Exhibit 7
Potential Pollutants the City Monitors

Development Document for Final Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category

April 2002

U.S. Environmental Protection Agency
Office of Water (4303T)
1200 Pennsylvania Avenue, NW
Washington, DC 20460

EPA-821-R-02-004

Exhibit 7
Potential Pollutants the City Monitors

United States
Environmental Protection
Agency

Development Document for Final Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category

EPA 821-R-02-004

Christine Todd Whitman
Administrator

G. Tracy Mehan, III
Assistant Administrator, Office of Water

Geoffrey H. Grubbs
Director, Office of Science and Technology

Sheila E. Frace
Director, Engineering and Analysis Division

Donald F. Anderson
Acting Chief, Chemical Engineering Branch

William Anderson and George Jett
Project Managers

Yu-Ting Guilaran
Project Engineer

Jade Lee-Freeman
Statistician

April 2002

U.S. Environmental Protection Agency, Office of Water
Washington, DC 20460

Exhibit 7
Potential Pollutants the City Monitors

minimize surface disturbances. Temper mills are typically used with only one or two stands (Reference 5-8).

Sendzimir cold rolling mills, commonly referred to as Z-mills, are another type of cold forming operation. Z-mills have various configurations, but generally steel passes through work rolls that are supported and driven by first- and second-intermediate rolls. The mill design allows for quick adjustments to vary the width, thickness, and hardness of the rolled steel. These mills typically use hydraulic fluid or oil emulsions rather than aqueous rolling solutions.

Cold rolling operations generate heat that is dissipated by flooded lubrication systems. These systems use palm oil or synthetic oils that are emulsified in water and directed in jets against the rolls and the steel surface during rolling.

Surface Treatment and Annealing Operations

Surface treatment and annealing operations include alkaline cleaning, annealing, hot coating, and electroplating. Facilities performing finishing operations often have a number of these operations on a single line.

Alkaline cleaning removes mineral and animal fats and oils from the steel surface. Caustic, soda ash, alkaline silicates, and phosphates are common alkaline cleaning agents. Passing the steel through alkaline solutions of specified compositions, concentrations, and temperatures is often enough to clean the product; however, for large-scale production or a cleaner product, sites may use electrolytic cleaning. Adding wetting agents to the cleaning bath also facilitates cleaning.

The annealing process heats steel to modify its bulk properties, which makes the steel easier to form and bend. Steel is heated and kept at a designated temperature and then cooled at a designated rate. Through the annealing process, the metal grain size increases, new bonds are formed at the higher temperature, and the steel becomes more ductile. Sites perform annealing through a batch or continuous process; they may follow annealing operations with a water quench to cool the steel for further processing.

Steel coating operations, such as hot coating and electroplating, improve resistance to corrosion or appearance. Hot coating operations involve immersing precleaned steel into molten baths of tin, zinc (hot galvanizing), combinations of lead and tin (terne coating), or combinations of aluminum and zinc (galvalume coating); any associated cleaning or fluxing (used to facilitate metal application) steps prior to immersion; and any post-immersion steps (e.g., chromium passivation). Based on survey responses, the metals used for hot coating operations include zinc, zinc/aluminum alloy, aluminum, chromium, lead, antimony, tin/lead alloy, and zinc/nickel alloy.

Electroplating uses electrodes to deposit a metal coating onto the steel. Historically, electroplating at steel mills was limited to tin and chromium electroplating for food

Exhibit 7
Potential Pollutants the City Monitors

Hot Coating

For this analysis, EPA defines hot coating as also including acid cleaning, annealing, alkaline cleaning, and other surface cleaning and preparation operations performed on the same line as a hot coating operation. Hot coating operations are performed on carbon and alloy steels only. The primary use of water and primary source of wastewater from hot coating operations are surface preparation operations, such as acid and alkaline cleaning, that the steel undergoes before hot coating. Twenty-four sites operate a total of 40 hot coating lines. Four of these operations reported a discharge from their hot coating tanks, but did not provide any flow data. Thirty-nine of the operations have a rinse following the coating operation. Rinse wastewater discharge flow rates ranged from 0 gpt to 4,044 gpt, with a median discharge flow rate of 182 gpt. Tank clean-outs, fume scrubbers, and equipment cleaning are other sources of wastewater reported by several sites.

Two of the lines reported operating without a discharge via contract hauling of process wastewater.

Electroplating

For this analysis, EPA defines electroplating lines as also including annealing, alkaline cleaning, acid cleaning, and other surface cleaning and surface preparation operations on the same line. Twenty-two sites reported performing electroplating on a total of 42 lines.

The primary uses of water and primary sources of wastewater from electroplating operations are acid and alkaline cleaning operations performed on the same process line, which generate solution blowdown and rinse wastewater. Wastewater discharge flow rates for electroplating operations vary by the type of metal applied and the product type. Some sites operate countercurrent cascade rinsing and other flow reduction techniques to conserve water; however, other sites require once-through rinsing to ensure product quality. At these sites, thorough rinsing after acid cleaning is critical for proper adhesion of the plating. The range and median wastewater discharge flow rates by metal type for these wastewater streams are listed below. Wastewater discharge flow rates for plate electroplating are not disclosed to prevent compromising confidential business information.

Wastewater Source	Range of Discharge Flow Rates (gpt)	Median Discharge Flow Rate (gpt)
Chrome/Tin Electroplating		
Cleaning solution blowdown	0 to 8,938	1.5
Cleaning rinse wastewater	0 to 54,444	154
Other Metals Electroplating		
Cleaning solution blowdown	0 to 74,691	5.3
Cleaning rinse wastewater	0 to 1,554	26

Exhibit 7
Potential Pollutants the City Monitors

Table 7-17

Pollutants of Concern
Steel Finishing Subcategory - Carbon and Alloy Steel Segment

Pollutant Group	Pollutant of Concern	Acid Pickling	Cold Forming	Alkaline Cleaning	Hot Coating	Electro-plating
Conventional pollutants	Oil and grease measured as hexane extractable material (HEM)	✔	✔	✔	✔	✔
	Total suspended solids (TSS)	✔	✔	✔	✔	✔
Nonconventional pollutants, other (a)	Ammonia as nitrogen	✔	✔	✔	✔	✔
	Chemical oxygen demand (COD)	✔	✔	✔	✔	✔
	Fluoride	✔	✔	✔	✔	✔
	Nitrate/nitrite	✔			✔	✔
	Total petroleum hydrocarbons measured as silica gel treated-hexane extractable material (SGT-HEM)	✔	✔	✔	✔	✔
	Total organic carbon (TOC)	✔	✔	✔	✔	✔
	Total phenols		✔			
	Sulfate	✔				
Priority metals	Antimony				✔	
	Arsenic	✔	✔		✔	
	Chromium	✔	✔		✔	✔
	Copper	✔	✔	✔	✔	✔
	Lead				✔	✔
	Nickel	✔	✔		✔	✔
	Selenium					✔
	Zinc	✔	✔	✔	✔	✔
Nonconventional metals	Aluminum		✔		✔	
	Boron				✔	
	Hexavalent chromium				✔	✔
	Iron	✔	✔	✔	✔	✔

Exhibit 7
Potential Pollutants the City Monitors

Table 7-17 (Continued)

Pollutant Group	Pollutant of Concern	Acid Pickling	Cold Forming	Alkaline Cleaning	Hot Coating	Electro-plating
Nonconventional metals (cont.)	Manganese	✔	✔	✔	✔	✔
	Molybdenum				✔	✔
	Tin			✔		
	Titanium	✔	✔		✔	✔
Priority organic pollutants	Bis(2-ethylhexyl) phthalate		✔			
	1,1,1-Trichloroethane		✔			
Nonconventional organic pollutants	alpha-Terpineol		✔			
	Benzoic acid		✔			
	n-Dodecane		✔			
	n-Eicosane		✔			
	n-Hexadecane		✔			
	n,n-Dimethylformamide	✔				
	n-Octadecane		✔			
	n-Tetradecane		✔			
	2-Propanone	✔				

(a) Nonconventional pollutants other than nonconventional metals and nonconventional organic pollutants.

Note: EPA did not identify POCs for stand-alone continuous annealing because EPA did not sample annealing quenching operations during its sampling program. POCs identified for the other finishing processes apply to continuous annealing.