Source: Devon County Minerals Local Plan, Adopted Plan: Part A, June 2004

Chapter 9

China Clay

Source: Devon County Minerals Local Plan, Adopted Plan: Part A, June 2004

The County Council's Strategy for the Future Working of China Clay and the Tipping of China Clay Waste will include:

- recognising the national importance of china clay, and its contribution to the national, regional and local economies;

  Policy MP 35 - Mineral Working Areas for China Clay.

- ensuring an adequate and steady supply of all grades of china clay, having regard at all times to the principles of sustainable development;

  Policy MP 35 - Mineral Working Areas for China Clay.

- designating the Lee Moor Mineral Working Area at which the continuation of mineral development will be acceptable in principle;

  Policy MP 35 - Mineral Working Areas for China Clay.
  Policy MP 36 - China Clay Development Outside Mineral Working Areas.

- to ensure that existing reserves of china clay and tipping capacity at Mineral Working Sites are maximised before permitting extensions;

  Policy MP 35 - Mineral Working Areas for China Clay.

- normally only to permit extensions to existing china clay sites in certain specified circumstances;

  Policy MP 36 - China Clay Development Outside Mineral Working Areas.

- the establishment and implementation of comprehensive extraction and restoration programmes to reduce conflicts with significant environmental, archaeological and historic landscape features;

  Proposal Inset 37.8.

- safeguarding resources of china clay bearing land from sterilisation by other forms of development;

  Policy MP 13 - Development in Mineral Consultation Areas.

- permitting proposals which will increase the supply of china clay sand as a secondary aggregate, having regard to local environmental impacts and technical constraints;

  Policy MP 35 - Mineral Working Areas for China Clay.
  Policy MP 27 - Use of Secondary and Recycled Materials.

Source: Devon County Minerals Local Plan, Adopted Plan: Part A, June 2004

9. China Clay

9.1 Introduction

9.1.1 The County Council recognises that china clay is a mineral of national and international importance, and that it is necessary to ensure that adequate reserves are maintained for long term use. MPG 1 states that the UK is a leading world producer and exporter of china clay and that the industry makes an important contribution to the national balance of payments

9.1.2 The County Council's Strategy for the future working of china clay and the tipping of china clay waste (set out in the frontispiece to this Chapter) recognises the national importance of china clay, and its contribution to the national, regional and local economies. It seeks to ensure an adequate and steady supply of all grades of china clay, having regard at all times to the principles of sustainable development.

9.1.3 Each bullet point in the Strategy refers to a Policy, Proposal or Statement of Intent.

9.1.4 This chapter deals with the special characteristics of the winning and working of china clay and the tipping of china clay wastes. Detailed proposals for china clay development are contained in the explanatory text accompanying Inset Plan 37.

9.2 Distribution of China Clay Resources

GEOLOGY AND SITES

9.2.1 The kaolin deposits of Cornwall and Devon are associated with the granite batholith and are formed by alteration of minerals in situ. Feldspars in these granites have been altered to kaolinite by hydro-thermal processes, whilst the other main constituents of the granites, quartz and mica, remain unaltered. These unaltered materials form the main waste products.

9.2.2 The kaolinisation process occurs as a result of steam and other vapours penetrating from beneath the granite along lines of weakness. The china clay deposits are therefore roughly funnel shaped and of considerable depth (in places estimated at up to 300 metres). The deposits are of irregular distribution, the quality of the clay being dependent upon the extent of hydrothermal activity. Hence, variation may occur along a single plane of kaolinisation. Therefore, the distribution does not relate to either present or previous ground surfaces.

9.2.3 Devon's exploitable resources of kaolinite are found in association with the granite underlying Dartmoor on high ground adjacent to exposed moorland. Large scale features of the china clay workings, taking the form of excavated holes, raised tips and processing plant, are thus seen in the context of valued moor landscapes, including extensive areas of the Dartmoor National Park. The existing permissions at Lee Moor extend up to the boundary of the Dartmoor National Park and in places, particularly at Shaugh Moor, straddle the boundary. The National Park is outside the area of this Local Plan but, in considering proposals for the Lee Moor Mineral Working Area, the County Council will take full account of the effect of tipping and other operations on the landscape of the National Park.

9.2.4 The exploitable mineral resources and reserves are not limited by depth of deposit but by the ability of existing technology to extract it. At present, the pits extend to a maximum depth of about 80 metres. The extent of the area for clay working is shown on Inset Plan 37. This also shows how these permissions straddle the Dartmoor National Park boundary.

Shaugh Moor workings with Lee Moor pit in the background.

9.3 Existing Reserves with Planning Permission

9.3.1 Prior to 1971, there were a number of old planning permissions in the Lee Moor area, often with few conditions relating to restoration of the pits and tips. However in 1971, the main operating company submitted comprehensive proposals to provide for 50 years of production and associated tipping of waste. This application was 'called in' by the Secretary of State for the Environment, in order that a

Source: Devon County Minerals Local Plan, Adopted Plan: Part A, June 2004

comprehensive review might take place. The remaining operator submitted proposals to the Inquiry for its workings in similar timescale. The outcome of the Inquiry, (which was finally concluded by the completion of a Section 52 Agreement in 1978) provided the main operator with planning permission for 50 years of reserves for china clay working but with a limited period (30 years) of tipping capacity. The 1978 permission required the operator to seek approval from the MPA for the various phases of tipping, the most recent of which (Phase 4) was approved in 1990.

Looking along the top of the mica dam wall, with surface of mica waste on left.

9.3.2 Thus at that time the existing planning permissions for tipping were brought into line with new tipping requirements and tip construction was phased with progressive landscaping. Since 1982, with the subsequent approval of phasing of tipping this has enabled the County Council to impose aftercare conditions.

ROMP SUBMISSIONS

9.3.3 In October 1998, submissions were made by the two operating companies in respect of the three Mineral Sites at Lee Moor, Shaugh Moor and Headon. The sites at Lee Moor and Shaugh Moor straddle the Dartmoor National Park boundary (the Marsh Mills processing plant for the Lee Moor site lies within the boundary of Plymouth City Council). Whilst the submissions have been registered as being valid, the decision-making process is currently in abeyance pending the receipt of Environmental Statements. The operators are aware that the landscape, archaeology and nature conservation interests are particularly sensitive throughout the whole of the submission areas, not just within the National Park. After considering the detail of the environmental information to be submitted to the County Council, the operators have announced that they intend to voluntarily relinquish their rights to work minerals and tip quarry wastes on the three separate areas (known as Areas X, Y and Z) that remain within the Dartmoor National Park boundary. It is intended that the unconditional revocation will be formalised as part of the ROMP decision-making process.

9.3.4 Essentially the three submissions represent the continuation of the existing china clay operations, including the winning and working of china clay by open pit methods, together with the associated tipping of china clay wastes The proposal by Imerys Minerals contains details of the re-opening of the Hemerdon and Smallhanger Pits as a new operation eventually to coalesce with the WBB Minerals' Headon Pit. The proposal also necessitates waste disposal on a new tip ('T3') in the Torycombe Valley, which would be accessed by a new haul road across Crownhill Down. Such proposals are within the context of the overall planning permissions for china clay working granted in 1958 and 1972.

9.4 Meeting the Demand

9.4.1 Existing areas with planning permission for the winning and working of china clay are sufficient for the Plan period and beyond at current levels of production. It is not necessary, therefore, to seek to identify Preferred Areas or Areas of Search for future working of china clay, or the tipping of china clay wastes.

9.4.2 However, it is accepted that there may be a need for additional tipping capacity for the various types of china clay waste. In considering any new proposals, the MPA will need to be convinced that a potential does not exist to accommodate waste either within mineral voids, or as an extension to an existing tipping facility.

9.5 Mineral Working Areas for China Clay

9.5.1 The proposed Mineral Working Area for china clay mineral development is at the Lee Moor Working Area, which includes Lee Moor, Shaugh Moor and Headon Mineral Sites. Proposals for china clay working or the tipping of china clay waste will be acceptable in principle subject to the detailed consideration of planning applications in accordance with the development control and environmental policies contained in this Plan.

9.5.2 The Lee Moor Mineral Working Area has been drawn closely around the current planning permission areas in order to be consistent with the County Council's' strategy which requires the full utilisation of the existing reserves of china clay and tipping capacity before other areas are considered as extensions to the Mineral Working Area.

Source: Devon County Minerals Local Plan, Adopted Plan: Part A, June 2004

POLICY MP 35

MINERAL WORKING AREAS FOR CHINA CLAY

Mineral Working Areas, to provide for the continued extraction of china clay, are identified on the Inset Plan to the Proposals Map at the following locations:

Lee Moor

Shaugh Moor

Headon

Proposals to renew the existing planning permission, or to seek variations to the approved schemes of working, will be permitted unless there is demonstrable harm to interests of acknowledged importance.

9.6 China Clay Development Outside Mineral Working Areas

9.6.1 While working of china clay is currently being undertaken within the boundaries of the Mineral Working Areas, there may be operational or environmental advantages of working additional areas with or before a permitted area as part of the orderly development of the mineral resource. Any proposal for china clay development outside the Mineral Working Area boundary will only be permitted if they conform to the criteria contained in Policy MP 36.

POLICY MP 36

CHINA CLAY DEVELOPMENT OUTSIDE MINERAL WORKING AREAS

Proposals for china clay development outside the boundaries of the Mineral Working Areas referred to in Policy MP 35 will be permitted if:

(i) such development would reduce the adverse environmental impacts of existing china clay development; or,

(ii) a particular grade of clay is unavailable within the Mineral Working Areas; and,

(iii) there is no demonstrable harm to interests of acknowledged importance, having regard to any proposed mitigation or compensatory factors.

9.7 Tipping of China Clay Waste

9.7.1 With regard to the consideration of proposals for the tipping of china clay waste, such proposals will only be permitted if the applicant can demonstrate that backfilling is not feasible due to insufficient capacity, or where it would significantly constrain the ongoing china clay operations, or where it would result in the sterilisation of unworked clay reserves or adjacent resources.

9.7.2 In pursuit of a more sustainable approach to new surface tipping of china clay waste the MPA wishes all surface tipping to be of a temporary nature prior to future backfilling of mineral voids. Proposals for eventual permanent surface disposal of china clay waste will have to demonstrate that the final tip form and after-use would provide a positive benefit to the environment of the area.

POLICY MP 37

TIPPING OF CHINA CLAY WASTE

Proposals for the tipping of china clay wastes by method of new surface tips, or extensions to existing surface tips will be permitted where the final landform will harmonise with the landscape and where the preferred alternative of backfill of a china clay void is not feasible because:

(i) insufficient capacity is available in worked out pits at the time of the application; or,

(ii) such backfilling would significantly constrain the ongoing china clay operations; or,

(iii) such backfilling would result in the sterilisation of unworked clay reserves or adjacent resources; or,

(iv) there is demonstrable harm to interests of acknowledged importance, having regard to any proposed mitigation and compensation features.

9.8 Production and End-Uses of China Clay

9.8.1 Total production of china clay in the UK is limited to the counties of Devon and Cornwall.

9.8.2 As about 80% of the total production of china clay is exported, it makes a significant contribution to both the regional and national economy. It is estimated that the value of the china clay industry to the economies of Devon and Cornwall was about £150m in 1997 (Source: China Clay Association).

9.8.3 Figure 9.1 shows the production trends between 1985 and 2000. Production from Devon accounts for about 15% of the total UK production (about 400,000 tonnes). In the 1960s the production of china clay expanded significantly, slowing again in the

Source: Devon County Minerals Local Plan, Adopted Plan: Part A, June 2004

1970s and then increasing to reach a peak of 3.5mt in 1988. Production fell to 2.7 mt in 1992. Production in 2000 was similarly about 2.7mt.

9.8.4 The major markets for china clay comprise paper manufacture (about 80%), ceramics (12%), and pharmaceuticals. Clays of different grades are required for each use, the key properties being their brightness, yellowness, particle size, viscosity, abrasion and iron or potash content.

Lifting clay slurry by Archimedes Screw, Marsh Mills Processing Site.

9.9 Safeguarding of China Clay Resources

9.9.1 The national importance of the mineral has long been recognised by the establishment of a China Clay Consultation Area. The procedure established was similar to that for ball clay explained in detail in section 8.7.

9.9.2 The extent of the Mineral Consultation Area boundary is shown on Inset Plan 37.

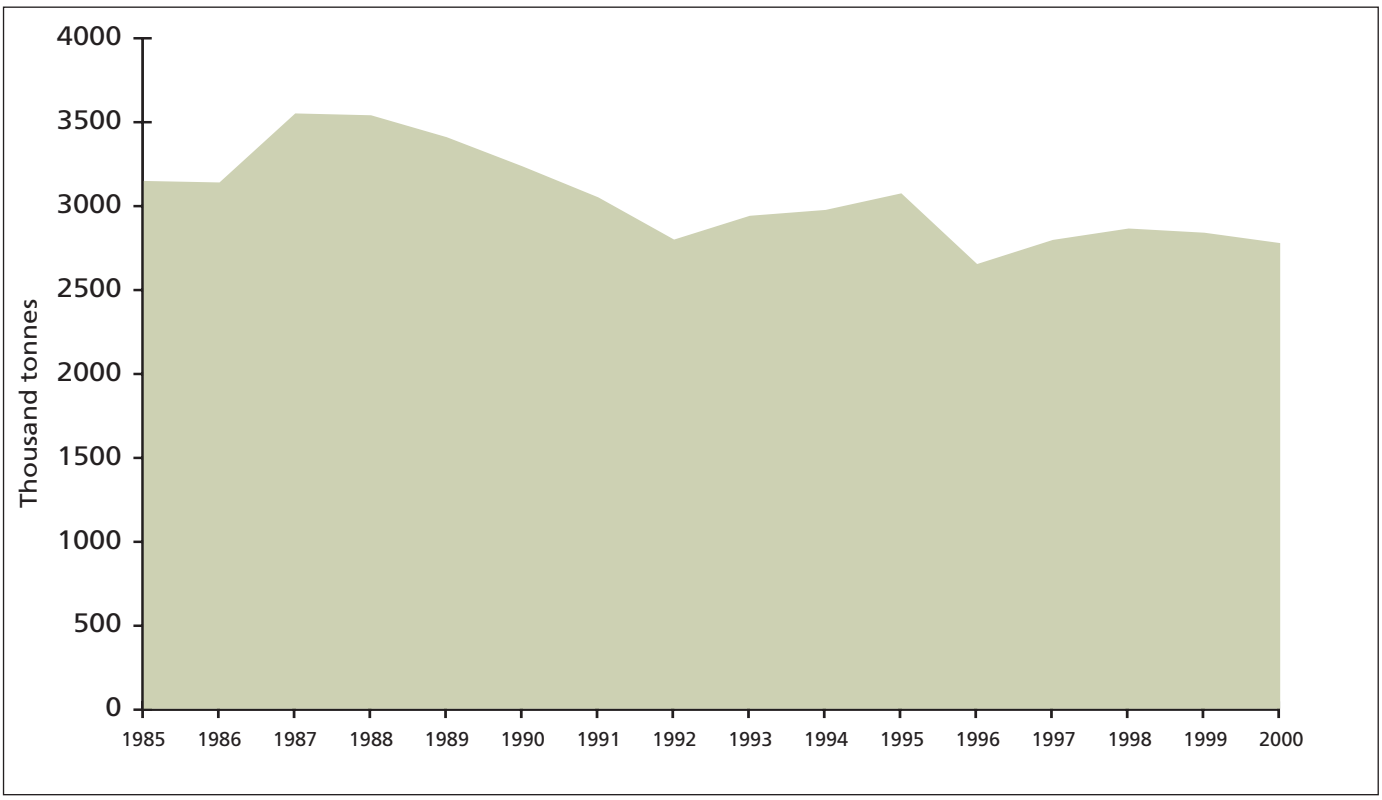
9.10 Extraction Processes

9.10.1 In general, the prime aim of extraction of the clay is to obtain specific clay qualities from a medium of variable clay content, and to refine it into a range of products each of consistent quality.

9.10.2 Clay mining and subsequent processing is a complicated series of activities that can be split into three distinct sections as follows:

Opencast mining - this process firstly requires the removal of overburden (which can vary in depth between 1 and 15 metres). Once the clay-bearing rock is exposed, extraction is by a hydraulic mining process, where a high pressure jet of water is fired at the pit face from a water cannon known in the industry as a 'monitor'. This washing liberates the china clay, together with sand and mica. The material runs into the lowest level of the pit as a thick slurry, where centrifugal pumps lift the material to mechanical sand classifiers where the more coarse sand elements are removed. Once separated, the

Figure 9.1 UK PRODUCTION OF CHINA CLAY 1985 - 2000



Source: Devon County Minerals Local Plan, Adopted Plan: Part A, June 2004

sand is disposed of to tip using belt conveyors and haul trucks and the clay suspension is then moved by pipeline to the processing plant for the secondary process of refining. In addition to hydraulic mining, the major operator increasingly carries out dry mining. Using this method, china clay and all associated waste minerals are removed by mechanical excavator and taken by haul lorry to the plant area for processing.

Clay thickeners, Lee Moor.

Refining - this consists of mineral processing techniques that are designed to remove the smaller sized waste particles that are mainly composed of very fine quartz and mica, leaving china clay behind. Value can also be added to the clay at this stage by a variety of processes designed to engineer the size and shape of the product, together with the use of a chemical bleaching process that improves its whiteness. After refining, the clay is moved on to the final process of drying.

Empty clay thickener undergoing cleaning and maintenance.

Drying - this consists of firstly converting the liquid clay into a solid material by filtration. This produces a material with a moisture content of about 25%. Moisture content is further reduced by passing the clay through a thermal dryer. These dryers are fired by natural gas and produce a clay with around 10% moisture content. This product is normally sold in pelletised form with a particle size range from 6 to 12 mm.

9.10.3 Due to increasing demands by the various industries using china clay, the final refinement of the product has become increasingly sophisticated. It is necessary for such specifications to be met and to ensure a consistency and uniformity of supply. The refining process involves the blending of clays, and uses a series of refinement processes including settlement and flotation techniques to separate different clay size particles, thickening of the slurry and sand grinding techniques to increase the percentage of fines in the kaolin. The products are then dewatered or dried for transport.

9.10.4 Clay is moved by pipeline from the refinery at Lee Moor to the drying plant at Marsh Mills, and hence the Mineral Consultation Area includes the immediate area alongside that route. During the process of the china clay production, on average, about 9 tonnes of waste are produced for each tonne of clay. In general, the waste comprises 4.5 tonnes of over burden/stent, 3.5 tonnes of sand and one tonne of micaceous/fine sand residues. This ratio is not constant and will vary according to the quality of deposit and the variation throughout the pits. In Devon, which accounts for 15% of total production, the waste production figure is around 4mt per annum, of which about 1.5mt is sand. Approximately 300,000 tonnes per annum of this sand is sold as aggregate.

China Clay tips at Lee Moor.

Source: Devon County Minerals Local Plan, Adopted Plan: Part A, June 2004

9.10.5 Until the late 1960s, tip form was dominated by conical incline tips. The main tips in the Lee Moor area now tend to be large structures in which all types of tip material are moved to the tip by dump truck, creating a small number of very large tips rising in steepsided benches with flat tops which are prominent in the surrounding landscape. However, more recent phases of tipping have gentler slopes blending in more naturally with the surrounding topography.

Mica dam retaining wall at Portworthy, Lee Moor

9.10.6 Mica is tipped in large lagoons behind embankments in stepped lifts. A typical example is at Portworthy where the tipping takes place in successive layers to a total height of around 30 metres.

9.11 Environmental Effects of China Clay Working

9.11.1 The characteristic landscape of the Lee Moor area is that of open moorland and upland agriculture within a generally nonintensive surrounding land use. The overall effect of such tipping activity on this landscape is extensive. Although the stark appearance of the tips does mellow with time, they are generally an intrusive part of the landscape with incongruous slope textures and footprints. A research project commissioned by the Department of the Environment entitled "Landscaping and Revegetation of China Clay Wastes" has been published by Wardell Armstrong. This Report sets out a reclamation strategy together with guidance on best reclamation practice. Regard will be had to this document in the consideration of new proposals involving the tipping of all types of china clay waste.

9.11.2 The ROMP applications for the china clay operations have been submitted and the Environmental Statement is expected to be submitted in 2004. At this time, particular regard will be had to the effects of working on the landscape, archaeology, nature conservation , and recreational use of the area.