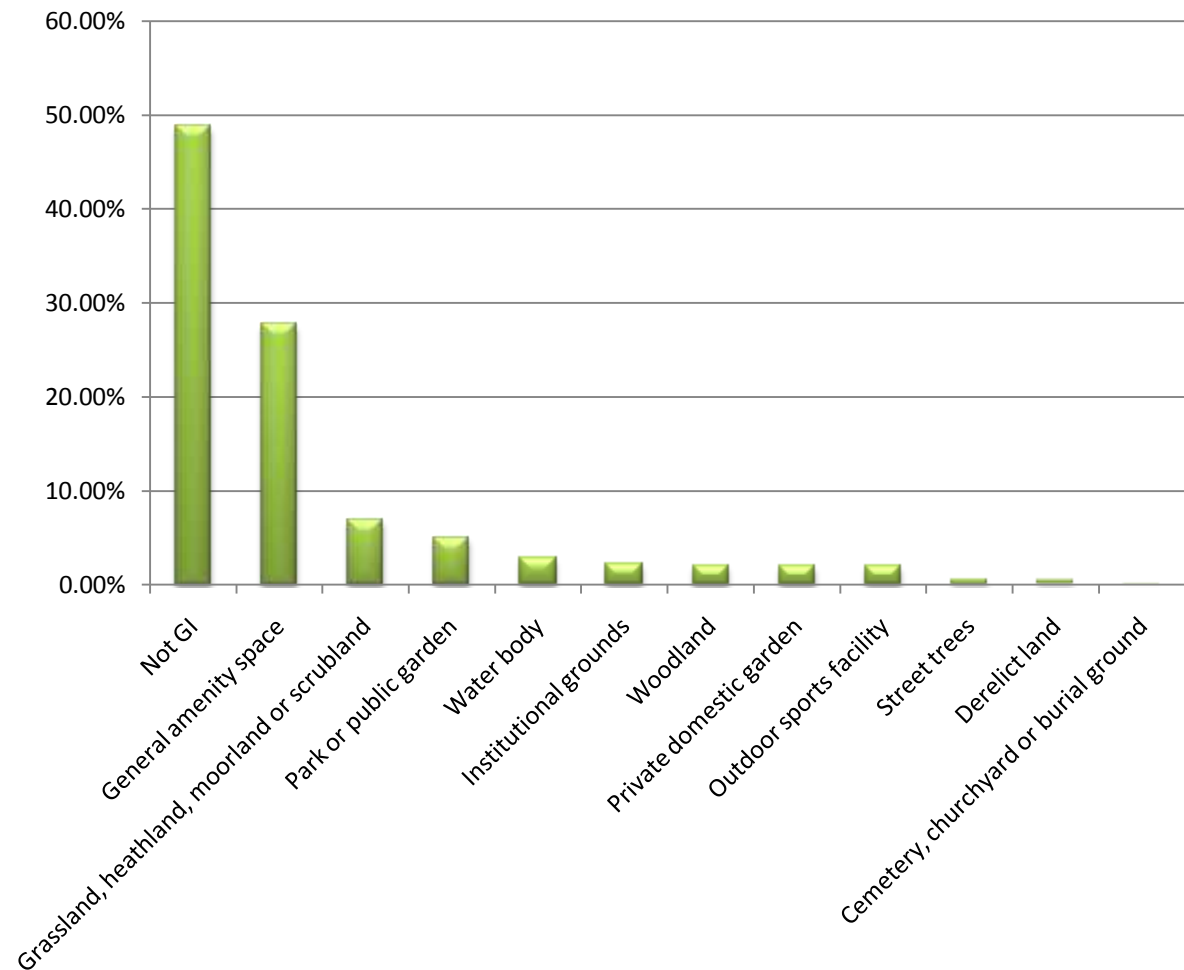
Institutional grounds	2.15	3.08
Woodland	2.03	3.41
Private domestic garden	2.01	16.12
Outdoor sports facility	1.99	4.25
Street trees	0.48	0.83
Derelict land	0.36	0.96
Cemetery, churchyard or burial ground	0.04	1.15

Map 172 Green Infrastructure typology of the SHLAA sites in the growth point wards



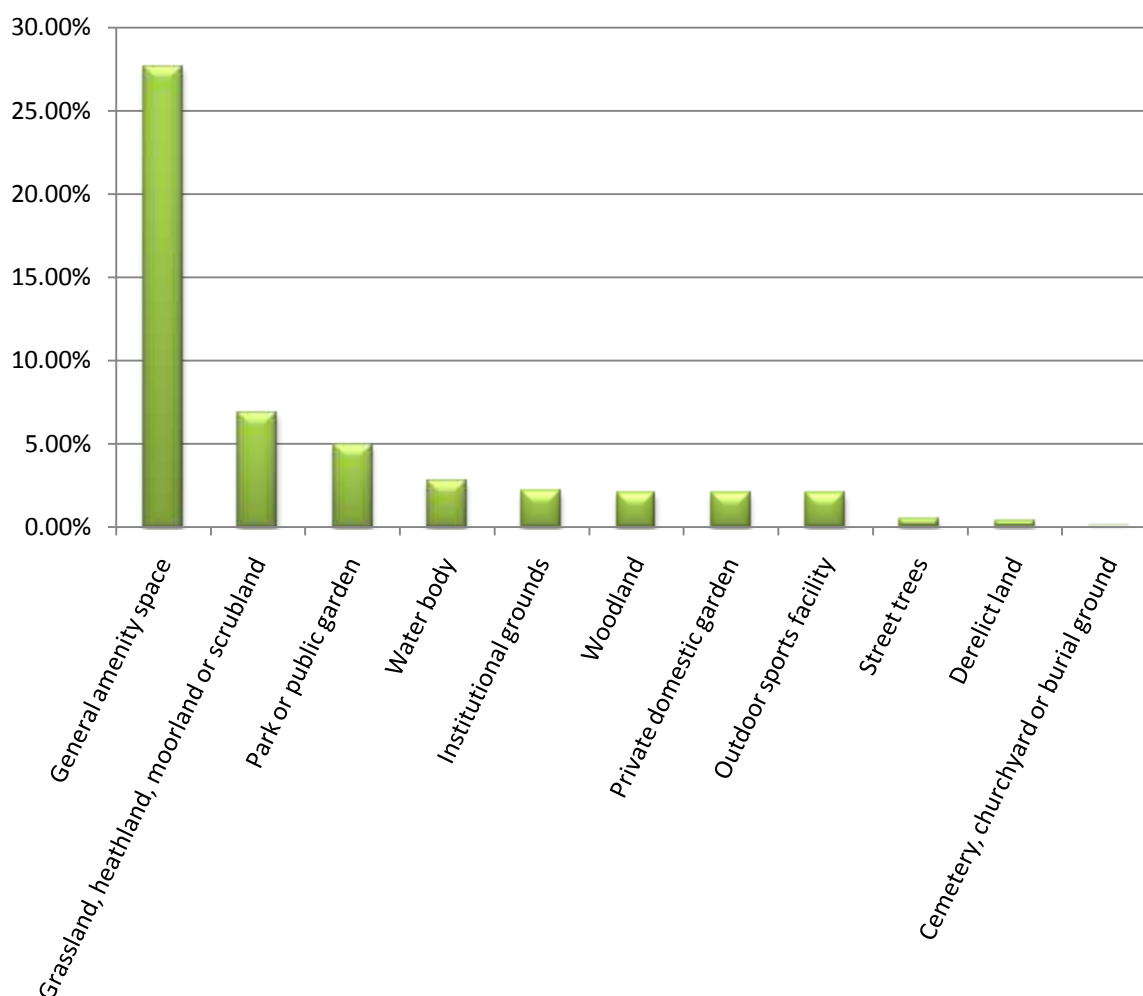
21.3.10. Figure 48 presents a graphical representation of the data for the overall typology as it has been assessed for the SHLAA sites in the Growth Point wards.

Figure 48 Typology of the SHLAA sites in the growth point wards (percentage of total area of SHLAA sites)



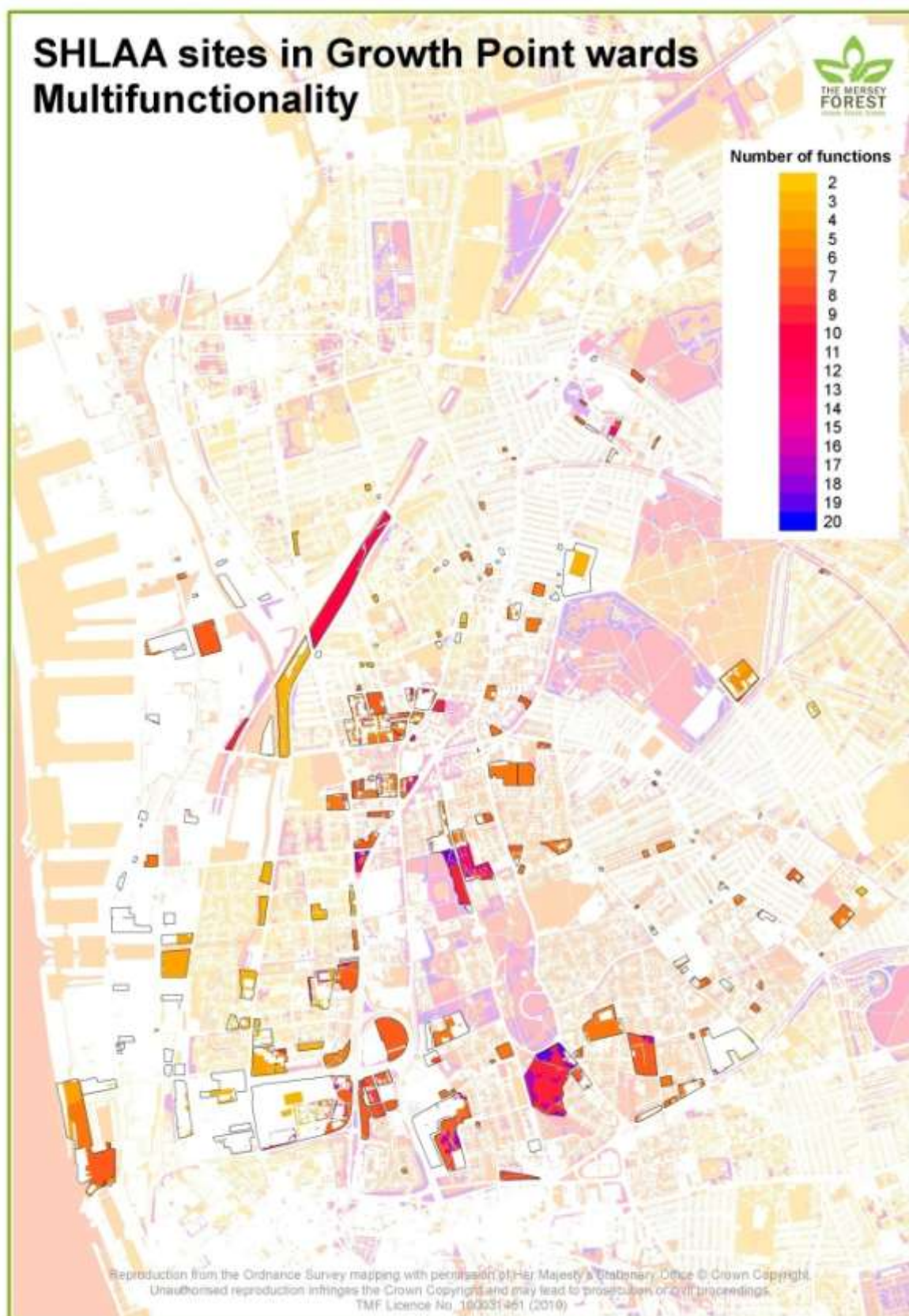
21.3.11. If the area of non green infrastructure is excluded from the chart (Figure 49) the dominance of the general amenity space typology becomes evident. The remaining 10 types found on the SHLAA sites in the Growth Point wards are all less than 5% of the overall sites' area.

Figure 49 Typology of the SHLAA sites in the growth point wards (percentage of total area of the SHLAA sites) with not GI removed



21.3.12. An assessment of typology leads to the analysis of functions present on the SHLAA sites. In total 28 functions were assessed. The Geographic Information System (GIS) data that has been developed for the Liverpool Green Infrastructure Strategy can be interrogated to find specific information for each function on each of the SHLAA sites. We can show the multifunctionality of the sites by identifying and mapping the number of functions for each site (Map 173).

Map 173 Multifunctionality of SHLAA sites in growth point wards



21.3.13. There are some sites that show areas of high multifunctionality, but most sites have relatively low multifunctionality. The key issue is whether the site is fulfilling a local need by providing functionality – is it an asset for the city?

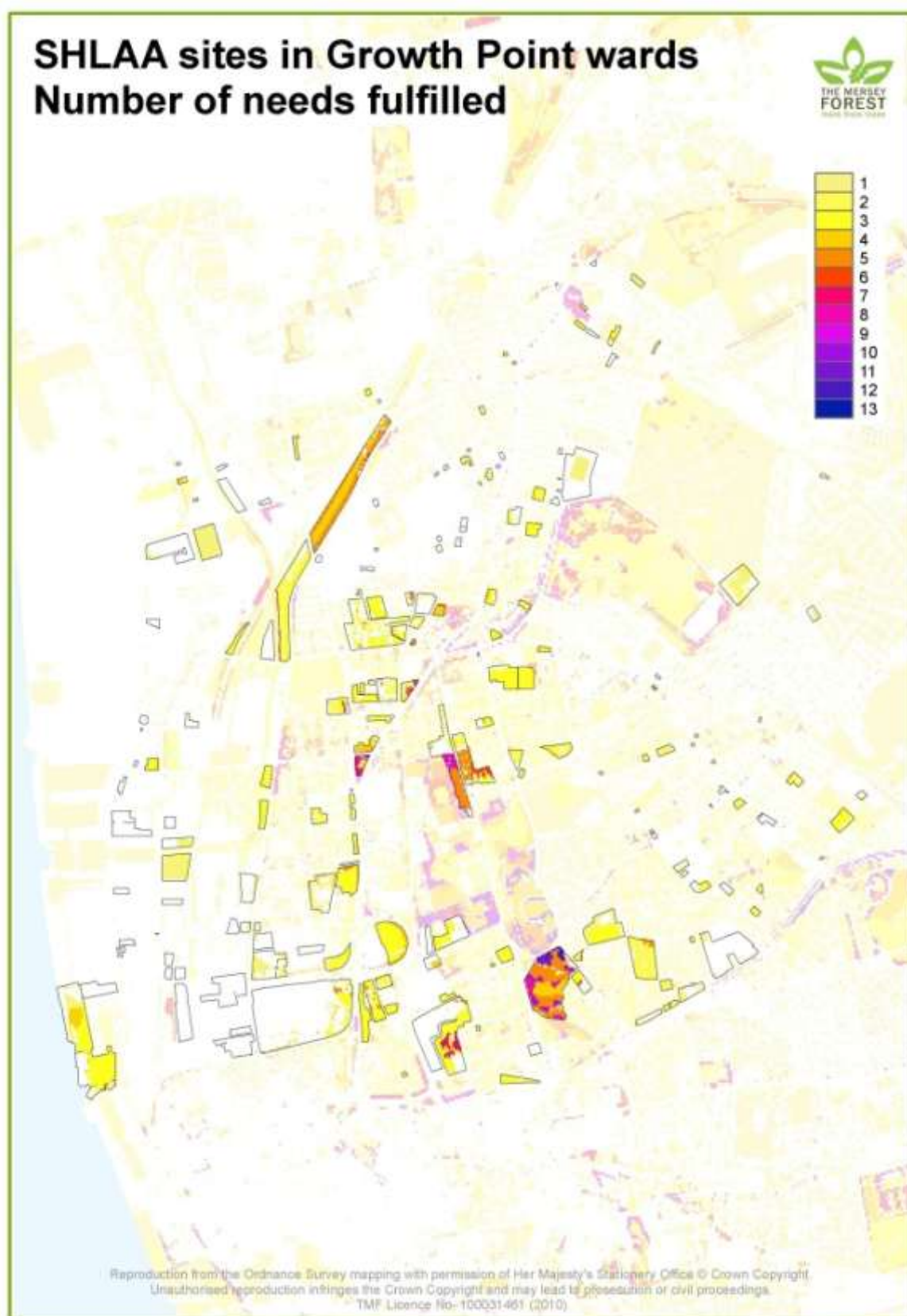
21.4. Existing Green Infrastructure Assets

21.4.1. In this strategy, the term “asset” has been used to describe green infrastructure that is delivering a function in an area of identified need. For example, woodland that is intercepting and storing water in an area of flood risk is a water management asset; it is providing functions that help to reduce the risk of flooding.

21.4.2. In developing the green infrastructure strategy for Liverpool a range of criteria were developed to assess the need for each of the functions, again full details of the criteria are provided in the Appendix 1. For each site we can then look at how many needs are being fulfilled by the functionality of the site. Sites that are meeting a greater number of needs may be seen to be a greater asset for the city. However, the assessment of need carries no weighting and it may be that in particular circumstances a particular need may be seen to be of greater importance than others and is therefore a greater asset.

21.4.3. Map 174 shows the SHLAA sites in terms of whether they have been identified as an asset based on this definition. The maps shows that many of the sites are fulfilling only 2 or 3 identified needs.

Map 174 Number of needs fulfilled in SHLAA sites in the growth point wards



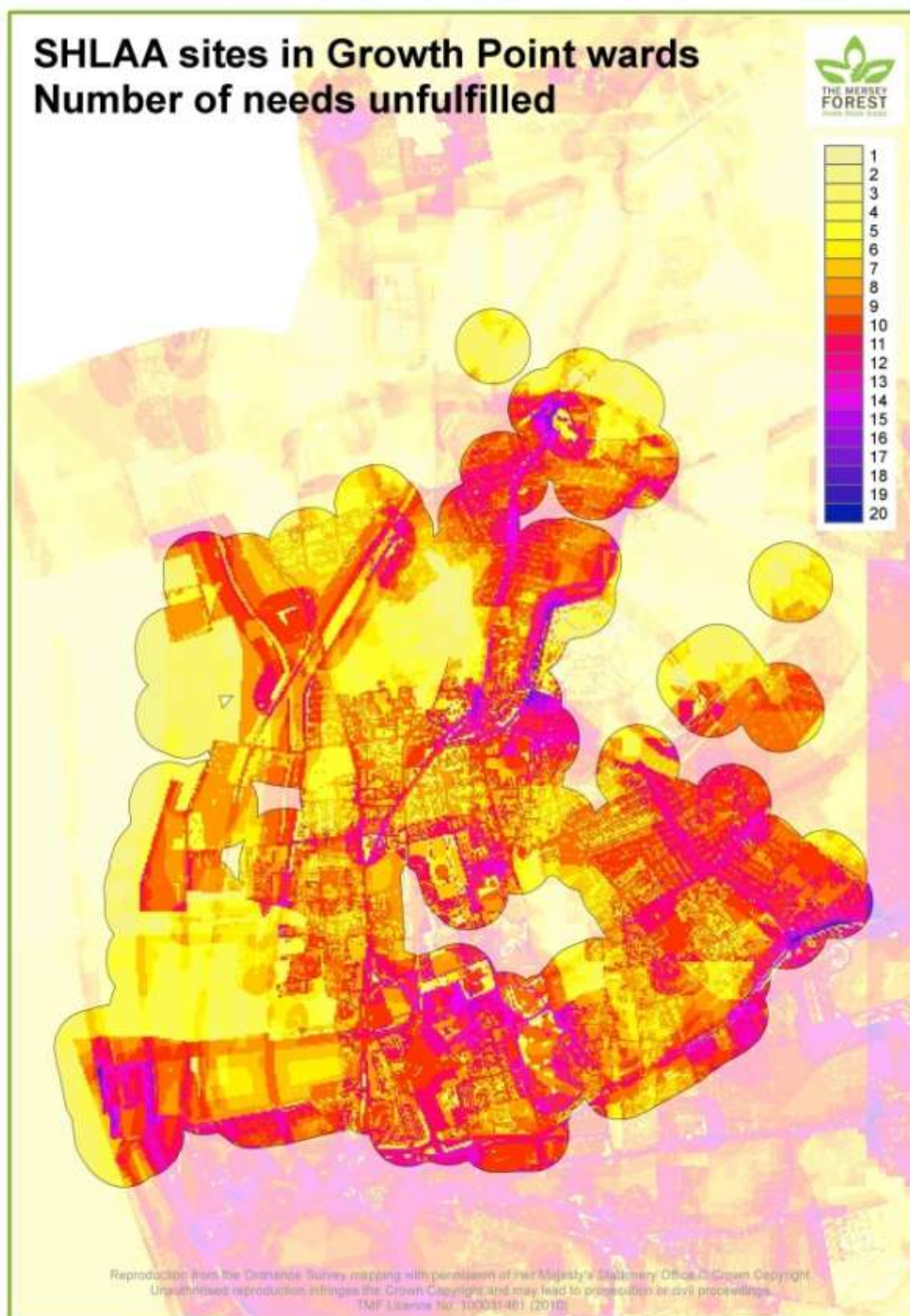
21.4.4. As new housing is planned and developed it will be important to try to safeguard the functionality that makes a site an asset for the area and the city. This can obviously be achieved by safeguarding appropriate areas of a site that is to be developed, ensuring that the functionality continues to be provided, or where loss is inevitable to ensure that the function is provided elsewhere at an appropriate level to mitigate the loss of functionality.

21.5. The Need for Additional Functionality Around the SHLAA Sites

21.5.1. In addition to being able to identify where need is being fulfilled the criteria developed to assess need also enables the areas where need is not being fulfilled to be identified. This provides a basis for managing existing or creating new green infrastructure as part of the Growth Point (and other) regeneration programmes.

21.5.2. Map 175 shows the numbers of needs unfulfilled at present on and around (100m buffer of) the SHLAA sites. As development comes forward or is planned, it will be possible to use the GIS to identify the specific needs that could be fulfilled in the area of development through appropriate green infrastructure management or creation.

Map 175 Number of needs unfulfilled in SHLAA sites in growth point wards



21.6. Actions in the Growth Point Wards

21.6.1. Based on the assessment of need above we can identify the actions that are needed in each ward. The actions are set out in detail in the main Action Plan of this strategy. The numbers across the top of each row in Table 44 identify the individual actions that area set out in the Action Plan.

21.6.2. A targeting exercise was carried out to identify which of the growth point wards were most in need of green infrastructure action to meet the priorities (for explanation of how the targeting score was calculated please see section 14.6). Map 176 shows the results of this exercise.

21.6.3. Kirkdale scores highest overall for all actions in this assessment and particularly highly for the action related to “Sustainable City” and “A city where health is a natural choice”. The overall targeting score scores for Everton and Anfield wards are similar, but the individual priorities are quite different. Everton target score for the action relation to the health priority is significantly higher than Anfield, whereas the targeting score for Anfield is much greater for the “Green and Biodiverse City” priority.

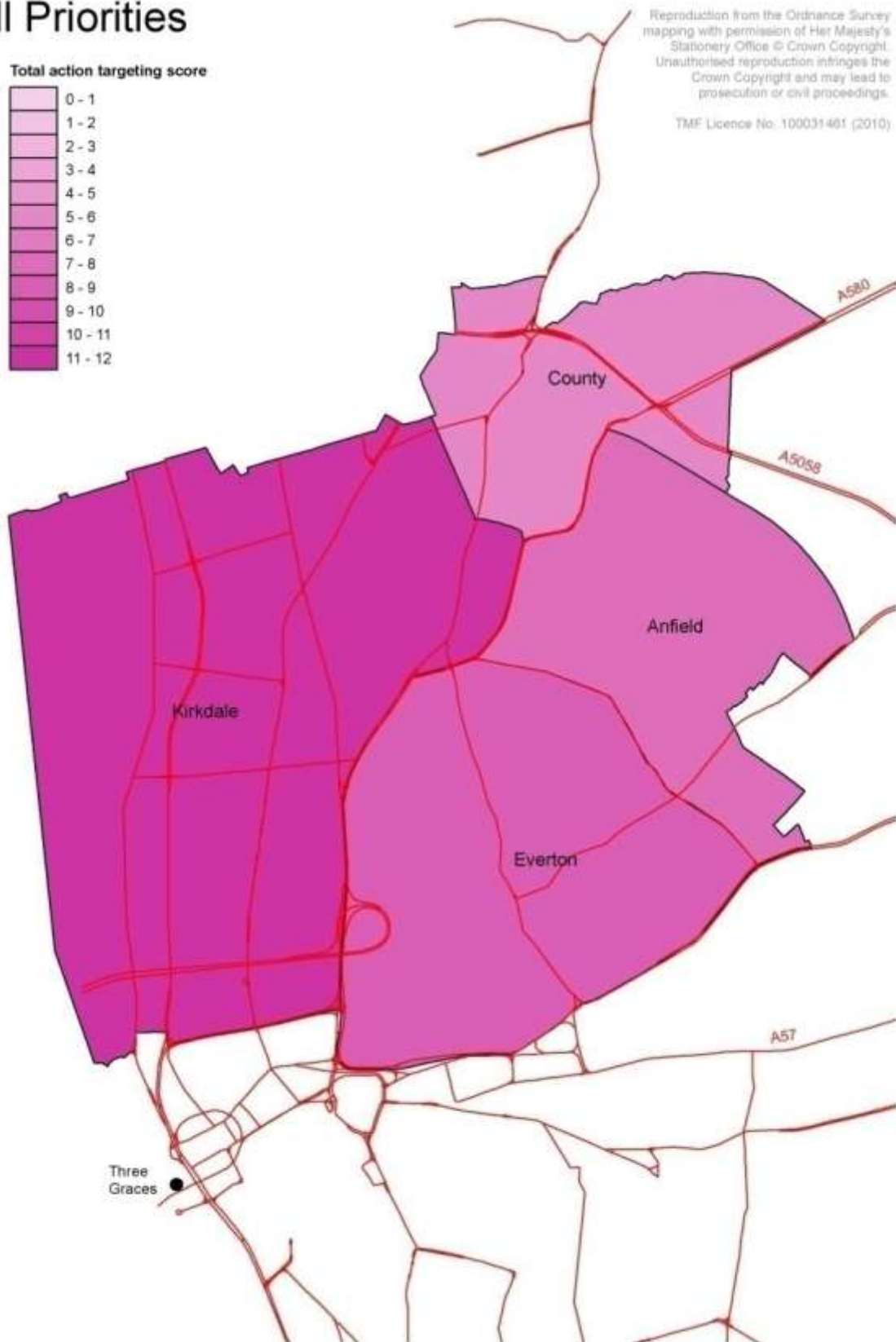
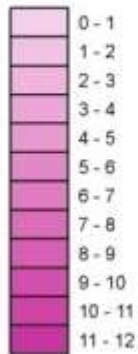
Table 44 Targeting actions in the growth point wards

			ACTIONS																						PRIORITIES				
NEIGHBOURHOOD MANAGEMENT AREA	WARD	ZONE	1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4	2.4	2.4	2.5	2.7	3.1	3.1	3.1	3.2	3.4	3.5	3.10	4.1	4.2	A SUSTAINABLE CITY	A CITY PROVIDING NATURAL CHOICES FOR HEALTH	A COOL CITY	A GREEN AND BIODIVERSE CITY	TOTAL	
Alt Valley	County	Inner Area	0.67	0.33	0.33	0.00	0.00	0.00	0.33	0.67	0.67	0.00	0.33	0.33	0.00	0.00	0.33	0.00	0.67	0.00	0.00	0.33	0.33	1.3	2.3	1.0	0.7	5.3	
City and North	Everton	Inner Area	0.75	0.00	0.75	0.25	0.50	0.75	0.25	0.50	0.50	0.50	0.50	0.75	0.50	0.75	0.25	0.00	0.50	0.50	0.00	0.25	0.00	1.8	4.3	2.5	0.3	8.8	
	Kirkdale	Inner Area	1.00	0.50	1.00	0.75	0.50	0.75	0.50	0.75	0.75	0.50	0.75	1.00	0.50	0.50	0.50	0.00	0.75	0.00	0.00	0.50	0.50	3.3	5.5	2.3	1.0	12.0	
Liverpo ol East	Anfield	Inner Area	0.67	0.33	0.33	0.00	0.00	0.67	0.33	0.33	0.33	0.00	0.33	0.33	0.33	0.67	0.67	0.00	0.33	0.33	0.00	0.67	0.67	1.3	2.3	2.3	1.3	7.3	

Map 176 Targeting all priorities across the growth point wards

All Priorities

Total action targeting score



21.7. Conclusion

21.7.1. It is not possible in this strategy to detail what needs to happen on each SHLAA site as it comes forward for development. However, the data that has been gathered, the approach developed and the general actions identified can help to shape the development so that green infrastructure is built in from the start as a critical infrastructure that meets the key priorities of the Growth Point wards in the city and to provide for areas that are sustainable, healthy, adapted to climate change, biodiverse, and planned and managed to a high quality.

22. APPENDIX 9 STORYLINES FOR THE CORE STRATEGY SUB AREAS AND THE NEIGHBOURHOOD MANAGEMENT AREAS

22.1. Introduction

22.1.1. The following storylines summarise the existing green infrastructure resource, issues and priority actions for each of the Core Strategy Sub Areas and each of the Neighbourhood Management Areas.

22.1.2. Core Strategy Areas originate from the Local Development Framework Core Strategy document published by Liverpool City Council Planning department in February 2010; it identifies the areas of the city that are likely to undergo greatest change due to housing growth or strategic investment for economic development.

22.1.3. Neighbourhood Management Areas are allocated their own dedicated team. These teams provide the basis for better and more dedicated support to the work of Neighbourhood Committees and Cluster Partnerships.

The teams have responsibility for, or a role in:

- Neighbourhood Services
- Residents Liaison, including Community Forums, Community Groups and Local Steering Groups
- Environmental Care and Maintenance
- Neighbourhood Wardens
- Local Area Enforcement issues
- Support for Neighbourhood Committees and Cluster Partnerships
- Project Development and Delivery
- JET's (Jobs, Education & Training provision)
- Youth provision
- Community Safety
- Ensuring local PSA (Public Service Agreement) targets - as set out in the Liverpool Neighbourhood Renewal Strategy - are met

22.2. City Centre Core Strategy Sub Area

(Compromising Central ward and sizeable parts of Riverside and Princes Park wards in the South of the area)

22.2.1. The Green Infrastructure Resource

- Low levels of green infrastructure in comparison to the rest of the city
- Dominated by The Mersey, with associated high quality access
- Higher levels of general amenity space and derelict land than any other type of greenspace some of which is of low quality and functionality
- Low percentage of parks, outdoor sports, woodland and private gardens compared to other areas; highest percentage of street trees
- High value as a heritage asset but low functionality for other functions
- The green infrastructure is scattered, with few large areas
- Key assets are St. James Gardens in the cathedral grounds, St. John's Gardens, the docks and elements of the incidental greenspace

22.2.2. Issues

- Protecting and enhancing the best of the green infrastructure that exists
- Restricted opportunities for creating new green spaces
- Importance of waterfront and public realm generally
- Area most likely to suffer from urban heat island effect
- Opportunity provided by new development to improve and/or increase green infrastructure functionality

22.2.3. Priority Actions

- Take advantage of regeneration and development opportunities to secure the use of street trees and green roofs (Action 1.1)
- Use street trees and planting schemes at strategic gateways and entry routes (Action 1.2)
- Encourage walking and cycling through the provision of attractive and safe walkways and cycle lanes (Action 1.3)
- Improve accessibility to green space such as gardens, orchards and allotments (Action 1.4)
- Increase the quality and quantity of green infrastructure for tranquillity to reduce poor mental health (Action 2.2)
- Increase accessibility to green infrastructure in areas of high incidence of coronary heart disease, diabetes and obesity (Action 2.4)
- Increase opportunity for physical activity by providing attractive public realm and green environments (Action 2.7)
- Protect areas of existing ecological value throughout the city centre (Action 4.1)

22.3. Inner Area Core Strategy Sub Area

(Contains wards: Riverside, Princes Park and Picton, County, Kirkdale, Anfield, Everton and Kensington & Fairfield, Half of Tuebrook & Stoneyfield, and small parts of Old Swan, Clubmoor, Childwall, St Michael's, Greenbank, Wavertree and Central wards)

22.3.1. The Green Infrastructure Resource

- Moderate to low levels of green infrastructure provision, most of which is private domestic gardens and parklands. High levels of general amenity space
- High levels of cultural and heritage functionality
- High levels of derelict land providing opportunities for temporary uses
- Key assets are Princes Park, Newsham Park, Everton Park, Wavertree Park, Stanley Park and Cemetery and Walton Hall Park

22.3.2. Issues

- Tackling the low levels of green infrastructure and functionality while recognising the limited opportunities and resources available to create additional areas of traditional greenspace
- Area of proposed significant new development (HMRI and Growth Point), as well as economic opportunities particularly within the Atlantic SIA
- Despite the low level of green infrastructure there is a relatively high proportion of parks and general amenity space. Some of these are of low quality and the issue will be to enhance their quality and functionality
- There are high levels of vulnerable population with above average levels of health deprivation
- The River Mersey represents a key resource - how best to increase accessibility to it north and south of the city centre
- The area is bisected by major transport routes with implications for noise and air quality
- The inner areas will be at risk from the urban heat island effect
- Regeneration processes may provide opportunities to promote temporary green infrastructure uses
- Biodiversity is low in the inner areas

22.3.3. Priority Actions

- Take advantage of regeneration and development opportunities to secure the use of street trees and green roofs (Action 1.1)
- Encourage walking and cycling through the provision of attractive and safe walkways and cycle lanes (Action 1.3)
- Increase the quality and quantity of green infrastructure for tranquillity to reduce poor mental health in Picton, Tuebrook, Old Swan, St. Michael's, Greenbank and Wavertree. (Action 2.2)
- In all wards increase physical activity by providing attractive green environments (Action 2.7)

22.4. Outer Area Core Strategy Sub Area

(Contains wards Warbreck, Fazakerley, Clubmoor, Norris Green, Croxteth, West Derby, Yew Tree, Old Swan, Knotty Ash, Wavertree, Childwall, Belle Vale, St Michael's, Greenbank, Church, Woolton, Mossley Hill, Cressington, Allerton and Hunts Cross, and Speke-Garston. There are also small parts of County, Anfield and Tuebrook and Stoneycroft)

22.4.1. The Green Infrastructure Resource

- The Outer Area covers a large area, therefore the green infrastructure quantity, type and functionality varies greatly in this sub area
- Overall relatively high cover of green infrastructure (60% of the area), with an above average percentage cover of woodland, outdoor sports facilities, institutional grounds, grasslands, allotments and agricultural land
- Relatively low percentage of blue infrastructure cover
- Only area which contains orchards and coastal habitat
- Overall functionality is high. Carbon storage, evaporative cooling, wind shelter and aesthetics are notably high in comparison to the rest of the city
- Private recreation function is high here due to the large presence of private gardens
- Food production is relatively high
- Functions relating to water management are below average
- Key assets in this area are Craven Wood, Croxteth Country Park, Allerton, Childwall and Lee Park golf courses, Sefton Park and Rice Lane City Farm.

22.4.2. Issues

- The largest spatial area comprising 70% of the city and while predominantly residential in character there will be a need to respond to variations within
- Main emphasis will be the safeguarding and consideration of opportunities to increase the functionality of existing green infrastructure
- Private gardens represent the largest green infrastructure resource but are not subject to external management policy and control
- Employment areas at Speke and A580 Corridor are at important strategic gateways
- There are small areas for example around Fazakerley, Old Swan and Speke where opportunities to use green infrastructure to contribute to meeting health needs should be
- Prioritised
- House building will be an important development issue particularly within the fringe regeneration areas where the opportunity should be considered to increase green infrastructure functionality through the design process

22.4.3. Priority Actions

- Encourage the use of SUDS, using swales and de-culverting of water courses, particularly in Anfield. (Action 3.2)
- Create water bodies and water courses to provide water for irrigation in times of drought particularly in Greenbank (Action 3.5)
- Take opportunities to de-culvert water courses and re-naturalise flood plains (Action 3.10)

22.5. Alt Valley Neighbourhood Management Area

(Contains the wards: County, Fazakerley, Croxteth, Norris Green, Clubmoor and Warbreck)

22.5.1. The Green Infrastructure Resource

- One of only two neighbourhood management areas with agricultural land
- High levels of private domestic gardens, parks, grasslands and institutional grounds
- Croxteth and Fazakerley have over 50% of the green infrastructure in the NMA and therefore dominate the functionality
- Key assets in this area are Croxteth Country Park, the grounds of University Hospital Aintree in Fazakerley and Walton sports centre grounds

22.5.2. Issues

- The A580 corridor employment area is an important strategic gateway where green infrastructure and tree planting in particular could contribute to raising the profile of the area and the city in general
- Housing development around the Stonebridge estate and Norris Green in particular may provide opportunities to improve green infrastructure functionality through the design process
- Approach 580 is an area vulnerable to the heat island effect
- Although the problem is not as severe as in the inner areas there are issues relating to ensuring green infrastructure is contributing to health improvement through improving accessibility, increasing functionality

22.5.3. Priority Actions

- Encourage the use of SUDS, using swales and de-culverting of water courses, especially in Clubmoor and Croxteth (Action 3.2)
- Increase tree planting in accordance with The Mersey Forest plan, and ensure maintenance, particularly in areas in need of shade: County and Fazakerley (Action 3.4)
- Create water bodies and water courses in Clubmoor, Croxteth and Fazakerley to provide water for irrigation in times of drought (Action 3.5)

22.6. City and North Neighbourhood Management Area

(Contains the wards: Kirkdale, Everton, Central, Riverside, Picton and Kensington & Fairfield)

22.6.1. The Green Infrastructure Resource

- There are low levels of green infrastructure in this area, it is scattered, with slight concentrations in the far north of the city.
- The city is dominated by the River Mersey, which is surrounded by publicly accessible land.
- There are high levels of general amenity space and derelict land.
- There are low percentages of allotments, outdoor sports facilities, street trees and woodland compared to other areas across the city.

22.6.2. Issues

- Low levels of green infrastructure and functionality
- High levels of vulnerable population with above average levels of health deprivation
- Given limited opportunities to create new greenspace, how best to ensure that the existing green infrastructure be protected and improved to increase its functionality
- This area will be a major focus for new development including housing providing opportunities to secure new and improvements to existing green infrastructure
- The Mersey represents a key resource. The issue will be how best to increase further accessibility to it
- Can new housing development provide opportunities to increase private garden space
- The city centre in particular is likely to suffer from the urban heat island effect in a changed climate
- Concentration of converging transport routes with implications for noise and air pollution

22.6.3. Priority Actions

- The City & North NMA has a lot of the actions in the Action Plan identified as priority actions, markedly more than any of the other NMAs. Due to this fact we have chosen the top scoring priority actions to list here:
- In all wards take advantage of regeneration and development opportunities to secure the use of street trees and green roofs (Action 1.1)
- Encourage walking and cycling through the provision of attractive and safe walkways and cycle lanes (Action 1.3)
- Increase the quality and quantity of green infrastructure in all wards to reduce poor mental health (Action 2.2)
- Increase opportunity for physical activity by providing attractive public realm and green environments (Action 2.7)

22.7. Liverpool East Neighbourhood Management Area

(Contains the wards: West Derby, Yew Tree, Knotty Ash, Old Swan, Tuebrook and Stoneycroft and Anfield)

22.7.1. The Green Infrastructure Resource

- Low percentage cover of derelict land and general amenity space
- High levels of outdoor sports facilities and public parks
- Highest proportion of cemeteries and private gardens
- Moderate levels of street trees and woodland
- Much less variable in functionality between wards than other NMAs. Most functions are around average, but the neighbourhood has relatively low carbon storage and water management functions.

22.7.2. Issues

- Strategically located on eastern approaches to city centre with potential for green infrastructure and in particular tree planting to enhance major routes and address issues of noise and air pollution
- Mixed social character with areas of vulnerable population and health deprivation. Housing initiatives such as the HMRI (Stanley Park) and Dovecote Priority Neighbourhood should consider how green infrastructure can be incorporated to improve environmental quality and contribute to health improvement
- Area is vulnerable to the heat island effect
- Croxteth Hall and Country Park straddles boundary with Alt NMA and is an area of high green infrastructure functionality for protection
- Priority actions:
- Encourage the use of SUDS, using swales and de-culverting of water courses, especially in Knotty Ash, Old Swan, Tuebrook & Stoneycroft, West Derby and Yew Tree (Action 3.2)
- Protect areas of existing ecological value in Anfield and Old Swan (Action 4.1)

22.7.3. Priority Actions

- Increase the quality and quantity of green infrastructure in Knotty Ash, Old Swan, Tuebrook and Stoneycroft, West Derby and Yew Tree to reduce poor mental health (Action 2.2)
- Protect areas of existing ecological value in Anfield and Old Swan (Action 4.1)
- Take opportunities to de-culvert water courses and re-naturalise flood plains (Action 3.10)

22.8. South Central Neighbourhood Management Area

(Contains the wards: Princes Park, St Michael's, Greenbank, Wavertree, Childwall and Church)

22.8.1. The Green Infrastructure Resource

- Heavily influenced by The River Mersey
- High percentage of allotments, private gardens and street trees
- Moderate percentages of woodland, outdoor sports and institutional grounds
- High levels of private recreation and aesthetic functions
- High functionality as a habitat and corridor for wildlife
- It has the lowest percentage of derelict land and general amenity space.

22.8.2. Issues

- The area has above average proportions of parks, outdoor sports and woodland which contribute to the high green infrastructure functionality including Sefton Park and Calderstones Park. The continuation of actions to protect and enhance key assets is a key issue for this area
- There are issues relating to health and the heat island effect
- The area has frontage to the Mersey which is a key resource and opportunities to increase and improve access should be considered
- Several main access routes cross the area with implications for noise and air quality

22.8.3. Priority Actions

- Take advantage of regeneration and development opportunities in Princes Park and Wavertree to secure the use of street trees and green roofs (Action 1.1)
- Encourage walking and cycling in Princes Park and Wavertree through the provision of attractive and safe walkways and cycle lanes (Action 1.3)
- Improve green infrastructure around hospitals and health centres in Greenbank, Princes Park and St Michael's (Action 2.5)
- Incorporate climate change adaptation design principles into all planning and development briefs and documents relating to Princes Park and Wavertree (Action 3.7)

22.9. South Liverpool Neighbourhood Management Area

(Contains the wards: Mossley Hill, Cressington, Speke-Garston, Allerton and Hunts Cross, Woolton and Belle Vale)

22.9.1. The Green Infrastructure Resource

- One of only two NMAs with agricultural land
- High percentage of parks, street trees, gardens, outdoor sports facilities, institutional grounds and cemeteries
- High levels of derelict land and general amenity space
- A great deal of disparity in the functions provided across the neighbourhood. It has well above average levels of food production, and above average levels of function for habitat and wildlife corridors as well as for aesthetic and evaporative cooling, but low for heritage and water management functions.

22.9.2. Issues

- There are issues relating to meeting social and health deprivation in Speke and Garston requiring action to consider how green infrastructure can contribute to their resolution
- The Speke Halewood SIA including the airport is at an important strategic gateway where green infrastructure and particularly tree planting could contribute to raising the profile and image of the area
- The Mersey represents a key resource and a key issue will be continuing efforts to improve accessibility wherever possible

22.9.3. Priority Actions

- Improve accessibility to green space in Cressington, Mossley Hill, and Speke and Garston such as gardens, orchards and allotments (Action 1.4)
- Improve green infrastructure around hospitals and health centres in Allerton and Hunts Cross, Belle Vale and Speke-Garston (Action 2.5)
- Take opportunities to de-culvert water courses and re-naturalise flood plains (Action 3.10)



To discuss or find out more about this document or the Green Infrastructure Strategy as a whole, please contact: Liverpool City Council Planning Service on 0151 233 3000.