equipment, and may be exposed to precipitation.

Another category of operations are rolling, drawing, and extruding operations. Facilities involved in these operations will often use furnaces similar to those described above. The metal will often be heated, and then passed through a series of rollers which alter its' dimensions, making it longer, flatter, etc. This process generally involves large amounts of contact cooling water which can contain high levels of suspended solids and oil and grease.

c. Preparation of Molds, Pouring, Cooling, and Shakeout. Foundry operations and die-casters will generally prepare the molds, casts, or dies that will determine the ultimate shape of the product to be produced. There are a number of possible operations with significant differences between them. These include sand casting, investment casing, and die casting.

Sand casting operations involve a number of possible steps and a range of materials. Casts are shaped in two sections which form the outside of the part to be produced. Cores can also be used to form inner surfaces of the parts. A variety of sands may be used and can be combined with clay and a number of other additives to give the mold the desired properties. Once the casting has cooled, it is placed on a vibrating screen which shakes loose the majority of the sand. The casting is then ready for cleaning and finishing operations. At some facilities the used sand may be recycled or some or all of the sand may need to be disposed of and replaced.

Investment casting involves the formation of a wax replica of the part to be produced, usually in a metal die. A series of wax parts may be attached to a "tree." Once a tree is completed, it is coated with a ceramic cast in a series of dipping operations. The wax may then be removed from the cast in a furnace or the metal can be poured in directly. As in sand casting, the casting is allowed to cool before the cast is removed. A separate wax form and ceramic shell must be made for each part to be produced.

Die-castings employ a more direct route from molten metal to finished part. A metal die is produced and molten metal in injected under pressure into it. Once it has cooled, the casting is removed and is ready for finishing operations. Unlike sand casting or investment casting, the die can be used over and over to produce more parts.

Like most foundry operations, molds are generally prepared indoors. There are, however, particulate emissions associated with the pouring and cooling of molten metal.

d. Metal Cleaning, Treating, and Finishing. Almost all operations in the primary metals industry result in metal products which require some degree of finishing. The type of finishing activities undertaken depend on the material being treated, as well as the properties desired in the final part and can include both mechanical and chemical operations.

Castings generally come out of their molds with metal sprues and other imperfections which must be removed. This can be done through grinding, cutting, or blasting with sand, shot, or grit. Other possible operations include drilling, threading, or dimensioning. A combination of these operations is often necessary.

Some facilities such as rolling mills will use a descaling process to remove oxides and other residues which can form on the surfaces of metallic products. Typical operations include blasting with water or sand. This produces large quantities of scale and other particulate matter which may contain other residual products such as oil.

Heat treating is another operation which can involve furnaces for controlled heating and cooling of large quantities of metal. A variety of media may be used to cool metals at different rates. Oil, water, and liquid salt baths may all be used depending on the properties desired in the finished product. Acid pickling may be used to remove unwanted material from the surface of metal. Other cleaning and finishing operations may involve a wide range of solvents, acids, or other chemicals. All of these processes can generate toxic wastes in the form of sludges, particulates, or spent baths. In addition, residuals from these operations left on the metal surface may become exposed to storm water if materials are transported or stored outside.

e. Waste Handling and Disposal. Wastes are generated from numerous sources within the primary metals industry. Some types of waste are found at a majority of facilities while others may be specific to a particular activity. Some of the common waste products include used sand, cores, butts, refractory rubble, machining and finishing wastes, slag, dross, and collected particulates such as baghouse dust.

Sand casting operations which are not able to fully recycle their sand may generate large volumes of waste or "burnt" sand. "Wet" sands may contain any one of a number of additives, depending on the specific type of casting being produced. Other related wastes include the cores and butts used in the sand casing process.

Most casting operations will produce a product which requires some degree of machining and finishing. The wastes produced will depend mainly on the material being finished and whether a mechanical or chemical process is used. Machining waste can include fines, turnings, or cuttings as well as shot, grit, and scale from blasting operations. Chemical finishing can result in waste solvents, acids, and pickling sludges and baths which contain metal wastes.

The metal melting process results in the production of slag from ferrous, or dross from nonferrous materials. The content and volume of these wastes produced will vary depending on the charge material, and any fluxing agents or additives that may be used. In general, slag is produced in greater quantities and will be more likely to be stored outside, however there is the possibility of exposure of both types of waste to precipitation.

Particulate matter generated in furnaces and during machining is another source of waste with significant potential for storm water contamination. These waste streams may be segregated at larger facilities or combined, but the concerns are essentially the same. The dusts are collected in baghouses, electrostatic precipitators, wet scrubbers, or in cyclones and disposed of. If the pollution control equipment is inadequate, or not operating effectively, there is potential for storm water contamination from these types of waste.

3. Pollutants Found in Storm Water Discharges

Impacts caused by storm water discharges from primary metals facilities will vary. A number of factors will influence to what extent the activities at a particular facility will affect water quality. These include: geographic location, hydrogeology, the amounts and types of materials stored outside, the types of processes taking place outside, the size of the operation, as well as the characteristics of a particular storm event. These and other factors will interact to affect the quantity and quality of storm water runoff. For example, particulate emissions from furnaces or ovens may be a significant source of pollutants at some facilities, while outdoor material storage such as scrap piles may be a primary source at others. In addition, sources of pollution other than storm