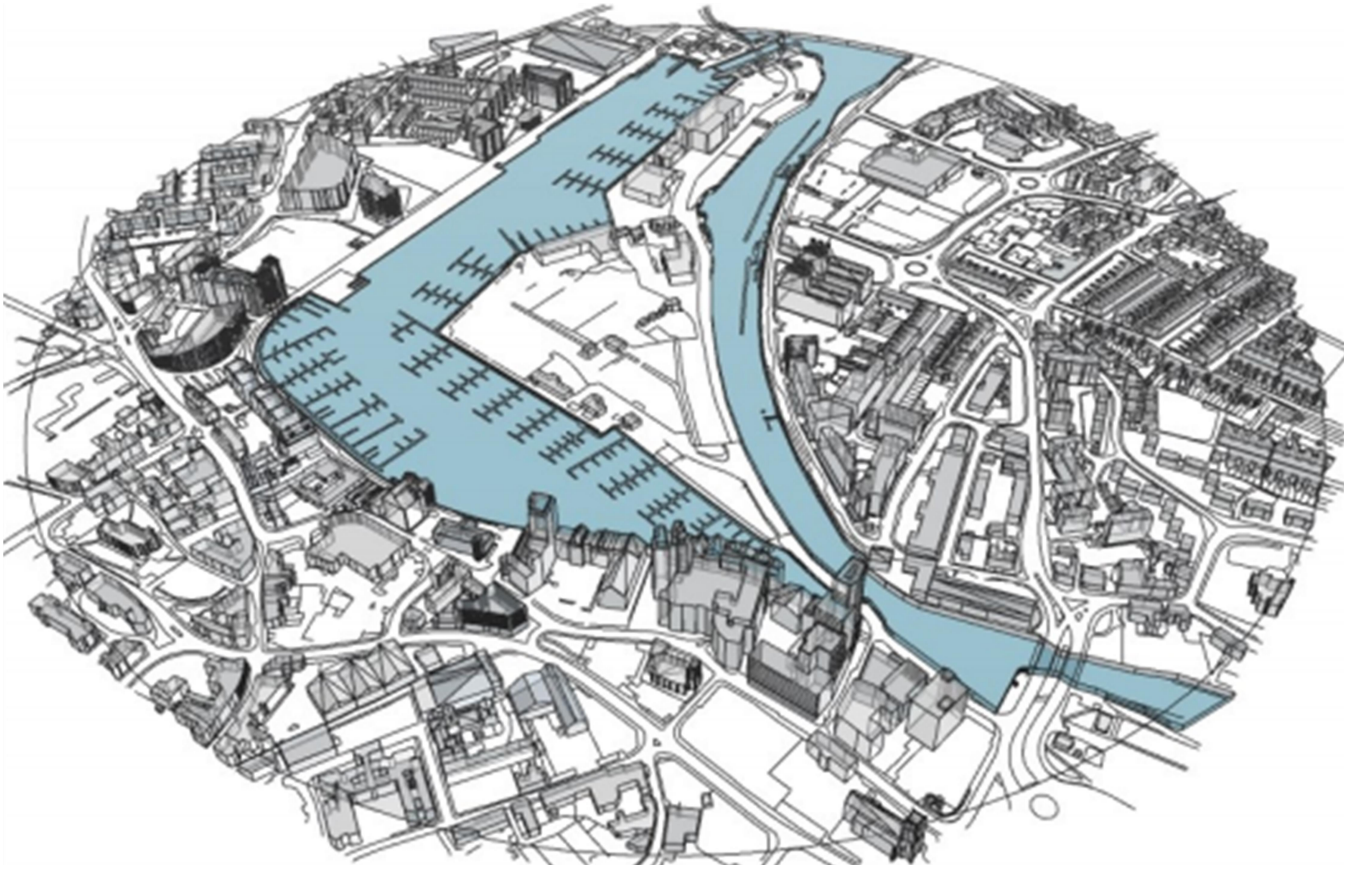
Using Digimap Data in Town Planning Projects– Mark Macdonald

Bio – Mark originally studied a BSc in Architecture, Planning, Building and Environmental Studies at UCL in London, and then taught Design for a number of years before returning to study the MSc in Town Planning, at Anglia Ruskin University (Chelmsford, Essex), in 2018. In 2019 he gained some valuable experience with the planning team at the Environment Agency, and went on to complete his dissertation earlier this year. He will shortly take up a role within a planning team at a Local Planning Authority after being awarded a distinction in his MSc.

The course at Anglia Ruskin enables students to submit an artefact, or planning document, which is informed by research, as their dissertation. Mark decided to produce a 'Case Study Guide for Planners' showing how Space Syntax could be applied in their practice. The case studies were centred on a dockside area of Ipswich in Suffolk and explored the area using Space Syntax approaches at a variety of scales. The mapping resources, provided by Digimap, were a vital resource in; researching the area; running the space syntax analysis, and presenting the findings in the artefact document.

Presentation Structure – 15-20 mins

- Background regarding the Case Study Area
- What is Space Syntax Analysis?
- How the Digimap resources were used to create a road centreline map for analysis?
- How the OS resources available were used to create a bounded area maps and how these were used to conduct visibility analysis and agent analysis in DepthMapX (the Space Syntax software).
- How the OS resources were used to construct the CAD model which was used extensively in the presentation of the artefact document. Also the use of the building heights data in CAD.

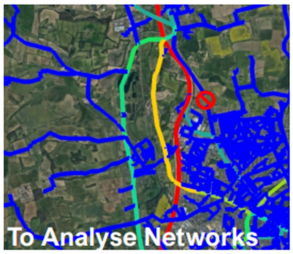


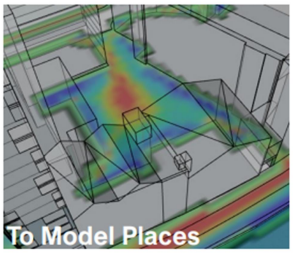
Above: The CAD file which was used as a presentation aid in the production of the Artefact.

Artefact - Extracts

Why Space Syntax?

These examples illustrate some of the ways Space Syntax can be used in planning.





Space Syntax can be used to analyse transport networks such as roads or cycle routes. Above, the north-west of Ipswich has been modelled; the numbers of vehicles using each road are displayed using a colour coded scale. Red shows the traffic on the A14, a major route; green shows the traffic choosing the local B roads.

The exercise has highlighted a significant amount of traffic using the yellow road within the model. Paper Mill Lane is unsuitable for this level of traffic. Conducting this exercise has identified this as a potential 'rat-run', highlighting potential problems with drivers choosing this alternative route under certain traffic conditions.

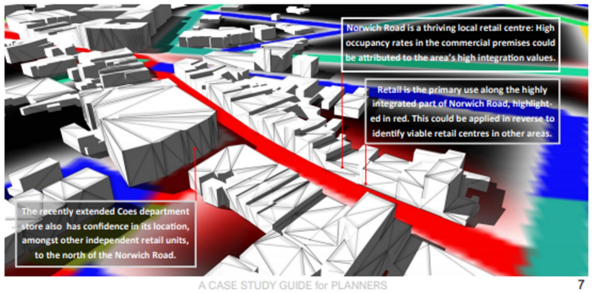
A consequence of this could be; revised signage, traffic calming measures, or, closing the road. This solution has been applied to the Old Norwich Road where a bus gate operates. Bus and cycles are the only forms of traffic allowed at the location marked.

Space Syntax can be used to model the use of spaces within developments such as in the image above which models pedestrian movement in an area of Ipswich waterfront. Highly trafficked areas are represented by red; other colours represent varying traffic levels from orange, yellow, green and blue.

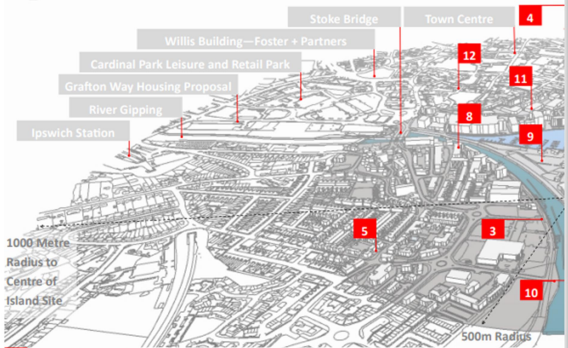
In the Space Syntax model above the waterfront promenade is shown as a highly trafficked and well frequented area in the lower part of the image (red). This correlates with what is observed in the area; many people enjoy the route along the waterfront, a conservation area containing a significant number of heritage assets.

The analysis highlights a problem with the courtyard service spaces (blue/green) as the they are not drawing through traffic in a similar way. Unfrequented spaces could be problematic and suggests that the design of these areas may benefit from further attention.

Above: Network maps can also show other qualities of the network. Highly integrated roads are shown in red, the least in blue.
Below: Integration can be used to define local retail centres such as the Norwich Road; an area which is clearly well integrated into the network. The well established network of streets naturally applies the logic further as residential uses occupy quieter streets, in blue.

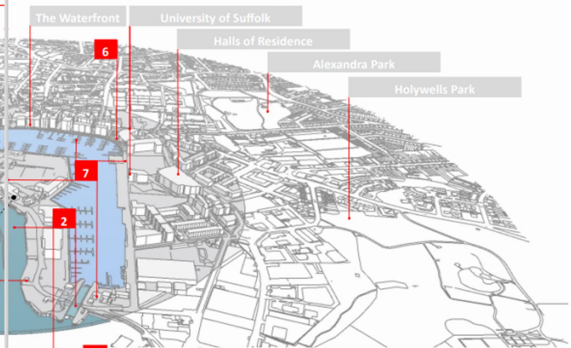


Ipswich Island Site



1 Case Study 1: Ipswich and the Wider Area — covers the wider area beyond what is shown.
2 Case Study 2: Investigating Potential River Crossing Locations
3 Case Study 3: Felaw Bridge Local Effects Investigation
4 Case Study 4: Ipswich Garden Community Analysis — situated to the north of Ipswich.
5 Case Study 5: Lower Stoke Permeability Investigation
6 Case Study 6: Ipswich Waterfront Visibility Study

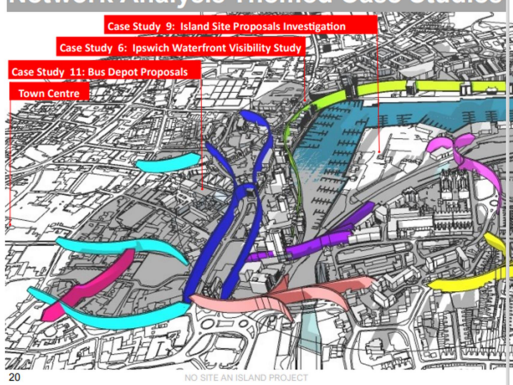
Case Study Locations



7 Case Study 7: Ipswich Waterfront Agent Analysis
8 Case Study 8: St Peters Dock Bridge Investigation
9 Case Study 9: Island Site Proposals Investigation
10 Case Study 10: Tidal Barrier Public Realm Analysis
11 Case Study 11: Bus Depot Site and Pleasant Row Proposals
12 Case Study 12: Prospect House Alleyway Closure

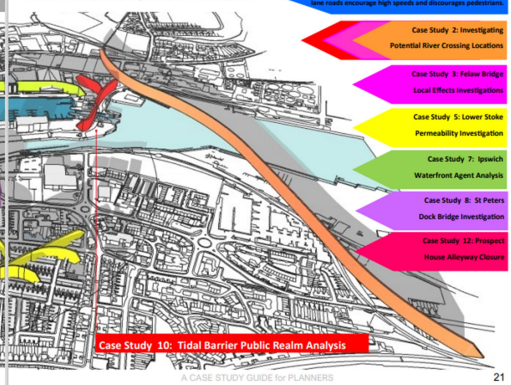
Key Site Issues

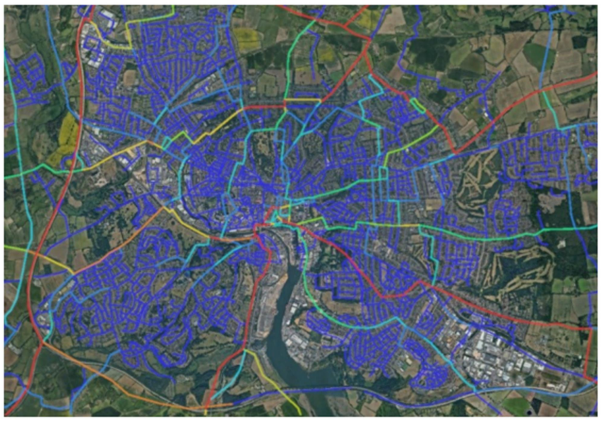
Network Analysis Themed Case Studies

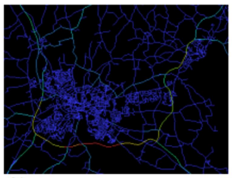


Case Studies 1-5 all focus on the capacity of Space Syntax to model networks. They use axial and angular segment analysis to model the network and examine the effects of making these links at a variety of scales. The arrows illustrate these case studies, and others which will examine the effects of making connections across the site: Three key movement issues affecting how the area works are also described.

Case Studies 7, 8 and 12 also look at the issue of connectivity and are also pictured. They will be described later in this guide as they utilise other forms of analysis, such as agent analysis, or a mixed approach.



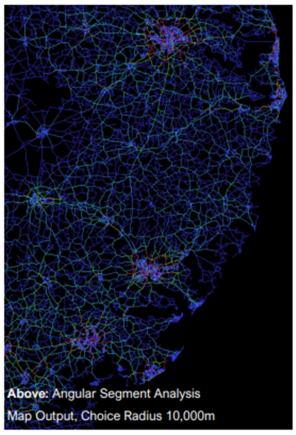




Left: Looking more closely at a detail of the Angular Segment Analysis map, showing the Ipswich area, the image to the left shows the network functioning effectively with the Orwell bridge, to the south, taking much of the vehicle load across the Orwell estuary. This route is shaded red to illustrate the high levels in this location alongside similarly high levels of traffic on the A12 and A14. Levels of traffic closer to the centre of town are shown with lower choice values and are rendered in blue.

Above: The map above models the effects of a bridge closure; the Orwell bridge is now carrying no traffic. This is a regular occurrence and results in the whole town centre suffering from massively increased traffic flows. The hugely increased traffic load focusses on the areas around the Island Site, at the head of the estuary – a situation which is also commonly experienced when the Orwell bridge remains open.

Above: Angular Segment Analysis
Map Output, Choice Global Radius (n)



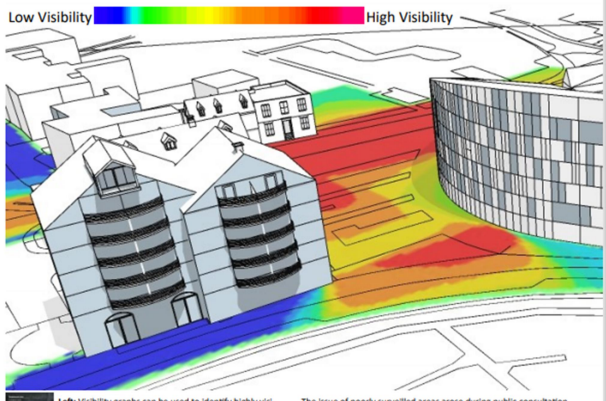
Above: Angular Segment Analysis
Map Output, Choice Radius 10,000m

Adjusting the Journey Radius from Global (n) to 10Km

To explain the inaccuracy of the traffic levels predicted in the town centre, the journey radius length used in the simulation could be adjusted to reflect the nature of journeys in town. Making this adjustment increases the traffic in built-up areas markedly; more effectively representing the experience of road users. This exercise demonstrates the nuances achieved, through making adjustments to the journey radius, when setting up simulations in DepthMapX. This reveals a background grid of streets, used on shorter journeys, in contrast to the foreground grid identified by the global analysis.

Outcome of the Process of Analysis

This case study has shown that Angular Segment Analysis can predict traffic flows. By adjusting the journey radius different journey types can be shown; shorter journey lengths better predict levels of traffic in town. This exercise has increased our understanding of how the road network functions around Ipswich and has shown the reasons behind the focus of traffic to the north, east and west of the Island site, when under stress. This contributes to the disconnect between the retail centre to the north, and the waterfront itself, and also to the detrimental effect on listed building and structures.



Left: Visibility graphs can be used to identify highly visible areas as in this case study; or, conversely, they can identify areas of poor visibility which in turn could be poorly surveilled and subject to property crime[18].

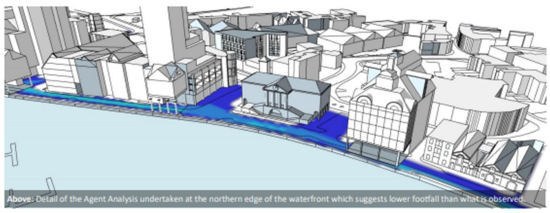
The issue of poorly surveilled areas arose during public consultation for a scheme, adjacent to the waterfront, to the west of Stoke Bridge. The use of public access, 'finger parks', in place of larger gardens, received objections from the Police, due to lack of surveillance[19].

Colour Coding Scheme: The output of each method can be represented spatially using a user defined colour coding system; for clarity this guide uses the 'DepthMapX Classic' colour range throughout. Blue represents low values through to a vivid pink which represents high output values from DepthmapX; here looking at visibility levels.

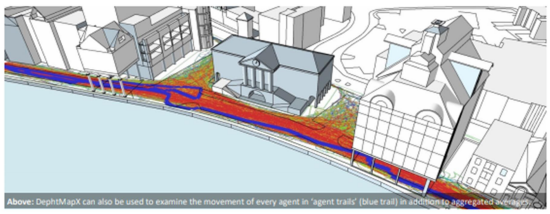
Above: Poorly Surveilled 'finger parks' **Image:** Mountfield Pigott LLP

The "?" Public Art Piece situated in front of the University of Suffolk

The Hold : A public access County Archive for Suffolk



Above: Detail of the Agent Analysis undertaken at the northern edge of the waterfront which suggests lower footfall than what is observed.



Above: DepthMapX can also be used to examine the movement of every agent in 'agent trails' (blue trail) in addition to aggregated averages.

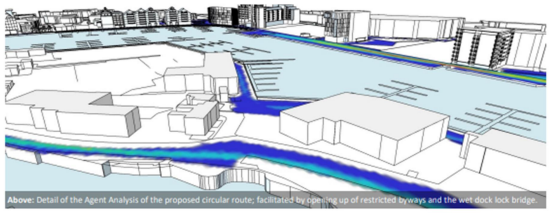
Agent Trails

Agent Analysis can be outputted in three forms; one is in real time showing the agents moving around the bounded area which leave a pixelated trail (in 3D view only), secondly the record of the trail lines themselves, known as agent trails (as above); finally the aggregated output can be observed. The aggregate of the movement of all the agents must be of most interest to the planner although the agent trails do bring into question the rules which inspire the agents to take meandering, circuitous routes.

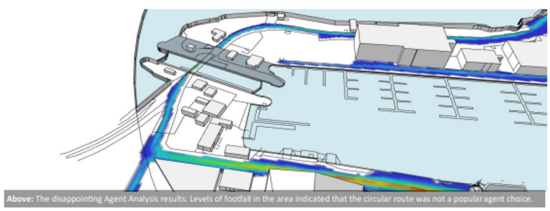
Waterfront Footfall

How can low levels of footfall in the northern waterfront be explained? What is drawing large numbers of people there—but not the virtual agents. This northern area:

- is a more established area first to be developed for leisure use.
- is closest to the town centre and its associated parking facilities.
- has a significant number of characterful, renovated heritage assets.
- has the most complete frontage without 'missing teeth'.



Above: Detail of the Agent Analysis of the proposed circular route; facilitated by opening up of restricted byways and the wet dock lock bridge.



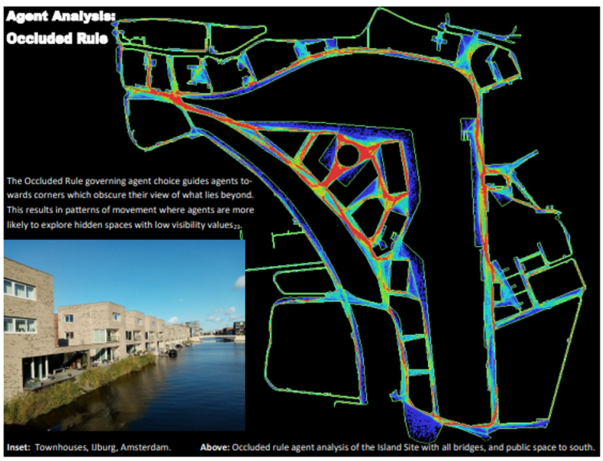
Above: The disappointing Agent Analysis results; Levels of footfall in the area indicated that the circular route was not a popular agent choice.

Weaknesses in the Agent Analysis

The use of the standard rule to guide agents around the site has resulted in a great deal of activity in the area, shaded red, in the lower part of the image above. An additional observation is that the routes on the Island site itself are very poorly used; both of these predictions of the model accord with observations of the area, although these have not been formally, quantitatively assessed using techniques such as pedestrian trails or similar forms of survey commonly used by Space Syntax Ltd.

There does seem to be a disconnect between the predictions of the model in the area to the north where reduced pedestrian flows are shown by blue and green on the colour scale. This could be a result of the narrow path in this area which reduces the predicted footfall. In reality this is an extremely popular part of the waterfront which attracts significant numbers of pedestrians throughout the day.

Agent Analysis: Occluded Rule



The Occluded Rule governing agent choice guides agents towards corners which obscure their view of what lies beyond. This results in patterns of movement where agents are more likely to explore hidden spaces with low visibility values[23].

Inset: Townhouses, IJburg, Amsterdam. **Above:** Occluded rule agent analysis of the Island Site with all bridges, and public space to south.

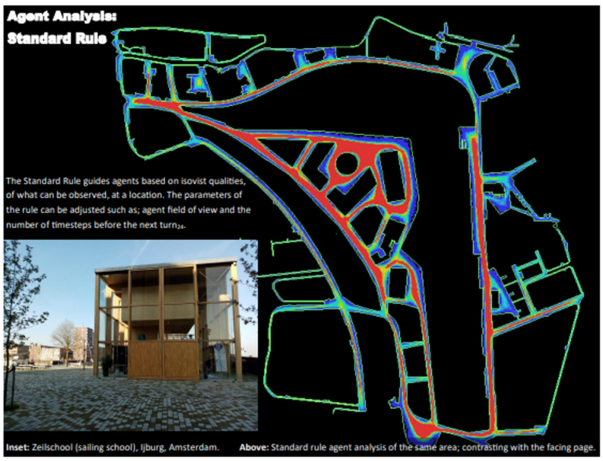
The bounded area map of the pedestrian space was adjusted to include all the bridges and form the circular route for the agent analysis; this was conducted with both the occluded rule and standard rule governing agent movement: Both are shown for comparison here.

Both rules result in high footfall across the island site however the occluded rule shows very little exploration of the public spaces to the northern and southern areas of the island site. Parts of the circular route show high traffic although in other areas this is more dispersed.

To the right the standard rule shows more widespread exploration of the island site and more extensive exploration of the public spaces to the north and south.

What is noticeable from both types of modelling is that the footfall in existing (built out) areas of the waterfront; the northern waterfront promenade, and the wide, straight section to the east, remain well frequented. This modelling could be used to allay fears that the new development could draw traffic away from the established areas.

Agent Analysis: Standard Rule



The Standard Rule guides agents based on isovist qualities, of what can be observed, at a location. The parameters of the rule can be adjusted such as; agent field of view and the number of timesteps before the next turn[24].

Inset: Zeilschool (sailing school), IJburg, Amsterdam. **Above:** Standard rule agent analysis of the same area; contrasting with the facing page.

Above: High density housing scheme; IJburg, Amsterdam.

An example of successful urban design ,which could inspire the redevelopment of the Island site, is the development of reclaimed land in IJburg, Amsterdam. IJburg occupies the dockside with a mix of uses, high permeability and excellent public transport links. A range of uses exist (as pictured), juxtaposed together, as in the plan for the Ipswich Island site. Ipswich Sea Scouts could occupy a structure similar to that enjoyed by the Zeilschool; townhouses could flank the canal side, similar to those proposed for the banks of the New Cut; and commercial uses could find ground floor space amongst residential development.

Urban Analysis CASE STUDY 11

BUS DEPOT SITE AND PLEASANT ROW PROPOSALS

Above: Bus Depot and Pleasant Row opportunity sites in the context of the key issues as identified by recent masterplan documents[25].

Above: Pleasant Row and the local area is in need of regeneration.

Rationale A problem identified in the town centre masterplan is the lack of connection between the town centre and the waterfront as described by the cyan arrows on page 20 and above. Site allocation documents include a number of sites in this area which could be used, in part, to remedy the lack of direct links between the two areas.

The bus depot site and Pleasant Row is one area where space syntax could be used to assess the connectivity improvements which could be made in their redevelopment. This case study will look at the two sites in this location and use space syntax to evaluate the effects of opening up these sites to improve permeability in the area[26].

Above: Ten Plain trees are all subject to a Tree Preservation Order.

Above: The Star Lane gyratory bisects the route to the waterfront.

Above: The Star Lane gyratory system and under-utilized public space.

Above: Star Lane Air Management Area, **Source:** Ipswich GIS Mapping

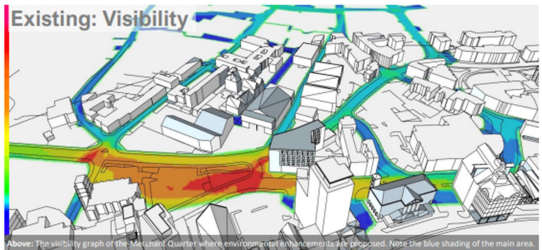
Above: The area includes a number of opportunity sites to exploit.

This case study will use a bounded area map of the Pleasant Row area, between the waterfront and town centre, to create a visibility graph analysis, of both the existing and proposed arrangements, of the local streetscape. An agent analysis will model the flow of people from the town centre to the waterfront; a facility of DepthMapX allows agents to be released from a specific location.

The aim of the case study is to inform the design brief for the key opportunity sites and to propose urban design layouts for the area.

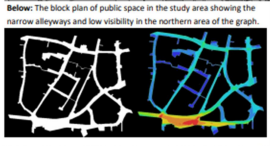
The local area is referred to as the Merchant Quarter which is the subject of planned environmental enhancement[27]. The planned improvements include new squares; although the opportunity of opening up Pleasant Row into a tree lined square has been overlooked. The area contains a number of important heritage assets, including almshouses and the Greyfriars, and retains the original tight street pattern of alleyways and dead-end streets; none of which follow the 'desire line' linking the retail centre and waterfront.

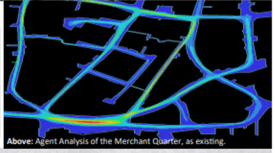
Existing: Visibility



Above: The visibility graph of the Merchant Quarter where environmental enhancement is not proposed. Note the blue shading of the main area.

Below: The block plan of public space in the study area showing the narrow alleyways and low visibility in the northern area of the graph.

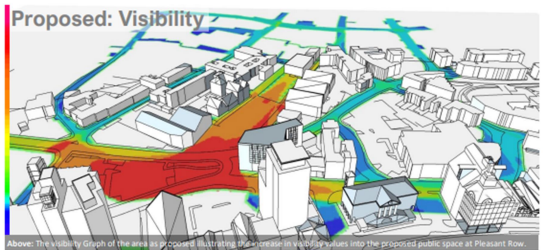




Above: Agent Analysis of the Merchant Quarter, as existing.

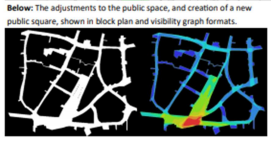
Above: Streetscape proposals to encourage pedestrian movement between town centre and waterfront. **Image Source:** Allies and Morrison.

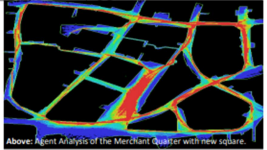
Proposed: Visibility



Above: The visibility Graph of the area as proposed illustrating the increase in visibility values into the proposed public space at Pleasant Row.

Below: The adjustments to the public space, and creation of a new public square, shown in block plan and visibility graph formats.





Above: Agent Analysis of the Merchant Quarter with new square.

Conclusion This case study has examined combining the bus depot opportunity site with other vacant premises in the area to create a civic square in the centre of the Merchant Quarter[27]. This would include the mature plain trees and open up the heritage assets of Pleasant Row, the almshouses and the Greyfriars themselves.

The creation of the square dramatically increases the visibility of the area; however it does not increase the visibility levels in the extremities and tight alleyways to the north, as these remain at the lower end of the visibility spectrum. An agent analysis showed that this may not draw people along the route up to the town centre as intended[28].

Outcome of the Process of Analysis

This study has shown that the creation of the square in this location would create a highly visible public space which has the potential to attract a high degree of footfall. It is questionable however how much of this footfall would be from increased pedestrian traffic making the journey from the town centre to the waterfront as is the clear intention of both master planning documents for the area[29].

The extent that this scheme can achieve its aim of increasing flows is therefore in question. Further analysis of the other proposed squares within the Merchant Quarter using Space Syntax is suggested.