Department of the Environment
Industry Profile

Railway land

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Contaminated Land and
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Industry Profiles, together with the Contaminated Land Research Report series, are financed under the Department of the Environment's contaminated land research programme.

The purpose of these publications is to provide regulators, developers and other interested parties with authoritative and researched advice on how best to identify, assess and tackle the problems associated with land contamination. The publications cannot address the specific circumstances of each site, since every site is unique. Anyone using the information in a publication must, therefore, make appropriate and specific assessments of any particular site or group of sites. Neither the Department or the contractor it employs can accept liabilities resulting from the use or interpretation of the contents of the publications.

The Department's Contaminated Land Research Report series deals with information needed to assess risks; procedures for categorising and assessing risks; and evaluation and selection of remedial measures.

General guidance on assessing contaminated land and developing remedial solutions which is complementary to the Department's publications is provided by the Construction Industry Research and Information Association (CIRIA).

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DOE Industry Profile

Railway land

This profile is based on work carried out by Ironside Farrar Limited and the Environmental Assessment Group Limited and was prepared for publication by the Building Research Establishment.

Preface

DOE Industry Profiles provide developers, local authorities and anyone else interested in contaminated land, with information on the processes, materials and wastes associated with individual industries. They are not definitive studies but they introduce some of the technical considerations that need to be borne in mind at the start of an investigation for possible contamination.

Every site is unique. Investigation of a site should begin with documentary research to establish past uses. Information on the site's history helps to focus a more detailed investigation. This knowledge needs to be supplemented by information on the type of contamination that may be present and where on site it may be found. Profiles give information on the contamination which might be associated with specific industries, factors that affect the likely presence of contamination, the effect of mobility of contaminants and guidance on potential contaminants.

The date when industrial practices first commenced on a site and its location are important clues in establishing the types of operations that may have taken place, so each profile provides a summary of the history of the industry and its likely geographical spread within the United Kingdom.

Profiles should be read with the following reservations in mind:

- individual sites will not necessarily have all of the characteristics described in the profile of that industry;
- practices can vary between sites and change over time;
- as practices change, problems of possible contamination may also change;
- the profile may refer to practices which are no longer followed, and may omit current practices which avoid contamination.

The risks presented by contaminated sites depend on the nature of the contaminants, the targets to which they are a potential threat (such as humans or groundwater) and the routes or pathways by which they reach these targets. The current or proposed use of a site and its environmental setting are crucial in deciding whether treatment is necessary and if so, the methods to be used. Some sites may not need treatment.

The information in profiles may help in carrying out Control of Substances Hazardous to Health (COSHH) assessments for work on contaminated land - see Health and Safety Guidance Note HS(G) 66 *Protection of workers and the general public during the development of contaminated land,* Health and Safety Executive, 1991, and *A guide to safe working practices for contaminated sites,* Construction Industry Research and Information Association, 1995.

Note: the chemical names given to substances in this profile are often not the modern chemical nomenclature, but the names used historically for those substances.

Railway land

1. Background

1.1 Scope

This profile covers facilities and activities, past and present, on railway land and includes the following:

running lines and lineside
electrical substations
infrastructure engineering depots
waste management
freight operations and freight depots

The potential for the contamination of railway land is greatest at depots for the construction and maintenance of locomotives and carriages and for refuelling locomotives, which are the subject of the Industry Profile 'Engineering works: railway engineering works' (see Section 4.3). However, contamination can result from any of the activities described in this profile, although not all will have taken place on any one site.

1.2 History and organisation

Rail networks developed and expanded rapidly throughout the whole of the United Kingdom from 1830 to 1870. Many companies were formed to construct individual routes. Development of the network continued in the latter part of the 19th Century and was accompanied by consolidation of the company structure with the take-over of local companies. Few railways have been built since 1910. In 1923, the many small companies were amalgamated into four large groupings:

Great Western Railway (GWR)
London, Midland Scottish Railway (LMSR)
London North Eastern Railway (LNER)
Southern Railway (SR)

By 1926 these companies operated 32,617 route miles, the maximum number in the history of the industry.

Nationalisation occurred in 1948, resulting in six regions being formed. Geographically these regions resembled the 1923 group boundaries, with LNER being divided into the Eastern and North Eastern regions and Scotland, becoming a separate region, formed from parts of LNER and LMSR. The railways were administered by the government through the British Transport Commission, of which British Rail (BR) was a subsidiary, from 1948 -1963. In 1963, the British Railways Board took over this function.

Major structural changes to the rail industry in the post-war period resulted from the growth of road transport. Railways have concentrated on those sectors of the transport market where they have an advantage, and have withdrawn from the 'common carrier' role of the 19th Century. Associated with this concentration on specific markets has been a significant contraction in the size of the network,

although this has remained fairly stable since the early 1970s.

In April 1994, responsibility for infrastructure, its maintenance and operation, was vested in a separate Government-owned plc, 'Railtrack', which today maintains about 10 300 route miles.

Other railway operators include London Transport and a growing number of light-rail systems, for example Tyneside, Manchester and Sheffield.

Railway Group Standards are the mandatory technical documents that set out what is required to ensure safe working by all participants on the restructured railway. They increasingly cover environmental matters and will minimise any contamination of railway properties in the future.

2. Activities

2.1 Infrastructure engineering

2.1.1 Running lines and lineside

The building of the railways involved the movement of large amounts of material to create cuttings and embankments, and the construction of bridges and tunnels. Fill material was used extensively during the 19th and 20th Centuries, where there was a shortfall of natural excavated material to raise ground levels and form embankments. This may have involved the use of waste materials, for example clinker, ash etc. from the local area. The industrial history of the area can be a valuable pointer to the range of possible contaminants. For example, iron and steel works wastes were used in South Wales and North-East England, whilst wastes from the LeBlanc process (alkali manufacture) were used for railway embankments and site preparation in North-West England. Maintenance of the 'way and works' is principally concerned with the maintenance of bridges, either by painting (metal structures) or by pointing (brick structures).

The track structure consists of a formation graded to shed water to either side, or into longitudinal drains and compacted to support superimposed loadings. A layer of crushed and broken rock, known as ballast, consisting of granite, limestone or sandstone is placed onto the formation and is levelled to support the track. In many areas, crushed slag from steel making processes has been used as a ballast and much remains today. In the past, vast quantities of steam locomotive ash were generated and this was extensively used to provide a track ballast. Drainage of rainwater from the bed of ballast is imperative if the ballast is to fulfil the requirement of supporting the track in both the horizontal and vertical planes. Interaction with the substratum, sometimes compounded by degradation of the crushed stone through abrasion, may lead to impedance of drainage. Removal of 'spent ballast' and its replacement with fresh ballast is then required.

The track comprises sleepers, rails and various fastening components. Periodic renewal involves replacement with new materials whose specification reflects current practice. For example, modern sleepers are mainly pre-stressed concrete, although quantities of imported hardwoods and softwoods which are treated with preservatives are still used. Many softwood sleepers which have been in service for

a number of years and are beginning to exhibit signs of decay are further treated with decay inhibitors in-situ.

Herbicides are used to prevent the growth of weeds on the tracks and along the lineside. In the past chemicals such as atrazine and simazine were used. Chemicals now in use include diuron and glyphosate.

Other activities include repairs, renewal of fences, excavation and maintenance of dykes, ditches and drainage systems, routeing of cable ducts, lowering of trackside margins and other embankment grading.

In the past, signalling systems were operated exclusively by mechanical means (wires and levers), with low voltage electric detection/telegraph communications between the frequent signal boxes. When electrically operated systems began to appear, signal boxes became redundant and were demolished. Modern systems rely upon solid-state interlocking components and fibre-optic cabling. Throughout the railway networks, signalling systems are found with trackside cabling carried within ducting, supported on hangers or occasionally buried up to 0.5m below trackside margins.

2.1.2 Electrical substations

Around 30% of Railtrack route mileage is electrified. Electric traction was first used in the 1890s. The technology evolved rapidly in the first half of this century, culminating in the adoption of 25kV ac, with overhead current collection, as the BR standard in 1955 and represents the majority of the electrified mileage. All overhead systems have now been converted to that standard. The 25kV ac system draws power directly from the National Grid and is using a higher voltage which requires far fewer supply points. Polychlorinated biphenyls (PCBs) which were used in transformers on the early 25kV ac electrification have now been replaced.

Third-rail dc electrification using relatively low voltage (600-750V) was adopted in earlier decades as an attractive economic proposition for suburban electrification. Extension of the South London suburban electrification in 1915-1930 resulted in the electrification of almost all the former Southern Region to this system. Third-rail operations are also found in Merseyside and North London. London Transport's underground network operates a fourth-rail system at a similar voltage. The low voltage of the third-rail system requires more sub-stations which transform the current supplied from the National Grid to low-voltage dc. These sub-stations are fed by oil-filled cables. In the past, the transformers used oils containing PCBs. These have now been replaced and the renewal of the main cables is reducing the length of oil-filled supply cables.

2.1.3 Infrastructure engineering depots

The infrastructure of engineering depots varies according to the size and activities of the engineering function being serviced. Depots are located throughout the United Kingdom and the tasks undertaken there include:

manufacture of concrete structures and components;
track assembly;
reclamation of components from used track;
welding and repairs;
metal machining and assembly/fabrication;

sawmills and woodworking shops;
electrical/electronic component supply, assembly and repair;
painting processes;
stores.

Owing to the wide range of depots in use, the raw materials received have been and continue to be varied. These materials range across the industrial spectrum and include aggregates, ballast, sand, timber, sleepers, cement and concrete items, steel sections and rails.

Other materials include plastics, glass fibre, glass, cables, bricks, chlorinated and non-chlorinated solvents, paints, oils (or in the past coal) and lubricants, bottled gas and adhesives.

In the past, most deliveries were by rail and some by road. These days, deliveries are mainly by road.

In the past, most material, including bulk items, would have been off-loaded and moved using manpower. Off-loading is now generally carried out using mechanical means. Materials such as sleepers, rails and other track components are stored outside. Smaller boxes and cartons are manhandled and stored inside purpose-designated stores. Drums of oil are nowadays stored on hardstanding or in bunded areas.

2.2 Railway operations

The construction, maintenance and repair of locomotives and rolling stock are discussed in the profile on railway engineering works (see Section 4.3).

2.2.1 Freight operations

During the 'common carrier' period which lasted until the early 1960s, railways carried a wide range of commodities. Significant industrial sites were connected directly to the rail network through private sidings. The ownership of the freehold and the track at these private sidings remains with the original freeholder and have not been transferred to Railtrack. The majority of freight transhipment took place on these private sidings.

2.2.2 Freight depots

Public sidings, often with an associated goods shed, were to be found adjacent to most passenger stations. Freight depots handled the transhipment of incoming goods, with coal for domestic consumption frequently the largest component. Depots also despatched products for local agriculture and industries. Larger facilities were located near to major cities and ports. At least sixty years ago some would have accommodated horse-drawn traffic and included stables and possibly associated facilities such as veterinary services. A small number of the largest freight depots may have included an abattoir.

Transhipment relied on manual means, on cranes and, in the case of hopper wagons, on gravity.

2.3 Waste management

Waste management is an issue in railway operations as in any other industry. As with other industries, practices in this area have changed and improved over time. Particular wastes are associated with the different types of railway land described in this profile.

2.3.1 Running lines and lineside

Following renewal and maintenance, replaced materials will normally be stored at the lineside awaiting return to an infrastructure engineering depot for reclamation or disposal. Ballast and other soil or rubble which is in suitable condition may be re-used on the network and some spent ballast is used to strengthen embankments. Where it is not appropriate to re-use ballast and other soil or rubble, the material is delivered to an engineering landfill site.

2.3.2 Engineering landfill sites

The British Railways Board have indicated that in the past there were more than forty engineering landfill sites or, as they are usually referred to, engineering tip sites. Those engineering tip sites now owned by Railtrack are located on operational railway land and are much smaller than municipal landfills. The engineering methods to protect the environment at these engineering tip sites are comparable to landfills of similar age operated by local authorities or the private sector. Nowadays, the bulk of the material disposed of at the engineering tip sites consists of spent ballast or rubble but, in the past, large quantities of ash and clinker were disposed of at these sites. Other materials disposed of in these tips are the small numbers of broken sleepers, scrap from other engineering activities, for example stock maintenance, and possibly excavation and building rubble. In addition, traces of fuel, oils and spilt cargoes could be expected in some or all of the tips. In some cases, scrap asbestos was buried in engineering tips and, where this is known to have taken place, appropriate precautions have been taken by the site management.

Most waste deposited into engineering landfill sites is delivered by rail. Typically, a number of sidings are laid out across the site. As areas of the site are filled the sidings are re-positioned. In the past, the wagons were emptied by hand but current practice is for the work to be carried out by machine. The wagons are emptied from either side and the deposited material is spread in rough layers. A number of the operational landfills owned by Railtrack are operated by a waste management contractor. Some engineering tips are actively worked to reclaim stone for resale into the aggregate market.

2.3.3 Freight depots and infrastructure engineering depots

The waste arisings at these depots will reflect the nature of the activity which was carried out at the site. Most solid wastes arise from scrap metal, drums, cartons and other packaging materials. In the past, combustible waste would have been burned on site or used as fuel for outdoor braziers to warm staff during cold weather. Alternatively, this waste would have been bulked together for off-site disposal. Timber sleepers were often sold for agricultural use, such as fencing. At some locations, where sufficient land was available, mixed waste may have been deposited and spread directly on to the soil or compacted with rubble/spent ballast.

2.3.4 Recycling and re-use

Material which has re-sale value is generally segregated from the rest at source and sold into the relevant scrap market. This includes considerable quantities of scrap steel from the reclamation of track and signalling equipment.

3. Contamination

The contaminants on a site will largely depend on the history of the site and on the range of materials produced there. Potential contaminants are listed in the Annex and the probable locations on site of the main groups of contaminants are shown in Table 1. It is most unlikely that any one site will contain all of the contaminants listed. It is recommended that an appropriate site investigation be carried out to determine the exact nature of the contamination associated with individual sites. In addition, some of the contamination scenarios discussed above represent a worse case and should not be expected as normal occurrences.

3.1 Factors affecting contamination

In some areas, ash ballast (possibly containing metals, phenols, sulphates and polycyclic aromatic hydrocarbons (PAHs)), may be found in siding complexes. Ash ballast may also be buried below modern ballast layers.

Fuel oils, lubricating oils and greases may cause localised contamination of ballast and of areas where locomotives and multiple units have stood for significant periods of time, for example at terminal stations and in sidings. There may also be localised contamination due to the use of antifreeze liquids such as ethylene glycol.

Tracks and the immediate trackside margins may be subject to the accumulation of herbicides.

Contamination is possible through spillages and leaks of materials stored or used at infrastructure engineering workshops, eg fuel oil, lubricating oils, solvents.

There may be contamination in sidings resulting from spillages of the cargoes; the nature of contamination would depend on the types of cargoes handled at particular sidings.

Section 2.3.2 summarises the materials deposited at engineering landfill sites.

There have been programmes of withdrawal and replacement of oil-filled transformers containing PCBs in electrical substations but it is possible that a few such transformers are still in place. There may be contamination because oils containing PCBs have leaked or been spilled.

Asbestos may have been used as roofing or cladding to buildings or lagging to pipework and may have caused contamination during the dismantling of buildings or removal of pipework.

General contamination of a site may also occur through the wind dispersal of airborne contaminants eg coal dust from open wagons in transit and from steam locomotive tenders, metal particulates and asbestos fibres.

3.2 Migration and persistence of contaminants

3.2.1 Oils and solvents

Organic contaminants such as diesel fuel, hydrocarbons from oils and greases, and solvents used in metal cleaning operations are highly mobile and pose a considerable threat to water resources. Close to the soil surface, some may be lost directly to the atmosphere by evaporation. Groundwater may be contaminated by the downward seepage of liquids under gravity, the movement of vapours in unsaturated soils and their subsequent solution in groundwater, and the infiltration of groundwater through oil and solvent contaminated soil. Surface water may be affected by run-off from or rainwater infiltration through oil-saturated ground, by contaminated soil and by the discharge of oils and solvents into drains or sewers and ultimately into nearby watercourses.

Oil and non-chlorinated solvents are usually less dense than water and will float on the surface of the water-table. Chlorinated solvents are more dense than water and will tend to migrate to the bottom of aquifers. They are persistent chemicals. The risk to soilwater depends on the depth of the water-table and the properties of the soil structure. Since they move under the influence of gravity, their migration may not be consistent with general groundwater flow.

The transport and fate of both organic and inorganic compounds within the soil will be dependent on a combination of physical, chemical and biological factors. Generally, the higher the natural organic matter and clay content within the soil, the greater the adsorption of organic contaminants and the greater the reduction of contaminant migration. Conversely, the greatest migration of contaminants will occur in coarse-grained sands and gravels with little organic content. Soluble compounds are the most mobile. Less soluble compounds which become adsorbed onto clay or organic matter may cause water pollution long after the original source has been removed, by continuing to desorb and dissolve into soil-water. The risk from organic compounds in the soil to current and future water supplies may therefore be considerable. The more volatile solvents or oil hydrocarbons will migrate through the soil or drainage systems as vapours.

Biodegradation processes in soil can be influenced by a number of factors, namely moisture content, oxygen concentration and pH values, acting separately or in combination. For example, low moisture content reduces microbiological activity, while high moisture content can reduce oxygen penetration and possibly lead to anaerobic soil conditions. Such conditions enhance the biodegradation of some materials eg chlorinated compounds, while aerobic conditions are needed to biodegrade many oils. Also, low pHs tend to reduce the bacterial population and encourage fungal activity; at pHs lower than 5, microbiological activity is much reduced. The presence of heavy metals also inhibits micro-organisms. Because of these factors, at high concentrations in soil, even relatively non-persistent compounds may not biodegrade easily.

Phenols are very soluble in water and may percolate in solution through the soil to groundwater or contaminate surface waters through run-off in rainwater. Phenol can permeate water supply pipes of polymeric materials such as PVC and can attack the joints of metal pipes which are usually made of PVC or plastic sealing compounds.

3.2.2 Other organics

Polycyclic aromatic hydrocarbons are persistent. Polychlorinated biphenyls are highly persistent, soluble in fat and tend to accumulate in food chains.

Pesticide mobility is dependent upon water solubility and soil condition. The decay rate for atrazine and simazine depends on the soil condition, but the worst case half-life of about 165 days indicates that any existing residual contamination will have disappeared within 5-10 years.

3.2.3 Metals and other inorganic compounds

The movement of metals through the soil is significantly retarded by the presence of clay minerals and organic matter. Under normal conditions the mobility of metals in soil is low. However, the solubility of some metals may increase under acidic conditions which increases the potential for ground and surface water contamination.

Soluble inorganic compounds can percolate through the soil to contaminate groundwater or surface waters through run-off in rainwater. Asbestos is not biodegradable and is likely to remain immobile in the soil.

4. Sources of further information

4.1 Organisations

For information concerning railway land in the United Kingdom the following organisations should be consulted:

British Railways Board
Euston House
24 Overshoot Street
London
NW1 1DZ

British Rail Scientific Services
PO Box 2
London Road
Derby
DE24 8YB

London Transport
55 Broadway
London
SW1H 0DB

Railtrack plc
Fitzroy House
355 Euston Road
London
NW1 3AG

Association of Railway Preservation Societies Ltd
3 Orchard Close
Watford
Hertfordshire
WD1 3DU

4.2 Sources of further information concerning the activities described in this profile

Ministry of Agriculture Fisheries and Food. *Advisory Committee on Pesticides evaluation documents Nos. 51 & 52.* Pesticides Safety Directorate. Rothamsted, Harpenden, Herts. AL5 2SS.

Harrison R M. *Pollution: Causes, effects, and control.* Royal Society of Chemistry.

Wrigley W et al. *Reclamation of former railway wagon repair works.* Simonside, South Shields, Tyne & Wear. Proceedings of 2nd International Conference on Construction on Polluted and Marginal Land, 1992.

Croucher B J et al. *Earthworks on contaminated land - the role of the chemist.* Proceedings of 2nd International Conference on Construction on Polluted and Marginal Land, 1992.

Fleming G (Ed). *Recycling derelict land.* Institution of Civil Engineers. Thomas Telford, London, 1991.

Thorpe's dictionary of applied chemistry. 4th. Edition. Longmans.

Nock O S. *The railway enthusiasts encyclopaedia.* Hutchinson & Co. Ltd. 1968.

Case study including information relevant to this Industry Profile:

Paul V. *Bibliography of case studies on contaminated land: investigation, remediation and redevelopment.* Garston, Building Research Establishment, 1995.

Information on researching the history of sites may be found in:

Department of the Environment. *Documentary research on industrial sites.* DOE, 1994.

4.3 Related DOE Industry Profiles

Engineering works: mechanical engineering and ordnance works
Engineering works: railway engineering works
Timber treatment works

4.4 Health, safety, hazards, wastes and clean-up

The Control of Substances Hazardous to Health (COSHH) Regulations 1994 and the Management of Health and Safety at Work Regulations 1992 are available from HMSO. Information on relevant health and safety legislation and approved codes of practice published by HSE publications are available from Health and Safety Executive Books, PO Box 1999, Sudbury, Suffolk, CO10 6FS (telephone 01787 881165), as well as HMSO and other retailers.

Information on the health, safety and environmental hazards associated with individual contaminants mentioned in this profile may be obtained from the following sources:

Sax N and Lewis R. *Hazardous chemicals desk reference.* New York, Van Norstrand Reinhold Company, 1987.

Verschueren K. *Handbook of environmental data on organic chemicals.* 2nd Edition. New York, Van Norstrand Reinhold Company, 1983.

Howard P H. *Handbook of environmental fate and exposure data for organic chemicals.* Vols I and II. USA, Lewis Publishers, 1990.

4.5 Waste disposal and remediation options

Useful information may be obtained from the Department of the Environment series of Waste Management Papers, which contain details of the nature of industrial waste arisings, their treatment and disposal. A current list of titles in this series is available from HMSO Publications Centre, PO Box 276, London, SW8 5DT.

Of particular interest is:

Department of the Environment. *Special waste.* Waste Management Paper No.23. Department of the Environment. London, HMSO, 1982.

Publications containing information on the treatment options available for the remediation of contaminated land sites, prepared with the support of the Department of the Environment's Research Programme, can be obtained from National Environmental Technology Centre Library, F6, Culham, Abingdon, Oxfordshire, OX14 3DB.

A full list of current titles of Government publications on all aspects of contaminated land can be obtained from CLL Division, Room A323, Department of the Environment, Romney House, 43 Marsham Street, London, SW1P 3PY.

Advice on the assessment and remediation of contaminated land is contained in guidance published by the Construction Industry Research and Information Association (CIRIA), 6 Storey's Gate, Westminster, London, SW1P 3AU.

Annex Potential contaminants

The chemical compounds and other materials listed below generally reflect those associated with the industry and which have the potential to contaminate the ground. The list is not exhaustive; neither does it imply that all these chemicals might be present nor that they have caused contamination.

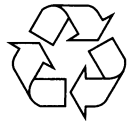
Organic	hydrocarbons: diesel, lubricating oils, paraffin polychlorinated biphenyls (PCBs) polycyclic aromatic hydrocarbons (PAHs) solvents ethylene glycol creosote (contains polycyclic aromatic hydrocarbons) herbicides: atrazine, simazine, 2,4,5 - trichlorophenoxyacetic acid, sodium chlorate, dalapon, diuron, borax, paraquat, picloram, 2,4 - dichlorophenoxyacetic acid
Metals	ferrous residues metal fines
Other	asbestos ash and fill (possibly containing metals, phenols, sulphates and PAHs) sulphates

Table 1 Main groups of contaminants and their probable locations

Railway land

Location or process / Chemical group	Running lines	Stations	Sidings and freights yards	Freight depots	Signal box lamprooms	Infrastructure engineering workshops	Electrical substations	Engineering landfill sites	Roofing
Fuel oils									
Lubricating oil									
Paraffin									
PCBs									
PAHs									
Solvents									
Ethylene glycol									
Creosote									
Herbicides									
Ferrous residues									
Metal fines									
Asbestos									
Ash									
Sulphate									

Shaded boxes indicate areas where contamination is most likely to occur



Recycled paper

DOE Industry Profiles

Airports
Animal and animal products processing works
Asbestos manufacturing works
Ceramics, cement and asphalt manufacturing works
Chemical works: coatings (paints and printing inks) manufacturing works
Chemical works: cosmetics and toiletries manufacturing works
Chemical works: disinfectants manufacturing works
Chemical works: explosives, propellants and pyrotechnics manufacturing works
Chemical works: fertiliser manufacturing works
Chemical works: fine chemicals manufacturing works
Chemical works: inorganic chemicals manufacturing works
Chemical works: linoleum, vinyl and bitumen-based floor covering manufacturing works
Chemical works: mastics, sealants, adhesives and roofing felt manufacturing works
Chemical works: organic chemicals manufacturing works
Chemical works: pesticides manufacturing works
Chemical works: pharmaceuticals manufacturing works
Chemical works: rubber processing works (including works manufacturing tyres or other rubber products)
Chemical works: soap and detergent manufacturing works
Dockyards and dockland
Engineering works: aircraft manufacturing works
Engineering works: electrical and electronic equipment manufacturing works (including works manufacturing equipment containing PCBs)
Engineering works: mechanical engineering and ordnance works
Engineering works: railway engineering works
Engineering works: shipbuilding, repair and shipbreaking (including naval shipyards)
Engineering works: vehicle manufacturing works
Gas works, coke works and other coal carbonisation plants
Metal manufacturing, refining and finishing works: electroplating and other metal finishing works
Metal manufacturing, refining and finishing works: iron and steelworks
Metal manufacturing, refining and finishing works: lead works
Metal manufacturing, refining and finishing works: non-ferrous metal works (excluding lead works)
Metal manufacturing, refining and finishing works: precious metal recovery works
Oil refineries and bulk storage of crude oil and petroleum products
Power stations (excluding nuclear power stations)
Pulp and paper manufacturing works
Railway land
Road vehicle fuelling, service and repair: garages and filling stations
Road vehicle fuelling, service and repair: transport and haulage centres
Sewage works and sewage farms
Textile works and dye works
Timber products manufacturing works
Timber treatment works
Waste recycling, treatment and disposal sites: drum and tank cleaning and recycling plants
Waste recycling, treatment and disposal sites: hazardous waste treatment plants
Waste recycling, treatment and disposal sites: landfills and other waste treatment or waste disposal sites
Waste recycling, treatment and disposal sites: metal recycling sites
Waste recycling, treatment and disposal sites: solvent recovery works
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- Charcoal works
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- Fibreglass and fibreglass resins manufacturing works
- Glass manufacturing works
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- Printing and bookbinding works

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