Strategic Stone Study
A Building Stone Atlas of Surrey

Published October 2020
Waverley Abbey, the first Cistercian abbey in England, founded in 1128 is built of several local stone types including Chalk, Ironstone (Carstone), Quaternary Flint and Bargate Stone.

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Introduction

The geology of Surrey comprises sedimentary strata laid down during the Cretaceous, Palaeogene-Neogene (Tertiary) and Quaternary periods of geological time. The succession becomes younger as one travels north-westwards across the county.

The oldest exposed strata, represented by sandstones, siltstones and mudstones assigned to the Lower Cretaceous Tunbridge Wells Sandstone, Wadhurst Clay and Ashdown formations, occur in the far south-eastern corner of Surrey between Shipley Bridge, Lingfield, Felbridge and Dormansland. To the north, and stretching right across southern Surrey between Haslemere and the county border with Kent (encompassing the towns of Cranleigh, Ewhurst, Coldharbour, Capel, Chalwood, Earlswood and Horley), lies the outcrop of the Weald Clay Formation. This comprises mainly mudstones with subordinate siltstones, shelly limestones (the ‘Paludina Limestones’) and occasional clay-ironstones.

Stratigraphically overlying the Weald Clay Formation, and extending in a broad, west-east trending belt throughout central Surrey, is a succession of calcareous and glauconitic sandstones (greensands), ironstones, mudstones and limestones assigned to the Lower Greensand and Selborne groups. These are in turn overlain by an Upper Cretaceous sequence of impure chalks and chalk with flints belonging to the Grey Chalk with flints and the Middle Chalk. These formations are in turn overlain by an Upper Cretaceous sequence of the Grey Chalk and White Chalk subgroups respectively. North of a line stretching approximately from Farnham via Guildford and Leatherhead to Epsom, the north-western part of Surrey comprises Palaeogene to Quaternary aged rocks and sediments; these are assigned to the Lambeth, Thames and Bracklesham groups. In the northern part of the county, principally in the area encompassing Stanwell, Egham, Walton-on-Thames, Woking and Esher, these sediments are largely concealed by a variety of essentially unconsolidated river terrace and alluvial deposits laid down during Pleistocene and Holocene times.

The Lower Cretaceous succession has been an important source of indigenous building stone in Surrey. The yellow-brown sandstones from the Lower Greensand Group were quarried for local use around Godalming, at Hurtmore (working material known as Bargate Stone), and also at Witley and Hurtwood. Bargate Stone is one of the most widely employed building stones within Surrey. Dark, purplish-black Ironstone (Carstone) occurring within the Folkestone Formation were also a former source of local building stone around Farnham. Ironstone has been used for various building purposes since at least the Iron Age. The last remaining quarry in the Lower Greensand Group producing sandstone for building purposes was located at Hurtwood (Pitch Hill), near Cranleigh, and is now closed. At Russ Hill and Charlwood, on the southern boundary of the county near Gatwick, Lower Cretaceous limestones from the Weald Clay Formation (known as Bethersden Marble or Charlwood Stone) were worked. However, these were mainly employed for internal decorative use.

Some of the most important building stone quarries in Surrey were formerly those in the Reigate-Gatton-Chaldon area. These produced a distinctive siliceous sandstone from the Upper Greensand Formation known as Reigate Stone (also called Merstham Stone and Gatton Stone). The Upper Cretaceous Chalk succession has yielded a small amount of flint for local building purposes and younger superficial deposits were often widely exploited for Sarsen Stone, Quaternary Flint and Chert pebbles and cobbles. There are no building stone quarries currently operating or consented in Surrey.

As a county, Surrey has a complex administrative history. In 1888, nearly 26,000 acres of Surrey were transferred to the County of London, including Rotherhithe, Southwark, Lambeth, Battersea and Putney. In 1965, the boroughs of Richmond, Barnes, Kingston, Wimbledon, Merton, Mitcham, Sutton, Carshalton and Croydon were incorporated into Greater London. Consequently, approximately one-fifth of the historic county of Surrey now lies within Greater London. A small area of the east of the county once belonging to the parishes of Charlwood and Horley (incorporating Gatwick Airport) was lost to West Sussex in the early 1970s.

Building stones in this Atlas are treated as either ‘Indigenous’ or ‘Imported’ and are described in stratigraphic order. To assist the reader in navigating around the Atlas, entries in the Stratigraphic Table and the corresponding descriptions are interactively linked (by means of small coloured triangles located in the upper right-hand corner of the relevant pages).

The section of this Atlas summarising the use of stone in Surrey is based on the relevant National Character Areas (NCAs), the boundaries of which are very relevant to the vernacular built heritage. They are defined by a combination of local landscape character, history, cultural and economic activity, geodiversity and biodiversity (https://gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making).

Parts of eight NCAs fall within the modern administrative County of Surrey:

- NCA 114 Thames Basin Lowlands
- NCA 115 Thames Valley
- NCA 119 North Downs
- NCA 120 Wealden Greensand
- NCA 121 Low Weald
- NCA 122 High Weald
- NCA 129 Thames Basin Heaths
- NCA 130 Hampshire Downs
BUILDING STONE SOURCES

THAMES GROUP - (INCLUDING LONDON CLAY FORMATION) GRAVEL, SAND, SILT AND CLAY
LAMBETH GROUP - CLAY, SILT AND SAND
BRACKLESHAM GROUP - SAND, SILT AND CLAY
LAMBETH GROUP - SAND, SILT AND CLAY
LAMBETH GROUP - CLAY, SILT AND SAND
UPPER TUNBRIDGE WELLS SAND - MUDSTONE AND SANDSTONE
LOWER TUNBRIDGE WELLS SAND - MUDSTONE AND SANDSTONE
ARDINGLEY SANDSTONE MEMBER - SANDSTONE
THANET FORMATION - SAND
UPPER GREENSAND FORMATION - CALCAREOUS SANDSTONE
Gault Formation - Mudstone
Folkestone Formation - Sandstone
Folkestone Formation - Sandstone
HYTHE FORMATION - SANDSTONE AND LIMESTONE
Atherfield Clay Formation - Mudstone
Weald Clay Formation - Clay, Ironstone, Limestone, Sandstone and Mudstone
Upper Tunbridge Wells Sand - Mudstone and Sandstone
Lower Tunbridge Wells Sand - Mudstone and Sandstone
Ardingley Sandstone Member - Sandstone
Byfleet Clay Formation - Mudstone
Ashdown Formation - Sandstone and Siltstone
BUILDING STONE SOURCES

ALLUVIUM - CLAY, SILT, SAND, GRAVEL AND PEAT
RIVER TERRACE DEPOSITS - CLAY, SILT, SAND, AND GRAVEL
HEAD - CLAY, SILT, SAND AND GRAVEL
PEAT - PEAT
CLAY-WITH-FLINTS FORMATION - CLAY, SILT, SAND AND GRAVEL
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| QUATERNARY       | Great Britain Superficial Deposits     | Variously subdivided                | • Quaternary Flint (Field Flint, River Terrace Gravel Flint)  
|                  | Supergroup                             |                                     | • Chert pebbles and cobbles                          |
|                  |                                        |                                     | • Sarsen Stone (Greywethers, Silcrete)               |
|                  |                                        |                                     | • Ironpan Conglomerate (Conglomerate, Puddingstone, Ferricrete) |
| NEOGENE          |                                        |                                     |                                                      |
|                  | Bracklesham Group                      | Camberley Sand Formation            | • Chalk                                              |
|                  |                                        | Windlesham Formation               | • Quarry Flint (Fresh Flint)                         |
|                  |                                        | Bagshot Formation                  |                                                      |
|                  | Thames Group                           | London Clay Formation              |                                                      |
|                  | Lambeth Group                          | ‘Woolwich and Reading Beds’         |                                                      |
|                  | Montrose Group                         | Thanet Formation                   |                                                      |
| PALAEOGENE       |                                        |                                     |                                                      |
| (Eocene -       |                                        |                                     |                                                      |
| Palaeocene)      |                                        |                                     |                                                      |
|                  | Bracklesham Group                      |                                     |                                                      |
|                  |                                        |                                     |                                                      |
|                  | Thames Group                           |                                     |                                                      |
|                  |                                        |                                     |                                                      |
|                  | Montrose Group                         |                                     |                                                      |
| Upper            | Chalk Group                            | ‘Upper Chalk’ and ‘Middle Chalk’    | • Chalk                                              |
| Cretaceous       |                                        | ‘Lower Chalk’                       | • Quarry Flint (Fresh Flint)                         |
|                  |                                        |                                     |                                                      |
|                  | Selborne Group                         | Upper Greensand Formation           | • Upper Greensand Sandstone                          |
|                  |                                        |                                     | • Reigate Stone (Merstham Stone, Gatton Stone)        |
|                  |                                        | Gault Formation                     |                                                      |
|                  | Lower Greensand Group                  | Folkestone Formation                | • Ironstone (Carstone)                               |
|                  |                                        | Sandgate Formation                  | • Bargate Stone (Bargate Sandstone)                   |
|                  |                                        | Hythe Formation                     | • Holmbury Hill Sandstone (Leith Hill Stone, Hurtwood Stone) |
|                  |                                        | Atherfield Clay Formation           |                                                      |
| Lower            | Wealden Group                          | Weald Clay Formation                | • Sussex Marble (Paludina Limestone, Periwinkle Stone, Bethersden Marble, Charlwood Stone) |
| Cretaceous       |                                        | Tunbridge Wells Sand Formation      | • Wealden Sandstone                                  |
|                  |                                        | Wadhurst Clay and Ashdown formations | • Tunbridge Wells Sandstone                          |
|                  |                                        |                                     | • Ardingly Sandstone                                 |

Table 1. Summary (Interactive) of stratigraphical and building stone names applied to sediments, superficial deposits and sedimentary rocks in Surrey.
The use of stone in Surrey’s buildings

Background and historical context

Surrey has 6590 listed buildings (105 Grade 1 and 322 Grade II*). They range from graveyard monuments and garden walls to the post-modernist Legal and General House, Tadworth (1986-1991). There are 200 Conservation Areas in the county.

Surrey was and remains well wooded. The poor quality of much of its soils, the heathlands in the north west, the Chalk scarp of the North Downs and the dense woodland of the Downs dip slope and of the Weald, restricted agricultural production. Substantial parts of the county were economically impoverished. Throughout the Medieval and post-Medieval periods vernacular buildings were predominantly timber framed. An extensive brick and tile industry developed from the C16th, with the materials coming to dominate vernacular construction. However, the county had significant building stone resources, though they were not of particularly good quality. In the north west local Quaternary Flint, Chert pebbles and cobbles, Ironpan Conglomerate and Sarsen Stone were frequently used in Medieval churches. Chalk from the North Downs was quarried in many locations but was usually used for marl for agricultural improvement. It was also employed internally in Medieval churches close to the sources and occasionally further afield, such as at Stoke D’Abernon, Wisley and Godalming. Chalk was occasionally used externally for dressings, such as at Waverley Abbey and Loseley; it is also is found in the base to the C11th keep at Guildford Castle.

Flint was used from the Roman period onwards. Field, Quarry and River Terrace Flint were used depending on availability. Flint was used as facing to at least 2/3rds of Surrey’s Medieval churches, particularly north of the chalk ridge of the Downs. In the C19th it was favoured for refacing, and in the construction of extensions and new churches in the area. Most surviving flint domestic buildings date from the C18th-C19th, reflecting the increased availability of the material as a by-product to the chalk marl industry. Flint was used particularly in the east, close to the chalk downs, and nearly always with brick dressings.

In the Weald of the south and south east of the county considerable use was made of local Reigate Stone (locally named Merstham Stone or Gatton Stone) and Upper Greensand Sandstone. Lower Greensand Holmbury Hill Sandstone was used in the village of Holmbury St. Mary. Wealden Sandstone was used at, for example, Ewhurst, Charlwood and Outwood. Sussex Marble and Tunbridge Wells Sandstone were occasionally employed in the far south east of the county; examples of the use of Sussex Marble include The Dolphin Public House and the Church of St. Michael in Betchworth and Tigbourne Court, Hambledon.

In the south west of the county, Lower Greensand Bargate Stone was employed extensively for churches alongside some use of Ironstone (Carstone). Brick was usually used for dressings. Galleting, is often found in stone buildings of the area; Ironstone chips were often used for decoration and flint buildings were also sometimes galleted with flint chips. There was a revival in the use of Bargate Stone in the late C19th/early C20th in Arts and Crafts Movement houses in particular.

Stone, particularly Reigate Stone, was exported from the early Medieval period. It was used in the Tower of London, Westminster Palace and Abbey, Hampton Court, Old London Bridge, in what is now Southwark Cathedral and Windsor Castle. Reigate Stone is easy to work but is not durable. In church restoration it has often been replaced with harder materials such a Bath Stone. In the early C19th, large quantities of Reigate Stone were transported to London by the Surrey Iron Railway and Croydon Canal.

Until the Dissolution, religious communities had a significant influence on the landscape, the economy and on the extraction and use of building stone. There were probably ten post-Conquest monasteries in the county; the most significant were Chertsey and Waverley abbeys. Chertsey Abbey became one of
the largest and most influential monasteries in England. Waverley Abbey, Farnham was the first Cistercian abbey to be built in England. Abbeys in the area of the county now incorporated into Greater London such as Bermondsey, St. Saviour and St. Mary Overie, Southwark, and Merton Abbey, held extensive lands in Surrey. Westminster and Canterbury and Oxford and Cambridge colleges also held significant amounts of land in the county. Monastic influence reached its peak in the C14th during the tenure of Abbot Rutherwyk (1307-46) at Chertsey. The Abbey was responsible for building and rebuilding many churches, including Cranleigh, Egham, Godalming, Shere and Tatsfield, and for roads, bridges, mills, barns and granges. Several stone bridges of the period survive across the Wey including at Eashing, Elstead and Tilford Green.

There are 206 listed churches in Surrey; 64 churches were recorded in the Domesday Book. Most pre-Reformation churches were initially small and developed piecemeal over the centuries. The long history of alteration, extension, rebuilding and repair of such churches means they frequently exhibit a range of stone of different origins and periods. In most areas of the county they are the most significant stone-built structures. Some fifty Medieval towers remain.

Many Saxon churches were rebuilt after the Norman Conquest. In the latter C12th many churches were enlarged by the addition of aisles and the rebuilding of their arcades such as at Chobham and Walton-on-Thames. Several towers were added in local materials such as at Cobham and Limpsfield. Changes to religious practices and beliefs in the C14th led to the extension of several chancels such as St Mary’s Guildford and Stoke D’Abernon. Occasionally new towers were built such as at Chiddingfold, Chipstead and Wonersh.

After the Norman Conquest in 1066, those higher up the social hierarchy, built castles and manors to defend the realm and demonstrate their authority. Early castles included the royal castle of Guildford, Farnham Castle (the home of the Bishops of Winchester) and Reigate Castle (the home of the de Warren family). Much of Surrey was forest, chase or parkland. Henry II claimed the whole of the county was within Forest Law. In the C12th. The Royal Forest of Windsor extended across 17 parishes in the north west, including Chobham, Frimley, Horsell, Ottershaw, Pirbright, Pyrford and Worplesdon.

Guildford was a Saxon royal borough. By the C11th, it had developed as the main town of the west of the county. By the C12th the castle had become an important royal residence for Henry III and Edward I. The town was planned in the late C10th to early C11th. Settlements such as Godalming, Reigate, and Dorking developed during the C12th and C13th as centres for trade and markets. Like Guildford, they developed at the river gaps that run south to north through the Chalk escarpment.

During the second half of the C14th, the Black Death led to economic collapse and had a sever effect on the county’s monasteries and economy. Areas of cultivated land reverted to waste, particularly on poorer land, such as in the north west. Arable farming in areas such as the Weald dramatically contracted. Migration to towns where people could work for themselves and be independent increased significantly. The scarcity of labour in rural areas led to an increase in wages and more freedom. The Yeoman class increased in size and built many timber-framed houses.

Surrey became an important extractive and manufacturing area in the later Medieval period. Quarries around Godstone and Merstham provided stone for building. A large pottery industry made jugs, bowls and cups and smaller industries (such as glass making at Chiddingfold) all developed to mainly supply London. The Weald of Surrey, Kent and Sussex had been the main iron-producing area during the early Roman period. The industry returned to prominence in the Tudor and early-Stuart
periods. By the late C16th there were over 100 furnaces and forges in the Weald of Surrey. During the reign of Henry VIII, the Weald became the centre of an armaments industry. Eventually, the onset of the Industrial Revolution took heavy industry north to the coalfields in the early C19th.

Clothmaking was one of the staple industries of Surrey from the C13th to C17th particularly in the south west of the county around Guildford, Godalming and Farnham. However, the county did not develop the very wealthy merchant class that funded the rebuilding of churches in the C15th elsewhere in England. There are few C15th churches, the best being Lingfield. A few towers were rebuilt such as at Chobham, Farnham, Leatherhead, Reigate and West Molesey. Very few churches were built or rebuilt in the late Medieval period. A rare example is St. George’s Church, Esher (mid C16th). Nearly all post-Reformation new work was constructed in brick.

The Dissolution resulted in the fragmentation of monastic estates and their transfer to secular landowners. Most of the buildings were demolished and cannibalised for their building materials. The proximity of Surrey to London led to royalty and their courtiers building mansions in the county. Many were of brick, such as Sutton Place (1523-5). Nonsuch Palace (1538), Henry VIII’s favourite building was built with a chalk and flint ground floor with timber frame above. It was demolished in 1682-88. Loseley (1561-9) built for Sir William More, was the first house in the county with the ‘H’- or ‘E’-shaped plan that became characteristic of the period. Stone from Chertsey Abbey was re-employed in Hampton Court and Bargate Stone from Waverley Abbey was re-used in Loseley.

Competing demands for timber for iron and glass making and shipbuilding led to a scarcity in early C17th. Stone became more extensively used for building where it was locally available. Timber frame had become obsolete by the end of the C17th, largely replaced by brick. At end of the C18th, imported Baltic softwood was used to build light framed house and other buildings clad in weatherboard, or occasionally lath and plaster.

London continued to grow during the C18 and its demands on Surrey for food and other supplies continued. Before the end of the C18th threshing barns were often the only farm building. Most Surrey barns date from the C17th and C18th. Only about 1% of Surrey Barns are constructed of stone. The materials used included Bargate Stone, Greensand sandstone, Quarry Flint and Quaternary Flint. In the Weald, Horsham Stone-slab was occasionally used. Post-C18th, with improvements in the transportation network, Welsh Slate started to be used on farm buildings.
Until the late C18th the road network of the county was very poor. The increased demand by London for goods made in Surrey necessitated the development of better methods of transport. One of the country’s first canal systems, the Wey Navigation, opened in 1653, the Godalming navigation in 1760, and the Basingstoke Canal from 1788 provided access to London via the Thames. From 1685, the Turnpike Trust competed to improve roads between London, the major towns and the south coast so that by 1820 a virtually new road system had been created. Partly as a result of this road system, in the late C17th and early C18th Surrey began to attract fashionable society members looking for places of retreat. The Romantic and Picturesque movements valued Surrey’s scenery. The Landscapes of many estates were extensively redesigned in parks, gardens and arboretum and across farmland. The North Downs acquired a reputation as a health resort. Epsom became one of the first spa towns in England in 1711.

The Grand Surrey Iron Railway, the first public railway in the country, opened in 1803 from Croydon to the Thames at Wandsworth. In 1805 it was extended by the Croydon, Merstham and Godstone Railway over the North Downs. The railway transported Reigate Stone, Chalk and lime from Jolliffe and Banks’s quarries at Merstham for use in London.

From the 1840s, the establishment of a network of railways across the county (serving the south coast ports and resorts, Exeter and the west country) and the linking of freight routes (around the west of London to railways serving the north of England), enabled the importation of an increasing range of building stones and slates. The construction of a suburban railway network facilitated the development of commuting and the rapid expansion of London across much of the north and north east of the historic county.

The rapid population increase due to the expansion of London in the C19th led to the need for many new churches. In 1826 there were 155 churches and 19 chapels in the current Surrey area; by 1965 there were 263. Most were constructed prior to 1870. New parishes were created such as St Paul’s, Addlestone. Nearly all Surrey’s Medieval churches were restored, and many were enlarged. Many significant Victoria architects were responsible for restoring, rebuilding and constructing new churches including W. Burgess, A.W. Pugin, H. Woodyear, G.G. Scott, G.E. Street and J. L. Pearson. A wide range of stones were used including Bath Stone and Kentish Rag, along with various sandstones, marbles and Serpentine.

In the C19th, religious worship was starting to become more varied in Surrey, with an increasing mix of different cultures and faiths. The oldest mosque in Britain, the Shah Jahan Mosque in Woking was opened in 1889. It is constructed of dressed, uncoursed Bargate Stone with Bath Stone dressings.

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Few churches were built in the C20th. At St Martin’s, Pixham, Dorking (1903) Lutyens used Chalk with tiles and sandstone patterning. W. D. Caroe did much work in the north west of the county including St Paul’s, Camberley, St Mary of Bethany, Woking and St John the Baptist at West Byfleet (1909). St Mary’s Church at Burgh Heath (1909) was built in flint chequerwork. In the 1930s a stone west tower was added to Woldingham by Sir Herbert Baker with East Anglian style flint flushwork. The county’s most significant new religious building, Guildford Cathedral (1933-1961), was built in brick.

The improvements in transportation throughout the C19th largely brought Surrey’s farming role to an end. Existing towns like Guildford and Farnham grew rapidly and new towns were created such as Redhill and Woking. Settlements of the north and east of the county becoming subsumed into Greater London. Particularly in the south west of the county, easy rail access to London led to the area being attractive to wealthy businessmen. Numbers of large and medium sized late C19th houses were built in and near settlements such as Haslemere, Hindhead, Godalming, Cranleigh, Ewhurst, Puttenham, Guildford, Abinger and Holmbury St Mary. The style became highly influential across the country and in Europe and the USA. Surrey probably has more houses of the period than any other English county.

Architects favoured the use of local materials, particularly Bargate Stone that was readily available from the Godalming area and Horsham Stone-slab for roofing (although the latter was already in short supply by this period, and it was stripped off vernacular buildings to roof these architect-designed country houses). Architects often delighted in the use of stone patterning and ornamentation. Lutyens designed a wide range of buildings most famously the ‘Orchards’, ‘Ruckmans’, ‘Tigbourne Court’ and ‘Munstead Wood’. He forged a partnership with the gardener, Gertrude Jekyll who would lay out the gardens which complimented the houses using a similar range of materials. A significant number of architects also built in the area including R.N. Shaw, H. Ballie Scott, C. Harrison Townsend, A. Powell, E. Newton, Thackeray Turner, C. Voysey and P. Webb along with many other lesser known practitioners.

Surrey Style

In the late C19th, Surrey was briefly at the forefront of European architectural design. The architecture of the Arts and Craft Movement was heavily influenced by the vernacular of Surrey and the materials it used. Surrey-born architects such as Edwin Lutyens developed their early architectural practice, particularly in the west of the county. Here easy access by rail to Westminster and the City of London led to the area being colonised by businessmen intent on playing to role of ‘country gent’. Numbers of large and medium sized late C19th houses were built in and near settlements such as Haslemere, Hindhead, Godalming, Cranleigh, Ewhurst, Puttenham, Guildford, Abinger and Holmbury St Mary. The style became highly influential across the country and in Europe and the USA. Surrey probably has more houses of the period than any other English county.

Movement, occasionally other building forms were commissioned. Wycliffe Buildings, Portsmouth Road, Guildford (1894) by H. Thackery-Turner, is a rare example of a complex of Arts and Crafts Movement residential flats. They are built of coursed and snecked Bargate Stone.
Thames Basin Lowlands

The National Character Area (NCA) forms a low-lying plain within the London Basin. It stretches from the London suburbs of South Norwood in the east to Hale on the Surrey/Hampshire border in the west. The Thames Basin Heaths NCA lies to the north, the North Downs to the south, Greater London to the north and the North Kent Plain to the east.

To the north-east, the NCA incorporates parts of Greater London and its outer suburbs such as Epsom, Ewell and Esher. Further south and west the settlements of Hale, Weybourn, Guildford (north), Ash, Leatherhead, Stoke D’Abernon, Cobham and Chobham lie within the Area.

In the north east, the NCA is well wooded with areas of wood pasture common such as Ashtead Common. C20th suburban development is extensive. To the south west, it supports a small-scale farmed landscape dissected by the meandering river valleys of the Wey and Mole. The Royal Forest of Windsor extended to Chobham. Much of the area was owned by Abbeys such as Chertsey and Westminster. The area became densely settled in the Medieval period with a varied settlement pattern of isolated farmsteads and houses, hamlets and small villages. Hunting forest and estate parks with grand houses were established, including Henry VIII’s Nonsuch Palace, Ewell.

Timber-frame was the dominant form of construction for vernacular houses in the Medieval period. Local flint was used extensively in Medieval churches. Dressings were often originally of Chalk, but they have frequently been replaced following their deterioration with a variety of imported limestones. In churches, particularly in the north west of the area, other materials were sometimes used including Ironpan Conglomerates (such as All Saints Church, Ockham and St George’s Church, Esher) and Ironstone in the C15th tower at St Andrew’s Church, Cobham (shows one of the most northerly uses of Horsham Stone-slate slabs for roofing in the county).

Most of the area’s churches were heavily restored and altered or rebuilt in the C19th. Flint was often used to reface the buildings. The Church of St. Mary, Stoke D’Abernon is one of the very few seignorial churches to have survived from the Saxon period; the south wall dates from the C7th. It is constructed largely of flint but was extensively restored in the C19th and partly refaced in flint and a mix of other materials including Chalk, Ironpan Conglomerate and various sandstones. The Church of St. Mary and St. Nicholas, Leatherhead (C12-13th) is built largely of Quaternary Flint with dressings of Rockingham Forest Lincolnshire Limestone. It was refaced in the C19th and the north transept has a Horsham Stone-slate roof.

From the C16th, the area became a popular recreational area and retreat from London. Epsom became one of the first spa towns in England in 1711. County houses, generally built of brick, and landscaped parks were constructed, such as those at Claremont at Esher. At East Horsley, the Earl of Lovelace refaced Horsley Towers (originally designed by Charles Barry in 1820-29) in flint and brick and built sizeable extensions in flint rubble and brick, including cloisters, a chapel and large tower between 1847 and 1860. Many cottages, houses and farms on the estate and in East Horsley village were built in flint and brick. A series of 15 flint and brick bridges were constructed to facilitate riding through the woods and the extraction of timber on his estate.

During the C18th, villages such as Cobham, Esher, Ripley and Send grew up along what is now the A3, providing stopping points for coaches as they travelled between London and Portsmouth. The development of the railway network in the C19th encouraged commuting to London. The pricing strategy of the railway company favoured the development of commuting by the managerial classes rather than the working class.
Many larger detached and semi-detached town and suburban houses were built. In Guildford for example, Bargate Stone was often used for such buildings. Railway electrification in the 1920s encouraged further development of estates of large detached houses, particularly around settlements such as Esher, Cobham, Guildford, Oxshott and Leatherhead. The construction of the M25 in the late 20th century has led to continuing development pressure.

Guildford

Guildford straddles the boundary between the Thames Basin Lowlands NCA and the North Downs NCA. The town originated in the early Saxon period, located at a gap in the North Downs where a crossing point over the River Wey became established. Its central position between London and the naval port of Portsmouth ensured its prosperity. It became the county town of Surrey. The castle was established in the late 11th or early 12th century, with a shell keep of Bargate Stone brought by river from quarries near Godalming. Circa 1130 a tower keep was added, again largely of Bargate Stone with a chalk plinth, Upper Greensand Sandstone quoins and some dressings. The keep has been much repaired with Quaternary Flint and Quarry Flint and other materials including tile, Bargate Stone, Upper Greensand Sandstone and Ironstone.

St. Mary the Virgin is the oldest church in Guildford and dates from circa 1040. It is largely built of flint and chalk with chalk dressings and interior. Some of the window dressings have been replaced in Forest Marble and Bath Stone. The tower parapet was repaired in Bargate Stone in the 19th. The church path is surfaced in Ironstone cobbles.

By the 17th century, Guildford boasted both a grammar school (1557, built of brick with flint panels and Chalk dressings to the rear wings) and George Abbot’s Hospital (1619, built of brick with Bath Stone and Portland Stone dressings and some Sussex Marble paving). The construction of the Wey Navigation canal in the 17th allowed boats to bring materials to Guildford. In the 19th the arrival of the railway resulted in significant growth in the town.

There was a resurgence in the use of local stone in the 19th and several new churches were built. St Nicholas and Christchurch are constructed of Bargate Stone, with imported dressings including Bath Stone. Larger houses in the east of the town often used Bargate Stone in their construction. Wycliffe Buildings to the west of the Wey are one of the few examples of an Arts and Crafts Movement block of flats in the UK; they are built from coursed and snecked Bargate Stone. C18th to early...
C20th commercial and civic buildings in the High Street often made use of imported stone such as Portland Stone. Tunsgeat Arch (1818) and the National Westminster Bank (C18-20th) exhibit Portland Stone. Ancaster Stone and Mansfield Red Sandstone are evident at 133-135 High Street (C19th). Millstone Grit was used for the abutments to the Town Bridge (1902). The use of granodiorite paving cobbles from Mountsorrel, Leicestershire and granites from Devon and Cornwall, along with variously sourced limestones, is also common.

**Thames Valley**

A small area of the Thames Valley NCA falls within north west Surrey. It includes the settlements of Staines, Sunbury, Shepperton, Littleton and Laleham to the north bank of the river and Walton on Thames, Thames Ditton, East and West Molesey to the south bank. Former areas of Surrey that now form part of Greater London such as Kingston upon Thames, Richmond and Kew lie within the NCA.

The Thames has always formed an important transport route and played a significant part in the country’s history. In the Roman period it was bridged at Pontes (Staines) in 43AD. The town lay on the main road between Londinium (London) and the west via Calleva Atrebatum (Silchester). The fifth and current bridge, constructed in granite by George Rennie, opened in 1832. A little upstream Magna Carta was sealed Runnymede in 1215.

In the Medieval period, the Thames was much modified to allow easier navigation, causing the tide to extend much further upstream than was natural. The river was tidal as far as Staines before Teddington Lock was built (1810–12). The rich soils of the flood plain supported thriving agriculture and considerable settlement. Medieval churches of the area were built of a variety of local materials. St Mary Magdalene Littleton, Shepperton (C12th-C18th) is constructed of Chalk, Ironpan Conglomerate with a brick tower and clerestory. St Mary’s Walton on Thames (C12th-C13th), has a tower of circa 1450 of flint, chalk and Ironpan Conglomerate with various sandstones and limestones. The Church of St. Nicholas at Shepperton is a rare example of a church rebuilt in the C17th; it is constructed largely of flint rubble with sandstone and flint chequerwork in the south wall. The tower was built of brick in 1710.

Following the construction of Richmond Palace and Hampton Court Palace in the C16th, many aristocratic families constructed great houses along the river. The trend continued through the C18th and early C19th. In the C18th, the area attracted the most influential thinkers, poets, artists and landscape designers of the day. The river and other parts of the area became foci for development with villas, ornamental parks and residential development. Many mansions were created such as Ashley Park (1605), Walton on Thames (now demolished), Sunbury Court (early C18th) and Laleham Abbey (1803-06). Most were built of brick.

Railways came to the area in the 1840s. The LSWR’s Windsor branch, passing through Staines from Richmond was opened in 1846 and Chertsey and Hampton Court were reached in 1849. The Staines line was extended to Wokingham in 1856. The Shepperton branch from Strawberry Hill via Sunbury opened in 1864. Development took place rapidly with the historic villages becoming enveloped in new housing, nearly all built of brick. Large areas of the flood plain were built on. Heathrow Airport developed just to the north of the NCA.

Gravels have been extracted from the flood plain since the middle ages. Extensive extraction is continuing today. A substantial number of reservoirs were built to serve London from the 1850s with construction continuing into the C20th with the Staines Reservoirs (1901), Queen Elizabeth II Reservoir, Molesey (1962) and Queen Mother Reservoir, (Staines (1976).
North Downs

The North Downs form a long Chalk escarpment extending from the Hog’s Back in Surrey to the White Cliffs of Dover. The steep-sided escarpment faces south with the extensively wooded dip-slope, with areas of heathland, extending northwards from the escarpment. The Thames Basin Lowlands NCA lies to the north and the Wealden Greensand NCA to the south. A small part of the Hampshire Downs NCA lies to the far west.

There area is generally sparsely populated. To the west the settlement pattern is characterised by small, nucleated villages such as Puttenham, Seale and Wanborough located on the spring line at the base of the escarpment and scattered farmsteads on the dip slope. The rivers Wey and Mole drain through valleys dissecting the downs from the Wealden Greensand in the south to the Thames in the north. Major settlements such as Guildford, Dorking and Leatherhead developed at the openings to the gaps but, except for Guildford, largely lie outside the NCA. Small settlements such as Westhumble and Mickleham lie on the valley sides of the Mole gap. To the east C19th and C20th suburban development has been extensive. Downland villages such as Walton on the Hill, Tadworth and Banstead have merged into an urban sprawl. Similarly, valley bottom settlements such as Chipstead and Coulsdon (Greater London) and Caterham and Worlingham have expanded dramatically. In the far east the hilltop villages of Woldingham and Tatsfield retain more of their rural character.

Timber-framing was the traditional building form with thatch for roofing, although thatch has largely been replaced by plain clay tiles from the Weald. Flint, Chalk, brick, timber and tiles were also used. Wealden bricks were widely used from the later C17th, sometimes for dressings and quoins to flint structures.

Chalk has been dug out of the downs from small quarries, pits and shafts for at least 2,000 years, principally to improve clay lands, making them easier to plough. The Industrial Revolution and construction of railways led to ‘industrial scale’ Chalk quarrying, with extensive quarries near, for example, Betchworth and Oxted. Use was made of Chalk in Mediaeval churches close to the escarpment. St Lawrence, Caterham (C11th-C12th) is built of Chalk rubble with some ashlar and Chalk dressings with a brick east wall rebuilt 1790. At Seale, to the far west of the NCA, various C18th – C19th buildings in the village are built of Chalk with Bargate Stone and Ironstone. The village’s church, St. Lawrence, was entirely largely rebuilt in 1861-73 by J Croft in Chalk and Upper Greensand Sandstone with a central tower in Bargate Stone.

Between Brockham in the west and Godstone in the east, Reigate Stone was extensively mined and quarried from the Upper Greensand outcrop that passes through the parishes of Betchworth, Buckland, Reigate, Gatton, Merstham, Chaldon, and Bletchingley. Over forty entrances to underground Reigate Stone quarries have been identified. There are over 16 km of underground tunnels. The stone was widely exported in the Medieval period. Some use of the stone was made in many Surrey churches across the Weald, on the North Downs and beyond. St Katherine, Merstham (C13th) is of Reigate Stone (Merstham Stone) with some Chalk; it has Horsham Stone-slate roofs. The Church of St. Mary the Virgin, Warlingham (C13th) was heavily restored in the C19th in flint with Reigate Stone dressings.

On the dip slope and in the valleys, flint was more frequently used. The Church of St. Michael and All Angels, Mickleham (C12th restored and enlarged 1871 and 1891 by Christian), is largely of flint with some chalk. Unusually, the Norbury chapel has flint flushwork and chequerwork with Reigate Stone.
The use of flint for facing became popular in the C19th for new and restored churches. The nave of St. Mary the Virgin's Church at Headley (1855) is built of coursed flint cobbles. The fine Denbies Estate Church of St. Bartholomew, Ranmore Common (1859), the associated school and rectory were all designed by Sir George Gilbert Scott for George Cubitt, the first Lord Ashcombe. The church is faced in flint cobbles with ashlar dressings and plinth. Flint and brick were used occasionally for cottages in the C18th-C19th such as at Headley, Chipstead and Coulsdon. Flint is still used in modern buildings, for example the large entrance tower and restaurant to the Denbies Wine Estate, Dorking the largest vineyard in the UK, is faced in flint and brick.

To the eastern end of the North Downs some use of sandstones was made. The Church of St. Mary the Virgin, Tatsfield, has a C11th nave built of a dark sandstone with flint; the dressings were originally Reigate Stone (which is still prevalent in the chancel interior).

The advent of the railways enabled the easier transportation of materials. The Church of St. John the Baptist at Puttenham, (1861) was re-clad in Bargate Stone by Woodyer with some Bath Stone replacing earlier Chalk dressings. The Arts and Crafts Church of the Wisdom of God, Lower Kingswood (1892) by S Barnsley is constructed of brick with Ham Stone. The interior exhibits a Roman and Byzantine influence and is richly decorated in reused Roman marbles including African and Carrara marbles. The capitals are C4th-C6th and re-used from Byzantine buildings such as the Church of St. John at Ephesus.

Wealden Greensand

The Wealden Greensand runs across Surrey parallel with and to the south of the North Downs, from the border with Kent near Oxted in the east to the Hampshire Downs NCA near Farnham in the west. The Low Weald NCA lies to its south. The area is characterised by scarp-and-dip slope topography, with outcrops of Upper Greensand, Gault Clay and Lower Greensand. The Greensand forms escarpments rising to Leith Hill the highest point in Surrey. The area remains well wooded with areas of heathland particularly in the west. The settlement pattern is dominated by dispersed farmsteads, hamlets and nucleated villages such as Puttenham, Shere, Gomshall, Haslemere, Holmbury St Mary, Betchworth, Bletchingly, Godstone, Limpsfield and Oxted. There are several market towns including Farnham, Godalming, Dorking and Reigate.

Waverley Abbey near Farnham was a significant landowner in the west of the area. There were further monastic establishments in Guildford and further east are the priorities of Reigate.
and Tandridge. In the Medieval period the area became nationally important for iron making, using local ironstone and timber for charcoal for smelting. The Tillingbourne valley became an important area for gunpowder production from the C17th. For a time, its mills were the only authorised gunpowder producer in Britain.

Timber-frame was the predominant form of vernacular construction until the introduction of brick and a shortage of timber developed in the C17th. In the west of the area, Bargate Stone was extracted near Godalming from at least the C12th. It is used in over 250 listed buildings in the county and more widely. It was the preferred stone for use in local Medieval churches, including Godalming Parish Church and St. James’s Church at Shere. Often it is found used with a range of other stone such as Ironstone, Chalk, Caen Stone and various sandstones.

In the C19th and early C20th there was a significant revival in the use of Bargate Stone for new churches such as St. Edmund King and Martyr’s Church, Godalming and St. Christopher’s Church, Haslemere. It was also used for Charterhouse School and by architects of the Arts and Crafts Movement for houses in the area. Edwin Lutyens, and garden designer, Gertrude Jekyll, made use of Bargate Stone in both houses and garden features they designed including Munstead Wood, Godalming Orchards in Bramley and Tigbourne Court. The stone continues to be used today.

Ironstone was extracted from the Lower Greensand and was particularly used around Farnham in the west and Limpsfield in the east. St. Peter’s Church, Limpsfield (C12th) is built of Ironstone and Wealden Group sandstone with Horsham Stone-slate roofs. The Church of St. Mary the Virgin, Buckland (C14th-C15th) between Dorking and Reigate, is built of rough coursed Ironstone and Bargate Stone. Ironstone was often used for galleting (particularly of Bargate Stone) in the wider area.

Reigate Stone has also been extracted in the area from the Upper Greensand Formation between Brockham and Godstone in the east. The Church of St. Mary Magdalene, Reigate (C12th-C15th) was largely built of Reigate Stone but the church was extensively refaced in Bath Stone by G.G. Scott jnr. in 1877-81 following its deterioration. Several buildings and walls in Reigate are built of the stone including Sunningdale, London Road.
Chalk was extracted from the North Downs immediately to the north of the NCA and used for agricultural improvement and lime in addition for internal mass walling. Quarries at Mickleham were worked for a more durable form of chalk which was suitable for windows and external dressings (e.g. external carved stone at Betchworth Castle). Chalk was occasionally also used as a building stone, for example with Bargate Stone, Ironstone and Caen Stone in St. James’s Church, Shere.

Christchurch, Brockham was built of Chalk in 1847 by Benjamin Ferry. The material was given by Sir Benjamin Brodie of Broome Park, Betchworth, who's estate extended to the top of Box Hill and included Betchworth and Brockham quarries. In 1883, the church needed restoration due to the perishable nature of the Chalk; much of the material was replaced by Bath Stone.

St. Andrew’s Church, Farnham is of Chalk and Greensand Sandstone with repairs to the tower and some dressings in imported red sandstone (Hollington Stone) with some Ironstone.

Flint was used particularly near to the North Downs in the C19th for buildings from cottages to churches, largely reflecting its ready availability as a by-product of the Chalk extraction and lime industry. Dorking parish church, St. Martin’s (1868-77) by Henry Woodyer is of coursed knapped Flint with ashlar quoins and dressings and a Welsh slate roof. St. Paul’s Church, Dorking and the lodge and chapel buildings of Dorking’s Reigate Road Cemetery, are also built of flint. It was used for many cottages and smaller houses across the NCA from Redhill to Hindhead and Haslemere. Brick was usually used for the quoins and dressings. Flint continues to be used occasionally in the area.
for houses and other buildings. The church hall of St. John the Evangelist, Redhill, was built using the material in 2017 as an addition to James Knowle’s the knapped flint faced church of 1842-3.

Horsham Stone-slate was extensively used for roofing in the NCA particularly for churches such as St. James, Abinger; St. James, Shere; St. John, Wotton; St. Michael, Betchworth; St. Peter’s Limpmsfield and in several villages such as Abinger and Dorking.

G E Street’s last church at Holmbury, St. Mary’s Church (1879) was built at his expense in local Holmbury Hill Sandstone with Bath Stone dressings.

**Low Weald**

The Low Weald occupies much of southern Surrey to its border with Sussex. The Wealden Greensand NCA lies to its north and west. The NCA extends to the south beyond the county’s border with Sussex. A small area of the High Weald NCA lies to its south east near East Grinstead.

The Low Weald is an extensively wooded, broad, low-lying clay vale. Small towns and villages including Chiddingfold, Dunsfold, Cranleigh and Ewhurst in the west and Newdigate, Charlwood, Horley, Lingfield and Dormansland are characteristic. Isolated farmsteads, often occupying ancient sites are common. They are often associated with a landscape of small and irregular fields, created by assarting from woodland in the Medieval period. In the late C19th and C20th, villages close to major transport routes that cross the area such as the M23 have expanded considerably. Gatwick Airport lies immediately across the county boundary near Horley.

The underlying geology provided materials for industries including iron working and brick and glass making. The Wealden iron industry of the area was significant for over 2,000 years.

Until the C18th, buildings were predominantly timber framed. Later buildings are often weather-boarded and barns clad with weatherboarding are a feature of the area. Local brick, often with tile-hanging predominate from the C18th. Horsham Stone-slate roofing was used extensively as a roofing material.

A variety of building stones were used in the area’s Medieval churches. In the west of the area Ironpan Conglomerate was used with Ironstone at the Church of St. Nicholas, Cranleigh, one of the few C14th decorated churches in Surrey. Bargate Stone was used for the Church of St. Mary and All Saints, Dunsfold (C13th) with Ironstone galleting. The church was cited by William Morris as “The most beautiful country church in all England”. Some Sarsen, Iron Conglomerate, Greensand Sandstone and a range of limestone dressings are also present.

Wealden Sandstone was used further east in for example St Bartholomew, Burstow, (C12th-C16th) unusually with Reigate Stone dressings. The fine Norman church of St Peter and St Paul, Ewhurst (1140) uses Wealden Sandstone. The C15th west porch and doorway is of chalk. Moorhouse Farm, Limpsfield, has a rare group of barns and cottages built of Wealden Sandstone with brick dressings and slate roof. Stone manors are relatively common here on Sussex borders, such as Smallfield Place, Burstow (1617) built of Wealden Stone ashlar.
remainder of the building was rebuilt in the C15th - the only late Mediaeval rebuilding in Surrey) is built of Tunbridge Wells Sandstone. St. Peter’s Church, Newdigate (C13th - C15th) exhibits a variety of stones including Sussex Marble, Bargate Stone and Reigate Stone, all sourced from within 6 miles of its site.

Horsham Stone-slate slab roofing was used in many villages such as Capel, Chiddingfold, Cranleigh, Ewhurst, Horley, Newdigate and Ockley and rural buildings such as Smallfield Place.

Long Copse, Ewhurst (1897) is an example of an Arts and Crafts house in the area. It is built of Bargate Stone blocks and rubblestone with a thatch and part Horsham Stone-slate roof.

**High Weald**

The High Weald NCA encompasses the ridged and faulted sandstone core of the Kent and Sussex Weald. A very small part of Surrey south of Lingfield and close to East Grinstead, West Sussex lies within the NCA. The settlements of Felbridge, and Dormans Park and part of Dormansland Parish lie within the NCA.

The area has a dispersed settlement pattern of hamlets and scattered farmsteads and ridgetop villages founded on trade and non-agricultural rural industries. Felbridge was on the road from London to Brighton used during the C17th-C18th but declined in the C19th. The Dormans Park Estate has its origins in the late C19 century when the land was bought by the Bellaggio Estate Company. The new railway made the area easily accessible to London. The estate grew steadily during the early C20th.

The Weald was the premier iron-producing district of England during the Roman occupation and again in the C16th. In the mid C19th, the opening of railways brought about considerable building and the growth of country houses and estates.

Timber-framed buildings were dominant until the C18th. Horsham Stone-slate-slate was often used for the roofing of timber structures. Wealden Sandstone was the most frequently used stone of the area. The walls to the moat and garden house of Starborough Castle (1431) are of Wealden Stone. The garden house was constructed on older foundations, reusing materials from the castle in 1754. The stone walls of the moat survive to just above ground.

Greathed Manor (1868), a large county house built after the opening of the railways, was designed by Robert Kerr for the Spender-Clay family. It is constructed of coursed Wealden Sandstone with ashlar dressings, with slate roofs of varying types.

St John's Felbridge (1865) designed by W White, is built of Wealden Sandstone quarried a half-mile away in Cooper’s Wood.

Deerpark and Felbridge Copse (1916) were originally built as kennels and stables by Sir Edwin Lutyens. The new main house was never built. Felbridge Copse was designed in the style of a classical temple and influenced by Soane’s barns ‘a la Paestum’. Both were later converted to dwellings. They are built of sandstone blocks with hipped Horsham Stone-slate roofs and sandstone chimney stacks.

**Thames Basin Heaths**

The Thames Basin Heaths NCA stretches westwards from Walton on Thames to the countryside around Newbury in Berkshire. To the north it is bordered by the Thames Valley NCA, to the south and east by the Thames Basin Lowlands and to the south west by the Hampshire Downs NCA.

Vestiges of the Norman royal hunting forests of Bagshot and Windsor that covered much of the north of the area remain. Chertsey Abbey significantly influenced the area throughout the Medieval period. Until the C18th the commons and heathlands of the area constituted one of the largest and most continuous areas of lowland heathland in England. In the east residential development due to the influence of London has been extensive since the C18th. The NCA includes the extensive settlements of the lower reaches of the Rivers Mole, Ember and Way that lie within the Green Belt, such as Walton on Thames, Weybridge, Byfleet, Chertsey and Chobham. West of the green belt, the settlement pattern is a mix of dispersed hamlets,
farmsteads and houses interspersed with villages, many of Medieval origin. Many smaller settlements developed around commons from the 16th century onwards. Woking developed as a result of the opening of the London and Southampton Railway in 1838.

The largely uninhabited heathland of the area has long attracted military uses. The large bases at Aldershot and Farnborough just over the border in Hampshire and the National Riffle Associations ranges at Bisley were established from the mid C19th. The C20th conurbation of Camberley merges into Farnborough and Aldershot. The River Wey Navigation (1653), the Southampton and Exeter railway main lines, M25, M3 and numerous A roads all cross the area.

Timber frame was dominant historically. By the C18th and C19th, most buildings were constructed using locally produced brick and tile. Earlier timber frames were often encased or fronted with brick. The churches of the area exhibit a range of locally sourced building materials. The majority have been heavily restored and often refaced. In the east of the area St. Mary’s Church at Walton on Thames (C12th-C15th) is mainly faced in knapped flint with stone dressings with occasional Chalk and Ironpan Conglomerate. The later north aisle is of brick. The Church of St. Lawrence, Chobham (C11th) has a Sarsen Stone tower and Ironpan Conglomerate and Sarsen Stone chequerwork to the south aisle with a Horsham Stone-slate eves course.

In the west, Ironpan Conglomerate was frequently used with flint and other materials in churches such as St. Mary the Virgin, Byfleet (C13th) and St. Peter, Old Woking, (C11-14th) where coursed Sarsen Stone and Ironstone were also used. The Church of St. Nicholas, Pyrford (C12th) is built of Ironpan Conglomerate with Ironstone and Chalk. The C15th buttresses are constructed of Sarsen Stone. The Church of St. Michael and All Angels, Pirbright, was rebuilt in 1783; it is a rare example of a Georgian church. The tower is of local coursed Sarsen Stone. Ironstone chips are used for galleting and there are some Ironstone blocks. The nave of brick on a galleted stone base. There is some use of Chalk internally. St. Mary the Virgin’s Church, Worplesdon, in the far south west of the area has a Wealden Sandstone C15th clerestory. Most of the church is built of roughly coursed flint with Ironstone.

The growth in population of the area led to the need for the rebuilding and extension of many existing churches and the construction of new churches. The improved transportation network allowed the use of a wider range of materials from more distant sources.
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including the neo-classical Portland Stone Columbarium mausoleum (1900).

The very large Holloway Sanatorium (1872-85), Virginia Water and Royal Holloway College (1878-87), Egham by W H Crossland, one of the first women’s colleges, are both constructed of brick with Portland Stone dressings.

Hampshire Downs

A very small area of the Hampshire Downs NCA lies in the far west of the county on the northern side of Farnham. It includes the west and northern part of the town and the hamlet of Dippenhall.

Timber-frame and later brick were the main materials used in vernacular buildings in this part of the NCA. Chalk was used for a range of buildings including the chapels and lodge to West Street Cemetery (1870) with Bath Stone dressings, occasional cottages, and the Factory, Dippenhall. Bargate Stone was also used for the Farnham House Hotel (1896, formerly Willey Park).

Farnham Castle lies within the NCA. It was founded in 1138 by Henry of Blois, Bishop of Winchester and brother of King Stephen and has been in almost continuous occupation since. In the Medieval period the diocese of Winchester was the richest in England and the castle home of its Bishop for over 800 years. The castle was rebuilt in the late C12th and early C13th. The C12th 23-sided shell keep is largely built of Chalk with extensive repairs in Upper Greensand Sandstone. It follows the shape of the original earth motte. To the south of the keep are an extensive range of buildings of various periods dating from the C12th onwards. Further additions and alterations included an enlarged chapel in the C13th, a brick tower in 1470-75, a further chapel and stables in the C17th. Much use was made of Chalk with brick repairs and dressings.
Stones in walls and paving

Surrey’s built heritage displays a diverse range of stones and styles of usage in walls; representative images of the county’s main indigenous building stones are provided on the following pages.
Dressed and coarsed blocks of Upper Greensand Sandstone, Farnham Castle

Block of coarse variety of Bargate Stone, Quarry Hill House, Guildford

Merstham Stone (Reigate Stone) in wall and window dressings of the Church of St. Katherine, Merstham

Usual variety of Bargate Stone with Ironstone galleting, Church of St. Christopher, Haslemere

Blocks of randomised Ironstone in wall of the Church of St. Mary the Virgin, Buckland

Dressed blocks of Holmbury Hill Sandstone, Church of St. Mary the Virgin, Holmbury St. Mary
Blocks of Wealden Sandstone with iron staining, Church of St. Peter and St. Paul, Ewhurst

Polychromatic banding of knapped Quarry Flint and Bargate Stone (some herringbone style), Castle Keep walls, Guildford

Quaternary Flint (Field Flint) nodules with some Chert nodules, Guildford Lodge, East Horsley

Church wall at St. James’ Church, Shere exhibiting randomised and varied blocks of mainly Ironstone and Upper Greensand Sandstone with Ironstone galleting

Chert pebbles and cobbles (with some Quaternary Flint nodules), Church of St. John the Baptist, West Byfleet

Ironstone wall at St. Peter’s Church, Limpsfield
Pathway of Ironstone cobbles, near Church of St. Mary, Guildford

Wall at Tigbourne Cottage and Little Leat, Godalming showing Bargate Stone with Ironstone galleting

Horsham Stone-slab at Dormer Cottage, Stan Hill, Charlwood
(photo courtesy of Martin Higgins, Surrey CC)

Ironstone cobbles used for ornamental paving, Titsey Place, Titsey (photo courtesy of Martin Higgins, Surrey CC)
Lower Cretaceous

Wealden Group

Tunbridge Wells Sand Formation (including the Ardingly Sandstone Member)

Tunbridge Wells Sandstone and Ardingly Sandstone

The outcrop of the Tunbridge Wells Sand Formation is confined to the far south-eastern corner of Surrey encompassing Lingfield, Dormansland, Newchapel, Felcourt, Felbridge and Shipley Bridge. The formation comprises fine- to medium-grained, pale or silvery grey to ochreous or buff-brown sandstones and siltstones with darker coloured mudstones. Individual sandstones can be quite variable; some are thinly bedded or flaggy and exhibit parallel lamination or low-angle cross-bedding; other sandstone units are more massive and display ripple marks. In overall terms, however, and in common with many other Wealden Group sandstones, the sandstones of the Tunbridge Wells Sand Formation tend to possess very similar lithological characteristics and consequently they usually cannot usually be distinguished from one another when seen ex-situ unless their exact provenance is known by other means. One exception to this is the Ardingly Sandstone which mostly comprises silvery-grey, massive, fine-grained, well-sorted quartz sands and sandrock.

The Tunbridge Wells sandstones often exhibit a wide variety of textures and structures, including cross-bedding, ripple structures, slumped beds and sand-filled scours. Some blocks contain small carbon flecks (lignite) and are iron-stained and exhibit Liesegang banding. Fossil burrow structures and plant debris are common in many beds and are often seen on the surface of quarried blocks.

Tunbridge Wells Sandstone is readily worked and is typically employed as dressed blocks in churches, prestigious houses and sections of wall in prominent locations. A good example of its use is provided by the Grade I listed Church of St. Peter and St. Paul in Lingfield.

Weald Clay Formation

Wealden Sandstone

The Weald Clay Formation crops out as a broad belt across southern Surrey extending from near Haslemere in the west, via Cranleigh and Horley to near Oxted in the east of the county. The formation contains several sandstone units which form a series of low topographical ridges and have historically been quarried to a minor extent for building stone. However, these sandstones are all very similar lithologically, and unless their provenance is known with certainty from documentary evidence, distinguishing them and their sources is very difficult once they are set within the fabric of a building. These Wealden sandstones are mainly fine-grained (occasionally medium-grained), finely laminated, and often micaceous and flaggy; individual sandstone units range in thickness from 1-5 m. Their colour also varies, but they are typically buff to pale grey, or olive-grey, weathering to an orange-brown or brown colour due to iron staining, and they often exhibit Liesegang banding. The sandstones are composed of pale quartz sand, with scattered flakes of mica, and are cemented with minor

The C14th Church of St. Peter and St. Paul, Lingfield is constructed mainly of dressed and coursed blocks of Tunbridge Wells Sandstone with a Horsham Stone-slate roof

Surrey’s indigenous building stones
amounts of calcite, clay minerals and iron oxides. Many of the sandstones show 5-10 cm thick cross-bedded units, with varied ripple structures being commonly seen in the upper part of each bed (and in individual blocks in walls). Occasional scour structures are also present.

Wealden Sandstone was worked and employed in a similar fashion to Tunbridge Wells Sandstone and distinguishing between these sandstone types in southern Surrey is not easy. However, blocks of Wealden Sandstone do tend to be thinner, more rectangular and less regularly cut, and the stone has sometimes been used as a rubblestone. A good example of the use of Wealden Sandstone is provided by the Church of St. Peter and St. Paul, Ewhurst.

Sussex Marble (Paludina Limestone, Betersden Marble, Charlwood Stone, Petworth Marble)

Sussex Marble is a freshwater limestone occurring in the upper part of the Weald Clay Formation in southern Surrey as beds which typically are 15-30 cm in thickness, but may be considerably thicker, occasionally reaching up to 70 cm. The limestone is usually light grey or buff in colour but varies to shades of blue or green can be developed depending on the presence of clay and iron minerals (which often become brownish upon weathering). Sussex Marble is readily identified by the presence of abundant fossil gastropod shells, Viviparus, which tend to be somewhat paler in colour than their matrix (they are whitish in section) and are commonly infilled with patches of transparent crystalline calcite.

In southern Surrey, Sussex Marble was historically worked in areas around Russ Hill and Charlwood in the Mole Valley. Although relatively hard when fresh, Sussex Marble weakens due to water penetration, which causes the rock to crumble and fail; exterior memorial stones rarely last more than 100 years. This limestone, which takes a good polish, has consequently been used mainly for internal decorative and monumental features such as altar tables, tombs and ledgers, fonts, columns and fireplaces. One of its occasional external uses was as paving and flagstones, an example of this being provided by the pavements adjoining George Abbots Hospital in Guildford; it was also employed as paving in the Reigate, Horley and Charlwood areas, especially in churchyards and other routes.
The Hythe Formation crops out as a band which extends right across Surrey from Haslemere in the west to Oxted in the east. Its main occurrences are north of Haslemere and between Godalming and Dorking (especially near Holmbury and Abinger); eastwards between Dorking and Oxted the outcrop area is relatively narrow.

The formation is highly variable and contains medium- to coarse-grained sandstones and ferruginous sandstones which range in colour from pale brown and yellowish-orange to olive or dark green, or pale to dark grey; they sometimes exhibit a bluish sheen. Individual sandstone units may be thinly bedded or more massive; some contain hard, grey cherty layers, while others are friable and striped with alternating paler quartz-rich and darker glauconite-rich bands. Many of the sandstones are highly bioturbated and contain fossil burrow or shelly structures or are iron-stained and exhibit Liesegang banding. The more finely bedded units often exhibit sedimentary structures including ripple marks and planar and trough cross-bedding on a variety of scales. The sediments are sometimes a vivid green colour when first quarried, altering colour upon exposure to air.

Several ‘varieties’ of Hythe Sandstone have been informally named after the villages near to which they were quarried and where they were mainly used. In Surrey, one of the best-known varieties of Hythe Sandstone is Holmbury Hill Sandstone. As its name implies, this sandstone (and accompanying cherts) were quarried on Holmbury Hill; traces of the extensive workings and pits can still be seen today, particularly in the area around the Iron Age hillfort. The church at Holmbury St. Mary provides a particularly good example of the use of local Holmbury Hill Sandstone. Elsewhere, sandstone from the Hythe Formation was formerly much used for buildings in the vicinity of Haslemere and Midhurst. Leith Hill Stone is very similar to Holmbury Hill Sandstone but is slightly more friable and has a tendency to be striped yellow and red. The last working stone quarry in the Hythe Formation was at Pitch Hill, just west of Holmbury Hill and extracted Hurtwood Stone; the quarry had effectively closed by the turn of the century.

Sandgate Formation (including the Bargate Sandstone Member)

Bargate Stone (Bargate Sandstone)

Along with Quaternary Flint and Reigate Stone, Bargate Stone is probably the most common and widely used building stones employed in Surrey. The Bargate Sandstone Member occurs across the central-western part of the county in a band stretching from Liphook via Milford and Godalming (where the outcrop is at its widest) to Gomshall, Abinger Hammer and...
Cocks Farm, Abinger. Further east, the outcrop of the Sandgate Formation becomes much narrower and the Bargate Sandstone Member is absent.

The main lithology is a hard, medium-grained, rich honey-brown coloured calcareous sandstone but varieties include dark fawn-brown or grey-green, glauconitic, often flaggy, calcareous sandstones and a pale brown, coarse-grained ‘gritstone’ which contains small (2-5 mm diameter) sub-angular to rounded clasts of quartz, quartzite, flint, chert and sandstone. The Bargate sandstones include massive and well-bedded types, the latter breaking into slabs 10-15 cm thick, which can be easily used as brick-sized blocks. They also sometimes exhibit cross-bedding and/or honeycomb weathering textures. In places, the sandstones contain fossil burrows which are typically 0.5 cm wide cylindrical structures, each surrounded by a rim of glauconite grains.

Bargate Stone was formerly quarried for local use around Godalming and at Hurtmore and Whitley. The stone mainly occurred as large concretionary ‘doggers’ which were extracted by the quarrymen using crowbars, planks and leverage poles (a process known as ‘jumping a stone’). The last working quarry of Bargate Stone in Surrey was Stockstone Quarry, just north of Hindhead; production ceased here in the early 1990s. Bargate Stone is encountered throughout Surrey but particularly fine examples of its use include: the Keep at Guildford Castle; the Shah Jahan Mosque, Woking; Tigbourne Court, Wormley; the Church of St. Christopher, Haslemere; the Church of St. Mary and All Saints, Dunsfold and the Wycliffe Buildings, Guildford. Further details regarding the form and geographical extent of the use of Bargate Stone are included in ‘The use of stone’ section of this Atlas.
**Folkestone Formation**

**Ironstone (Carstone)**

Ironstone (occasionally referred to as Carstone in Surrey) crops out as a continuous band from just south of Farnham (in the west) via Dorking, Reigate and Betchingley to Oxted and Limpsfield in the east; the outcrop is at its widest in western Surrey in an area delineated by Farnham, Tilford, Thursley, Frensham and Lower Bourne. It is a medium- to coarse-grained, ochreous to dark brown or reddish-black quartzose sandstone or gritstone, sometimes containing chert and quartz pebbles set within a dark purplish-black matrix of iron oxides and hydroxides. Ironstone occurs as irregularly shaped masses, thin layers and veins within the ‘typical’ sands that comprise the Folkestone Formation. Where it is massive, larger blocks of Ironstone may exhibit cross-bedding structures and display Liesegang banding. The surfaces of blocks may also display a bluish sheen created by the presence of coatings of iron oxide. Generally, Ironstone is a hard, durable and tough rock, that is resistant to weathering.

Ironstone is frequently encountered as a building stone in Surrey, especially in ecclesiastical buildings where it is usually found as isolated blocks or small clusters of blocks within wall fabrics. However, in those areas where it is better developed within the Folkestone Formation, Ironstone tends to be quite extensively employed, particularly in the Oxted area and in many of the older buildings and streets of Farnham. Particularly fine examples of its use are provided by the Church of St. Peter, Limpsfield and the ruins of Waverley Abbey. It is occasionally used as setts or cobbles (pitching), for example near the Church of St. Mary, Guildford. Galleting, involving the insertion of small chips of Ironstone into the mortar (often between dressed Bargate Stone, Sarsen Stone or random Upper Greensand Sandstone blocks), is evident in the nave walls of the Church of St. James in Shere; the Church of St. Michael and All Angels in Pirbright; Tigbourne Cottage and Little Leat in Godalming and in St. Christopher’s Church, Haslemere.

**Selborne Group**

**Upper Greensand Formation**

**Upper Greensand Sandstone**

The Upper Greensand Formation crops out as a narrow band of strata across central Surrey, extending from west of Farnham, via Gatton Bottom and Merstham, to just north of Limpsfield on the county border with Kent. The Upper Greensand Formation comprises pale olive to pale grey, fine-grained sandstones, silty sandstones and sandstones, which are frequently glauconitic and shelly. A facies of the Upper Greensand Sandstone that has been used extensively as a building stone, is Reigate Stone (and its locally named variants), and this is described in the following section.

Upper Greensand Sandstone is used for building purposes wherever it occurs, despite the fact that it has a tendency to weather readily and spall. It was formerly extensively used in the Farnham area – much of the stone employed for the walls and keep of Farnham Castle, the Church of St. Andrew in Farnham and the Church of St. Laurence in Seale, was obtained from the Upper Greensand Formation.
Reigate Stone (Merstham Stone, Gatton Stone, Chaldon Stone, Godstone Stone, Firestone, Hearthstone)

Reigate Stone, and its locally named varieties, is a particular facies of the Upper Greensand Formation (described above). The rock is a massive, pale grey to off-white calcareous siltstone with a sub-conchoidal fracture which weathers to a pleasant pale buff or cream colour. It is rarely fossiliferous. From a distance, weathered Reigate Stone can resemble Chalk, but the latter powders easily when scratched; Reigate Stone is usually more durable, especially the forms that contain more chert and calcite cement. A more reliable way of distinguishing these stone types is that Reigate Stone often 'sparkles' in bright light due to the quartz grains it contains – Chalk lacks these grains.

All varieties of Reigate Stone have been widely employed for building purposes along its outcrop. Although much of the stone is a freestone, it is generally roughly dressed and laid to course, or used as rubble stone. Reigate Stone was once used extensively in the Reigate and Dorking areas (where historically it was termed ‘Firestone’) and it can be seen in many of the older buildings including churches, farmhouses and barns. Soft Reigate Stone was used to whiten hearths and doorsteps (hence the name Hearthstone) during the C19th. Gatton Stone is noticeably stronger than Reigate Stone and by the Victorian period, only Gatton Stone was used for quoins, arches and main walling.

Particularly good examples of the use of Reigate Stone can be seen in Reigate (e.g. Sunningdale House on London Road); Merstham Stone is finely displayed in the church of St. Katherine and Wellhead Cottage, Merstham.
Upper Cretaceous

Chalk Group - White Chalk Subgroup

‘Middle Chalk’ and ‘Upper Chalk’

Chalk

The white chalky limestones of the Upper Cretaceous White Chalk Subgroup occur in an easterly widening belt extending from near Farnham in the west of the county, via Guildford and Leatherhead to Whyteleafe on the eastern boundary of the county. Chalk is a white to very pale grey or pale buff, typically structureless, very fine-grained limestone, which in places contain fossil oysters (inoceramids) and echinoids. It is generally unsuitable for exterior masonry as repeated wetting and drying (coupled with frost action), causes the relatively soft rock to powder and disintegrate into small angular brash. Softer forms of the stone, may show concave weathering away from mortar lines.

Chalk is not commonly employed as an external building stone in Surrey and, where it has, it is usually found in association with other stone types; examples of its use include Waverley Abbey ruins, Guildford Castle Keep and the tower of St. Peter’s Church, Woking. Occasionally, Chalk dominates a built structure, with fine examples including the castle walls and Castle Arch gate in Guildford.

Quarry Flint (Fresh Flint)

Quarry Flint occurs as bands or isolated nodules within the chalky limestone beds of the White Chalk Subgroup. It is an extremely fine-grained (cryptocrystalline) and hard form of silica containing microscopic quartz-crystal aggregates. Quarry Flint usually occurs as irregular-shaped nodules that are 10-20 cm across, or as (sub-)rounded pebbles or cobbles; occasionally, it is also found as weakly banded tabular sheets or layers up to 20 cm thick. The colour is very distinctive; fresh nodules have a white outer cortex with a black or dark grey interior.

Quarry Flint breaks with a characteristic conchoidal fracture, producing razor-sharp, fine edges. Flint nodules may contain cavities lined with translucent botryoidal chalcedony or small transparent quartz crystals. Some nodules contain well preserved fossils, with echinoids, sponges, bivalves, burrow structures and occasionally belemnites. The Upper Cretaceous Chalk succession in Surrey has yielded a small amount of flint for local building purposes. Where encountered, it is often seen in association with Quaternary Flint, and was employed in a variety of ways, including as knapped, faced, trimmed or ‘cleaved-faced’ stone and sometimes in squared chequerwork. A fine example of its use can be seen in the walls of Guildford Castle Keep.

The mid C13th gate tower and walls (Castle Arch) to Guildford castle are built mainly of Chalk with flint rubble.

The Keep at Guildford Castle has Norman origins. It is constructed mainly of Bargate Stone and Quarry Flint (with some minor Chalk) some of which exhibits polychromatic banding and herringbone work.
Ironpan Conglomerate is the name given here to a distinctive ironstone variety, blocks of which are frequently encountered in buildings (often churches) mainly in central and northern Surrey. The main rock type usually seen is a clast-supported conglomerate comprising a dark purple-black coloured, coarse-grained iron-rich matrix in which pebbles of orange-brown Chert or blackish Quaternary Flint are set. These pebbles are usually well rounded and vary in diameter from 2 to around 7 cm; typically, smaller subangular clasts or flakes of Chert and Flint are also present sandwiched between the larger, rounded pebbles. The clasts show no obvious preferred orientation. Superficially, some blocks of Ironpan Conglomerate resemble Hertfordshire Puddingstone, but they are readily distinguished by their overall darker colour and iron-rich matrix – these features contrast strongly with the much paler coloured Hertfordshire Puddingstone, with its light grey, siliceous matrix. Some blocks of Ironpan Conglomerate lack the larger, rounded pebbles and instead contain smaller, subangular clasts (up to 2 cm diameter) of Chert, sandstone and (occasionally) Flint set within a purple-black iron-rich matrix; these blocks may be classed as matrix-supported breccio-conglomerates. Intermediates between these varieties of Ironpan Conglomerate also occur, sometimes even within the same block.

The stratigraphical origin of the Ironpan Conglomerate is not known. The stone has not been seen in-situ but a possible source horizon could lie within the Neogene/Quaternary superficial deposits. Alternatively, this stone could be derived from a ferricrete horizon within the late Palaeogene Bracklesham Group.

In older literature, Ironpan Conglomerate is often variously and inconsistently referred to as ‘Conglomerate’, ‘Puddingstone’ or ‘Ferricrete’. It is typically encountered as isolated, irregular blocks within church walls – it is often associated with Quaternary Flint. Occasionally, it represents one of the main constituents of a building and it may dominate the stone fabric of sections of individual walls. Particularly good examples of its use can be seen in the walls of churches in Cranleigh (Church of St. Nicolas) and Woking (Church of St. Peter).
Sarsen Stones are loose blocks of hard quartzitic sandstone which typically occur as rounded or elongate boulders, but sometimes as metre-scale slabs. They are pale grey to pale brown in colour, becoming distinctly creamy buff or deep greyish-brown when weathered, and possess a very fine-grained, saccharoidal ('sugary') texture comprising sub-rounded quartz grains set within a silica matrix (which is visible on fractured surfaces). Sarsen Stones are very hard and resistant to weathering; their surfaces are often smooth and may occasionally show poorly defined bedding structures.

Sarsen Stone was worked as a building stone in northern and north-western Surrey, and this was an important local industry historically. Sarsen Stones were trimmed into paving setts, coping and building stones, and doorsteps. Fine examples of the use of squared and coursed Sarsen Stone can be seen in the Church of St. Michael and All Angels, Pirbright and the towers of the Church of St. Peter, Woking and the Church of St. Mary the Virgin, Worplesdon.

The C15th tower (restored in 1866) of the Church of St. Mary the Virgin at Worplesdon, is built mainly of dressed and coursed block of Sarsen Stone.

The Church of St Michael and All Angels, Pirbright (rebuilt in 1784) is constructed mainly of dressed Sarsen Stone blocks laid to course; the dressings are mainly Bath Stone or brick.

**Quaternary**

**Various Groups**

**Sarsen Stone (Greywethers, Silcrete)**

Sarsen Stones are loose blocks of hard quartzitic sandstone which typically occur as rounded or elongate boulders, but sometimes as metre-scale slabs. They are pale grey to pale brown in colour, becoming distinctly creamy buff or deep greyish-brown when weathered, and possess a very fine-grained, saccharoidal ('sugary') texture comprising sub-rounded quartz grains set within a silica matrix (which is visible on fractured surfaces). Sarsen Stones are very hard and resistant to weathering; their surfaces are often smooth and may occasionally show poorly defined bedding structures.

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Chert pebbles and cobbles

The Quaternary fluvio-glacial deposits of Surrey encompass a diverse range of poorly sorted, relatively soft and unconsolidated sediments which have been exploited for construction materials on mainly a local scale. These deposits vary in composition, but sometimes contain harder pebbles and cobbles of Chert, which are mainly sub-rounded and orange-brown to brown coloured.

The use of Chert pebbles and cobbles in Surrey walls is not especially common, but is geographically quite widespread nonetheless; where seen, such pebbles have often been used in conjunction with Quaternary Flint. Particularly fine examples are provided by the walls of the Church of St. John the Baptist and the Church of St. Mary the Virgin in West Byfleet.

Quaternary Flint
(Field Flint, River Terrace Gravel Flint)

Quaternary Flint, (along with Bargate Stone and Reigate Stone), probably represents one of the most extensively and commonly used building stones in Surrey. Quaternary Flint typically occurs as irregular-shaped nodules which are found lying on the surfaces of fields or as pebbles within fluvio-glacial sands and gravels. The size of the nodules typically ranges from 10-30 cm. The colour is variable; less weathered flint nodules or pebbles have a cream outer cortex with darker coloured (greyish) interior; weathered flints, in contrast, or those that have lain in soil or superficial deposits for a long period of time, may be variously discoloured or bleached, and often have brown stained interiors due to the precipitation of iron hydroxides from percolating ferruginous waters. This ‘weathered’ appearance helps distinguish Field Flint from the much ‘fresher-looking’ Quarry Flint.

A combination of its hardness, durability and resistance to weathering has resulted in Quaternary Flint being much used as a building stone wherever deposits are (or were) present in Surrey. It was mainly employed as nodules or pebbles laid randomly or roughly to course, but occasionally as knapped, faced, trimmed or cleaved faced stone in random or decorative arrangements. The stone was used extensively and can be seen in many churches, buildings and walls in towns and villages across the county. Particularly fine examples of its use can be seen in: houses in East Horsley; the Church of St. Nicholas, Leatherhead; the Church of St. Mary, Guildford; the Church of St. Mary Stoke D’Abernon; the Church of St. Mary in Walton on Thames; the Church of St. Mary in Ripley and the Church of St. Leonard at Chelsham.

Further details regarding the form and geographical extent of the use of Quaternary Flint in Surrey are included in ‘The use of stone’ section of this Atlas.
Although the Lower Cretaceous to Quaternary successions of Surrey have yielded a variety of indigenous building stones, these are in limited supply in some areas and extensive use has been made of ‘imported’ stones sourced from other parts of England, and indeed the UK.

A summary of the main imported building stone types which have seen use in the county follows below. Additional descriptions of imported stones relevant to Surrey can be found in the references listed in the Further Reading section of this Atlas and in the Strategic Stone Study atlases covering the source areas of these various stones.

One of the most unusual examples of stone importation into Surrey is provided by the Temple of Augustus, Virginia Water. This is a reconstructed ruin built Roman ruins transported over to Britain from the city of Leptis Magna in modern day Libya. It was a gift presented in 1816 from the Local Governor to the Prince Regent, later King George IV. It included 22 granite columns, 15 marble columns and 10 capitals.

### Millstone Grit

*West Yorkshire*

Carboniferous

Millstone Grit Group

A hard, medium- to coarse-grained sandstone, sometimes pebbly and feldspathic, with a distinctive granular appearance (arising from sugar-like, grey quartz grains) and occasional small flakes of white mica. It exists in various colours, ranging from pale grey to a buff-orange or pale brown colour (particularly when weathered). It typically displays lamination and cross-bedding structures along with Liesegang banding. It is a very durable stone, with good abrasion resistance.

*Laminated blocks of Millstone Grit form the approach walls to Town Bridge, Guildford, which was rebuilt following its partial destruction due to flooding in February, 1900*

### York Stone (Yorkshire Flags)

*West / South Yorkshire*

*Upper Carboniferous*

Elland Flags, Pennine Coal Measures Group

Buff to pale grey or greenish grey, typically fine-grained sandstones, which are often micaceous and laminated, but occasionally show small-scale cross-bedding features. Usually weathers evenly but may separate along mica-rich horizons. Little used as a building stone in Surrey, being employed mainly as flagstones, paving stones or as plinths.

*Grey-buff York Stone paving stones alongside the Church of St. Mary, Guildford*
**Mansfield Red Sandstone**  
*Mansfield, Nottinghamshire*

**Permian**  
Cadeby Formation, Zechstein Group

A distinctive, pale red-brown, sandy dolostone or dolomitic sandstone that exhibits cross-lamination in some blocks. It has been employed very occasionally in Surrey as a facing or decorative stone.

*The bronze plaque marking the Site of the Ancient Castle of Guildford is set within decorative dressings of Mansfield Red Sandstone, Castle Street, Guildford*

**Hollington Stone**  
*Staffordshire*

**Triassic**  
Helsby Sandstone Formation, Sherwood Sandstone Group

A pale-red or red-brown, fine- to medium-grained sandstone which characteristically displays expressions of cross-bedding – these features are observed in many blocks seen in buildings. It has been employed only occasionally in Surrey, and then usually as dressings.

*Window dressings of red-brown Hollington Stone (along with pale yellow Bath Stone), Church of St. Andrew, Farnham*

**Ham Stone (Ham Hill Stone)**  
*Montacute, Somerset*

**Jurassic**  
Ham Hill Limestone Member, Bridport Sand Formation, Lias Group

A coarse-grained shelly limestone which is readily sawn and dressed. When freshly cut, the stone has a light golden yellowish-brown colour which darkens with age and weathering. The latter picks out the weaker, less well cemented seams and cross-bedding features which are characteristic of this sandy limestone. Relatively little employed in Surrey – the best examples of its use are provided by houses along Quarry Hill, Guildford and the Church of the Wisdom of God, Lower Kingswood.

*Door surrounds constructed of typical Ham Hill Stone, Quarry Hill, Guildford*
Surrey Strategic Stone Study 37

Rockingham Forest Lincolnshire Limestone
Lincolnshire, Northamptonshire

Middle Jurassic
Lincolnshire Limestone Formation, Inferior Oolite Group

‘Rockingham Forest Lincolnshire Limestone’ is employed here as a general term that applies to a variable ‘suite’ of Lincolnshire Limestones imported into Surrey. The name encompasses several named varieties of Lincolnshire Limestone (including Weldon Stone and Kings Cliffe Stone) which cannot reliably be distinguished. Rockingham Forest Lincolnshire Limestone incorporates a continuum of pale cream to pale grey coloured limestones, which weather to shades of buff-yellow; the stones are variably textures ooidal and/or bioclastic. Cross-bedding features may or may not be displayed, and the stone is variably porous. Rockingham Forest Lincolnshire Limestone has been employed throughout Surrey, primarily as dressings and for decorative work in ecclesiastical buildings.

The Church of St. Mary and St. Nicholas, Leatherhead (C12-13th) is built largely of Quaternary Flint with dressings of Rockingham Forest Lincolnshire Limestone; the north transept has a Horsham Stone-slate roof.

Ancaster Stone
Ancaster, South Kesteven, Lincolnshire

Middle Jurassic
Lincolnshire Limestone Formation, Inferior Oolite Group

A coarse-grained, creamy-white to pale yellow (occasionally weathering reddish), ooidal and bioclastic limestone exhibiting cross-bedding structures that give rise to a distinctive ‘streaky bacon’ appearance. In Surrey, Ancaster Stone has been seldom used and is mainly encountered in the construction of ornate front portals of commercial buildings or as dressings in churches and chapels.

The front pillars and surrounds of ‘Massimo Dutti’, 133-135 High Street Guildford, are constructed of Ancaster Stone; the first and second floor window dressings are built of various Permo-Triassic red sandstones including Hollington Stone.

Bath Stone
Bath, NE Somerset and possibly Corsham area, Wiltshire

Middle Jurassic
Chalfield Oolite Formation, Great Oolite Group

A cream to buff-yellow, ooidal and variably bioclastic limestone (freestone). Extensively used throughout Surrey, especially in Victorian new-build and church refurbishment schemes, especially as ashlar and window and door mouldings. A particularly noteworthy example of its use as ashlar is provided by the tower of St. Mary’s Church, Reigate.

St. Mary’s Church, Reigate dates from the C13th but was extensively restored in the C19th using Bath Stone ashlar.
Caen Stone
Normandy, France

Middle Jurassic
Calcaire de Caen Formation

An off-white to pale creamy-yellow coloured limestone with a fine-grained texture and few large bioclasts. It may exhibit spalling and individual blocks of Caen Stone may also show uneven weathering. It has been employed only occasionally in Surrey, mainly in ecclesiastical buildings or fortifications dating to Norman times but is also encountered in important domestic Tudor houses such as Reigate Priory (windows) and Non-such Palace.

Building of the Church of St. James, Shere commenced in the C12th. Its construction includes Caen Stone along with Ironstone, Ironpan Conglomerate, Rockingham Forest Lincolnshire Limestone (including Barnack-type Stone) and Quaternary Flint

Forest Marble
Dorset

Middle Jurassic
Forest Marble Formation, Great Oolite Group

A non-porous, bioclastic, limestone consisting mainly of variously abraded fossil shell, crinoid and coral fragments. Typically, this limestone is pale grey and has a crystalline appearance on fresh surfaces, but quickly weathers to an earthy, light brown colour. Rarely encountered in Surrey.

The Church of St. Mary, Guildford is constructed mainly of Quaternary and Quarry flints with Bath Stone dressings. However, some older window dressings appear to exhibit a shelly fabric characteristic of Forest Marble
Purbeck Limestone
Isle of Purbeck, Dorset

Lower Cretaceous
Purbeck Group

A dark grey-green, shelly limestone, often containing pale coloured sections of fossil oysters and other shells. It is mainly used for internal ornamental work, but has occasionally been employed for external paving and walling.

Purbeck Limestone flagstones and steps outside Holy Trinity Church, Guildford

Portland Stone
Isle of Portland, Dorset

Upper Jurassic
Portland Stone Formation, Portland Group

A near-white or very pale coloured limestone that (in its ‘Basebed’ guise at least) is typically a fine- and even-grained freestone. It has seen widespread use across Surrey since the C18th, especially in urban areas in carved form. It has been used for monuments, war memorials, gravestones, fountains and columns. Portland Stone is also employed as a high-quality walling stone, notably in civil, administrative and financial buildings.

Tunsgate Arch, High Street, Guildford, was built in 1818 from ashlar blocks of Portland Stone to provide cover for the important grain and corn market. The columns are constructed in the style of a Tuscan temple.
Kentish Ragstone (Kentish Rag)  
Weald of Kent

Lower Cretaceous  
Hythe Formation, Lower Greensand Group

A medium- to coarse-grained, pale greenish-grey or pale brown limestone which contains greater or lesser amounts of quartz, glauconite and fossil shell debris. Kentish Ragstone has been employed occasionally in Surrey, and usually for the walling of ecclesiastical buildings such as the churches at Englefield Green and Tasfield; it may be found as dressed (typically rock-faced) tabular blocks or forming irregular random rubblestone patterns.

The Church of St. Simon and St. Jude, Englefield Green, near Egham, was constructed in 1859 using roughly squared blocks of Kentish Ragstone; the dressings are mainly of Bath Stone

Horsham Stone-slate (Horsham Slab)  
West Sussex

Lower Cretaceous  
Wealden Group, Weald Clay Formation, Horsham Sand Member

A honey-brown to brown-grey coloured, calcareous sandstone, some beds of which readily cleave into 2-3 cm thick slabs which are ideal for use as roofing slates and flagstones. It exhibits few structures apart from fine laminations and occasional broad amplitude ripple marks. In Surrey, it has been most frequently used as a roofing slate on churches and lychgates, and as a paving flagstone. Thicker slabs were used for floors, especially in the Ewhurst area; one of its most attractive uses is in the form of thinner ripplestone paving slabs which were employed across south Surrey in churchyards and old houses.

The main roof of the mid C11th Church of St. John the Evangelist, Wotton, is built of Horsham Stone-slate; the church is constructed of Bargate Stone with Firestone and Bath Stone dressings

The lychgate to the Church of St. James, Shere was designed by Sir Edwin Lutyens and built in 1901-2. Its pyramidal roof is constructed of Horsham Stone-slate
Granite
Various sources (including Cornwall and Devon)
Neoproterozoic to early Permian
A coarse-grained igneous rock, usually pale grey or pink in colour, comprising an interlocking network of grey quartz and white or pink feldspar crystals; the latter can exist as distinctly larger, well-formed crystals termed phenocrysts. Darker iron- and magnesium-bearing minerals and glinting flakes of mica are also usually present in greater or lesser amounts. Granite is very durable and various types have been employed in Surrey; it can be seen used decoratively in finely dressed and polished guises or used as a facing stone in association with buildings such as including banks and offices. Granite has been used in the construction of bridges, and as paving setts, kerbs and memorial stones.

Construction of the fifth (and present) bridge at Staines that crosses the River Thames commenced in 1827 and was completed in 1832. The pale granite ashlar blocks and corbels likely originate from the Bodmin area of Cornwall
Pinkish coloured Peterhead Granite (from Aberdeen) and Portland Stone (from Dorset) were used in the 1887, World War I and World War II memorials at Guildford Railway Station

Granodiorite
Mountsorrel, Leicestershire
Ordovician
Mountsorrel Complex
These variously coloured, medium- to coarse-grained igneous rocks comprise a network of interlocking crystals of quartz (typically pale grey coloured) and feldspar (often white or pinkish-red coloured), together with greater or lesser amounts of ferromagnesian minerals (black or dark green coloured). A range of granodiorites and diorites from several sources, including the Mountsorrel Complex (Leicestershire), has been employed in Surrey for various purposes including ornamental stonework. These stones are durable and hard wearing and have commonly been used for paving setts and kerbs as a result.

Granodiorite paving setts outside the Angel Hotel, High Street, Guildford
Several different types of metamorphic slate are known to have been imported into and used in Surrey for roofing purposes. Welsh Slate, for example, was employed in many of the county’s villages and towns; good examples of its use can be seen in Guildford. Other types of metamorphic roofing slate used in Surrey include Westmorland Slate from Cumbria (see preceding section on Borrowdale Volcanics).

Greyfriars, in Wanborough, is a house built in 1896 by C. A. Voyser for Julian Sturgis. It is whitewashed roughcast with a hipped Westmorland Slate roof.

External facings of dark greenish-grey andesitic tuff (Borrowdale Volcanics) in a shop front at 130 High Street, Guildford.

Borrowdale Volcanics

*Cumbria*

*Ordovician*

Borrowdale Volcanic Group

Typically greyish to greenish coloured, hard, fine-grained volcanic rocks (including tuffs and andesites); some types show irregular bands and contortions of darker iron-rich material. Most of the commercial workings of the Borrowdale Volcanic ‘green slates’ (used for roofing and facing stones) are within the outcrops of the Seathwaite Fell and Tilberthwaite formations in the Coniston, Langdale and Kirkstone areas, where extraction continues today.

Roofing slates (including Welsh Slate, Westmorland Slate)
Ashlar: Stone masonry comprising blocks with carefully worked beds and joints, finely jointed (generally under 6 mm) and set in horizontal lines (‘courses’). Stones within each course are of the same height. Although successive courses may be of different heights. ‘Ashlar’ is often wrongly used as a synonym for facing stone.

Bioturbated: Sediments that have been reworked or disturbed by burrowing organisms such as worms.

Bivalve: A mollusc with two shells, which may be marine or freshwater. Examples are cockles, clams, scallops, oysters.

Breccio-conglomerate: A type of Conglomerate that contains a mixture of angular and rounded rock fragments or clasts.

Calcareous: A sedimentary rock containing a significant amount (10–50 %) of calcium carbonate.

Chalk: A soft, white limestone, sometimes powdery, which was formed at the bottom of a sea during Late Cretaceous times.

Chert: An opaque, extremely fine-grained sedimentary rock composed of silica (quartz). It occurs as nodules (Flint), concretionary masses, or occasionally as layered deposits.

Conchoidal fracture: A smooth fracture surface, often occurring in a fine-grained rock such as Flint, which shows a curved pattern of fine concentric rings or ripples.

Conglomerate: A sedimentary rock that comprises broken up, rounded rock fragments, pebbles (>2 mm), cobbles or boulders set in a finer-grained matrix.

Cretaceous: A period of geological time that lasted from approximately 145 million to 65 million years ago. Sedimentary rocks of this age are the source of a number of important types of building stone such as Greensand, Flint and Chalk.

Cross-bedding: A structure in the layers (beds) of a sedimentary rock formed by the movement of water or air. The term is usually applied to sandstones and the feature itself typically resembles sets of lines which are inclined with respect to the bedding planes or form regular arc-shaped patterns.

Dolostone: A sedimentary carbonate rock (often a limestone) that contains a high percentage of dolomite (a calcium and magnesium carbonate mineral).

Echinoid: A type of marine organism formed of calcareous plates, commonly called a sea urchin. Often found in Chalk sediments.

Exfoliation: A type of weathering pattern, often seen in relatively sedimentary rocks, in which the surface layers of rock are weathered and split away as thin layers.

Feldspar: A mineral similar to quartz but slightly softer and often coloured white or pale pink depending on its chemical constituents. Occurs in both sedimentary rocks (e.g. sandstones) and igneous rocks (e.g. granites).

Flint: A form of very hard, micro-crystalline quartz. Typically occurs in Chalk deposits as rounded or irregular shaped masses (nodules) and has a dark grey or black coloured inner ‘core’, with a white outer ‘skin’.

Freestone: Term used by masons to describe a rock that can be cut and shaped in any direction without splitting or failing.

Glauconite: A mineral composed of iron and silica. It often occurs in Cretaceous and Tertiary sedimentary rocks as small greenish coloured specks or grains. It gives the green colour to the rock type Greensand.

Ironstone: A hard sedimentary rock cemented by iron oxide minerals. Often dark brownish or rusty coloured.

Knapped Flint: Worked Flint which has been fractured (cleaved) to reveal the interior of the nodule.

Lamination: A small scale sequence of fine layers that occur in sedimentary rocks.

Liesegang banding: A type of banded structure which is characteristic of ironstones and iron-rich rock. In individual stone blocks it is often seen as different colour patterns, typically shades of red, orange, brown or purple.

Massive: Describes a sedimentary rock which is homogeneous and lacks any internal structures (such as cross-bedding or ripple-marks) or fractures.

Mudstone: A very fine-grained sedimentary rock composed of mud or clay sized grains up to 0.063 mm in sizes (i.e. generally invisible to the eye and too small to be distinguished without a microscope).
Nodule: A small, hard, rounded or elliptical mass within a sedimentary rock. Resembles a pebble or larger cobble.

Oolitic: A type of limestone that contains ooliths or ooids which are sand-sized (<2mm) rounded grains of mineral or fossil material coated in successive concentric layers of calcium carbonate (limestone).

Peloidal: A type of limestone that contains peloids which are similar to ooids (see oolitic limestone) but typically are formed of very fine-grained mud which lack any discernable internal structure or concentric layering.

Quaternary: A period of geological time that lasted from approximately 2.6 million years ago to the present Day. It includes the last Ice Age.

Quoin: The external angle of a building. The dressed alternate header and stretcher stones at the corners of buildings.

Sandstone: A sedimentary rock composed of sand-sized grains (i.e. generally visible to the eye, but less than 2 mm in size).

Sarsen Stone: A very hard sandstone formed mainly of silica-cemented quartz grains. Often found as boulders or rounded pebbles.

Superficial deposits: Surface deposits and sediments of various types formed during the Quaternary period.

Syncline: A downward, U-shaped fold in layers of rock in the earth’s surface in which younger layers are normally located closer to the centre of the structure and the beds dip toward each other from either side (limb) of the fold.
This study, written by Dr Andy King (Geckoella Ltd., andy@geckoella.co.uk) and Phil Collins (Phil Collins Associates, phil@phil-collins.co.uk), is part of Surrey’s contribution to the Strategic Stone Study, sponsored by Historic England.

This report incorporates data from several sources, including local geological and heritage building reports, BGS memoirs and references (listed below) along with independent fieldwork by the authors. Use has also been made of the BGS on-line lexicon of named rock units (www.bgs.ac.uk/lexicon).

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BGS Memoirs, Sheet Explanations and Mineral Resource Reports


Further Reading


Websites

The following websites were all accessed on 12 December 2019:


British History Online – Victorian County History – Surrey. https://www.british-history.ac.uk/search/series/vch--surrey


Farnham Geology Society. https://www.farnhamgeosoc.org.uk/

Mole Valley Geological Society http://www.mvgs.org.uk/


Surrey Hills AONB. https://www.surreyhills.org/


Surrey History Centre. https://www.surreycc.gov.uk/culture-and-leisure/history-centre
