

# **Publication Places for Everyone joint DPD: North of Irlam Station allocation (JP Allocation 28)**

## **Build cost implications associated with ground conditions**

### **1. Introduction**

- 1.1 The North of Irlam Station allocation is situated between New Moss Road and Roscoe Road. The site is 30 hectares in size and is an area of land lying to the south of the M62, which forms part of Chat Moss, and is to the north of the existing Cadishead neighbourhood. It is predominantly comprised of agricultural land that is crossed by a number of tracks, together with farm buildings, a landscaping business and a small number of dwellings. There are a series of hedgerows running across the site. The site is identified for 800 dwellings.
- 1.2 As noted with the reasoned justification to the allocation, most of the site has significant depths of peat across it, meaning that there will be increased build costs associated with development on it.
- 1.3 This report briefly sets out the work that has been undertaken to better understand the ground conditions, and then provides a high level costing of additional build costs associated with bringing the site forward.
- 1.4 This report has been prepared by the Spatial Planning team at Salford City Council, having regard to the advice of the GMCA Core Investment Team and a specialist ground remediation / improvement company (Deep Soil Mixing).

### **2. Assessment of ground conditions**

- 2.1 As noted above work has been ongoing on the allocation in order to better understand the ground conditions; this has been with co-operation from the landowners. The following reports have been published and formed part of the evidence base for the former GMSF allocation (this evidence remains relevant to the allocation proposed through Places for Everyone):
  - Preliminary risk assessment (Urban Vision, January 2019)
  - Ground Investigations report (Capita, July 2020)
  - Non-technical summary (SCC Environmental Consultancy, September 2020)
- 2.2 A summary of the findings is set out below:
  - Site investigations were undertaken in late 2019. 19 boreholes were drilled and analysed and ground gas monitoring completed.

- Peat was found to range in depths between 0.70 metres and 4.45 metres below ground on the site, with peat depths increasing from the southwest to the northeast of the site. Peat levels are generally lowest in the southern parts of the site.
- There is currently no reason to conclude the site cannot be developed as intended, using alternative foundation technologies which exist (for example soil mixing, vibrated concrete columns and piled foundations).
- Whilst it is considered that sufficient information is known about the ground conditions to determine that the site can be allocated, further technical assessments will need to be undertaken at the masterplanning stage including soil testing for contamination, ground gas/ground water monitoring, further geotechnical testing and a hydrological assessment in order to consider the impacts on Chat Moss.

2.3 Although further assessments will be needed by the masterplanning and planning application stages, the Non-technical summary (on page 16) highlights the Ground Investigations geotechnical conclusions as follows:

“Soil mixing is likely to be the preferred method for this site. This is a method of improving the bearing capacity of soils by addition of material with a greater bearing capacity. This technology is used across a number of sites.

Roads and buried services are likely to be affected by differential settlement (depending on their final location). Roadways are likely to require soil mixing to form a suitable slab, and drainage services will likely require flexible connectors.

It is not possible to undertake a further detailed site investigation at this stage in the planning process. This will be required when a layout is known as it will be necessary to target further investigations depending on (for example) where buildings are to be founded, and where areas of open space will be placed.

The more onerous foundation solutions have the potential to increase costs. Where peat depths are greater, or buildings bigger this will rise. There is however potential to offset some of these costs elsewhere within the development (for example reducing the need to import material).”

2.4 Soil mixing, which is identified above as the preferred method for dealing with the ground conditions, involves mixing a cementitious binder into peat, silts or soft clay and is carried out with a mixing tool that has been installed on an excavator machine. By mixing in both the horizontal and the vertical direction the substances combine to form a much improved structural quality material that in some instances can be used as fill. Mass mixing is applied at depths between one to six metres. The procedure has a number of potential advantages, including:

- A reduced period of construction
- Zero vibration during construction
- Soil can be used as construction material

- No need to bring costly and bulky materials on site
- A more cost effective foundation solution – i.e. no need for costly piling/suspended slabs
- A substantial reduction in material that needs to be taken away from site given there is no need to excavate, so reducing landfill tax charges
- Effective on soils which have poor load bearing and lots of voids (such as peat)
- Increases bearing pressure, controls settlement and reduces permeability
- The peat will be treated so there is no need to remove it, which has carbon benefits
- Water levels are not usually an issue

### **3. Financial implications of ground conditions**

3.1 With regards to potential costs of building on peat, the city council has had discussions with a Quantity Surveyor in the Core Investment team at the Greater Manchester Combined Authority (GMCA). In line with the preferred method for dealing with ground conditions identified above (i.e. soil mixing), the GMCA has held discussions with Deep Soil Mixing who are a specialist ground remediation / improvement company.

3.2 Criterion 1 of the North of Irlam Station allocation identifies that development should:

“Be in accordance with a masterplan/framework or Supplementary Planning Document (SPD) that has been developed in consultation with the local community and other stakeholders, and is considered acceptable by the city council, or in the case of an SPD adopted by the city council....”

3.3 At this stage there is no Masterplan for the site showing layout and the precise mix of dwellings etc. As a result of this, a number of assumptions were made about the potential development of the site, in order to provide a high level estimate of costs associated with developing on peat (and these have also informed the overall viability work on the site that has been undertaken by Three Dragons as part of the evidence base). These assumptions are set out below:

- The site is allocated for 800 houses
- Higher density houses will be in those parts of the site closest to Irlam train station in order to make efficient use of land and given the sustainability benefits of this
- The total gross site area is 30.0ha
- 200 houses will be on around 3ha of the site at a net density of 70 dwellings per hectare, at 3 storeys in height.
- 600 Houses will be on around 17ha of the site at a net density of 35 dwellings per hectare, generally at 2 storeys in height
- A 2 form entry primary school will be located on around 2ha of the site
- The remaining c. 8ha of the site would accommodate:

- Infrastructure associated with the residential development, such as main service roads
- Open spaces and recreation land in order to meet policy requirements (such as for a neighbourhood park and allotments)

3.4 Taking into account discussions with the GMCA and Deep Soil Mixing around potential costings associated with the soil mixing procedure, it is estimated that the additional build costs associated with ground conditions (i.e. the peat) at the North of Irlam site total £18,521,130. Given the scheme is for 800 houses this equates to around £23,000 per house, inclusive of provision for roads, footpaths and school facilities.

3.5 The costs identified above are additional to standard build costs associated with more typical developments. The costs should be treated as indicative given, they involve broad assumptions, and in advance of further investigations on the site at later stages in the development process. They are however based on conservative assumptions and are not considered to under-estimate the costs. Indeed, the borehole test results on some parts of the site show depths of peat under 1m, such that conventional construction methods may be suitable.

3.6 The cost is based on assumptions around the floorspace of different built elements of the proposed development, in line with paragraph 3.3 above, and then applying a square meterage cost for ground improvements to that floorspace (with these costs being provided by GMCA having regard to their discussions with Deep Soil Mixing). These costs are set out below.

- Houses and school building = £160 per sqm<sup>1</sup>
- Roads = £140 per sqm
- Footpaths, driveways / parking, and school hard play area = £90 per sqm<sup>2</sup>
- School soft play area = £70 per sqm

3.7 Having regard to the above, a breakdown of the total £18,521,130 cost is shown in the table below:

Element of build	Cost relating to ground improvement	Assumptions
High density houses close to Irlam train station	£1,680,000	200 townhouses with an average floorspace of 93sqm (£8,400 per plot)

<sup>1</sup> Due to the nature of the deep soil mixing ground treatment, the costs associated with 2/3 storey houses and a school building are broadly the same.

<sup>2</sup> For the purposes of this assessment it has been assumed that footpaths contain a fair amount of services within them and telecommunication chambers, lamp post supports, cabinets etc. on top, and cars sometimes parked at least partly on them. A driveway construction isn't as thick a make-up compared to a regularly trafficked road, hence why it's priced less than a road.

Houses elsewhere on the site	£7,872,000	600 semi – detached houses with an average floorspace of 96 sqm (£13,120 per plot)
School building	£240,640	Standard sized two form entry primary school for 420 pupils plus a 26 place nursery.
Hard play associated with school building	£86,580	Typical sized playground
Soft play associated with school building	£549,360	Standard sized football pitch
Driveways / parking	£2,959,470	Driveway for each house
Footpaths	£1,775,880	Footpaths to all houses including either side of the road to the school
Roads	£3,357,200	Roads to service houses, apartments, and the school
<b>Total costs</b>	<b>£18,521,130</b>	

3.8 A detailed breakdown of these costs is at Appendix 1 of this report.

#### 4. Overall financial viability of the site

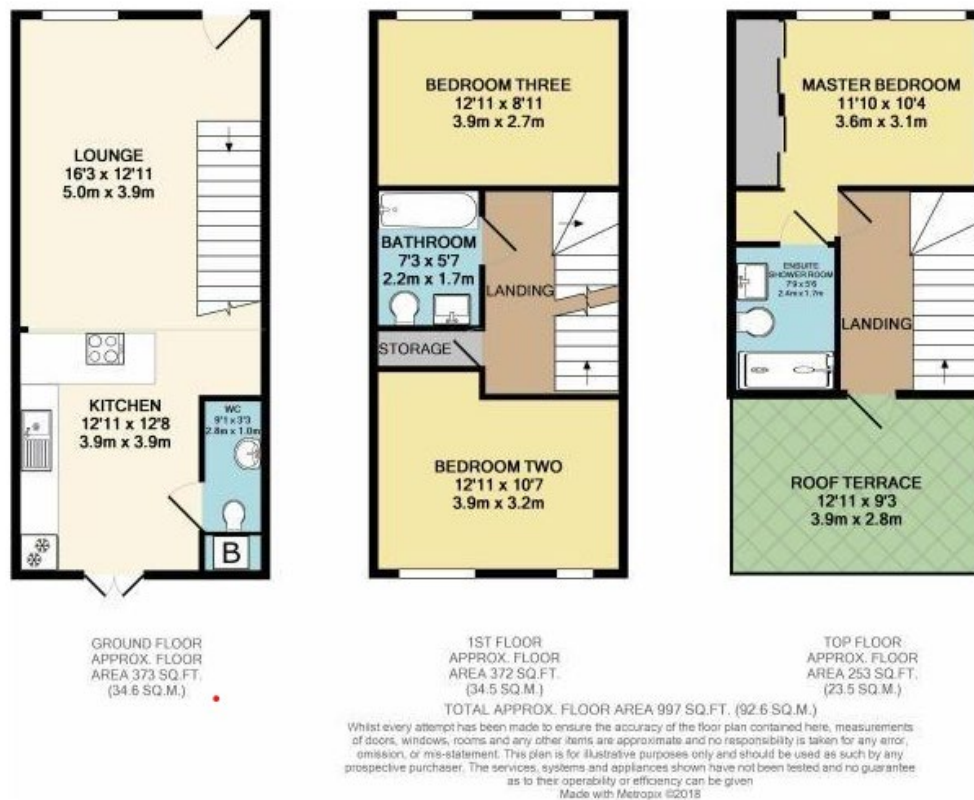
4.1 Three Dragons has assessed the overall viability of the allocation and this work forms part of the evidence base. As part of their assessment of the North of Irlam Station site, they have factored in the £18,521,130 increased build costs identified above relating to ground treatment for 800 houses. Having regard to all costs of development (including policy costs, such as the provision of 25% on-site affordable housing) and revenue the scheme will generate, they conclude that the development would be viable.

## Appendix 1 – Detailed breakdown of costs

### 200 high density houses closest to the station

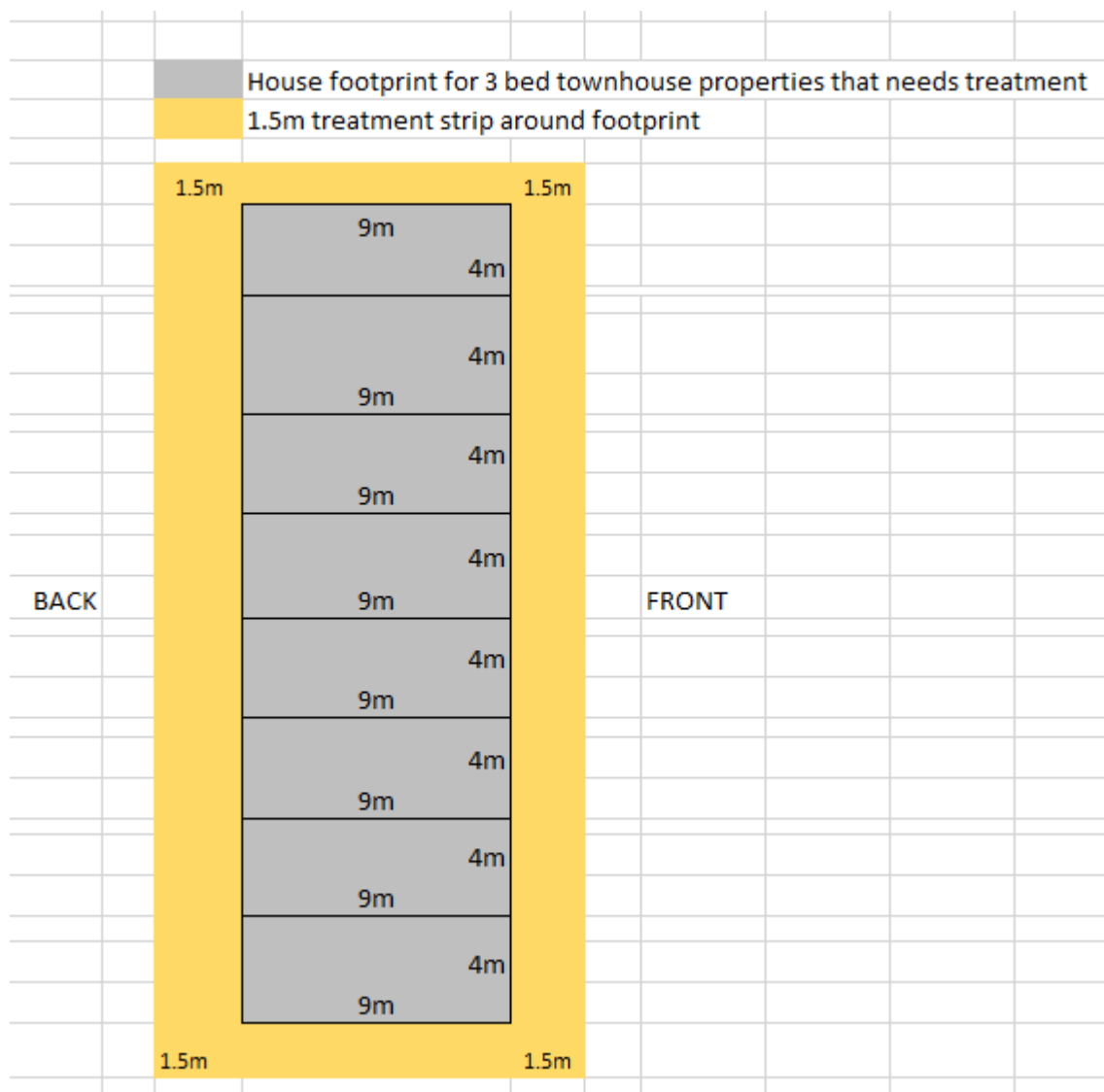
It was assumed that 200 high density houses will be located around Irlam Station. These houses are in the form of three storey, 3 bedrooms townhouses, with roof terraces potentially forming part of the top floor, and a small garden to the rear. These are at a density of around 70 dwellings per hectare.

The townhouses will be provided in blocks of 8 properties (so 25 blocks of townhouses across the site). It is recognised that some dwellings on this site may have a different number of bedrooms and the design will vary. However, for the purposes of this high level assessment it is considered to represent an appropriate average. An example floorplan is shown below.



Taking into account the above floorplan it is assumed that each townhouse has a footprint of 36sqm (4m x 9m). This footprint requires treatment as a result of the ground conditions. In addition, it was assumed that a further 1.5m wide strip of land around the perimeter of each townhouse block needs treatment.

The diagram below (not to scale) shows, in a simple manner, the area of land that requires treatment for each block of townhouses.



Having regard to the above, the area of land that requires treatment associated with each block of townhouses (the house footprint plus a 1.5m wide treatment strip around the perimeter) is calculated as follows:

- Total width = 35m (1.5m + 4m + 4m + 4m + 4m + 4m + 4m + 4m + 4m + 1.5m)
- Total depth = 12m (1.5m + 9m + 1.5m)
- Total footprint = 420 sqm (35m x 12m)

Given that there are 25 townhouse blocks the total footprint of them plus the treatment strip is 10,500sqm (420sqm x 25).

Multiplying the total footprint that needs treatment (10,500sqm) by an assumed cost of £160 per sqm, results in a total estimated cost of £1,680,000 for dealing with ground conditions related to the construction of 200 high density houses.

No allowance has been made for ground treatment for the rear gardens associated with the proposed townhouses. Such an allowance is not generally required as the garden will simply be a layer of topsoil that is mixed on top of the existing turf

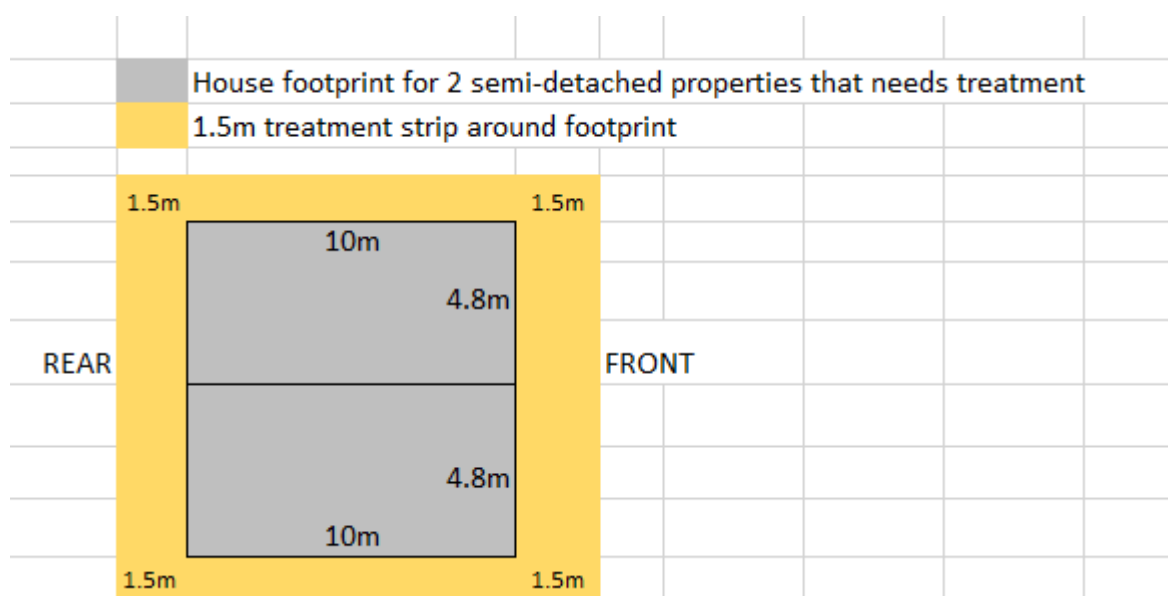
material. Although there may be some slight settlement over time, as it relates only to a garden area this is considered to be acceptable.

### 600 houses elsewhere on the site

It was assumed for the purposes of this report that all 600 houses within the development are in the form of three bedroom semi-detached properties. These are at a density of around 35 dwellings per hectare. It is recognised that some dwellings on the site will have a different number of bedrooms and the house type may also vary (e.g. some town houses, detached properties etc). However, for the purposes of this high level assessment it is considered to represent an appropriate average.

It was further assumed that each typical 3 bed semi-detached house has an internal floorspace of 96sqm, which is typical of that being built by volume housebuilders<sup>3</sup>. Given that each of these houses are 2 storeys in height, the footprint of each house is 48sqm. This footprint requires treatment as a result of the ground conditions. In addition, it was advised by Deep Soil Mixing that a further 1.5m wide strip of land around the perimeter of each pair of semi-detached houses needs treatment.

The diagram below (not to scale) shows, in a simple manner, the area of land that requires treatment for each pair of semi-detached houses.



Having regard to the above, the area of land that requires treatment associated with each pair of semi-detached properties (the house footprint plus a 1.5m wide treatment strip around the perimeter) is calculated as follows:

- Total width = 12.6m (1.5m + 4.8m + 4.8m + 1.5m)
- Total depth = 13m (1.5m + 10m + 1.5m)
- Total footprint = 164 sqm (12.6m x 13m)

<sup>3</sup> This floorspace is broadly consistent with the overall average floorspace assumptions made by Three Dragons for houses within their overall viability assessment for the site.



It can be seen above that the total footprint for each pair of houses that needs treatment is 164sqm. Dividing this by two gives a footprint of 82sqm per house.

The total footprint of houses on the development that needs treating is therefore estimated to be 49,200sqm (i.e. 600 x 82sqm). Applying an assumed treatment cost of £160 per sqm results in an overall estimated cost of £7,872,000.

No allowance has been made for ground treatment for the gardens associated with the proposed houses. Such an allowance is not generally required as the garden will simply be a layer of topsoil that is mixed on top of the existing turfy material. Although there may be some slight settlement over time, as it relates only to a garden area this is considered to be acceptable.

### **School building**

A footprint of 1,504 sqm has been assumed with this based on a 420 place two form entry primary school, and a 26 place nursery. This is based on the floorspace of the school and a 1.5m treatment strip around it. The floorspace of the school building itself is derived from a baseline design for a two storey primary school as published by the Education and Skills Funding Agency<sup>4</sup>. Applying an assumed cost of £160 per sqm to the 1,504sqm footprint requiring treatment results in an estimated cost of £240,640.

### **Hard play area associated with school**

An area of 37mx26m was assumed which totals 962 sqm in area. This area is considered to be an appropriately sized hard play area for a two-form entry primary school. The rate for ground improvement under school hard play areas is assumed to be £90 per sqm which gives a total estimated treatment cost of £86,580.

### **Soft play area associated with school**

The soft play area for the school has been assumed to be the size of a standard football pitch, which is 105m by 68m. Adding in a 2m border to this area (to allow for a reasonably stable side section for any spectators) equates to an area requiring treatment of 7,848sqm (109m x 72m). The assumed rate for ground improvement under soft play areas associated with a school is £70 per sqm which gives an estimated total treatment cost of £549,360.

### **Driveways / parking**

Taking into account a typical size car (4.5m x 2m), an average driveway has been assumed to be 6.75m x 6m, which equates to an area of 40.5sqm per house. Applying this to the total 800 houses results in a footprint of 32,400sqm requiring treatment. The cost for treatment is assumed to be £90 per sqm; applying this to the 32,400sqm footprint results in an estimated cost of £2,916,000.

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<sup>4</sup> Education and Skills Funding Agency (11 March 2014) Baseline design for 420 place primary school with 26 place nursery (62 and 55 metre classrooms)

An additional allowance for 21 car parking spaces has been made relating to the school (for teachers/staff/visitors). Assuming that each space takes up 23sqm (including circulation space) results in a floorspace of 483sqm. The cost for treatment is assumed to be £90 per sqm; applying this to the 483sqm footprint results in an estimated cost of £43,470.

Taking all of the above into account, the cost associated with treatment for driveways and parking is estimated to be £2,959,470 (32,883sqm x £90).

### Footpaths

Taking into account standard footpath widths, an allowance of:

- 18,976sqm has been used for footpaths to all houses/apartments
- 216sqm for footpaths surrounding the school
- 540sqm for footpaths either side of the road to the school.

The total footprint of pavements is therefore 19,732sqm. Applying an assumed cost of £90 per sqm to the floorspace results in an estimated treatment cost of £1,775,880.

### Roads

It has been assumed that roads within the site will be 5.5m in width. The roads will cover a distance of 4.36km, with 4.26km of roads to service the houses (at circa. 5.32m of road per house), and 0.1km for the school access road. The footprint for roads is therefore 23,980sqm (5.5m x 4.36km).

The rate for ground improvement under roads is assumed to be £140 per sqm; applying this to the floorspace of 23,980sqm results in an estimated cost of £3,357,200.

### Summary

The table below sets out the different elements of build, the associate footprint, the cost per square metre for treatment, and the overall estimate costs of treating the ground conditions on the site. This is for 800 dwellings and associated school, roads etc.

Element of build	Total area requiring treatment (sqm)	Treatment rate per sqm	Total cost
High density houses	10,500	£160	£1,680,000
Other houses	49,200	£160	£7,872,000
School building	1,504	£160	£240,640
Hard play associated with school building	962	£90	£86,580

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Soft play associated with school building	7,848	£70	£549,360
Driveways / parking	32,883	£90	£2,959,470
Footpaths	19,732	£90	£1,775,880
Roads	23,980	£140	£3,357,200
<b>Total</b>	<b>146,609</b>		<b>£18,521,130</b>