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LPMEOH™

ENVIRONMENTAL INFORMATION VOLUME

DE-FC22-92PC90543

KINGSPORT, TN
LIQUID PHASE METHANOL PROJECT

PATENTS CLEARED BY CHICAGO ON FEBRUARY 16, 1996

FINAL

MAY 1996

DISCLAIMER

ABBREVIATIONS

AFDU	Alternate Fuels Demonstration Unit
AP-42	Air Pollution Emission Factor
APCI	Air Products and Chemicals, Inc.
BOD	Biochemical Oxygen Demand
CAAA	Clean Air Act Amendments
CBD	Central Business District
CCT	Clean Coal Three
CFR	Code of Federal Regulations
CFS	cubic feet per second
CGCC	Coal Gasification Combined Cycle
CMA	Chemical Manufacturers Association
CO	Carbon Monoxide
CO2	Carbon Dioxide
dBA	decibel
DDC	Dietroit Diesel Corporation
DGC	Dakota Gasification Company
DME	Dimethyl Ether
DOE	Department of Energy
DVT	Design Verification Testing
ECC	Eastman Chemical Company
EIS	Environmental Impact Statement
EIV	Environmental Information Volume
EPA	Environmental Protection Agency
g/MI	grams per mile
H2	Hydrogen
HC	Hydrocarbon
HF	Hydrogen Flouride
HVAC	Heating, Ventilation & Air Conditioning
ICI	Imperial Chemical Industries
IGCC	Integrated Gasification Combined Cycle
ISC	Industrial Source Complex
ISO	International Standards Organization
ISCST	Industrial Source Complex - Short Term
KVRTA	Kanawha Valley Transportation Authority
KW	kilowatt
LACMTA	L. A. County Metro Transportation Authority
LDAR	Leak Detection and Repairs
LPMEOH	Liquid Phase Methanol
M100	100% Methanol
M85	Blend of Methanol with 15% Gasoline
MACT	Maximum Achievable Control Technology
MGD	million gallons per day
MPG	miles per gallon
MSDS	Material Safety Data Sheet
MTBE	Methyl Tertiary Butyl Ether
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAPS	Nat'l Emission Stds for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NH3-N	Ammonia (reported as Nitrogen)
NO2	Nitrogen Dioxide
NOAA	National Oceanic & Atmospheric Association
NOx	Nitrogen Oxide
NPDES	National Pollutant Discharge Elimination System
NSPS	New Source Performance Standards
O3	Ozone
OCPSF	Organic Chemicals, Plastics & Synethetic Fibers
OSHA	Occupational Health & Safety Act
OTM	Once-Through Methanol
PETC	Pittsburgh Energy Technology Center
VOL	Volatile Organic Liquid
PM	Preventative Maintenance
PSD	Prevention of Significant Deterioration
PSI	pounds per square inch
PSIA	pounds per square inch absolute
PSM	Process Safety Management
RCRA	Resource Conservation Recovery Act
SARA	Superfund Amendments & Reauthorization Act
SCAQMD	California South Coast Air Quality Management
SFHRM	South Fork of Holston River Mile
SO2	Sulfur Dioxide
SOCMI	Synthetic Organic Chemical Manufacturing Industry
SOx	Sulfur Oxide
SPCC	Spill Prevention Control & Countermeasure Plan
TCLP	Toxicity Characteristic Leachate Procedure
TCWP	Texaco Coolwater Project
TDAPC	Tennessee Division of Air Pollution Control
TDHE	Tennessee Department of Health & Environment
TEC	Tennessee Eastman Corporation
TED	Tennessee Eastman Division
TOC	Total Organic Compounds
TPD	tons per day
TSI	Texaco Syngas, Inc.
TSP	Total Suspensed Particulates
TSS	Total Suspended Solids
TVA	Tennessee Valley Authority
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
VOC	Volatile Organic Compounds

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1.0 COVER SHEET

Air Products Liquid Phase Conversion Company, L.P. (the Partnership), a joint venture between Air Products and Chemicals, Inc. (Air Products) and Eastman Chemical Company (Eastman), is proposing to design, construct, own and operate a 260 ton per day Liquid Phase Methanol (LPMEOH™) facility at the Eastman facility in Kingsport, Tennessee. The proposed plant will be located on property currently owned by Eastman. It will take a portion of the synthesis gas (a mixture of hydrogen and carbon monoxide) from Eastman's integrated coal gasification system and will supply an existing downstream Eastman chemical plant with methanol. Some of the methanol produced will be used in stationary and mobile demonstrations to test the characteristics of the methanol produced.

The enclosed document is an Environmental Information Volume (EIV) prepared in accordance with 40 CFR Parts 1500 - 1508 and U.S. Department of Energy (DOE) Regulations for the implementation of the National Environmental Policy Act (NEPA) (10 CFR Part 1021). This document will be reviewed by the U.S. Department of Energy (DOE), the lead agency, to identify the level of NEPA documentation required. Information regarding the NEPA process is available from the DOE Office of NEPA oversight (Ms. Carol M. Borgstrom) or from Ms. Mara Dean [(412) 892-4520] and Ms. Karen Khonsari [(412) 892-6106] at Pittsburgh Energy Technology Center (PETC). For project specific information outside the scope of NEPA, the DOE contact person is Mr. Robert M. Kornosky, who can be reached at:

U.S. Department of Energy/PETC
CT-10, Mail Stop 920-L
P.O. Box 10940
Pittsburgh, PA 15236 (412) 892-4521

Ms. Dean and Ms. Khonsari can be contacted by mail at the same address as Mr. Kornosky.

The principal Air Products Liquid Phase Conversion Company, L.P. contact with overall responsibility for this project is:

Mr. William R. Brown, DOE/Clean Coal Technology Program Manager,
Kingsport LPMEOH™ Demonstration Project
Air Products and Chemicals, Inc.
7201 Hamilton Blvd.
Allentown, PA 18195-1501 (610) 481-7584

2.0 EXECUTIVE SUMMARY

This section summarizes the major project aspects contained in this Environmental Information Volume. The purpose and need for the project are identified, as is a summary of the proposed action. Alternatives to this project are profiled. For each environmental aspect, a summary of existing conditions and environmental consequences, if any, is provided.

2.1 Summary of Purpose and Need

The purpose of this proposed project is to demonstrate the commercial viability of Air Products and Chemicals, Inc.'s Liquid Phase Methanol (LPMEOH™) Process using coal-derived synthesis gas, a mixture of hydrogen and carbon monoxide. The Department of Energy's (DOE's) purpose for the demonstration of the proposed project is to help fulfill the goals and objectives of the Clean Coal Technology program by demonstrating the potential of a more efficient, liquid phase reaction process as a preferred alternative to gas phase reactions for methanol production.

The United States needs future sources of alternative liquid fuels. With domestic oil production declining and imports shrinking, the potential of producing affordable liquid fuels from non-petroleum sources could one day prove both strategically and economically important. The LPMEOH™ process offers an extremely attractive route to supplementing our liquid fuel supplies with methanol made from abundant United States coal reserves.

Methanol also has a broad range of commercial applications. It can be substituted for or blended with gasoline to power vehicles. It is an excellent fuel for the rapid-start combustion turbines used by utilities to meet peak electricity demands. It contains no sulfur and has exceptionally low nitrogen oxide characteristics when burned. It can also be used as a chemical feedstock.

Eastman Chemical Company currently both produces and purchases methanol for use at the site. The technology to be demonstrated at the Eastman facility could someday be used as an adjunct to a coal gasification combined cycle (IGCC) power plant -- one of the cleanest and most efficient of the 21st century power generating options. When the power plant is not generating at its full capacity, excess synthesis gas could be used to make methanol. The methanol could be stored on-site and used in peaking turbines or sold as a commercial fuel or chemical feedstock. In this configuration, the cost of making methanol from coal is likely to be competitive with stand alone natural gas-to-methanol facilities.

Air Products and Eastman entered into a joint venture known as Air Products Liquid Phase Conversion Company, L.P. (The Partnership). The Partnership is participating with the DOE in the Clean Coal Technology demonstration of Liquid Phase Methanol technology. Air Products would design and build the LPMEOH™ demonstration facility and Eastman would operate it. The demonstration unit would be a nominal 260-ton-per-day unit on a 0.6 acre plot within the existing Eastman facility in Kingsport, Tennessee.

The program objectives are to demonstrate the LPMEOH™ process scale-up and operability (up to four years) under various coal-based feed gas compositions and to gain operating experience for future synthesis gas conversion projects. If practical, the production of dimethyl ether (DME) as a mixed co-product with methanol will also be demonstrated.

LPMEOH™ technology offers significant potential to economically produce chemical feedstocks (using the United States LPMEOH™ technology over existing foreign Lurgi and Imperial Chemical Industries (ICI) methanol production technologies) and to reduce electric power generation costs with the production of alternative liquid fuels. The domestically developed LPMEOH™ technology uses United States coal to produce clean, storable, liquid fuels and chemical feedstocks. Eventual commercialization of the LPMEOH™ process in IGCC power plants would provide low priced chemical feedstocks and fuel leading to electric power generation cost savings, lower sulfur dioxide (SO_2) and nitrogen oxide (NO_x) emissions, and the reduced use of imported liquid fuels.

The methanol product from the proposed project would be tested off-site in California and West Virginia for suitability as a stationary-use fuel (boilers) and as a vehicle fuel (busses and van pools). These end-use tests would provide a basis for the comparison of the methanol as-produced with conventionally accepted fuels including emission levels and economic viability. The program goal of demonstrating methanol as a fuel would lead to the potential for greater use of oxygenated fuels, which burn cleaner than conventional fuels, thereby reducing air emissions from mobile and stationary sources.

2.2 Summary of Proposed Action

The U.S. Department of Energy, under the Clean Coal Technology Program, would provide cost-shared financial assistance for the design, construction and operation of the commercial-scale liquid phase methanol production facility by the Partnership.

The demonstration unit would be integrated with Eastman's Integrated Coal Gasification facility, accepting synthesis gas and converting it to methanol, for use as a chemical feedstock within the Eastman facility. The Eastman integrated coal gasification facility has operated commercially since 1983. At this site, it will be possible to ramp methanol production up and down to demonstrate the unique load -following flexibility of the LPMEOH™ unit for application to coal-based IGCC electric power generation facilities. Methanol fuel testing will be conducted in both on-site and off-site stationary and mobile applications, such as boilers, buses and van pools. The operation at Eastman also includes the planned production of dimethyl ether (DME) as a mixed coproduct with methanol which can be suitable as a storable fuel or as a chemical feed stock.

Several possible means for locating and operating the proposed plant were considered in developing the proposed project, including investigation and investment in alternative sites and investigation/resolution of issues relating to wastewater discharge, airborne emissions, and recovery/disposal of spent catalyst. These matters are more fully discussed in Section 3.

2.2.1 Site Location and Characteristics

The 0.6 acre site proposed for the LPMEOH™ unit is located in Kingsport, Tennessee, at the Eastman facility. Kingsport is on the western edge of Sullivan County and includes a small portion of Hawkins County. The world headquarters of Eastman Chemical Company are also located in Kingsport. The Eastman facility also includes the eastern half of Long Island, where the proposed demonstration unit would be built adjacent to existing process plants.

The Kingsport area is shown in Figure 2.2-1. The location of the proposed demonstration unit on Long Island is shown on Figure 2.2-2. A photograph of the Eastman facility as it currently exists is also shown on Plate 2.2. The current site for the proposed project is a gravel area bounded to the north by a fence, to the west by an interplant road that runs between the future process area and a chemical manufacturing plant, to the east by a pipe rack, an existing methyl acetate plant, and an interplant road, and to the south by an existing building and interplant road. The new unit would highly resemble the existing facility surroundings.

2.2.2 Physical Facility Description

The proposed project includes four major process areas. The reaction area would include the reactor and the synthesis gas recycle compressor. The purification area would include two distillation columns and their heat exchangers. The storage/utility area would comprise oil and product methanol storage. The catalyst preparation/reduction area would be under roof with several large vessels, slurry handling equipment, and a hot oil skid.

2.2.3 Process Description

The fundamental characteristics of a liquid phase reactor, which is used in the LPMEOH™ technology, make it particularly suitable for the OTM (Once Through Methanol) needs. It is unlike the conventional gas-phase reactors that use fixed beds of catalyst pellets and largely depend upon recycle dilutent gas to both dilute the carbon monoxide concentration and control the reaction exotherm. The LPMEOH™ reactor is a slurry reactor with small, powder-size catalyst particles suspended in inert mineral oil. The synthesis gas bubbles up through the slurry where the hydrogen and carbon monoxide dissolve in the oil and diffuse to the catalyst surface where the methanol reaction occurs. The product methanol diffuses out and exits with the unreacted synthesis gas. The inert oil acts as a heat sink and permits isothermal operation. The net heat of reaction is removed via an internal heat exchanger which produces steam. Unlike the gas-phase reactors that limit the per-pass conversion of synthesis gas to methanol to accommodate the reaction exotherm, the LPMEOH™ reactor maintains isothermal operation. Unlike the gas-phase reactors, the LPMEOH™ reactor is tolerant to carbon monoxide-rich gas. It does not require recycle. Shift and carbon dioxide removal are not required. Low hydrogen-to-carbon monoxide ratios are acceptable as is any carbon dioxide content. Finally, in contrast to the gas-phase reactor in which the catalyst is sensitive to flow variations and changes from steady-state, the LPMEOH™ reactor is eminently suited for on-off operation for electric load-following.

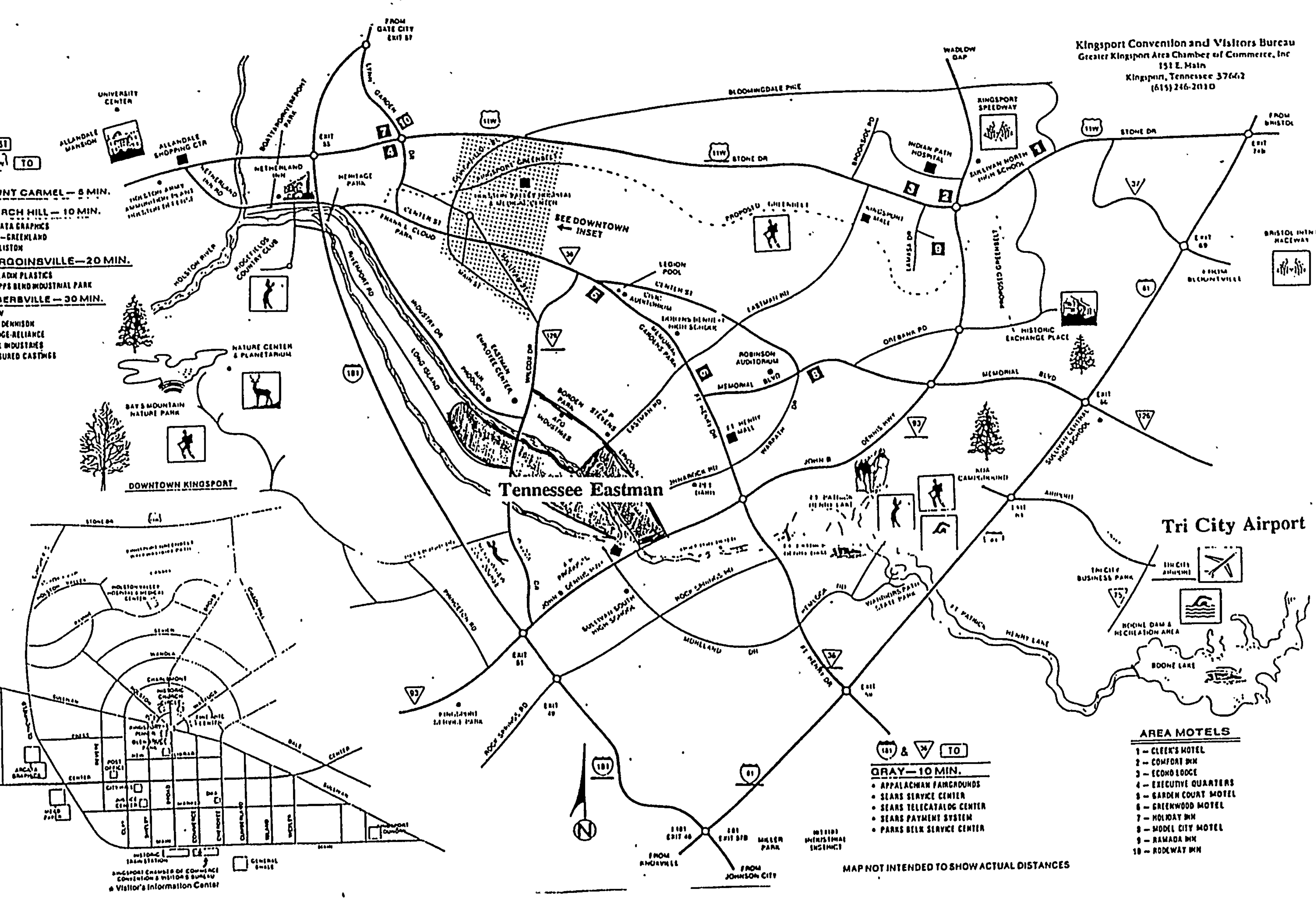

FIGURE 2.2-1 KINGSPORT AREA

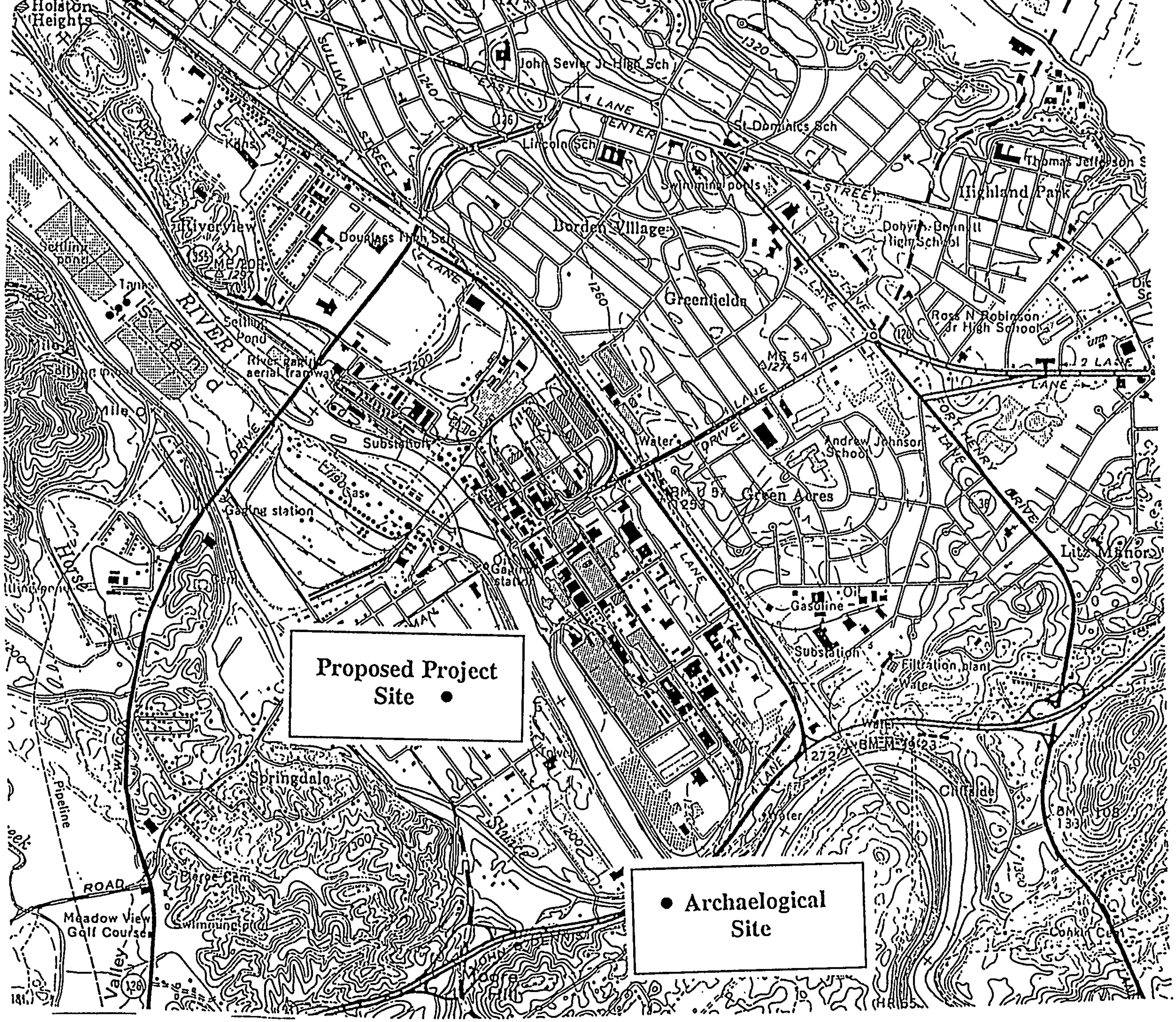

FIGURE 2.2-2 LOCATION OF THE PROPOSED PLANT

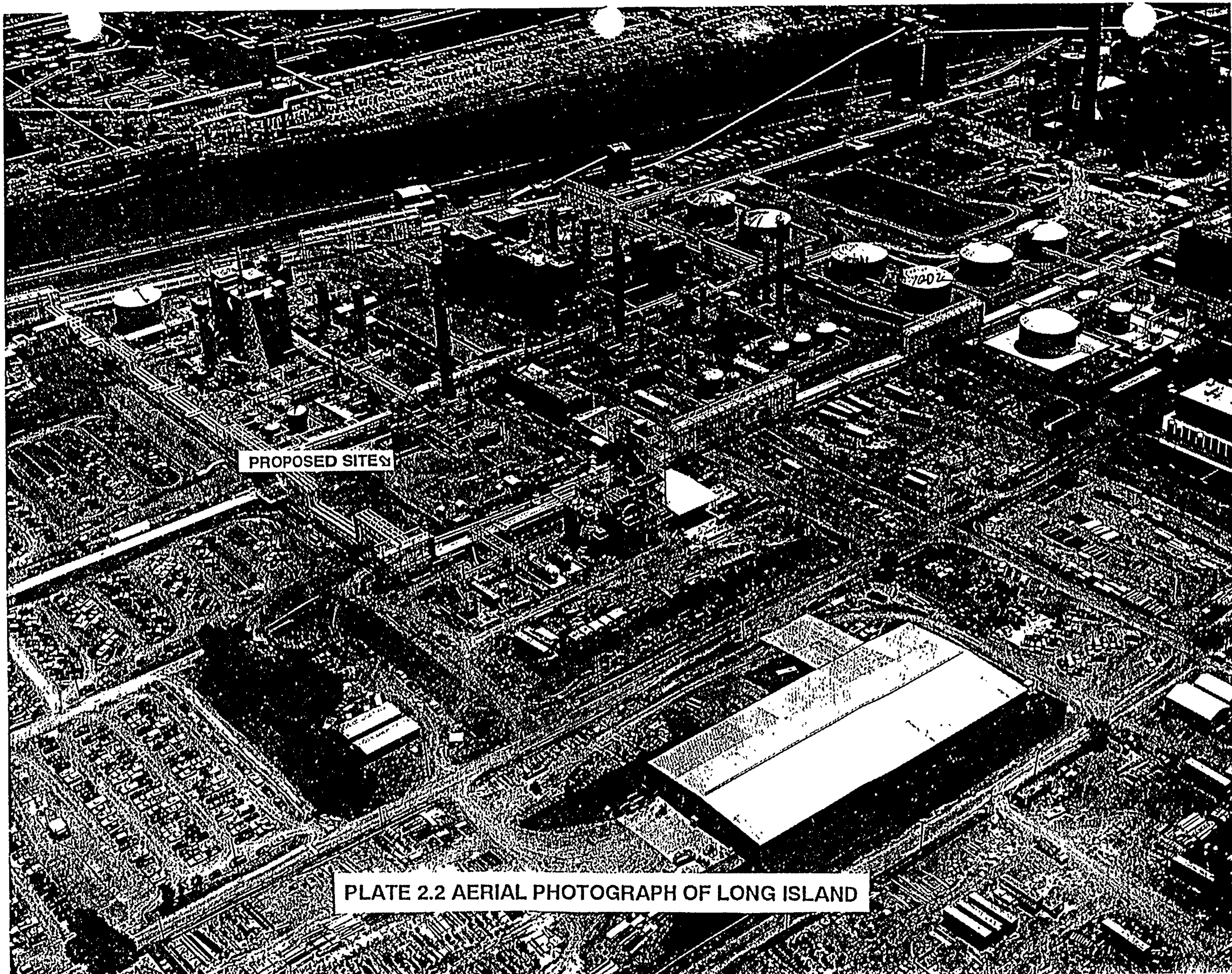

PLATE 2.2 AERIAL PHOTOGRAPH OF LONG ISLAND

The LPMEOH™ unit is to be integrated with Eastman's coal gasifier process train and would be inserted in parallel with an existing Lurgi technology methanol unit. Eastman currently both produces and purchases methanol for use at this site. The net effect of adding the LPMEOH™ demonstration unit is to require the purchase of a nominal 30 tons per day of additional methanol for the Kingsport site. When the LPMEOH™ unit is operating, the output from the Lurgi unit would be reduced. Synthesis gas would be introduced to the slurry reactor, which has liquid mineral oil with solid particles of catalyst suspended in it. The synthesis gas dissolves through the mineral oil, contacts the catalyst, and reacts to form methanol. The heat of reaction is absorbed by the mineral oil and is removed by steam coils. The methanol leaves the reactor as a vapor, is condensed to a liquid, sent to the distillation columns for removal of higher alcohols, water, and other impurities, then stored in the day tanks for sampling prior to being sent to Eastman's methanol storage. Unreacted synthesis gas is sent back to the reactor with the synthesis gas recycle compressor, improving cycle efficiency. The methanol is used for downstream feedstocks and for on-site and off-site fuel testing.

2.3 Summary of Alternatives to the Proposed Action

A number of alternatives were considered in the selection of the project as currently proposed. These are summarized below, with additional details concerning the selection and analysis of alternatives found in Section 3.2.

2.3.1 No-Action Alternative

Under the no-action alternative, the U.S. Department of Energy would not provide cost-shared financial assistance for the proposed project and the Partnership would not construct the proposed project. If the proposed project were not constructed, Eastman Chemical would continue to produce its total daily methanol requirement utilizing the existing Lurgi unit. Under this scenario, no methanol would be utilized in off-site testing.

Consequently, the no-action alternative would result in a failure to demonstrate the commercial viability of this process and the process would not be scaled-up for commercial production. Hence, all the development work and investment into the Alternate Fuels Demonstration Unit at LaPorte would be lost. The utility or industrial customer who is considering an IGCC power plant would be reluctant to include the LPMEOH™ technology if it has not been proven at a commercial scale. The benefits of developing economical chemical feedstocks and an economical, cleaner burning mobile and stationary fuel would be lost. Chemical feedstock production would therefore continue to use foreign and less cost effective technology and, for fuel methanol, the goals of increasing United States energy independence would not be met.

Should the LPMEOH™ not be funded it is highly likely that an Eastman Chemical plant expansion would be built on this 0.6 acre site with in the next decade .

2.3.2 Alternative Sites

In addition to a recent nationwide site selection search, two major alternative sites have been studied in detail for this process. The first, at Dakota Gasification Company's Great Plains Synfuels facility in Beulah, North Dakota, was initially selected as the demonstration site in late 1989. The synthesis gas supplier was unable to obtain permission to divert sufficient synthesis gas for use, and the site was rejected. In 1991, Texaco Syngas, Inc. was selected as a host site provider at the existing, but not operating, Cool Water Facility. Due to required modifications, the Cool Water Facility was judged economically unfeasible for re-start, and thus was not available as a host site. The search for a new site was then commissioned, with an emphasis on viable economics, sufficient synthesis gas supply, and low environmental impact. The result of this search was the selection of the Eastman Chemical Company's Kingsport, Tennessee site for further consideration.

The Eastman site was subsequently determined to best satisfy the requirements for developing a liquid phase methanol unit. The Eastman site can provide the coal-derived synthesis gas and ancillary facilities necessary to demonstrate all facets of the LPMEOH™ process as described previously. This site is the only existing coal gasification facility with synthesis gas available for this LPMEOH™ demonstration. The cost to build a coal gasification facility specifically to provide synthesis gas for the LPMEOH™ demonstration would be prohibitive. The site was, therefore, selected for the proposed project.

2.3.3 Alternative Technologies

The LPMEOH™ technology is a new process for methanol synthesis that has marked advantages over conventional gas-phase methanol production technologies. The key advantages include:

1) reactor feed need not be hydrogen-rich; almost any combination of hydrogen, carbon monoxide, and carbon dioxide can be processed directly without adjusting the gas composition via the shift reaction,

2) there is no need to dilute the feed gas to the reactor in order to control catalyst surface temperature,

3) highly concentrated gas streams can be processed directly, allowing much higher per-pass conversions to methanol than conventional technology, and

4) the LPMEOH™ process has been extensively and successfully tested at the Air Products/DOE Alternative Fuels Demonstration Unit (AFDU) at LaPorte, Texas, demonstrating its readiness for commercial-scale production.

The LPMEOH™ process technology was developed specifically to be used with an IGCC power plant, to be used on a Once-Through Methanol (OTM) basis and to directly process carbon monoxide-rich gases produced by advanced coal gasifiers. Usually the carbon monoxide concentration is high and the hydrogen to carbon monoxide ratio is low. Carbon dioxide content is variable depending on the type of coal feeding system, i.e., dry coal or slurry. The ability of the methanol process to load-follow electrical demand is key -- this is, on a daily basis, to start quickly, stop, and ramp-up or down rapidly. Finally, the process should be relatively simple and reliable, adding value to the IGCC operation, not detracting in any way from the high reliability expected of an IGCC installation. Conceptually the OTM synthesis step can be simply inserted in the IGCC flowsheet. In an OTM arrangement, a fraction of the synthesis gas is converted to methanol, typically between 10% and 40% of the heating value. In an electric power cycling scenario, methanol is produced during low demand periods and accumulates in storage; during peak demand it is withdrawn and burned as peaking fuel. The front-end coal gasification section runs at full capacity all of the time.

As described previously, the characteristics of the LPMEOH™ process that are responsible for its advantage in the IGCC coproduction scenario are simplicity, flexibility, resiliency, and expandability. While gas-phase technology can be applied to the coproduct scenario, the LPMEOH™ process costs less and is easier to operate. The gas-phase technology requires several additional capital-intensive processing steps. In addition, the LPMEOH™ process directly produces a methanol product suitable for direct use in many fuel applications. For these reasons, the LPMEOH™ process technology is considered the technology of choice for this application.

2.4 Summary of Affected Environment and Environmental Consequences

2.4.1 Air Quality/Air Emissions

Air quality regulatory requirements in the general vicinity of the project site were evaluated by Eastman. In addition, existing air quality background data were reviewed and compared to applicable Federal and state air quality standards. These background levels, as measured at a network of air quality monitoring sites, were evaluated with respect to the attainment status for each of the regulated pollutants. The concentrations of all regulated pollutants are in attainment with their respective standards.

The proposed project would result in very small increases in carbon monoxide and volatile organic emissions and no increases in sulfur dioxide and nitrogen oxides to the atmosphere.

The primary sources of air emissions during the construction phase of the project would be vehicular exhaust emissions, such as from construction equipment, as well as "fugitive" particulate emissions. The latter emission would be generated primarily by wind erosion during site excavation. Site watering would be implemented as appropriate.

Operational impacts of the LPMEOH™ plant would be primarily associated with equipment leak emissions and the incremental waste streams directed to on-site disposal boilers. Total emissions from equipment leaks are estimated at 9.8 tons per year including carbon monoxide and VOCs (volatile organic compounds), including methanol, which is a hazardous air pollutant, as defined in the Clean Air Act Amendments of 1990, Section 112. The fugitive emissions would be minimized by the application of modern engineered physical systems, such as low leakage control valves, and vapor return lines on truck loading stations. The project would comply with all applicable standards to protect the ambient air quality of the region. There would be a net increase in the fugitive air emissions of the combination of the Lurgi methanol unit and the LPMEOH™ methanol unit when the LPMEOH™ unit is brought onstream.

In addition to the process generated pollutants, small quantities of fugitive particulate matter emissions would result from general on-site vehicular traffic, which increases slightly due to the presence of the unit.

2.4.2 Earth Resources

The Eastman site is located in the Valley and Ridge geologic province. The region is characterized by parallel valleys and ridges. The ridges are mostly sandstone, siliceous limestone, and dolomite, and the valleys are underlain by shale and limestone. The Long Island site of the proposed methanol unit is underlain by alluvium on top of a thick layer of shale bedrock. Long Island is bounded by South Fork Holston River and by Big Sluice. No significant soil constraints were noted at the site.

Construction and operation of the LPMEOH™ plant is not expected to affect earth resources at the site. The construction lay-down area will be located a short distance from the west boundary of the proposed site. The temporary construction office will also be located there.

2.4.2 Water Resources

The major surface water feature in the site is the South Fork Holston River. The river flows southwestward to merge with the North Fork Holston River to form the Holston River. Flow is regulated by several Tennessee Valley Authority (TVA) dams. The combined flow from the South Fork Holston River and the Big Sluice averages 2610 cubic feet per second (cfs). Downstream studies of water quality have shown that most parameters measured met the state's criteria except for dissolved oxygen, nitrate, and fecal coliform. The lower dissolved oxygen concentrations are due to the Fort Patrick Henry Dam upstream of Eastman. The nitrate concentration is exceeded both upstream and downstream and is probably caused by agricultural and urban development. The presence of fecal coliform correlates to the influence of urban development near the river. Water is withdrawn from the river and used for heat removal and process water; wastewater generated by the Eastman processes is treated and returned to the river under a National Pollution Discharge Elimination System (NPDES) permit.

Groundwater resources in the vicinity have been studied for flow rates and direction of flow, and a limited amount of data are available on the surface waters bordering Long Island. The groundwater from Long Island flows towards the Big Sluce and the South Fork Holston River. Groundwater flow is approximately 1 cfs compared with river flow at 2600 cfs. Groundwater samples were taken in the mid 1980s within a quarter mile of the project site and resulting analysis revealed acceptable water quality.

Water use at the plant would be from filtered river water. The wastewater from the plant would be stormwater and water separated from the process by distillation. Process wastewater flow is expected to be 1150 gal/day. The increase in BOD load on the existing wastewater treatment facility is expected to be 4,180 lb/day.

Stormwater runoff would be collected in an oil/water separator prior to being routed to Eastman's industrial wastewater treatment facility. Oil would be collected and disposed of via energy recovery as it accumulates. The wastewater discharges are not expected to alter existing discharge characteristics.

2.4.3 Ecological Resources

Ecological resources consist primarily of open fields on Long Island and the bordering river aquatic life and birds. Water quality, as tested by the Academy of Natural Sciences of Philadelphia in the year 1990, showed some degradation at Fort Patrick Henry Dam and Eastman with improvement in the water quality downstream. The water quality showed a significant improvement in more recent years, between 1977 and 1990. Studies documented the species of algae, aquatic macrophytes, non-insect macroinvertebrates, aquatic insects, and fish in the area. No species of special concern have been identified in the vicinity of the project.

The construction and operation of the proposed project is not expected to have any impact on the local ecology. No unusual ecological resources have been identified at the project site. The proposed site, currently inside the industrial complex and idle, is filled and covered with stone, with no vegetative growth. There are no state or Federal threatened or endangered species known to be present at the proposed site, nor is the proposed site the habitat of any such species. The 0.6 acre parcel would be altered as a result of the development of the proposed unit, but this action should not cause any impact to the ecology.

2.4.4 Land Use

The proposed site is located within the Eastman facility in Kingsport. The Eastman facility comprises 3890 acres and is zoned Heavy Industrial. The proposed project site is 0.6 acres in the midst of the existing facility. Other land use in the surrounding vicinity is mixed and includes industrial, residential, commercial, and agricultural activities.

The proposed LPMEOH™ project would be located inside an existing industrial complex. As such, the project would be compatible with land uses in the area.

2.4.5 Socioeconomic Factors

The proposed site is located in Sullivan County, Tennessee. Sullivan County has a total employment of 71,000, of which 13,000 are employed by Eastman. The location offers a substantial labor pool to support activities in the area, with a significant number of trained workers available to meet construction and operational labor requirements.

At the peak of construction activity, the project would employ approximately 150 workers; their wages would contribute to economic activity in the region. Significant amounts of supplies and material would be purchased in the area; this would also have a stimulating effect upon the regional economy. The proposed project would contribute taxes to the local, state and Federal governments. Many of the services required by the plant would be provided internally; no extraordinary services would be required from governmental agencies.

2.4.6 Transportation

The Eastman site is highly accessible by road, rail, and air. The site has an entrance/exit onto I-181 leading to I-81 as well as access to State Roads 36, 126, and 93 and US-11W. Access by rail is extensive and unrestricted. The Tri-Cities Airport is less than 30 miles away. Within the Eastman facility, there are 28 miles of paved roadway and 37 miles of rail track.

Vehicular traffic would experience a transient increase during the construction period as construction workers drove on-site and deliveries were made to the site. The project would experience a maximum of 110 workers compared to the facility employment of 13,000, so the additional vehicular traffic is a very small fractional increase. After the completion of construction, the vehicular traffic would be slightly increased over the preconstruction levels due to the shipment of methanol from the site for off-site testing, the shipment of spent catalyst for recycling, and the occasional delivery of new catalyst. Coal shipments by rail should remain constant, as the existing Lurgi methanol unit would be turned down when the LPMEOH™ plant is in operation, with the net coal usage remaining constant.

2.4.7 Noise

Noise levels have been measured regularly at the Eastman perimeter since 1980. Analyses done on the noise measurements indicate the levels are consistent with the heavy industrial zoning of the Eastman site.

The noise effects of the proposed facility were evaluated for both construction and operational conditions. Increased noise would result during the construction phase from equipment, machinery, and vehicle operations. The nearest resident is about 260 feet from the proposed site and the nearest Eastman perimeter monitoring site is about 500 feet from the proposed site. During operations, the loudest known noise source would be a recycle synthesis compressor to be purchased with a noise specification of no more than 85 dBA at 3 feet. This would calculate to a noise level of less than 50 dBA at the nearest residence and less than 45 dBA at the perimeter monitoring site. To put this into perspective, listening to a TV 10 feet away has an equivalent sound level of 55-60 dBA. This would not add to the existing perimeter noise levels at Eastman.

2.4.8 Cultural Resources

Correspondence has been sent to and received from the Tennessee Historical Commission to identify any potential cultural resource concerns associated with the proposed project site. One source has indicated that Cherokee Native Americans used Long Island as a neutral zone for settling disputes, until the land was ceded in a treaty in the early 1800s. An archaeological site was revealed a mile from the proposed project site. Artifacts recovered showed the area to be a settlement from 10,000 B.C. Within several miles of the proposed site are several schools and golf courses, city parks, and Warriors' Path State Park. Tennessee Historical Commission concurs with the determination that there would be no impact on cultural resources as a result of the proposed project.

Correspondence from the Tennessee Historical Commission has been received stating their opinion that no historical resources would be impacted due to the proposed project activity. No archaeological resources are expected to be present on the site.

2.4.9 Visual Resources

The Eastman site at Kingsport is characterized by manufacturing buildings, office buildings, process plant areas including tanks, distillation columns, stacks, and steel structures. Outside the boundaries of the facility are other manufacturing industries and the town of Kingsport. Bays Mountain, south of the site, is a state nature preserve and park.

The plant would not significantly change the industrial nature of the facility, and would not significantly offer any change to the area's visual resources.

2.4.10 Solid Waste Disposal

Proposed solid waste disposal would be accomplished within the Eastman facility by the use of the site's solid waste treatment or incineration disposal facilities. Sufficient landfill capacity is available to satisfy all waste disposal requirements for the proposed LPMEOH™ plant. Spent catalyst may be reclaimed if economically feasible.

3.0 PURPOSE AND NEED FOR PROPOSED ACTION AND PROPOSED ACTION DESCRIPTION

The proposed Federal action is for the U.S. Department of Energy to provide, through a cooperative agreement with The Partnership, cost-shared funding support for the design, construction and operation of a nominal 260 ton-per-day Liquid Phase Methanol facility in Kingsport, Tennessee. This section addresses the purpose and need for the project and provides a description of the proposed facility.

3.1 Purpose of and Need for the Project

The primary purpose of this project is to demonstrate the commercial viability of a Liquid Phase Methanol facility to produce methanol from coal-derived synthesis gas (a mixture of hydrogen and carbon monoxide). Successful future commercial-scale application of LPMEOH™ technology could result in cost effective production of chemical feedstocks and clean burning alternative fuels from coal.

The U.S. Department of Energy's action is needed to assist the development of alternative fuel technologies that operate in an environmentally responsible manner. Developing superior technologies to produce clean fuels and chemicals from coal is a principal research and development objective of the U.S. Department of Energy. Success in this effort would have a major, positive impact on the economy of the United States. It would make a significant contribution to the balance of trade deficit, contribute to long-term energy pricing stability and to energy and military security, and create significant amounts of domestic employment. The United States needs future sources of alternative liquid fuels and chemical feedstocks. With domestic oil production declining and imports rising, the potential for producing affordable liquid fuels and chemical feedstocks from non-petroleum sources could one day prove both strategically and economically important.

The principal means envisioned to achieve these goals is through the continued development of technologies to utilize domestic coal reserves. Coal is of obvious interest because it is the United States' most abundant fossil fuel. The United States is estimated to have reserves (recoverable with present technology at current prices) of at least 268 billion tons, as compared to only 10 billion tons equivalent of natural gas and eight billion tons equivalent of oil. At current rates, America's recoverable reserves of coal could satisfy the nation's consumption for nearly 300 years (World Reserves Institute 1990).

The U.S. Department of Energy's action is needed to address environmental effects resulting from coal conversion and combustion. The U.S. Department of Energy cost-shared funding is intended to support the development of clean burning liquid fuels from coal-derived synthesis gas. With the passage of the Clean Air Act Amendments (CAAA) of 1990, stringent measures have been mandated to control emissions of the principal acid rain precursors, sulfur dioxide (SO_2) and nitrogen oxides (NO_x). The U.S. Department of Energy Clean Coal Technology Program is intended to encourage development of technologies that fully utilize coal's energy potential while avoiding increased pollution. The use of IGCC technology for electric power will play a major role in providing clean energy.

The IGCC electric power generation process is an advanced clean coal technology with high thermal efficiency, superior environmental performance, and the ability to handle all coals (from lignite to high-ranked bituminous) and other (waste) hydrocarbon feedstocks. The U.S. Department of Energy states in the Spring 1992 issue of Clean Coal Today, "IGCC plants are viewed as superior to today's conventional coal plants and are almost certain to be one of the lowest cost fossil fuel sources of electric power generation in the 21st century. Compared to today's conventional coal burning methods, an IGCC plant can produce up to 25 percent more electricity from a given amount of coal. Air pollutants can also be removed more efficiently from gas produced in a pressurized IGCC system than from the flue gas which results when coal is burned directly." Integrated coal/waste gasification power plants are more efficient and cleaner than direct coal/waste combustion power plants. Integrated gasification also has the advantage of providing a replacement for natural gas in existing natural gas-fired combustion turbines, including cogeneration systems. Therefore, integrated gasification can be effective for hedging the risk of uncertain natural gas prices in the short term, and for replacing natural gas in the long term. The Environmental Impact Statement for the Clean Coal Technology Program (DOE/EIS-0146) shows that in the year 2010, with commercial implementation of the IGCC technology, the national emissions of SOx and NOx would be cut in half (compared to 1985 levels); even CO2 would be somewhat reduced. This is while energy use is continuing to grow at forecasted rates (1-2%/yr).

The LPMEOH™ process, developed by Air Products in a cooperative effort with the U.S. Department of Energy over a period of twelve years, is an advanced indirect liquefaction technology that is particularly well-suited for integration with coal-based synthesis gas processes. It was developed specifically to be used with an IGCC Power Plant and is the only methanol technology that can be utilized on a OTM basis. No water gas shift or CO2 cleanup is required. This provides for a low capital cost plant.

The OTM process is inherently suited to on/off operation, able to utilize any excess capacity of the coal gas system on an hour-by-hour basis. During periods of low electric power demand, excess coal-derived synthesis gas is converted to methanol. This methanol can in turn be used as a fuel in gas turbines to satisfy peak load requirements or it could be sold on the open market. The methanol revenues would be used to reduce the power cost to the electric customer.

Methanol is a clean burning, storable fuel with versatile applications. As a combustion fuel, particularly for gas turbines used in electric power generation, it provides extremely low emissions. Methanol can also serve as a primary transportation fuel or an octane-enhancing transportation fuel additive. In fuel usage, methanol forms less smog than gasoline fuels, and when used in heavy-duty vehicles, particulate emissions are virtually eliminated and NOx emissions are cut by half.

The demonstration project would meet key objectives of the National Energy Strategy and of the Clean Air Act Amendments of 1990 (CAAA). The methanol could be used to provide peak electric power when needed, or as a clean liquid coproduct that will be in increasing demand as the Nation turns toward cleaner alternatives. Successful demonstration of the combined IGCC/OTM technologies would advance an environmentally clean, coal-based alternative for power plants and would help contain electricity prices while meeting the more stringent environmental requirements in the CAAA.

3.2 Description of the Proposed Project

This section provides a detailed description of the design, construction, and operation of the proposed demonstration project. Information provided includes a description of the proposed project elements, operational and performance characteristics relevant to the NEPA environmental review to be performed by the U.S. Department of Energy, and an overview of the construction schedule.

The Air Products Liquid Phase Conversion Co., L.P., proposes to build a liquid phase methanol production unit that would demonstrate the commercial viability of the LPMEOH™ process.

The project objective would be to demonstrate on a commercial scale (nominal 260 TPD) the production of methanol from coal-derived synthesis gas using the LPMEOH™ process and to determine the suitability of methanol produced during this demonstration for use as a low-SO_2, low-NO_x alternative fuel in boiler, turbine, and transportation applications and as a chemical feedstock. Important issues which would be confirmed under the proposed demonstration are:

- Demonstration of the scale-up of the slurry reactor from the 13 tons-per-day LPMEOH™ Alternate Fuels Development Unit to a nominal 260 tons-per-day.

- The ability to demonstrate long-term operation on actual coal-derived synthesis gas.

- Reliable on/off LPMEOH™ process operation in an integrated gasification facility.

- Demonstration of the reliability of the as-produced product methanol for its intended uses in applications such as a fuel in transportation or stationary units.

- Subject to design verification testing, demonstration of the slurry reactor's capability to produce dimethyl ether as a mixed co-product with methanol.

- Confirmation of commercial economics for the LPMEOH™ process.

The methanol product would be tested for suitability as both a stationary fuel and as a transportation fuel. These end-use tests would provide a basis for the comparison of the methanol product with conventionally accepted fuels including emission levels and economic viability. The methanol product will also be tested for the suitability as a chemical feedstock.

The program goal of demonstrating methanol as a fuel would lead to greater use of oxygenated fuels, which burn cleaner than conventional fuels, thereby reducing air emissions from mobile and stationary sources.

3.3 Site Location and Characteristics

The 0.6 acre site proposed for the LPMEOH™ facility is located in Kingsport, Tennessee at the Eastman facility. The Eastman facility is on the western edge of Sullivan County and includes a small portion of Hawkins County. The world headquarters of Eastman Chemical Company are also located in Kingsport. The

The location of the proposed demonstration unit on Long Island is shown on Figure 2.2-2. A photograph of the Eastman facility as it currently exists is also shown on Plate 2.2. The current site is a stoned area bounded to the north by a fence separating the proposed unit area from a parking lot, to the west by an interplant road that runs between the proposed unit area and an existing plant, to the east by a pipe rack and an interplant road, and to the south by an existing methyl acetate plant. The new facility will resemble the existing facility surroundings.

Eastman has 414 buildings on 3,890 acres of land. The chemical manufacturing facilities are located on the 1,046 acre main plant site which also includes 40.1 acres of warehouse area under roof and more than 1.16 million square feet of office space. The proposed project site is located adjacent to existing manufacturing facilities which are producing similar type products including methanol.

The area outside the boundaries of the Eastman facility is generally highly industrial. Besides Eastman Chemical Company, other major businesses in Kingsport are AFG Industries Inc., a glass-maker; Arcata Graphics, a manufacturer of books; General Shale Products Corp., a brick and block manufacturer; JPS Converter & Industrial Corp., a maker of cotton print cloth; Kingsport Foundry & Manufacturing Corp., a ferrous, machine, and nonferrous castings maker; Mead Paper; and Davis Pipe and Metal Fabricators.

3.4 Physical Facility Description

The proposed project includes the four major process areas with their associated equipment (reactor area, purification area, catalyst preparation area, and storage/utilities). The proposed unit will closely resemble the adjacent Eastman process plants, including process equipment in steel structures.

All of the LPMEOH™ process area will be situated on concrete pads with stormwater collected in a drain system that is routed to the oil/water separator per Figure 6.3-1.

Reaction Area

The reaction area will include the reactor itself, a steam drum, a skidded compressor with its ancillary equipment, separators, heat exchangers, and pumps. The equipment will be supported by a matrix of structural steel. The most salient feature will be the reactor, since it will be approximately 84' tall.

Purification Area

The purification area will feature two distillation columns, one approximately 82' tall, the other 97' tall. These columns will resemble the columns of the surrounding process areas. In addition to the columns, this area will include the columns' reboilers, condensers, air coolers, separators and pumps.

Storage/Utilities

The storage/utility area will include two diked tanks for methanol, two tanks for oil storage, a slurry holdup tank, trailer loading/unloading area, and buried oil/water separator.

Catalyst Preparation Area

The catalyst preparation area will be under roof in a building with partial walls, in which the catalyst preparation vessels, slurry handling equipment, and spent slurry disposal equipment will be housed. In addition, a hot oil utility system will be included.

3.5 Process Description

The LPMEOH™ process will be integrated with the Eastman Gasification plant as shown in Figure 3.5-1. In this design the raw synthesis gas is cooled, cleaned, and processed through the LPMEOH™ unit, where a portion of the gas is converted to methanol for use as a coal-to-chemicals intermediate product. A portion of the methanol will be used in on-site and off-site fuels testing.

The liquid phase methanol plant consists of four main sections: methanol synthesis, product purification, storage/utilities, and catalyst slurry preparation and handling. The process and instrumentation are shown in Figure 3.3-2. Below is a discussion of each major plant section.

3.5.1 Methanol Synthesis: Reactor Area

Methanol is formed by the reaction of hydrogen with carbon monoxide and carbon dioxide. Synthesis gas containing carbon monoxide, carbon dioxide, hydrogen, and other nonreactive gases, is preheated to the reaction temperature and then fed into the LPMEOH™ reactor. Inside the reactor is a mixture of mineral oil and solid particles of metallic catalyst. This solid/liquid mixture is called a slurry. The synthesis gas is introduced to the reactor and the gases dissolve in the oil and eventually contact the catalyst particle surface, where the methanol formation reaction occurs. The methanol then diffuses through the mineral oil, separates from the mineral oil mixture, and leaves the reactor as a vapor.

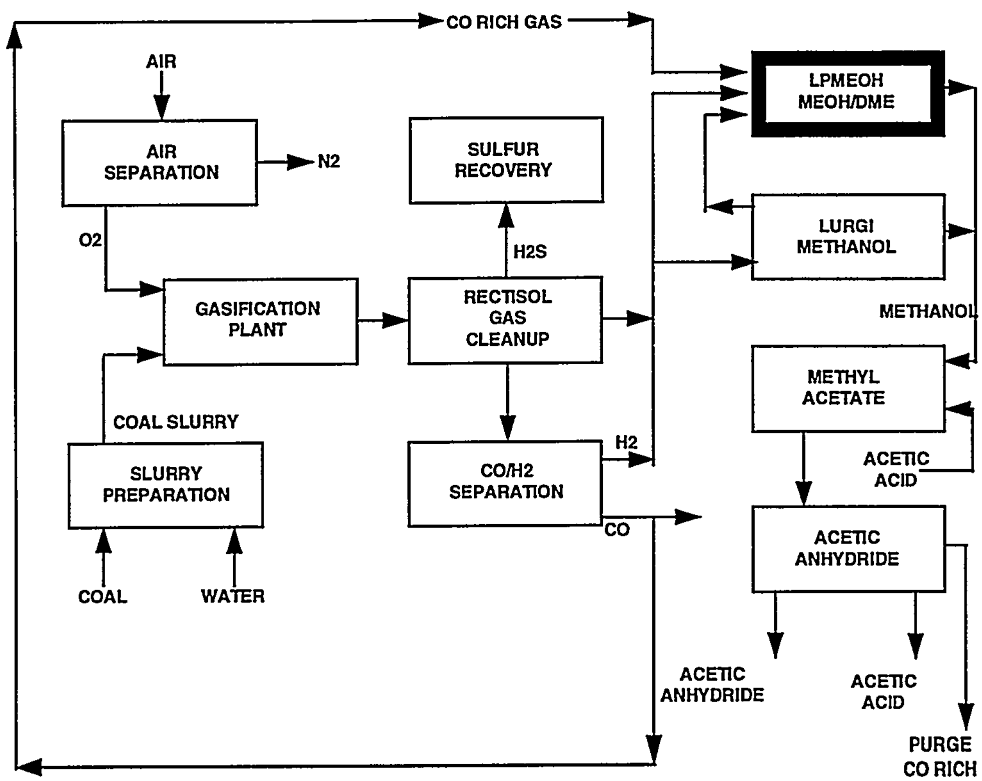

FIGURE 3.5-1 INTEGRATION OF LPMEOH™ UNIT INTO EASTMAN KINGSPORT PLANT

FSF 5/15/96

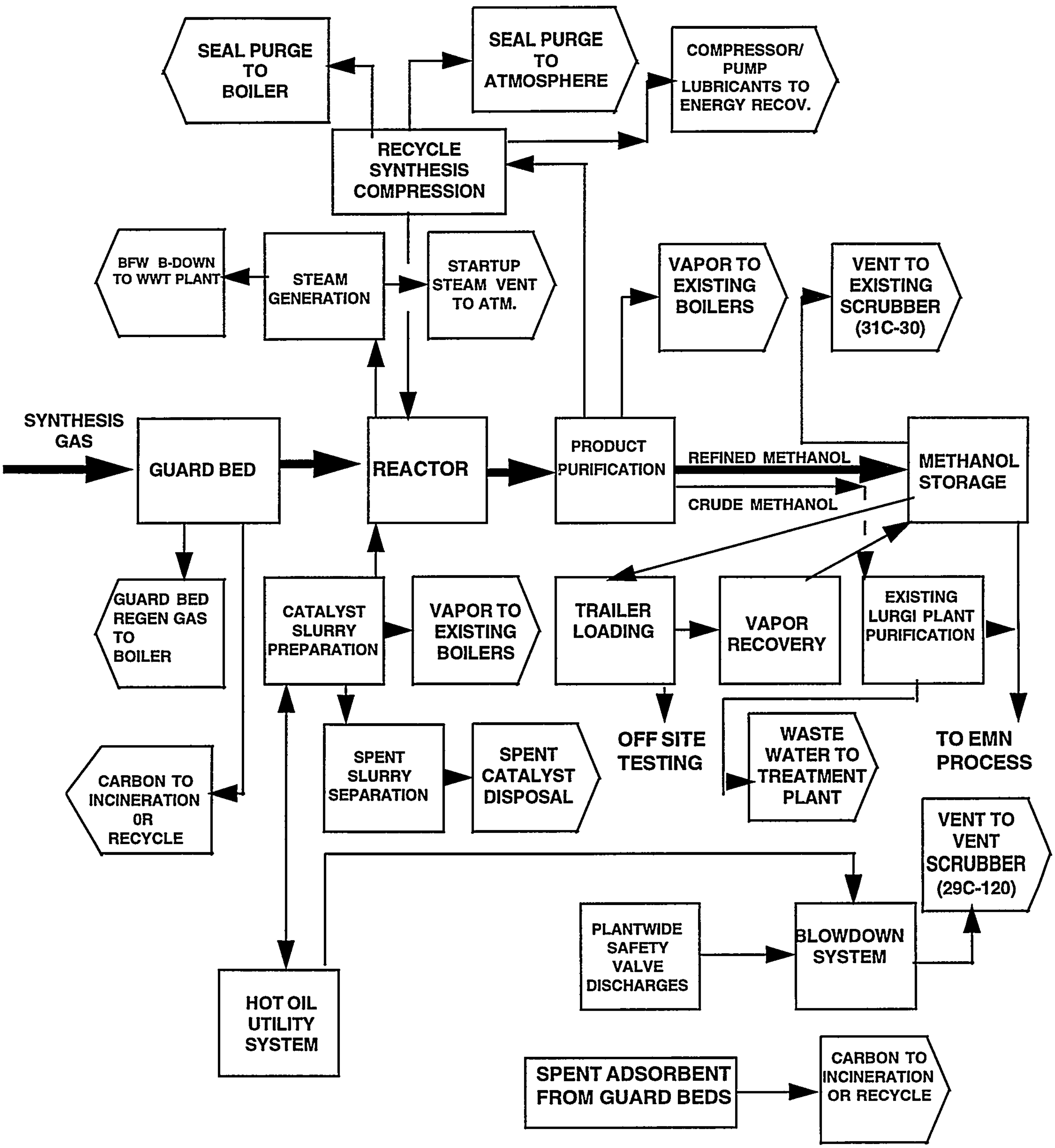

FIGURE 3.5-2 LPMEOH™ DEMONSTRATION UNIT PROCESS AND WASTE STREAMS

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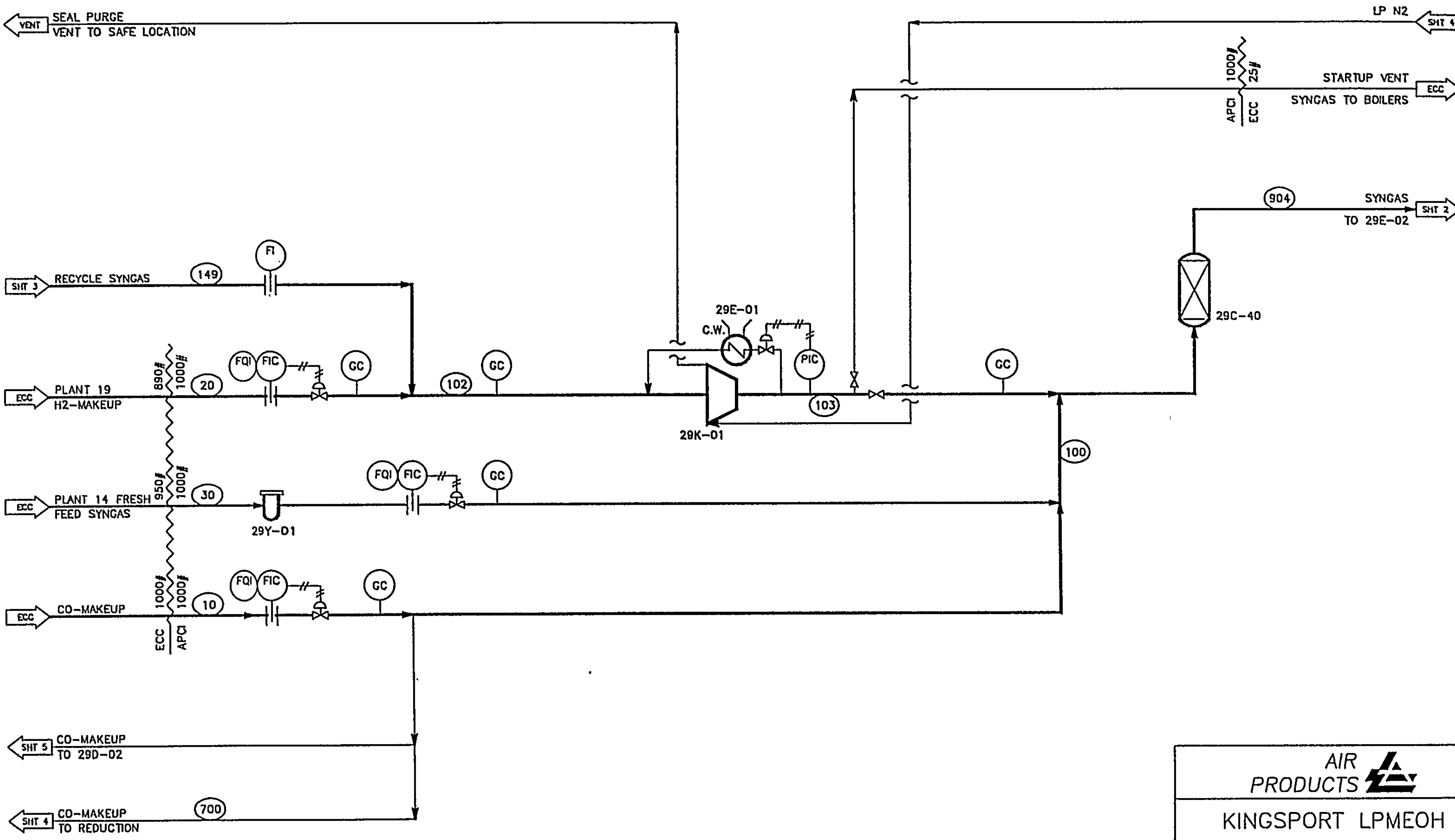


NOTE: LOCATION OF 29C-40 GUARD BED IS SUBJECT TO CHANGE PENDING FINAL RESULTS OF FEED STREAM ANALYSIS

9/27/94	JMR/CMC	VES	WRB	TEC	ADB	DPD	GAM	DPB	ECH	JLD
DWG DATE	PROCESS ENGINEER	PROCESS APPROVAL	BUSINESS AREA REPRESENTATIVE	SYSTEMS ENGINEER	PSG TECHNOLOGY	PROJECT ENGINEER	PROCESS CONTROLS	ENGINEERING SAFETY	PRODUCTION & DELIVERY	MACHINERY

AIR PRODUCTS

KINGSPORT LPMEOH
FEED SECTION

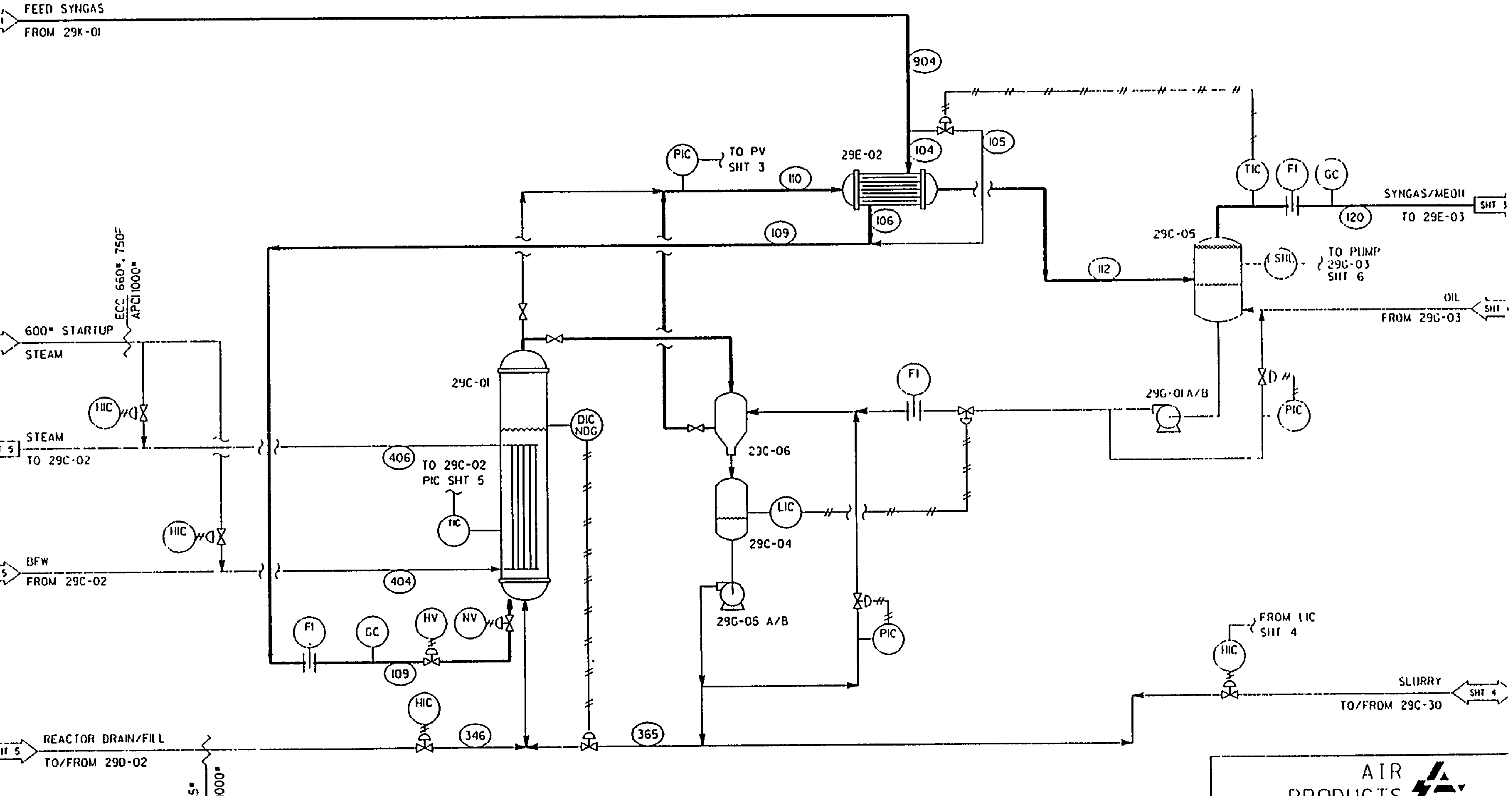
DRG. NO. LPM1

00-3-8215

SHEET NO. 1

REV. NO 0*

Rev 3/8/95 JJ



AIR PRODUCTS

KINGSPORT LPMEOH
SYNTHESIS SECTION

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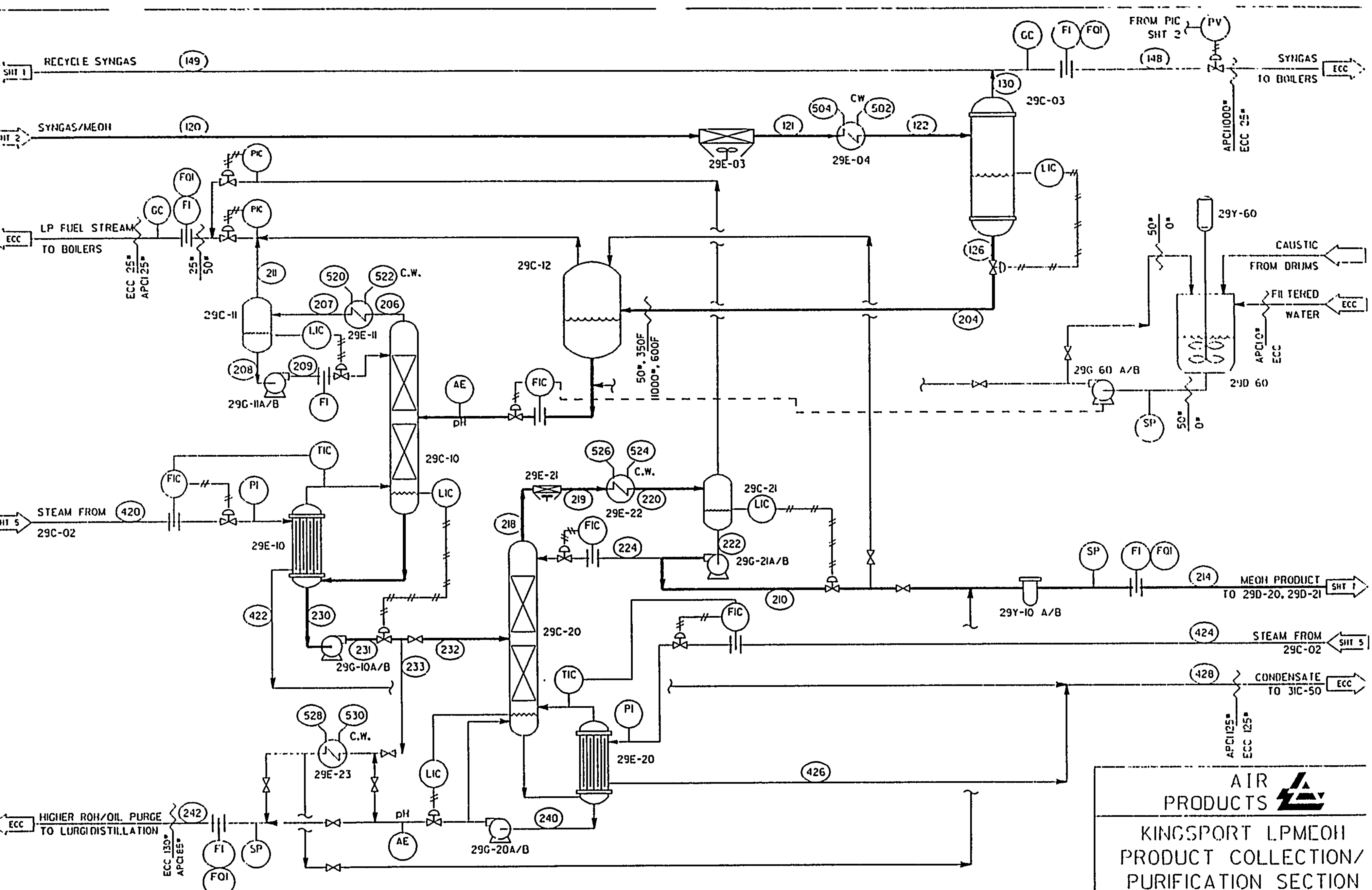
DWG DATE	PROCESS ENGINEER	PROCESS APPROVAL	BUSINESS AREA REPRESENTATIVE	SYSTEMS ENGINEER	PSG TECHNOLOGY	PROJECT ENGINEER	PROCESS CONTROLS	ENGINEERING SAFETY	PRODUCTION & DELIVERY	MACHINERY

DRG. NO.	LPM2	SHEET 2
	00-3-8215	REV. NO. 0

Rev 3/8/95 [initials]



AIR PRODUCTS

KINGSPORT LPMEOH PRODUCT COLLECTION/ PURIFICATION SECTION

DRG. NO. LPM3

00-3-8215

SHEET 3

REV. NO. 0

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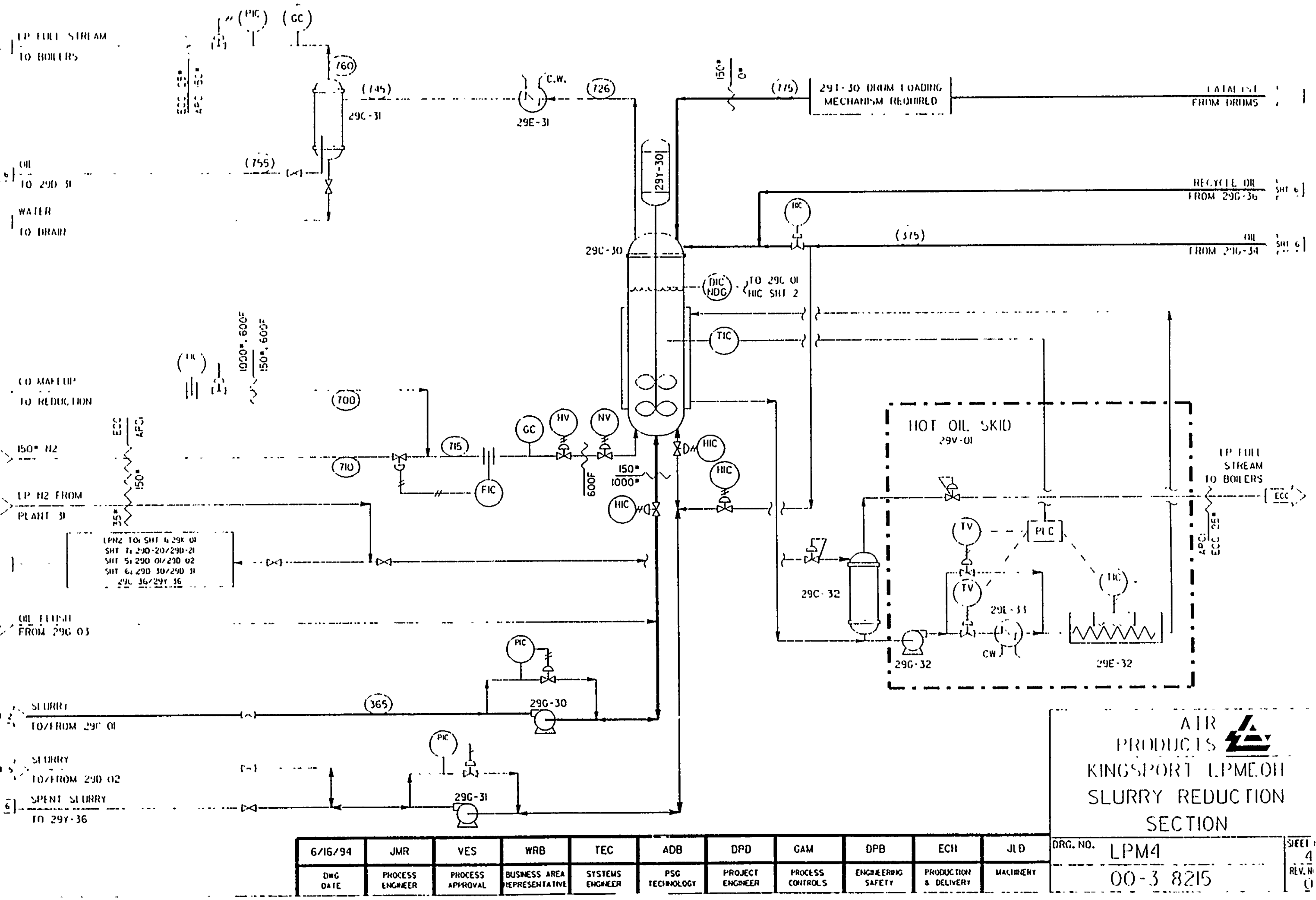
DWG DATE	PROCESS ENGINEER	PROCESS APPROVAL	BUSINESS AREA REPRESENTATIVE	SYSTEMS ENGINEER	PSG TECHNOLOGY	PROJECT ENGINEER	PROCESS CONTROLS	ENGINEERING SAFETY	PRODUCTION & DELIVERY	MACHINERY

Rev 3/8/95 JJ


LP FUEL STREAM TO BOILERS
OIL TO 29D 31
WATER TO DRAIN
CO MAKEUP TO REDUCTION
150# N2
LP N2 FROM PLANT 31
LPN2 TO: SHT 4: 29K 01
SHT 1: 29D 20/29D 21
SHT 5: 29D 01/29D 02
SHT 6: 29D 30/29D 31
29C 36/29Y 36
OIL FLUSH FROM 29G 03
SLURRY TO/FROM 29C 01
SLURRY TO/FROM 29D 02
SPENT SLURRY TO 29Y-36
PIC
GC
760
745
755
29C-31
C.W.
29E-31
726
29Y-30
29C-30
150#
0#
775
29T-30 DRUM LOADING MECHANISM REQUIRED
CATALYST FROM DRUMS
RECYCLE OIL FROM 29G-36
SHT 6
OIL FROM 29G-34
375
TRC
DIC NDG
TO 29C 01 HIC SHT 2
TIC
1000#, 600F
150#, 600F
FIC
700
715
710
HV
NV
600F
150#
1000#
HIC
ECC
APCI
35#
365
29G-30
29G-31
HOT OIL SKID
29V-01
TV
PLC
TIC
29C-32
29G-32
29L-33
CW
29E-32
LP FUEL STREAM TO BOILERS
ECC 35#
AIR PRODUCTS
KINGSPORT LPMEOH
SLURRY REDUCTION
SECTION
6/16/94
DWG DATE
JMR
PROCESS ENGINEER
VES
PROCESS APPROVAL
WRB
BUSINESS AREA REPRESENTATIVE
TEC
SYSTEMS ENGINEER
ADB
PSG TECHNOLOGY
DPD
PROJECT ENGINEER
GAM
PROCESS CONTROLS
DPB
ENGINEERING SAFETY
ECH
PRODUCTION & DELIVERY
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MACHINERY
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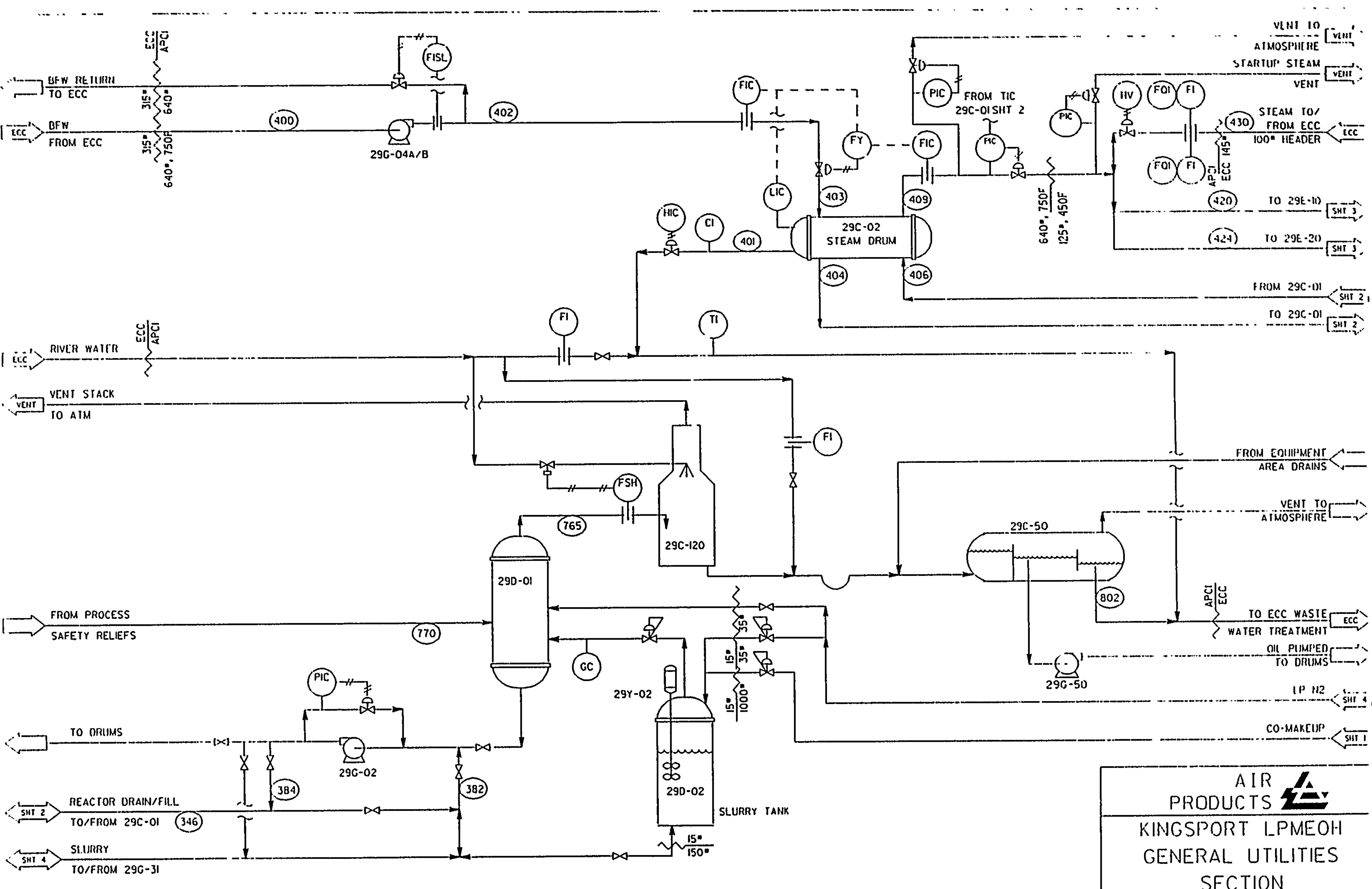
SHEET 4
REV. NO. 0

Rev 3/8/95



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DWG DATE	PROCESS ENGINEER	PROCESS APPROVAL	BUSINESS AREA REPRESENTATIVE	SYSTEMS ENGINEER	PSG TECHNOLOGY	PROJECT ENGINEER	PROCESS CONTROLS	ENGINEERING SAFETY	PRODUCTION & DELIVERY	MACHINERY

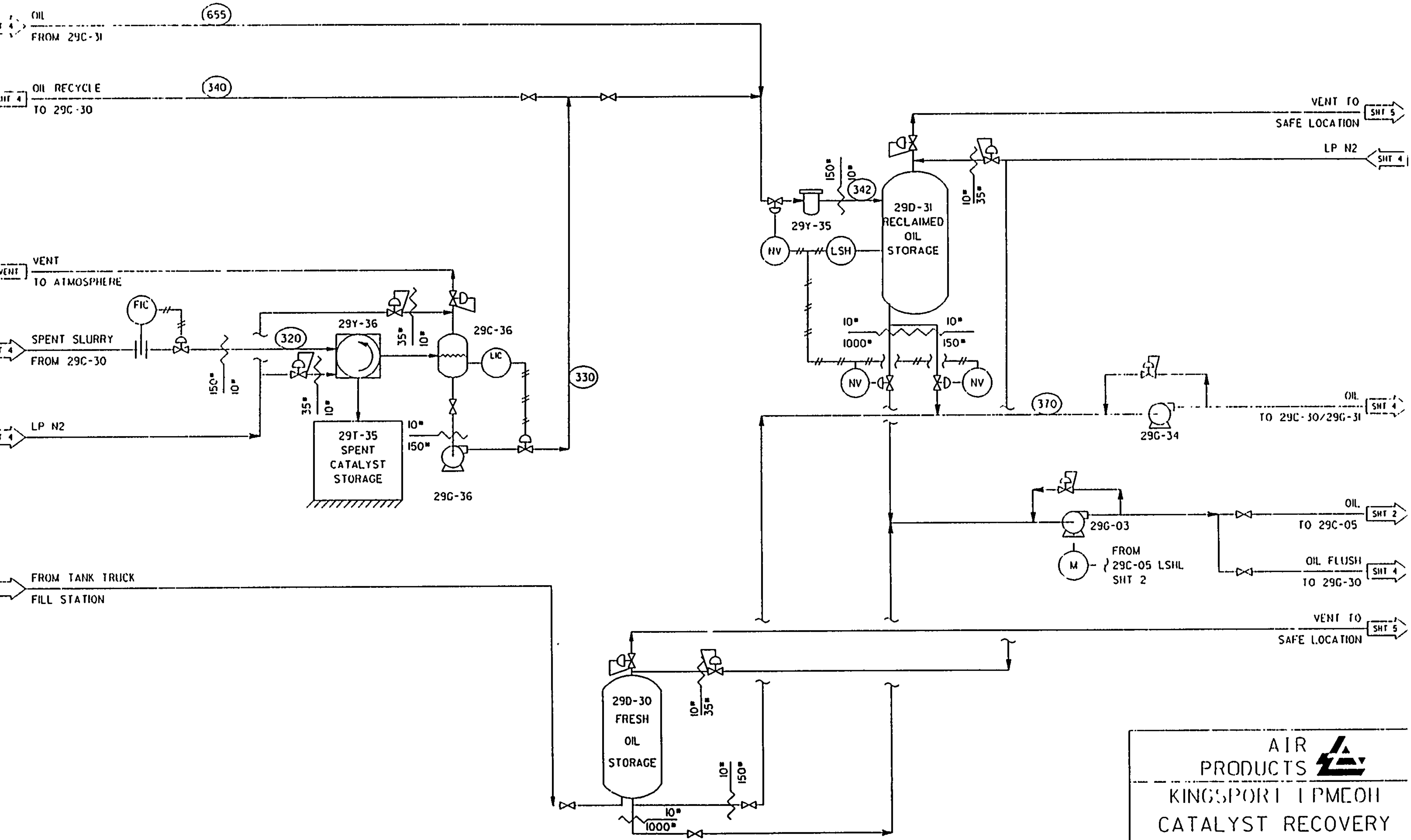
AIR PRODUCTS

KINGSPORT LPMEOH
GENERAL UTILITIES
SECTION

DRG. NO. LPM5
00-3-8215

SHEET 5
REV. NO. 0

Rev 3/8/95 JJ



AIR PRODUCTS

KINGSPORT LPMEOH

CATALYST RECOVERY SECTION

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DWG DATE	PROCESS ENGINEER	PROCESS APPROVAL	BUSINESS AREA REPRESENTATIVE	SYSTEMS ENGINEER	PSG TECHNOLOGY	PROJECT ENGINEER	PROCESS CONTROLS	ENGINEERING SAFETY	PRODUCTION & DELIVERY	MACHINERY

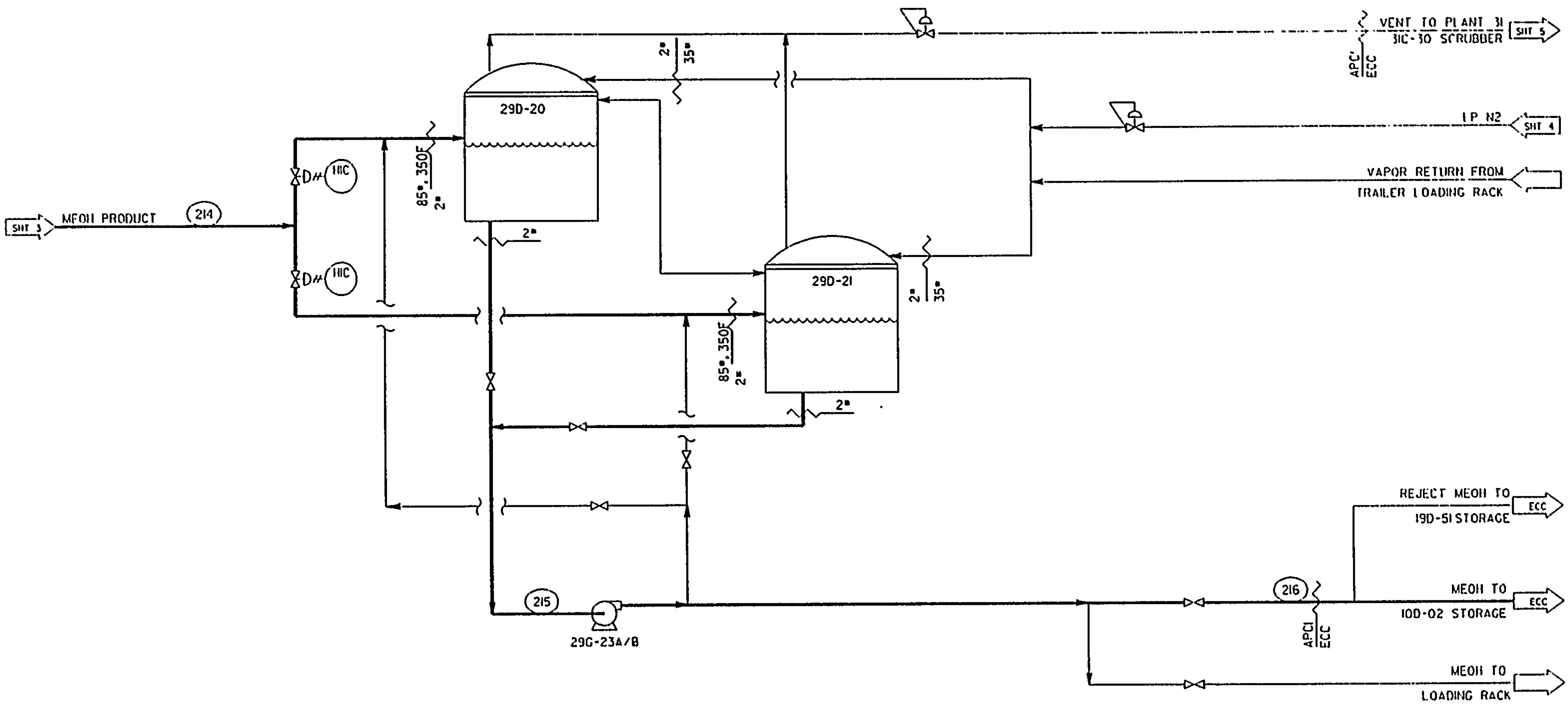
DRG. NO. LPM6

00-3-8215

SHEET 6

REV. NO. 0

Rev 3/8/95 JJ



AIR PRODUCTS

KINGSPORT LPMEOH
PRODUCT STORAGE
SECTION

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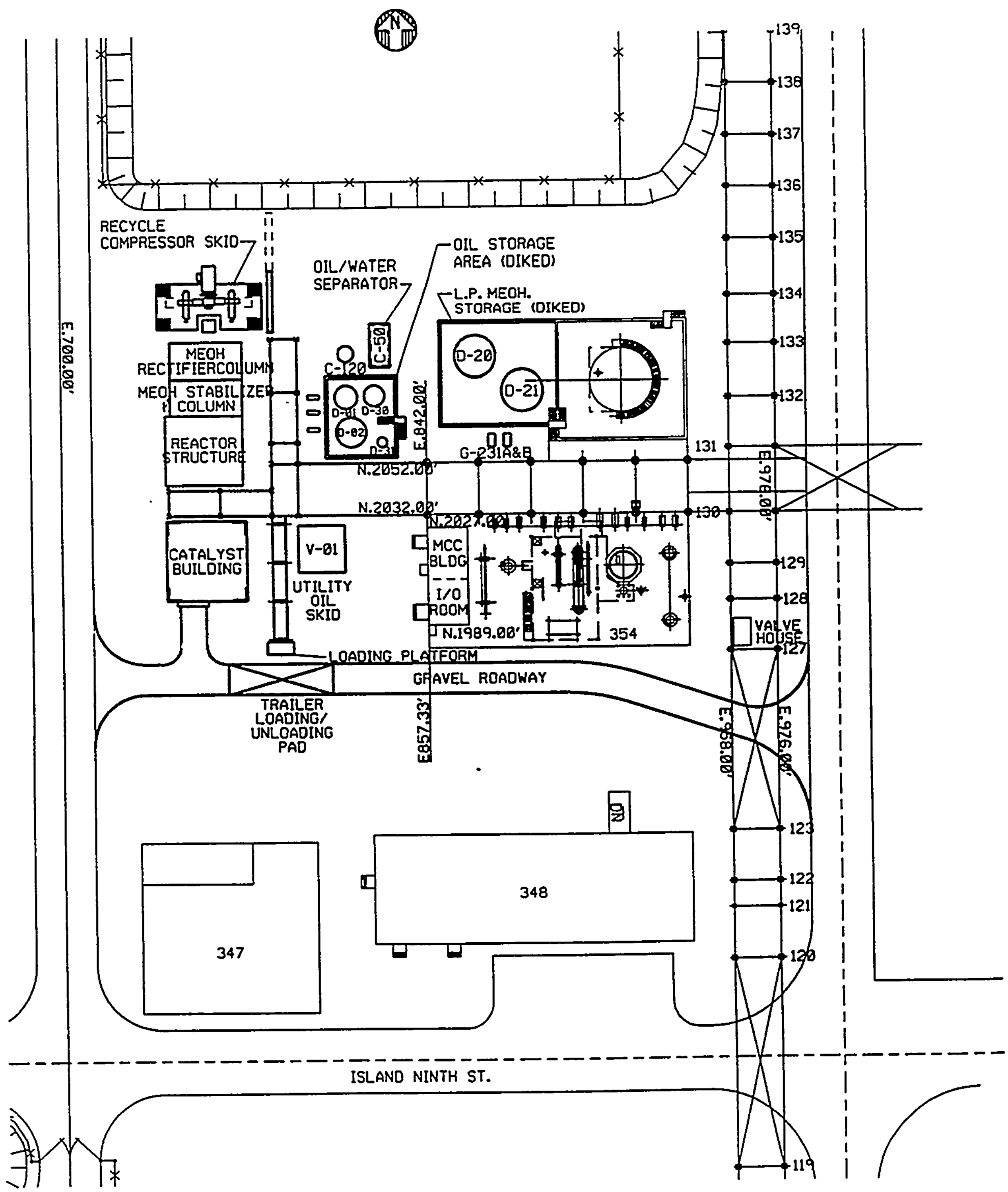
DWG DATE	PROCESS ENGINEER	PROCESS APPROVAL	BUSINESS AREA REPRESENTATIVE	SYSTEMS ENGINEER	PSG TECHNOLOGY	PROJECT ENGINEER	PROCESS CONTROLS	ENGINEERING SAFETY	PRODUCTION & DELIVERY	MACHINERY

DRG. NO. LPM7 — SHEET 7

00-3-8215 — REV. NO. 0

Rev 3/8/95 JJ



0 10 20 30 40 50 100

SCALE 1"=30'-0"

TITLE	
PRELIMINARY FACILITY ARRANGEMENT KINGSPORT LIQUID PHASE METHANOL KINGSPORT, TN	AIR PRODUCTS ALLENTOWN, PENNSYLVANIA ©Air Products and Chemicals, Inc., 1990 All rights reserved Unpublished TOTAL SAFETY
FILE 38215FD1. DGN	DWG NO. 00-3-8215-6299 D REV. P4
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FIGURE 3.5-4 LPMEOH Project 00-3-8215 Vessel List

Tank #	Description	Liquid Contents	Diameter (Ft)	Lng/Hgt(Ft)	Volume (Gal)	Design % Full	Normal Operating Capacity (Gal)	Plant Location
29C-01	LPMEOH Reactor	Drakeol, Catalyst	7.8	62.0	22,162	84	17,103	Synthesis
29C-02	Steam Drum	Water	5.5	18.5	3,288	50	1,645	Synthesis
29C-03	H.P. Methanol Separator	Crude Methanol	3.7	10.5	845	**	**	Synthesis
29C-04	Reactor Cyclone Holding Drum	Drakeol	**	**	**	**	**	Synthesis
29C-05	Reactor Economizer K.O. Drum	Drakeol	**	**	**	**	**	Synthesis
29C-06	Reactor Cyclone	Drakeol	**	**	**	**	**	Synthesis
29C-10	Methanol Stabilizer Column	Crude Methanol	4.3	89.0	9,668	**	**	Purification
29C-11	Methanol Stabilizer Reflux Drum	Methanol	2.5	10.9	400	50	200	Purification
29C-12	L. P. Methanol Separator	Crude Methanol	8.0	22.0	8,272	40	**	Purification
29C-20	Methanol Rectifier Column	Fuel-Grade Methanol	4.5	124.0	14,753	**	**	Purification
29C-21	Methanol Rectifier Reflux Drum	Methanol	3.0	9.5	502	50	250	Purification
29C-30	Catalyst Reduction Vessel	Drakeol, Catalyst	4.0	20.0	1,880	75	1,410	Catalyst Building
29C-31	Reduction Condensate Accumulator	Water, Drakeol	1.2	5.6	47	**	**	Catalyst Building
29C-32	Utility Oil Surge Tank	Utility Oil	3.5	9.5	893*	**	790	Slurry Reduction Area
29C-36	Slurry Centrifuge Surge Pot	Drakeol	2.0	4.7	110	30	33	Catalyst Building
29C-50	Oil/Water Separator-Coalescer	Rain Water	**	11.5 x 7.8 x 4.7	3,125*	---	1,800	Yard Area
29C-120	Vent Quench Drum	PSV Vents	5 / 2.5	20 / 30	4,200	0	0	Yard Area
29D-01	Blowdown Drum	Drakeol, Catalyst, Methanol	8.0	16.1	6,054	40	0	Synthesis
29D-02	Slurry Tank	Drakeol, Catalyst	12.0	18.7	15,821	70	0	Storage
29D-20/21	Methanol Lot Tanks	Product Methanol	16.0	24.9	37,451	80	30,000	Product Storage
29D-30	Fresh Oil Storage Tank	Fresh Drakeol	9.0	22.1	10,517	50	5000	Storage
29D-31	Reclaimed Oil Storage Tank	Recovered Drakeol	4.0	10.6	996	50	400	Storage
29 E-10	Methanol Stabilizer Reboiler	Fuel-Grade Methanol	**	**	**	**	**	Purification
29 E-20	Methanol Rectifier Reboiler	Product Methanol	**	**	**	**	**	Purification
29K-01	Syngas Compressor Lube Oil Console	Lube Oil	**	5 x 5 x 4	748*	**	600	Yard Area
29T-35	Spent Catalyst Hopper	Spent Catalyst	**	3.5 x 3.5 x 3.5	300*	80	240	Catalyst Building
29Y-36	Slurry Centrifuge	Drakeol, Catalyst	1.2	2.5	---	---	<50*	Catalyst Building

* preliminary estimate ** information not currnetly available

Any entrained slurry droplets leaving through the top of the reactor with the product gas are subsequently removed in a condensing heat exchanger, where the gas is cooled by the reactor inlet gas stream. The condensed liquid oil droplets are collected in a sump and pumped back to the LPMEOH™ reactor, thereby conserving mineral oil that might otherwise need to be stripped from the product and sent to the wastewater treatment facility.

The heat liberated during the exothermic methanol synthesis reaction is absorbed by the slurry and is removed by means of heat exchange coils inside the reactor. By generating steam within the heat exchanger tubes, the heat is removed from the slurry and the steam is used by the plant's utility steam system. The system will vent steam during plant startup transients.

Part of the reactor area is the recycle synthesis gas compressor. This compressor will recycle unconverted synthesis gas from the outlet of the reactor as well as three possible makeup streams exiting from the existing Eastman gasification facility's Lurgi methanol production unit (which normally is a Lurgi waste stream routed to the plant boilers). The compressor then raises the pressure of the unconverted synthesis gas and the Lurgi hydrogen and feeds them to the reactor for methanol production. This component of the system enhances the economics of the plant by using vapors that might otherwise be discarded as waste and converting these gases to methanol. One waste stream originating from the compressor is the seal purge, a flow of nitrogen intended to keep gases within the compressor from leaking out at the seals of the compressor shaft. Some traces of synthesis gas will be released to the atmosphere from this vent, but quantities are expected to be very small (approximately 2 TPY). Another waste stream from the compressor, and from all pumps and rotating equipment for the entire process, is the waste from used lubricants. This used oil will be disposed of via energy recovery in the plant's waste oil boilers.

The reactor section also includes guard beds, vessels filled with various adsorbents, designed to purify the synthesis gas feed stream of catalyst poisons. These adsorbents will be removed at some frequency for off-site regeneration, incineration, or disposal to a permitted facility. Adsorbents currently planned include activated carbon, which could be regenerated or incinerated, and zinc oxide, which would probably be disposed of as solid waste at a permitted facility.

3.5.2 Purification Area

The crude methanol leaving the reactor contains some dissolved gases, methyl formate, water, and higher alcohols. The crude methanol is purified in the purification section of the plant, consisting of two distillation columns. In these columns, the methanol product is stripped of dissolved gases and separated from lighter boiling hydrocarbons, higher alcohols, water, and oil.

The non-methanol components of the reactor outlet leave the purification section in two streams. The vapor stream, consisting of the dissolved gases and lighter boiling impurities such as methyl formate, is sent to on-site boilers as fuel. The bottom draw from the columns, containing crude methanol, higher alcohols, traces of mineral oil carried over from the reactor, and water, is sent to the existing Eastman Lurgi methanol unit's distillation area for further processing to separate the methanol from the oil, higher alcohols, and water. In the Lurgi purification section, the water separated from the product is directed to Eastman's wastewater treatment facility and the unusable hydrocarbons and higher alcohols are combusted in the boilers.

3.5.3 Methanol Storage/Proposed Project Utilities

The purified methanol produced from the LPMEOH™ process is to be used for further chemical production in the Eastman facility as well as for on-site and off-site fuels testing. The product should also meet MTBE manufacturers' requirements for methanol feeds.

The methanol is pumped from the distillation column area to the twin lot tanks, each of which holds ten hours of product at 260 tons-per-day production rate. After purity checks are conducted on the product, the methanol is pumped to the Eastman facility's methanol storage tanks. The lot tanks will be located inside dikes. Vapors from the stored methanol will be collected and routed to the existing absorber located at Eastman's Methyl Acetate Plant 31.

The proposed project utilities include oil storage tanks, a trailer loading/unloading area, and a buried oil/water separator. The oil storage tanks will be vented to the atmosphere, but due to the low volatility of this oil, emissions from these tanks are expected to be negligible (less than 0.005 TPY).

The trailer loading/unloading area will provide for loading of methanol product to ISO containers and for offloading of mineral oil to the oil storage tank.

The oil/water separator will collect water drained from the process area pads and will separate oil from stormwater (as well as water generated from firewater system tests). The water will be transferred to Eastman's wastewater system as shown on Figure 7.3-1. Oil will be removed to drums or to waste oil collection trucks and disposed of off-site or by routing to the boilers.

3.5.4 Catalyst Preparation, Oil Recovery, and Slurry Handling/Reduction

Impurities in the synthesis gas will eventually deactivate the catalyst, requiring new catalyst to be added and spent catalyst to be removed. The forming of fresh catalyst slurry and the process of preparing the spent catalyst for disposal is performed in the catalyst handling building.

Fresh slurry is made by introducing the catalyst powder into a vessel of mineral oil, then chemically reducing from the oxide form to -- or activating -- the catalyst by sparging in a mixture of nitrogen and synthesis gas while the vessel contents are heated and agitated. The reduction procedure takes approximately 30 hours. The result is a 35 to 40 wt% slurry mixture ready to be used in the reactor.

As new catalyst slurry is added to the LPMEOH™ reactor, the catalyst inventory is maintained by withdrawing an equivalent amount of partially deactivated or spent slurry from the reactor. The spent slurry is transferred back to the catalyst reduction vessel where it is cooled and its dissolved gases are purged. Vent streams from the catalyst reduction vessel are collected and combusted in Eastman's boilers.

After cooling, the spent slurry is transferred to the centrifuge. This centrifuge removes the oil from the slurry and discharges a high solids cake to a waste bin. The reclaimed oil is sent to an oil storage tank and is eventually returned to the process. The spent catalyst cake may be sold to a metals reclaimer or disposed of in a permitted waste management facility.

Plantwide vent headers will collect the discharges of safety valves for discharge into the blowdown tank, which will be vented to a quench tank vent prior to being vented to atmosphere. Since lifting of safety valves is an unplanned and infrequent event, discharges from these valves is not considered significant.

Within the catalyst preparation process area is the utility hot oil skid that provides heat for the catalyst reduction vessel. The utility hot oil skid will include an oil surge tank, pump, heater, and cooler. There are some fugitive emissions expected from this unit. Vapors will be collected from the utility oil surge tank and combusted in Eastman's on-site boilers.

3.6 Pollution Control

3.6.1 Air Pollution Emissions Control

The proposed project will result in small increases of emissions to the atmosphere. The new unit will be integrated into the existing production facility and will benefit from the use of existing air emission control equipment. There will be no changes in emissions from the coal gasification unit which supplies the feedstock to the LPMEOH™

unit. The two methanol storage tanks will be vented through an existing absorber. The two mineral oil tanks will be vented to the atmosphere. Because of the extremely low volatility of the mineral oil, the emissions are estimated to be negligible (less than 0.005 TPY).

Fugitive emissions from the pumps, valves, connectors, and pressure relief devices have been calculated to be approximately 10.8 TPY. These fugitive emissions will be minimized by the proper selection of materials and components designed for low levels of chemical leakage. Equipment leak emissions will be monitored by a leak detection and repair program that will be proposed in the monitoring plan. Proposed construction activities may result in the generation of some fugitive dust. The construction will not involve moving large quantities of earth. The site is less than an acre in size and will not require recontouring. The site has a gravel cover and precautions will be taken to preserve the gravel for reuse. Support caissons will be drilled and there will be shallow excavations for building foundations, but no other earth moving activities will occur. Construction is projected to last 14 months.

3.6.2 Liquid Waste Generation and Disposal

3.6.2.1 Construction Wastewater

Construction of the proposed project is not expected to impact existing surface water or groundwater resources. The proposed site has already been leveled, graded, and backfilled with compacted shale and a gravel cover. The potential for soil erosion and impacts on surface water will be minimized by removing cuttings from caisson excavations as they are produced and, if needed, by sand-bagging existing storm drains. The first phase of construction, following the placement of caissons, will be the pouring of concrete pads and curbing with underdrains to the interceptor (wastewater) sewer system. Once the pads are in place, any precipitation falling on the process, materials handling and storage areas will be collected and routed to the wastewater treatment facility by the interceptor sewer system.

3.6.2.2 Operational Wastewater

Potential impacts on surface water or groundwater due to the operation of the proposed facility are related to water used for cooling, process wastewater, and stormwater runoff. Stormwater runoff from the proposed unit is not expected to have any effect on surface water or groundwater resources. Runoff in areas unaffected by the manufacturing operation will be collected by an existing stormwater drainage system and routed to the South Fork Holston River. Areas potentially influenced by manufacturing will have collection systems for precipitation routed to the interceptor (wastewater) sewer system. These areas include process areas, the catalyst building, oil tank truck unloading pad, methanol storage area, and the oil storage area. A schematic diagram of this collection system is provided in Figure 6.3-1

Process wastewater flows from the proposed unit is expected to increase Biochemical Oxygen Demand (BOD) discharges from the LPMEOH™ unit. The proposed unit is expected to add 4180 lb/day BOD load and 1150 gal/day flow to the existing wastewater treatment facility. These discharges will not have any affect on the treatment facility or on the quality of its discharge to the South Fork Holston River.

water discharge to the South Fork Holston River. No adverse effect from these discharges is anticipated.

One final liquid waste stream is expected for the proposed unit. An oil/water separator is planned as a pretreatment step for stormwater runoff collected from the unit prior to discharge to the interceptor sewer. Oil collected from this separator will be managed through energy recovery on an as-needed basis.

A liquid waste stream not discussed above consists of compressor and pump lubricants. These liquid wastes will be managed through combustion for energy recovery; this stream is estimated to be 6.5 TPY.

3.6.3 Solid Waste Generation and Disposal

3.6.3.1 Construction Waste

During construction, some waste steel and other metals are expected to be generated, as well as normal construction debris (wood, concrete, paper, and other garbage). The daily volume of construction debris will be highly variable and dependent on the nature of construction activities. Based upon experience with other construction projects of this type, it is estimated that a total of 3,000 to 5,000 cubic yards of waste will be generated. Debris will be stored in on-site dumpsters, with each contractor responsible for managing and disposing of their own debris. It is anticipated that the on-site Eastman landfill will be used as the disposal site for this limited solid waste stream.

3.6.3.2 Operational Waste

Three solid waste streams are expected for the proposed unit. The first is spent methanol catalyst. Management of this waste may include a number of options. Emphasis will be placed on recycling and re-use. If possible the spent catalyst will be sent to a metals reclaimer for recycling. Another option would be incineration in Eastman's on-site incineration facility with residual ash disposal in a permitted hazardous waste disposal facility. The ash produced will be less than 1% of the ash currently being disposed of from this facility.

The second solid waste stream is activated carbon-carbonyl adsorbent from the guard beds. If possible the carbon will be regenerated and reused. Alternate options include disposal through on-site incineration. The third waste stream is a zinc oxide or other type of sulfur adsorbent. Management of this waste may include recycling or disposal in permitted off-site facilities.

These solid waste streams are typical of solid wastes already being managed successfully at Eastman. No adverse environmental impacts are anticipated due to the management of solid wastes from the proposed unit.

3.7 Safety Features

3.7.1 Fire Protection System

A comprehensive on-site fire protection system will be installed to control and extinguish fires in the process areas. The system will be designed to conform with the

Uniform Fire Code and all applicable National Fire Protection Association standards, as well as all state and local requirements. The system will include a capability to control fires by means of a fire water system and portable fire extinguishers; appropriate response to the range of potential fire situations at the unit will therefore be possible. All unit operators will be trained in the operation of the fire protection system.

The fire water system will include a fire water supply loop, fire hydrants, sprinkler and/or deluge systems, and hoses placed at key locations. An underground fire main pipeline will be installed, and hydrants with associated hose stations installed at appropriate locations. The existing fire water loop in the Eastman facility will be tied into for the new fire water system.

To supplement the fire water system, portable fire extinguishers will be provided at key locations within the unit. The type and number of extinguishers will satisfy all applicable code requirements.

3.7.2 Instrumentation and Controls

In order to maximize safe operation of the proposed LPMEOH™ unit, operations will be centrally directed from a control room. Unit instruments and controls will be designed to ensure safe startup, operation, and shutdown of the facility. The control system will also perform the major monitoring of operational parameters, annunciation, and reporting functions.

3.7.3 Medical Facilities

First aid kits, eyewash stations, and safety showers will be provided in the process area. This equipment will facilitate rapid medical response in an emergency situation.

3.7.4 Facility Design for On-site/Off-site Safety

Any potential safety hazards to personnel, equipment, and the community will be considered when producing equipment layouts and equipment locations. Local, state, federal standards and ordinances, including those established by the Occupational Safety and Health Administration (OSHA) and National Fire Protection Association (NFPA), as well as APCI company standards will be reviewed to minimize exposure to potential hazards.

Local emergency services such as fire departments, hospitals, and ambulance services will be identified, located, and contacted prior to startup of the unit. The Partnership will work with the local safety agencies to develop any safety and emergency procedures and plans required.

3.8 Transportation Features

Local traffic volumes will increase slightly during the peak construction period. Construction worker vehicles and trucks delivering equipment and supplies will access the site on a regular basis. However, the proximity of the site to a major transportation network, the ability to use rail for transport of some of the equipment, the potential to schedule construction shifts to avoid peak commuter travel periods, and the limited network, the ability to use rail for transport of some of the equipment, the potential to schedule construction shifts to avoid peak commuter travel periods, and the limited duration of the peak construction period are expected to minimize the effect of project construction on surrounding roadways.

During unit operations, project-related traffic will be minimal. This traffic will consist of catalyst deliveries (up to three truckloads per year), mineral oil deliveries (six to eight trucks per year), guard-bed adsorbent deliveries (one truck per year), and the removal of waste material (approximately one truck per month). In addition, off-site fuel demonstration pickups will be approximately 50 to 60 trucks over 12 to 18 months.

3.9 Construction Characteristics

Construction of the proposed LPMEOH™ unit is scheduled to begin in September of 1995 provided that the NEPA review is positive and all requisite construction approvals are obtained. Construction worker population is expected to start at 12 during initial mobilization for tie-in work and up-front construction work. The number of construction workers would gradually increase, peaking at approximately 135 by June of 1996. This peak workforce level is expected to be maintained for a period of approximately one month, after which the total number would gradually decrease until the construction is completed.

Construction would be scheduled for a typical 40-hour work week, with occasional periods of up to 60-hour work weeks. While the exact timing of the construction shift has not yet been determined, it is expected that work would generally occur during daytime hours.

Construction activities will include the following:

- setup and assembly of temporary office and warehouse facilties a short distance from the west boundary of the site;
- installation of temporary utilities (electricity, water, phone, sewage);
- preparation of construction parking and equipment staging areas;
- tie-in work to existing plant systems;
- disposal of wastes during construction;
- excavation and construction of foundations;
- erection of permanent facility steel structures and equipment;
- installation of mechanical, electrical, and instrumentation systems including permanent utilities; and
- commissioning and startup of the unit.

The proposed construction timetable is shown on Table 3.9-1. Staging and laydown areas will be established on the site during the first phase of construction. This area will be used for storage of bulk material such as structural steel, piping, mechanical equipment, electrical equipment, cable reels, and miscellaneous items. In addition, some materials may be stored locally and transported to the site by truck or stored inside the Eastman facility.

On-site parking will be provided for all construction employees. A security fence will be installed between the parking area and the site. The construction workforce will be drawn to the greatest extent possible from the local and regional area. Workers skilled as carpenters, masons, iron workers, welders, pipefitters, millwrights, insulators, painters, electricians, technicians, and engineers will be required. Due to the greatest possible use of the local workforce, in-migration would not result in significant stress upon the capacity of public and community services, such as educational facilities, health care and human services, police and fire protection, or public utilities.

TABLE 3.9-1 CONSTRUCTION SCHEDULE

MILESTONE	START	COMPLETE
NEPA Review	4/15/94	6/30/95
Civil Construction -- Piling, Foundations, and UG*	10/1/95	1/30/96
Steel Erection	1/11/96	3/25/96
Mechanical	1/16/96	9/26/96
Instrument/Electrical	3/18/96	10/10/96
Insulation and Painting	5/13/96	11/1/96
Plant Commissioning	8/9/96	11/27/96
Start-up	11/27/96	1/07/97

*UG = underground

3.10 Operational Characteristics

Once construction and start-up of the proposed demonstration unit are completed, it will be operated seven days a week, 24 hours per day. Three eight-hour shifts will be worked each day. No new employees are anticipated to be hired to staff the unit, since there will be sufficient employees within the existing Eastman facility to man the new plant.

A comprehensive training and start-up program will be implemented to ensure safe and efficient operation of the new facility.

3.11 Facility Pollution Prevention Measures

The proposed demonstration unit will include design and operating features to prevent pollution to the environment. Some of these features include:

- The use of low-leakage mechanical components in pumps, valves, and other systems to minimize the level of fugitive emissions.

- The use of secondary containment in the methanol and oil storage areas to eliminate the potential for discharge to the environment in the event of a tank or system leak.

- The implementation of a Preventive Maintenance (PM) program which includes procedures for reducing the potential of equipment failures that could lead to releases. These procedures include identification of applicable equipment and systems, periodic inspections, adjustments, and parts replacement.

- Potential sources of fugitive emissions and/or leaks will be detected and proactively managed through an environmental monitoring plan featuring periodic leak patrols.

- Good housekeeping practices will be employed at the unit. Housekeeping practices include neat and orderly storage of chemicals, prompt removal of small spills, regular refuse pickup, and proper storage of containers away from walkways and roads.

In addition, since the proposed facility will be constructed and operated by the Partnership in which Air Products is the general partner, it will be required to implement the pollution prevention programs which have been adopted by both companies. Both Air Products and Eastman have adopted the requirements of the Chemical Manufacturer's Association (CMA) Responsible Care Pollution Prevention Code of Management Practices. The initiative entitled "Responsible Care: A Public Commitment" commits member companies to improve performance in response to public concerns about the impact of chemicals on health, safety, and the environment. The Pollution Prevention Code consists of 14 management practices which provide the framework for companies to achieve ongoing reductions in the amount of contaminants and pollutants generated and released to the environment. Key concepts that are emphasized by this code include:

- **All Waste, All Media.** It applies to all wastes and releases to all media (e.g., air, water, land).

- **Preferred Reduction Hierarchy.** It embraces a pollution prevention hierarchy in which source reduction is preferred over recycle/reuse/reclaim which is in turn preferred over treatment.

- **Continuous Improvement.** It requires ongoing reductions of wastes and releases with a goal of establishing a long-term downward trend in the amount of wastes generated and releases to the environment. In other words, it requires continuous improvement as long as wastes or releases are generated.

The 14 management practices set out in the code are as follows:

1. A clear commitment by senior management, through policy, communications, and resources, to ongoing reductions at the facility in releases to the air, water, and land and in the generation of wastes.

2. A quantitative inventory of the facility wastes generated and released to the air, water and land, measured or estimated at the point of generation or release.

3. Evaluation, sufficient to assist in establishing reduction priorities, of the potential impact of each release on the environment and the health and safety of employees and the public.

4. Education of, and dialogue with, employees and members of the public about the inventory, impact evaluation, and risk to the community. This practice includes requirements under the Superfund Amendments and Reauthorization Act (SARA) Title 311 Emergency Planning Notification and SARA Title 312 Tier II Inventory Reporting programs.

5. Establishment of priorities and plans for waste and release reduction, taking into account both community concerns and the potential health, safety, and environmental impacts as determined under Practices 3 and 4.

6. Ongoing reductions of wastes and releases, giving preferences first to source reduction, second to recycle/reuse, and third to treatment. These techniques may be used separately or in combination with one another.

7. Measurement of progress at the facility in reducing the generation of wastes and in reducing release to the air, water and land by updating the quantitative inventory at least annually. This update includes annual summaries of SARA 313 Releases quantities and of all hazardous and non-hazardous solid waste quantities.

8. Ongoing dialogue with employees and members of the public regarding waste and release information, progress in achieving reduction, and future plans. This dialogue would be at a personal, face to face level, where possible, to obtain feedback.

9. Inclusion of waste and release prevention objectives in research and in design of new or modified facilities, processes, and products.

10. An ongoing program for promotion and support of waste and release reduction by others. This program would include commitment to the EPA 30/50 Voluntary Reduction Program.

11. Periodic evaluation of waste management practices associated with operations and equipment at the facility, taking into account community concerns and health, safety, and environmental impacts and implementation of ongoing improvement. The facility would be undergoing periodic internal environmental audits and inspections to assure ongoing compliance.

12. Implementation of a process for selecting, retaining, and reviewing contractors taking into account sound waste management practices that protect the environment and the health and safety of employees and the public.

13. Implementation of engineering and operating controls at the facility to improve prevention and early detection of releases that may contaminate groundwater. This includes routine inspection of spill containment devices under the provisions of the SPCC Plan.

14. Implementation of an ongoing program for addressing operating and waste management practices and for working with others to resolve identified problems, taking into account community concerns as well as health, safety and environmental impacts.

4.0 ALTERNATIVES TO THE PROPOSED ACTION

The proposed action is to demonstrate commercial-scale production of methanol from coal-derived synthesis gas using the LPMEOH™ technology. This section provides a discussion of the DOE alternatives to the proposed action as well as the proposed site alternatives.

4.1 The No-Action Alternative

Under the no-action alternative, DOE would not provide cost-shared funding to design, construct and operate the LPMEOH™ Demonstration Unit at Eastman Chemicals' Kingsport facility. Without the DOE funds to support the design, construction and operation of the LPMEOH™ plant, the LPMEOH™ demonstration unit would not be built. The LPMEOH™ process technology would not be commercially accepted in its principal application as methanol co-production in an integrated coal gasification combined cycle (IGCC) power plant if this demonstration unit is not built and operated.

It must be noted under the no-action alternative that failure to build the LPMEOH™ unit in the space reserved for it at Eastman's Kingsport site would leave that site available for construction of another process facility. It cannot be assumed that the no-action alternative results in a non-use of the land, because the site is centrally located to facility utilities and offers economies of scale for another process plant modules. Within the next decade it is highly likely that an Eastman Chemical facility expansion would be built here for another purpose should the LPMEOH™ project not move forward.

Proceeding with the No-Action Alternative would not contribute to the objective of the CCT Demonstration Program which is to make a number of advanced, more efficient, economically feasible and environmentally acceptable coal technologies available to the U.S. Energy marketplace.

4.2 Alternative Sites

From a land use standpoint, it is likely that this site would be used for another process unit within the next decade if the LPMEOH™ unit were not built.

The Kingsport site is one of the four locations Air Products has evaluated for locating the LPMEOH™ demonstration unit. Two previous site locations were developed and submitted to the DOE for this program.

In December 1989, the LPMEOH™ technology was chosen by the DOE, under Clean Coal Technology (Round III) Program, to be demonstrated on a 500 ton per day (TPD) of methanol scale at Dakota Gasification Company's (DGC) Great Plains Synfuels lignite-to-SNG plant in Beulah, North Dakota. Negotiations toward a cooperative agreement between DOE and Great Plains Methanol (the proposed joint venture between Air Products and DGC) commenced in January 1990. However, due to the inability of DGC to obtain permission to divert a sufficient amount of synthesis gas from SNG production for the natural gas pipeline companies, the demonstration could not be sited at Great Plains. Therefore, alternative sites were evaluated and the Texaco Cool Water Project (TCWP) facility was deemed most appropriate for the LPMEOH™ Demonstration Project. Texaco Syngas Inc. (TSI) had secured the rights to purchase the coal gasification facility with the intent to operate it as a coal/municipal sewage sludge gasification facility to produce electricity.

On October 16, 1992 the Cooperative Agreement was awarded to Air Products for the LPMEOH™ technology demonstration. Air Products proposed to perform a commercial-scale demonstration of the LPMEOH™ Process using coal-derived synthesis gas. A nominal 150-ton-per-day methanol demonstration unit, with maximum demonstration at up to 200 ton-per-day, was to be located at TSI's Cool Water Gasification Facility in Daggett, California. However, given the current economy and forecasts for natural gas price and availability in California, Air Products , TSI, and the DOE have recognized that the combined Texaco Cool Water/LPMEOH™ demonstration project, as proposed, could not successfully obtain an electric power contract in California.

Options to restructure the project needed to be considered. Therefore, Air Products and the DOE mutually agreed (Modification M002 of January 25, 1993) to suspend all work under the Cooperative Agreement until an acceptable alternative site proposal was developed. Air Products further agreed, that during the suspension period, it would pursue alternative LPMEOH™ Demonstration Projects with interested host site providers, preferably at existing, operating coal gasifier sites.

Air Products discussed the relocation of the project with Destec Energy, Inc. Operation of Destec's lignite gasifier in Plaquemine, LA is to be discontinued when funding runs out sometime before 1997; therefore the LPMEOH™ demonstration unit could not be located at this site.

Discussions with Eastman Chemical to locate the LPMEOH™ demonstration at their Kingsport, TN facility resulted in a revised technical proposal which was submitted to the DOE on July 30, 1993. The host site has a better infrastructure, including an operating coal gasifier with proven reliable performance.

The Eastman Chemical Kingsport site was selected because it can provide coal-derived synthesis gas at a rate high enough to demonstrate the LPMEOH™ process technology on a commercial-scale basis. Successful demonstration at this scale would enhance the acceptance of the LPMEOH™ technology into the IGCC market.

The Eastman Chemical Kingsport site would provide the coal-derived synthesis gas and ancillary facilities necessary to demonstrate the LPMEOH™ process as described above. This site is the only existing coal gasification site with synthesis gas available for this LPMEOH™ commercial-scale demonstration. The cost to build a coal gasification plant specifically to provide synthesis gas for the LPMEOH™ demonstration would be prohibitive.

4.3 Alternative Technologies

The majority of the world's methanol is currently produced by foreign technology, via either the ICI or the Lurgi gas-phase methanol synthesis process. Both of these processes require a feed gas to the reactor that is hydrogen rich. This requirement arises from the design to minimize the rate of catalyst deactivation while maximizing methanol production.

The composition of the reactor feed is also quite dilute with the total carbon monoxide concentration typically no greater than 6 to 9 volume percent. This imposes a severe limitation on the amount of methanol that can be made per pass through the reactor. The concentration of methanol in the reactor effluent is typically only 4 to 6 volume percent. The reactor effluent is cooled to condense the converted methanol and the unreacted synthesis gas is recycled back to the reactor. The reason for the use of a dilute reactor feed is catalyst deactivation. With higher concentrations of carbon oxides, the catalyst surface temperatures could increase to a level where deactivation is too high.

In the gas-phase process, the H_2/CO ratio must be adjusted to at least 2.1 to 1 before the CO-rich gas can be converted to methanol. This is accomplished by diverting a portion of the clean synthesis gas to a shift converter in which a fraction of the carbon monoxide is reacted with steam to form hydrogen and carbon dioxide via the water gas shift reaction. At this point, carbon dioxide is removed from the feed stream by one of several conventional absorption processes, leaving a clean synthesis gas that is on the H_2- rich side of stoichiometric. Although shift and carbon dioxide removal are proven technologies, they are capital and energy intensive. In addition, the carbon dioxide reject stream can be over 10% of the methanol plant feed and represents a significant loss of potentially recoverable energy in the high pressure gas stream.

The crude methanol produced in both gas-phase processes contains nearly 20 wt% water and 1 wt% by-products and dissolved gasses. A major disadvantage is that the crude product needs substantial upgrading before it can be used. The crude product requires (as a minimum): 1) a stabilization step to strip unreacted dissolved gases from the liquid; and 2) a methanol distillation to separate the alcohol products from the water by-products. This kind of purification section for fuel-grade methanol (max. 1 weight % water) in a gas-phase unit would be only slightly reduced in scope from a high-purity chemical purification system.

The biggest drawback for conventional technology, however, is that it cannot meet the load-following conditions imposed by coupling it to an IGCC power plant. The gas phase reactors are sensitive to rate changes and certainly could not operate in an on/off mode. The LPMEOH™ Process has demonstrated its ability to load follow as well as to operate in the on/off mode at the DOE's LaPorte Process Development Unit. This project will demonstrate these features at the commercial scale.

In summary, the LPMEOH™ technology is a novel process for methanol synthesis. Its key advantages are: 1) the feed to the reactor does not have to be H_2-rich; almost any combination of hydrogen, carbon monoxide, and carbon dioxide can be processed directly without adjusting the gas composition via the shift reaction; 2) there is no need to dilute the feed gas to the reactor in order to control catalyst surface temperature; and 3) highly concentrated gas streams can be processed directly. This allows much higher per-pass conversions to methanol than can be achieved with conventional technology, and finally (4) it can operate in a load-following and on/off mode.

5.0 EXISTING ENVIRONMENT

5.1 Air Resources

5.1.1 Climate

Kingsport, Tennessee, where the proposed demonstration unit would be located, is in the extreme upper East Tennessee Valley. The closest National Weather Service office is at the Tri-City Airport, which is approximately 15 miles east of the Eastman facility.

As reported by the National Weather Service, the area does not lie directly within any of the principal storm tracks that cross the country, but comes under the influence of storm centers that pass along the Gulf Coast and then up the Atlantic Coast toward the northeast. However, the topography has considerable influence on weather changes peculiar to this region. Moist easterly air flow in the low levels of the atmosphere is more or less blocked on the eastern slopes of the mountains, thus producing an abundance of precipitation on these higher ridges and subsequently reaching the Kingsport area rather dry and sometimes a little warmer. The maximum monthly amount of precipitation occurring in July is characteristically diurnal thunderstorms occurring most frequently during the afternoon and early night hours. A secondary maximum of precipitation occurring in the late winter months is due mainly to overrunning moist air associated with storm centers to the south and also the northeast.

Although average annual precipitation is near 41 inches in the immediate vicinity, annual amounts of 80 inches have been recorded on mountainous sections to the east and south (NOAA, 1990).

Monthly normal temperatures range from the January mean of 36°F to a July mean of 75°F. Prolonged periods of cold weather are generally due to slow-moving cold cells associated with storm centers in the vicinity of Pennsylvania and southern New York. On the other hand, periods of unusually high temperatures occur most frequently during diurnal heating under conditions involving subsiding superior air usually associated with high pressure systems dominating the eastern section of the Continental United States. Snowfall seldom occurs before November and rarely remains on the ground for more than a few days. However, mountains to the east and south are frequently well blanketed with snow for much longer periods of time (NOAA, 1990).

Eastman also collects meteorological data on site for use in air dispersion modeling at a 45-meter tower, the location of which is shown in Figure 5.1-1.

A windrose constructed from 1988 wind speed and wind direction data is shown in Figure 5.1-2. The predominant wind direction is from the southeast with secondary strong sectors being the west southwest and the west. The 10-year average wind speed at this site is 6.8 miles per hour.

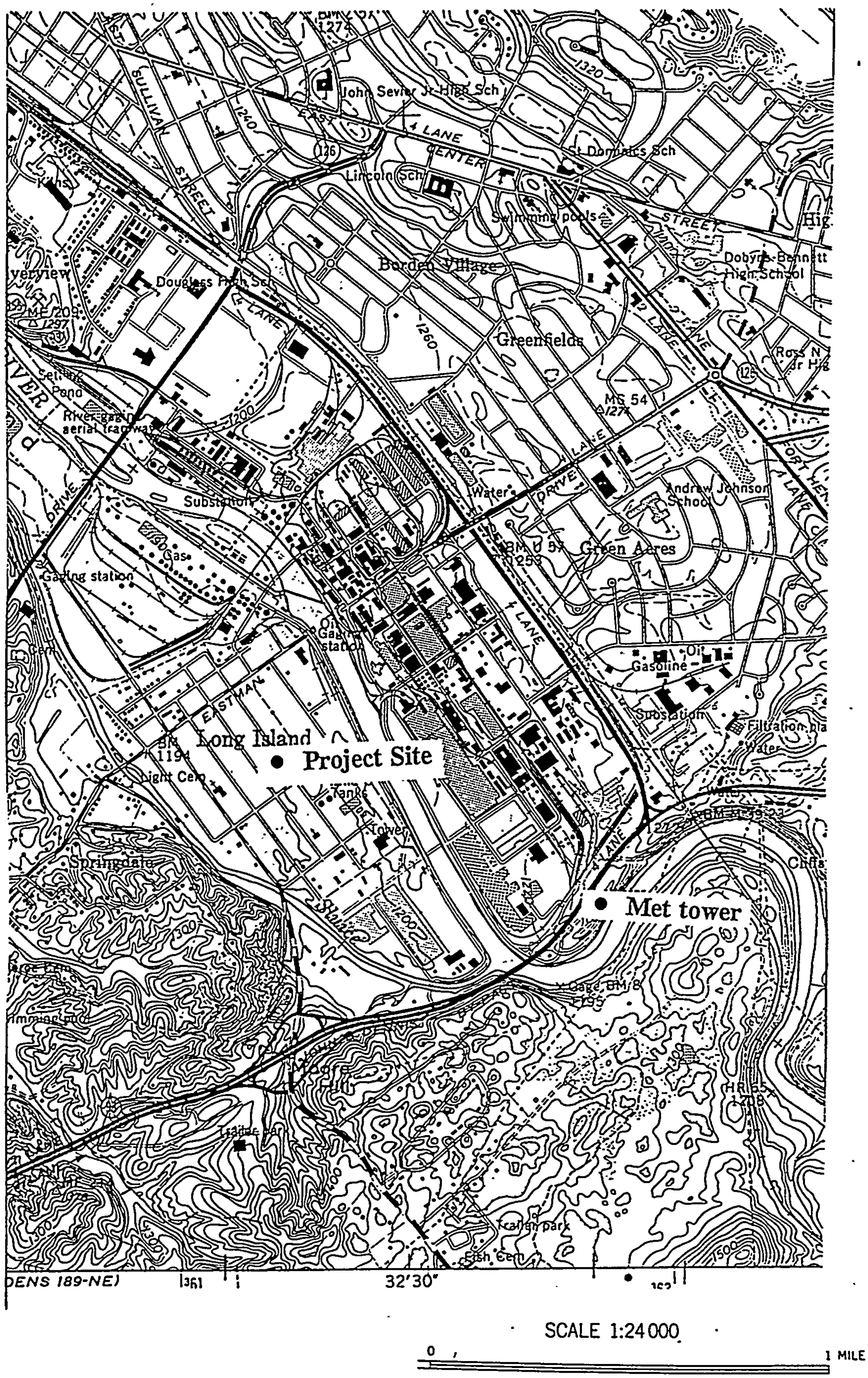


Figure 5.1-1 Location of Eastman Met Tower

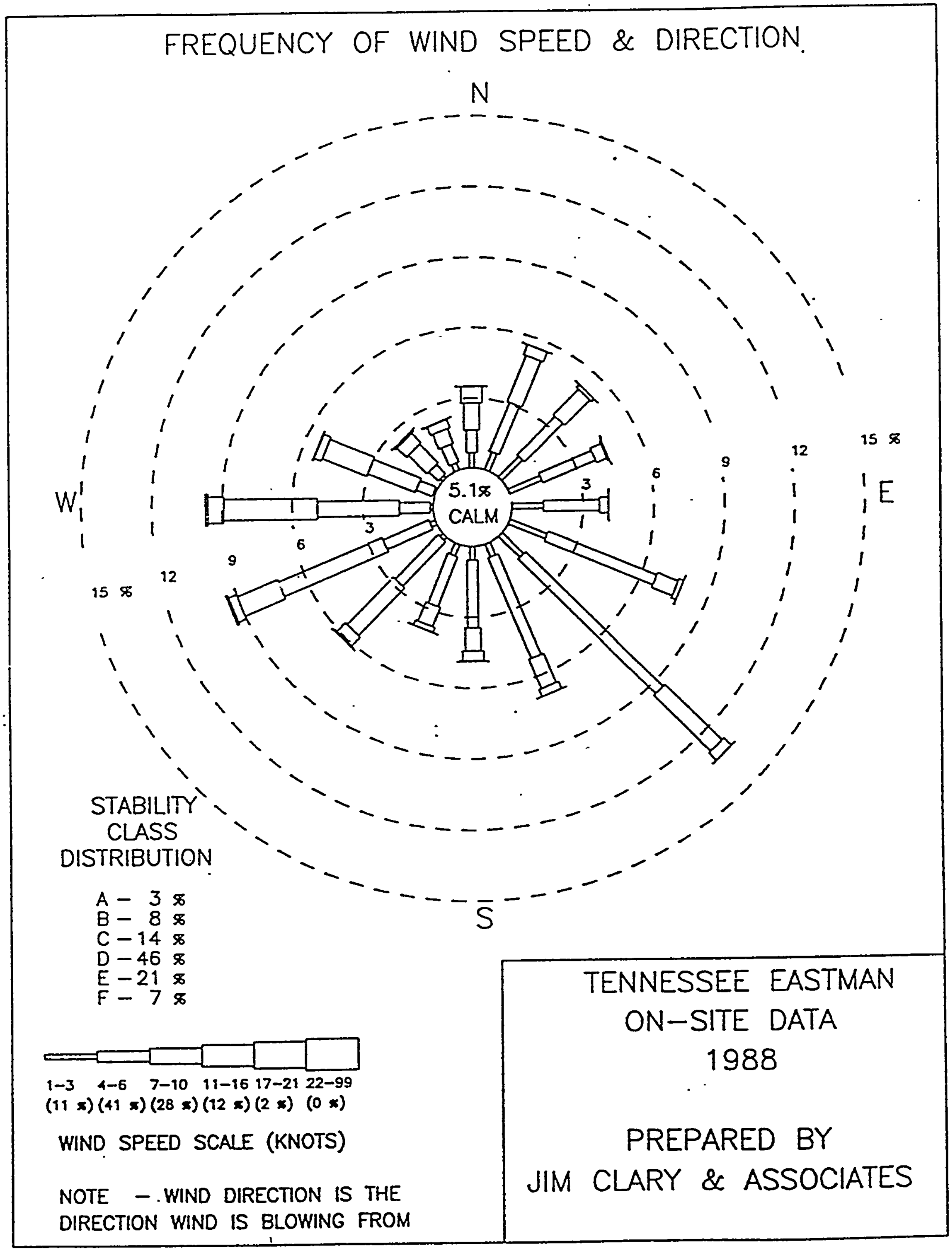


Figure 5.1-2 Windrose from TED Meteorological Data

5.1.2 Baseline Air Quality Condition

National Ambient Air Quality Standards (NAAQS) have been established by the Environmental Protection Agency for six major pollutants. These six pollutants are commonly referred to as criteria pollutants because the standards are based on published criteria documents that state current understanding of concentration levels that cause identifiable effects on health and welfare. The primary ambient air quality standards define levels of air quality which the Administrator judges necessary, with an adequate margin of safety, to protect the public health. The secondary ambient air quality standards define levels of air quality which the Administrator judges necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

Areas that have monitoring data showing that the air quality meets the primary and secondary NAAQS are classified as attainment, and likewise those areas that exceed air quality standard are classified as nonattainment. If monitoring data are not available the area is called unclassified and is treated as an attainment area. State agencies generally concentrate monitoring efforts in highly populated areas or those having major pollutant sources and do not monitor areas expected to be meeting standards.

The State of Tennessee has established the same standards for the criteria pollutants as the federal government. In addition, Tennessee has retained a standard for total suspended particulate matter, which was dropped as an indicator for particulates by EPA when the PM-10 standard was adopted. Tennessee also has a standard for gaseous fluorides. Both the EPA and Tennessee air quality standards are summarized in Table 5.1-1.

Sullivan County, where Kingsport is located, is in attainment or unclassified for all of the NAAQS. The Tennessee Division of Air Pollution Control (TDAPC) operates an ozone monitor, total suspension particulates (TSP) samplers, and PM-10 samplers within the county. Eastman monitors and submits to the TDAPC monitoring data for sulfur dioxide, nitrogen dioxide, carbon monoxide, TSP and PM-10. Monitoring data from 1990-1992 are summarized in Table 5.1-2. The monitoring stations referenced in this table are shown in Figures 5.1-3 and 5.1-4. Because the short-term standards are not to be exceeded more than once per year, the second highest value is determined for each year and the highest of those yearly values reported in the table.

Particulate Matter (PM-10 and TSP)

Particulate matter is measured both as TSP and PM-10 by Eastman at two sites, one on either side of the Kingsport manufacturing facility, shown on Figure 5.1-3. Measurements of TSP at the Eastman sites show a maximum annual average of 40 $\mu g/m^3$, which is 67 percent of the secondary guideline. The maximum 24-hour concentration of 96 $\mu g/m^3$ is 64 percent of the secondary standard. The maximum PM-10 annual average of 32 $\mu g/m^3$ is 64 percent of the standard, and the 24-hour maximum concentration of 78 $\mu g/m^3$ m is 52 percent of the annual secondary standard.

Table 5.1-1. Summary of National Ambient Air Quality Standards (NAAQS) and Tennessee State Standards[1.]

Pollutant	Averaging Interval	NAAQS		Tennessee	
		Primary	Secondary	Primary	Secondary
Total Suspended Particulates (TSP)	Annual[2.] 24 hours	- -	- -	75 260	60 150
Particulate Matter < 10 um (PM-10)[3.]	Annual 24 hours	50 150	50 150	50 150	50 150
Sulfur Dioxide	Annual 24 hours 3 hours	80 365 -	- - 1300	80 365 -	- - 1300
Carbon Monoxide	8 hours 1 hour	10,000 40,000	10,000 40,000	10,000 40,000	10,000 40,000
Ozone[4.]	1 hour	235	235	235	235
Nitrogen Dioxide	Annual	100	100	100	100
Lead	Cal. quarter	1.5	1.5	1.5	1.5
Gaseous Fluorides as HF	30 days 7 days 24 hours 12 hours	- - - -	- - - -	1.2 1.6 2.9 3.7	1.2 1.6 2.9 3.7

[1.]All values other than annual and quarterly values are maximum concentrations not to be exceeded more than once per year. All values are in µg/m³.

[2.]The annual TSP values are geometric means. The secondary value of 60 µg/m³ is a guide to be used in addressing implementation plans to achieve the 24-hour standard.

[3.]The PM-10 standards are attained when the expected number of days per calendar year with a 24-hour concentration above 150 µg/m³ is equal to or less than one and when the expected annual arithmetic mean is less than or equal to 50 µg/m³ as determined by 40 CFR 50, Appendix K.

[4.]The ozone standard is attained when the expected number of days per calendar year with a maximum hourly average concentration is above the standard or is less than or equal to one as determined by 40 CFR 50, Appendix H.

Table 5.1-2. Summary of Air Quality Monitoring data Kingsport, Tennessee 1990-1992

Pollutant	Averaging Interval	Highest[1] Concentration $\mu g/m^3$	Monitor Location	Site ID
TSP	Annual	40	Eastman Robinson	47-163-0007
	24 hours	96	Eastman Meadowview	47-163-0005
PM-10	Annual	32	Eastman Robinson	47-163-0007
	24 hours	78	Eastman Robinson	47-163-0007
SO_2	Annual	29	Eastman Robinson	47-163-0007
	24 hours	163	Eastman Robinson	47-163-0007
	3 hours	441	Eastman Robinson	47-163-0007
CO	8 hours	5557	Eastman Robinson	47-163-0007
	1 hour	8165	Eastman Robinson	47-163-0007
O_3	1 hour	225[2]	TDAPC Hill Rd.	47-163-2002
NO_2	Annual	37	Eastman Robinson	47-163-0007

1. Annual values are the highest site annual average in the 3-year period. Short-term values are the highest of the yearly second high values.

2. Ozone value is the design value (fourth highest value during 1991-1993).

Sulfur Dioxide (SO_2)

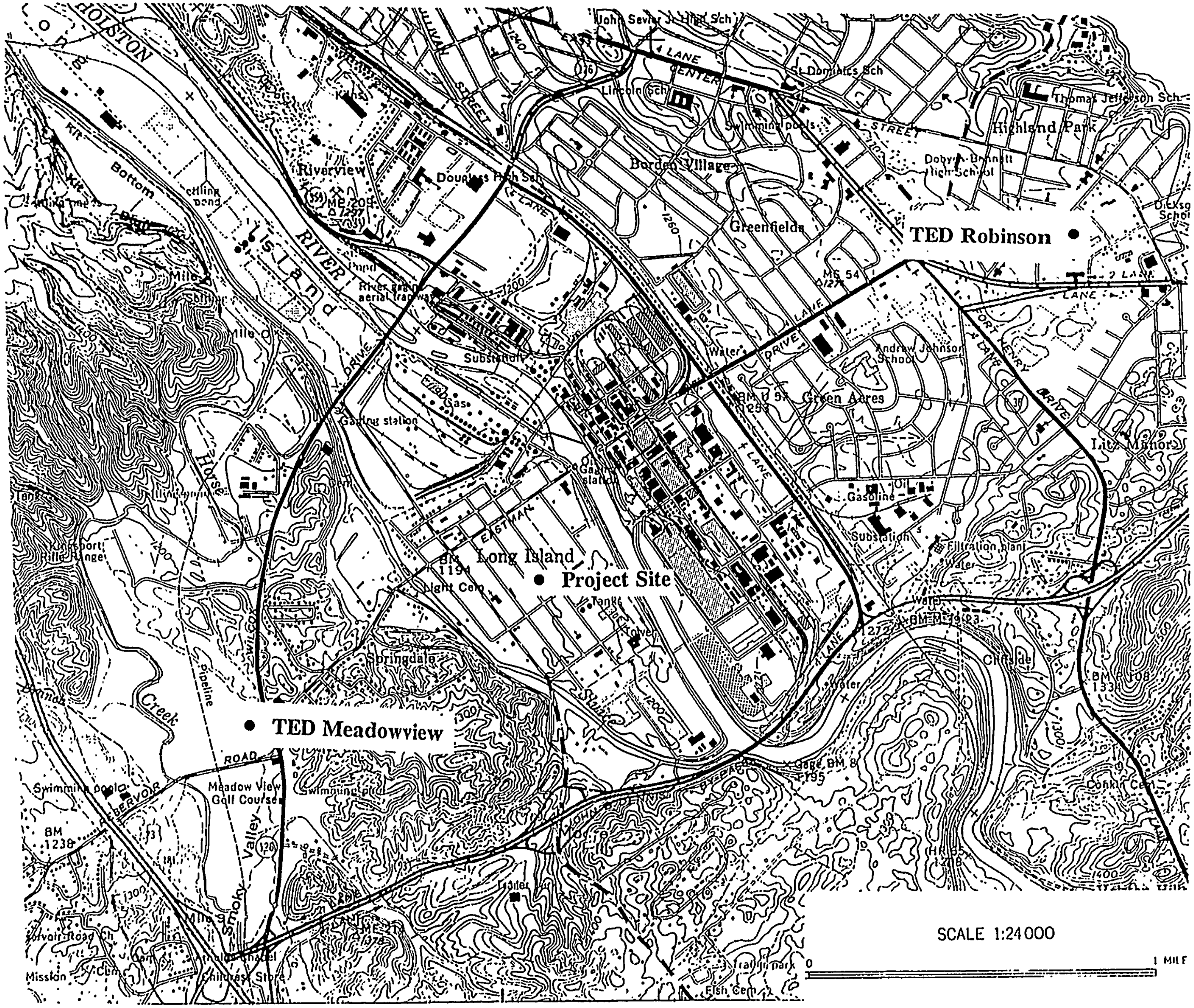


Figure 5.1-3 Location of Eastman Ambient Air Monitors

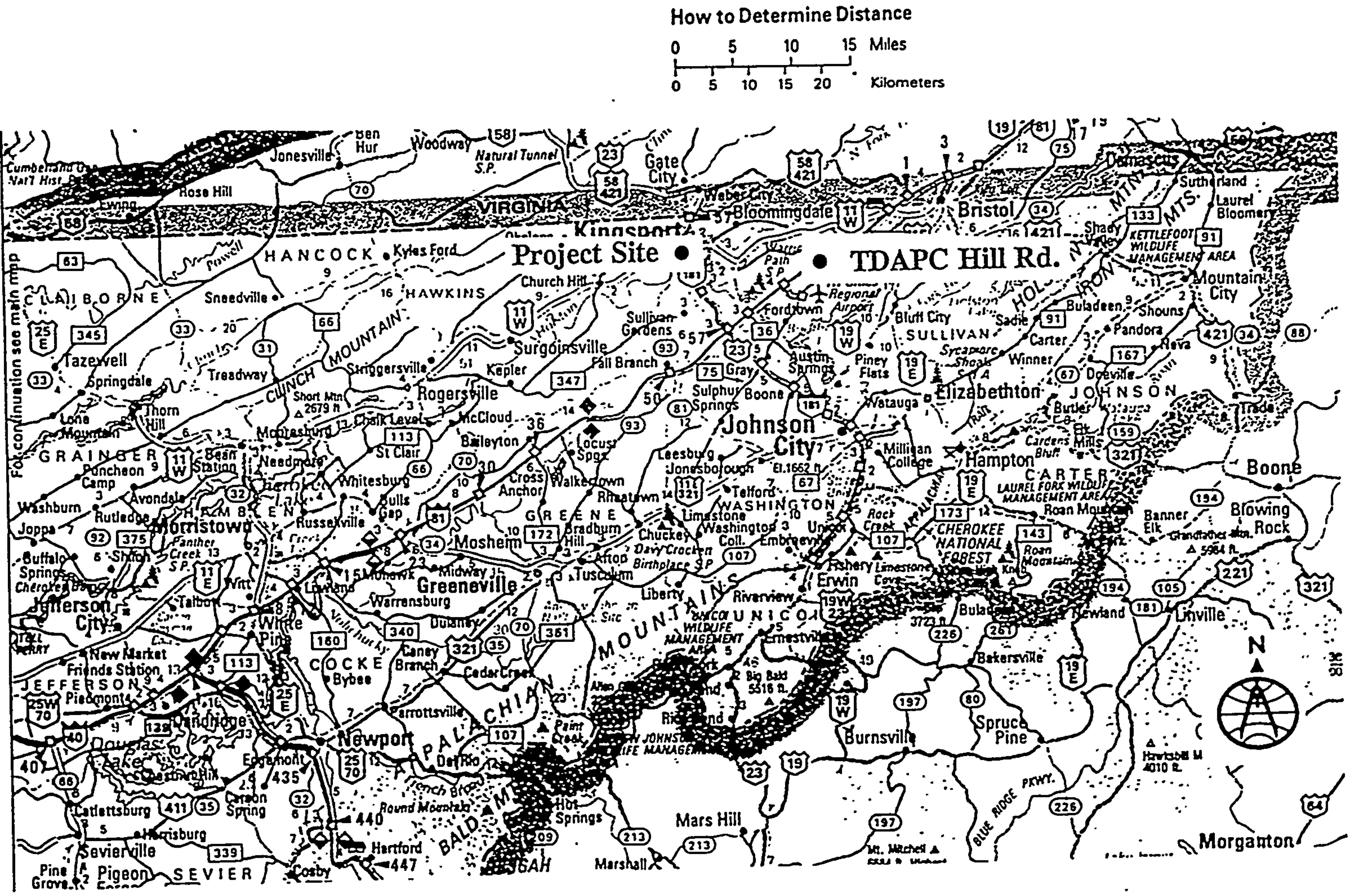


Figure 5.1-4 Location of TDAPC Ambient Air Monitor

Eastman monitors sulfur dioxide at both monitoring locations. The highest annual average in the 1990-1992 data set is 29 µg/m^3 which is 36 percent of the NAAQS. The short-term averages are also well below their respective standards. The highest 24-hour concentration of 163 µg/m^3 is 45 percent of the 24-hour standard, and the highest 3-hour concentration of 440 µg/m^3 is 34 percent of the secondary standard.

Carbon Monoxide (CO)

Carbon Monoxide concentrations measured by Eastman are also well under the NAAQS levels. The maximum 8-hour concentration is 5557 µg/m^3 which is 56 percent of the standard. The 1-hour concentration of 8165 µg/m^3 represents 20 percent of the standard.

Ozone (O_3)

Ozone is measured by the TDAPC at a site within Sullivan County approximately 15 miles east of Eastman and shown in Figure 5.1-4. Compliance with the standard is achieved when the expected number of days over the standard per calendar year is less than or equal to one. The most recent three years of monitoring data are used for the compliance determination. Thus, the fourth highest value in a three-year data set, which is called the design value, is used to determine attainment status for an area. The design value for the Kingsport area is 225 µg/cu m for 3-year period 1991-1993. Based on this design value, Sullivan County is currently classified as an attainment area for ozone.

For projects in attainment areas, Prevention of Significant Deterioration (PSD) regulations may also apply. This regulation is triggered when emissions are increased above pollutant-specific levels. For instance, the triggers for carbon monoxide and volatile organic compounds are 100 tons per year and 40 tons per year, respectively. The proposed project will increase emissions of carbon monoxide and volatile organic compounds, but the increases are not greater than these levels. In addition, the proposed project will not increase emission rates of the other compounds mentioned in the Prevention of Significant Deterioration regulations, such as sulfur dioxide and nitrogen oxides.

5.2 Earth Resources

The Eastman facility is located in the Valley and Ridge geologic province, a region of parallel valleys and ridges that trend northeastward across eastern Tennessee. In general, the ridges are comprised chiefly of sandstone, siliceous limestone, and dolomite, and the valleys are underlain by less resistant rocks such as calcareous shale and limestone. Unconsolidated materials occur at the land surface in valley bottoms as products of stream and river deposition, and as residuum weathered from the underlying bedrock. Generally, the thickness of the residuum is many times greater over limestone and dolomite than it is over shale bedrock. Trellis drainage patterns are dominant in the Valley and Ridge where numerous streams flowing perpendicular to the trend of the ridges empty into a single stream in the valley bottom (Geraghty and Miller, 1990).

The Eastman facility is located in a large valley occupied by the South Fork Holston River and an adjoining valley occupied by Horse Creek, a tributary of the South Fork River. An extremely thick section (as great as 4,000 feet) of shale bedrock underlies the facility except for the area southeast of the Cliffs Fault which separates the Sevier Shale and its equivalents from the older Knox Group (Figure 5.2-1). The Tellico, Blockhouse and Lenoir Formations are equivalent to the Sevier Shale previously identified in this area. Alluvium overlies the bedrock on Long Island, and adjacent to Horse Creek, Big Sluice and South Fork Holston River. The area between Horse Creek and Big Sluice is characterized by low bedrock knobs covered by a thin layer of residuum (Geraghty and Miller, 1990).

Figure 5.2-2 shows a generalized cross section through the area south of the Eastman facility. The Bays Mountain syncline is a major structural feature that terminates above ground just south of the facility. Bays Mountain formed during a period of intensive structural deformation as rock layers were thrust to the surface from the southeast. Compressional forces responsible for thrusting older rock layers on top of younger layers, as is the case along the Cliffs Fault where the older Knox Group was thrust onto the Sevier Shale, also caused the rocks below Bays Mountain to crumple into a large syncline. Local structural deformation has resulted in varied orientations of the rocks in the area such that bedding may dip to the southeast or the northwest with orientations ranging from horizontal to nearly vertical. East of Horse Creek, beds in the Blockhouse Shale and the overlying Tellico Shale are overturned (Geraghty and Miller, 1990).

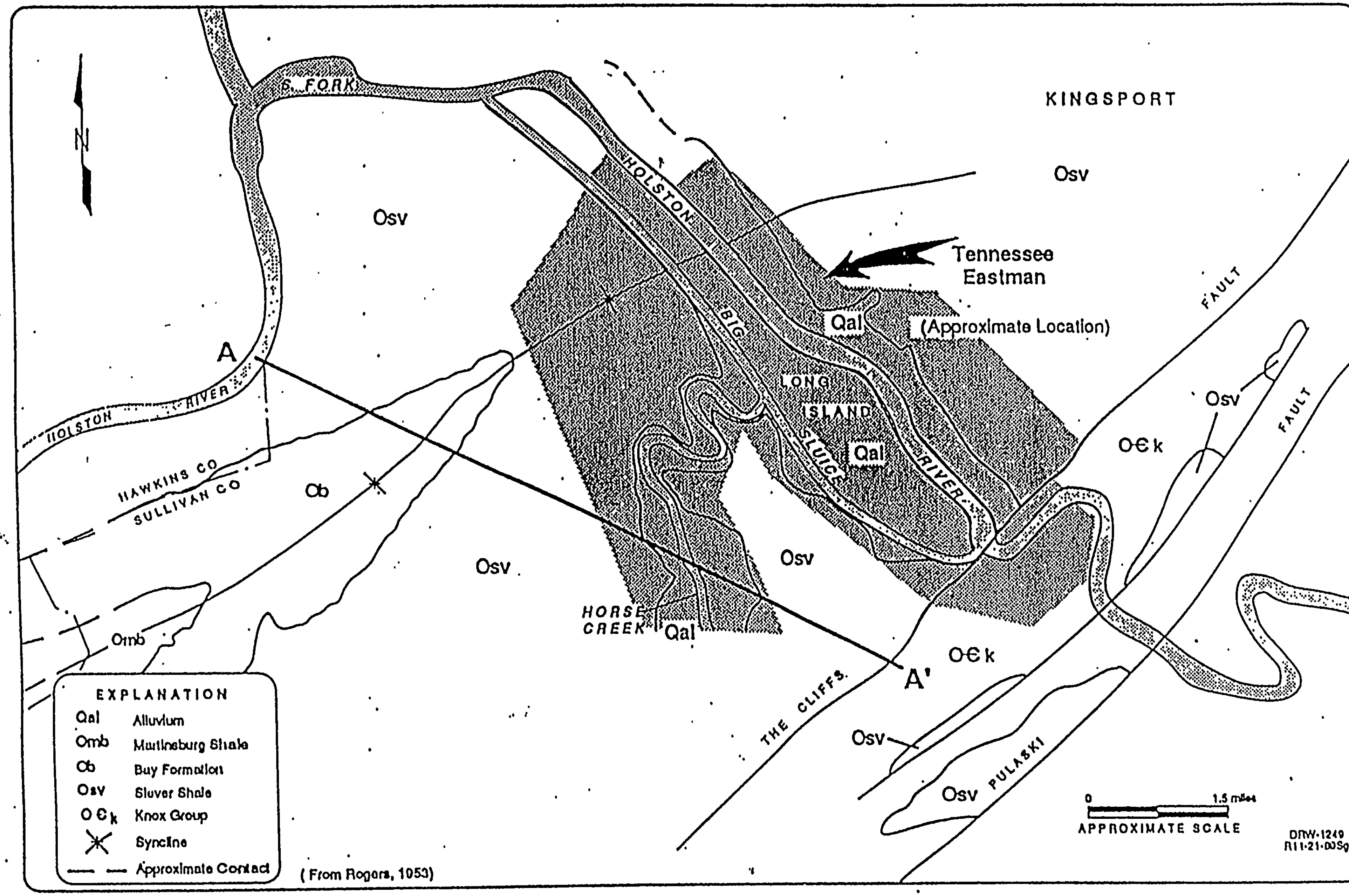


FIGURE 5.2-1. GEOLOGY NEAR EASTMAN

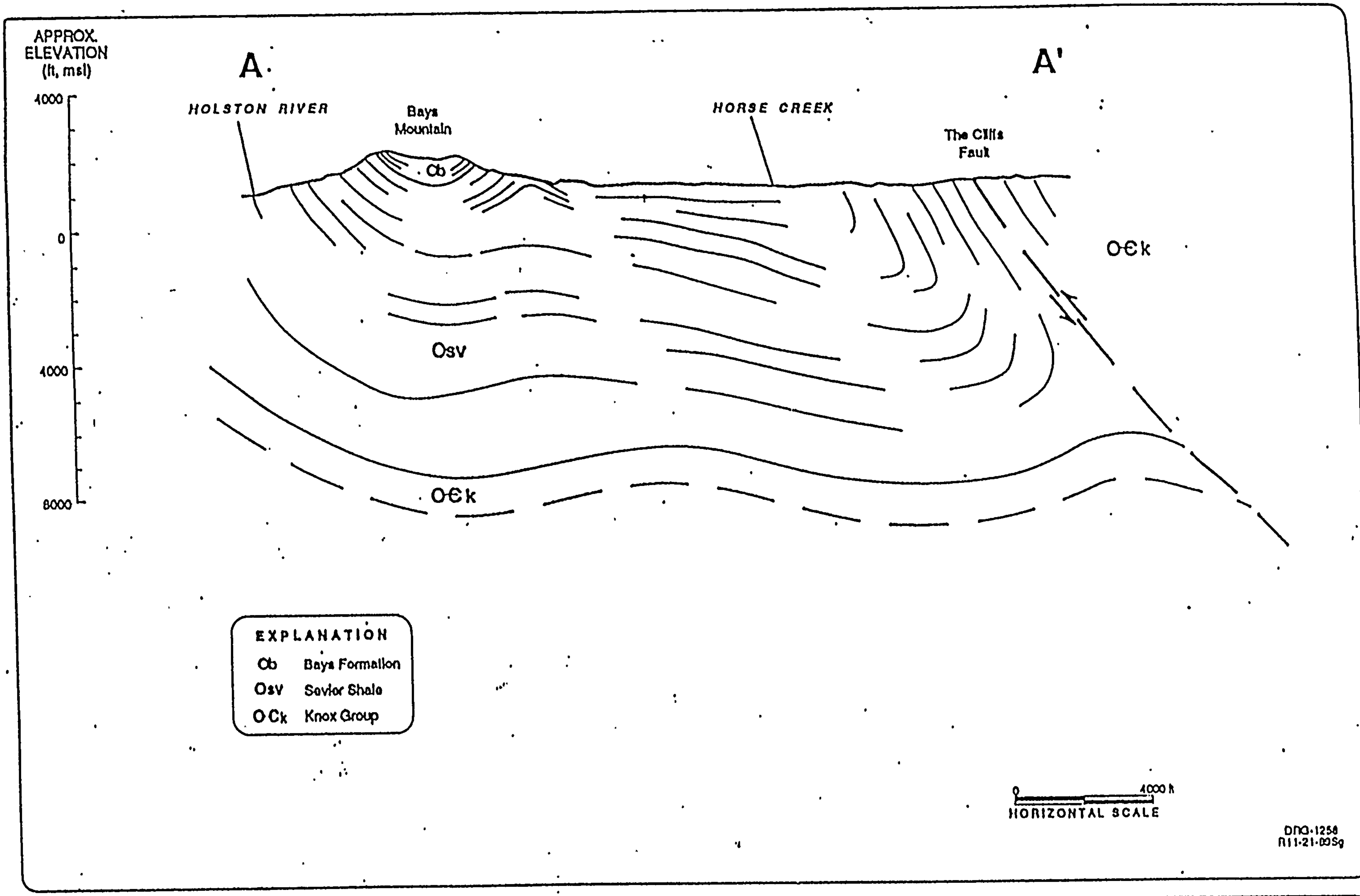


FIGURE 5.2-2. GENERALIZED GEOLOGIC CROSS SECTION A-A' SOUTH OF EASTMAN

5.3 Water Resources

5.3.1 Surface Water

5.3.1.1 Hydrology

The South Fork Holston River includes 2,048 square miles of watershed of which 869 square miles are drained by the Watauga River. Originating in Smyth County, Virginia, the South Fork Holston River flows southwestward joining with the Watauga River and eventually merging with the North Fork of the Holston River to form the Holston River immediately downstream of Kingsport, Tennessee. Flow in the South Fork is regulated throughout its length by a series of dams operated by the Tennessee Valley Authority (TVA). These include South Holston (South Fork Holston River Mile or SFHRM 49.8) followed by Boone (SFHRM 18) and Fort Patrick Henry (SFHRM 8.2). Two other dams are located on the Watauga River (TVA, 1970).

Elevations in the South Fork watershed range up to 5,720 feet. The Watauga River, which joins the South Fork 20 miles above its mouth, lies in the heavily forested Blue Ridge region of eastern Tennessee and western North Carolina. Elevations along the Watauga watershed rim range up to 6,285 feet. Some 57 percent of the Watauga River basin is forested as compared with 45 percent of remainder of the South Fork Basin (TVA, 1961).

The Fort Patrick Henry Dam is located approximately three river miles upstream of the Eastman facility. At the upstream Eastman boundary (SFHRM 5.6), the South Fork splits into two channels the smaller of which is named the Big Sluice. The two channels join together again at a point approximately one mile upstream of the confluence of the North Fork and the South Fork of the Holston River. The island which exists between the main channel of the South Fork and the Big Sluice is called the Long Island of the Holston. Part of the Eastman facility is located on the most upstream section of this island.

Two minor tributaries contribute flow to the river in the vicinity of the Eastman facility. These are Horse Creek which empties into the Big Sluice 2.2 miles upstream of where Big Sluice and the South Fork of the Holston join together and Reedy Creek which discharges to the main channel at a point downstream of the Eastman facility at SFHRM 2.1.

The nearest active gaging station is operated by the United States Geological Survey and is located over 140 river miles downstream of Eastman near Knoxville, Tennessee. However, historical data on the combined flows of the South Fork Holston main channel and the Big Sluice are available from gaging stations which were operated in Kingsport from 1925 through 1977. The average discharge for this period of record was 2,610 cubic feet per second (cfs). The maximum discharge since the regulation of flows by the upstream reservoirs was 24,200 cfs which occurred on March 12, 1963 (USGS, 1978).

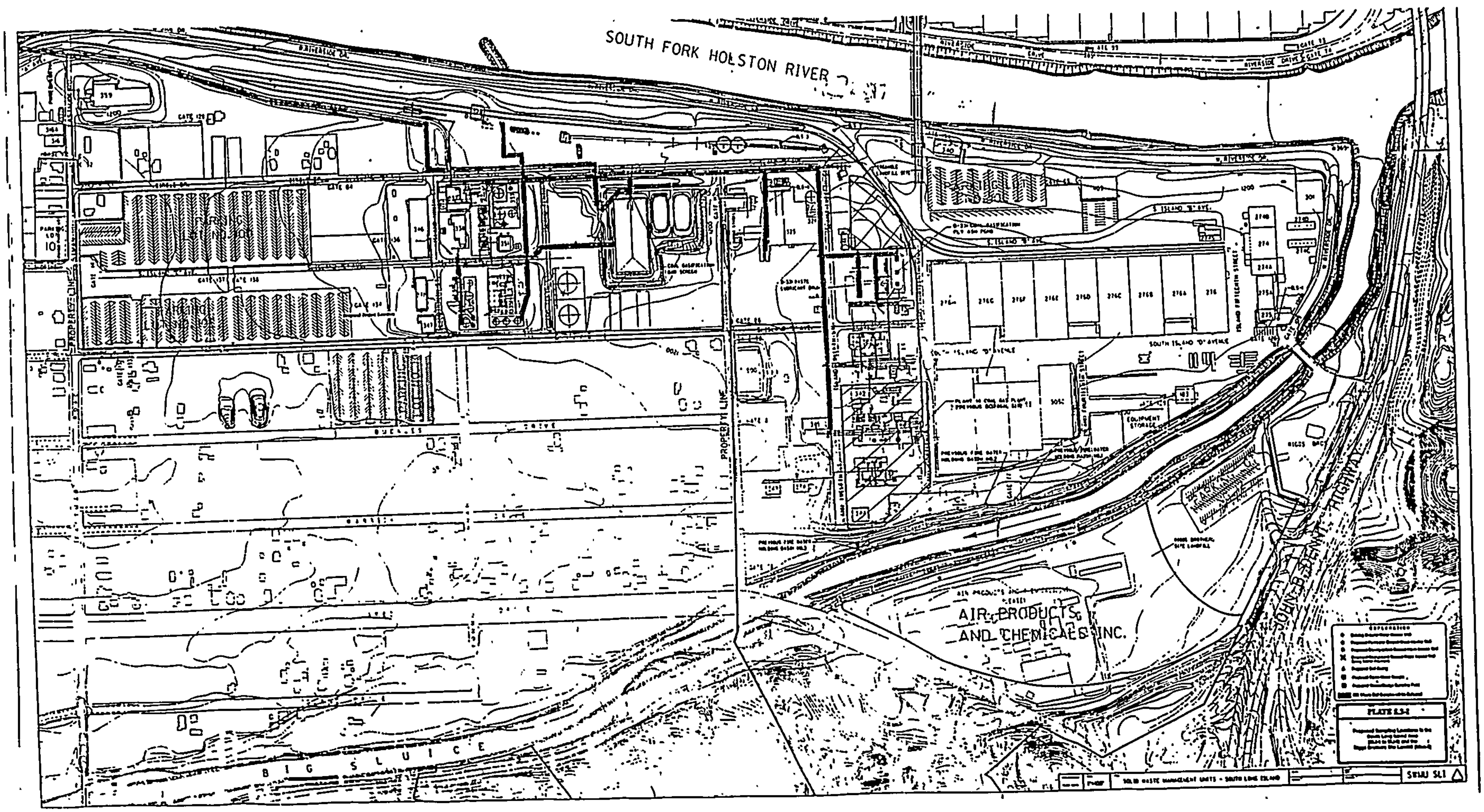
5.3.1.2 Surface Water Quality

The South Fork Holston River in the vicinity of Eastman is classified by the state of Tennessee for use as an industrial water supply, recreation and the propagation of aquatic life. Periodically, the Tennessee Department of Health and Environment (TDHE) evaluates the ability of the State's surface waters to meet their designated use classifications. Data for 18 chemical, physical and bacteriological parameters are compared to criteria or standards specific to the appropriate use classification. Judgments are then made as to whether or not a stream fully supports, partially supports or is not supporting its designated uses.

In the most recent study which was issued in 1990, the South Fork Holston River near Eastman is listed as partially supporting its designated uses. Reasons for this classification included poor water quality releases from Boone and Fort Patrick Henry reservoirs, elevated concentrations of nitrate and fecal coliform, occasional spills from Eastman and the presence of dioxin detected in fish tissue downstream of Mead Paper Company (TDHE, 1990).

In the summer of 1990 the Academy of Natural Sciences of Philadelphia completed the fifth in a series of comprehensive river studies for Eastman. Results from chemical, physical and bacteriological analyses taken during the most recent study substantiate the State's conclusions regarding current river water quality. However, the Academy's work also documented substantial improvements in water quality since the first study in 1965 (Academy, 1992).

Figure 5.3-1 shows the location of sampling stations used during the Academy study. Station 2 is upstream of Eastman and stations 3 and 5 are downstream of the facility in the main channel of the South Fork Holston River. Station 4 is in the Big Sluice. Table 5.3-1 lists the mean concentrations at the various stations for the 18 water quality indicator parameters used by the State of Tennessee to evaluate surface waters. The State's criteria are also listed. All values for the parameters are well within the State's criteria with the exception of dissolved oxygen, nitrate and fecal coliform. Lower dissolved oxygen concentrations are present in the water released from Fort Patrick Henry Dam upstream of the Eastman facility. Dissolved oxygen concentrations improve through reaeration as the water flows downstream. Nitrate concentrations also exceed the state's criteria at the upstream sampling point and remain virtually unchanged at the downstream locations. Nitrate is a pollutant common to both agricultural and urban development and its presence in the South Fork Holston River is indicative of development within the watershed. The presence of fecal coliform within the Kingsport area is indicative of the influence of urban development (e.g., treated municipal wastewater, stormwater runoff, and septic systems) on the river (Academy, 1992).


SOUTH FORK HOLSTON RIVER
AIR PRODUCTS AND CHEMICALS INC.
PROPERTY LINE
BIG SLUICE
JOHN B DENNIS HIGHWAY
SOUTH ISLAND "D" AVENUE
EQUIPMENT STORAGE
PLATE 2.5-2
SWMU SL1

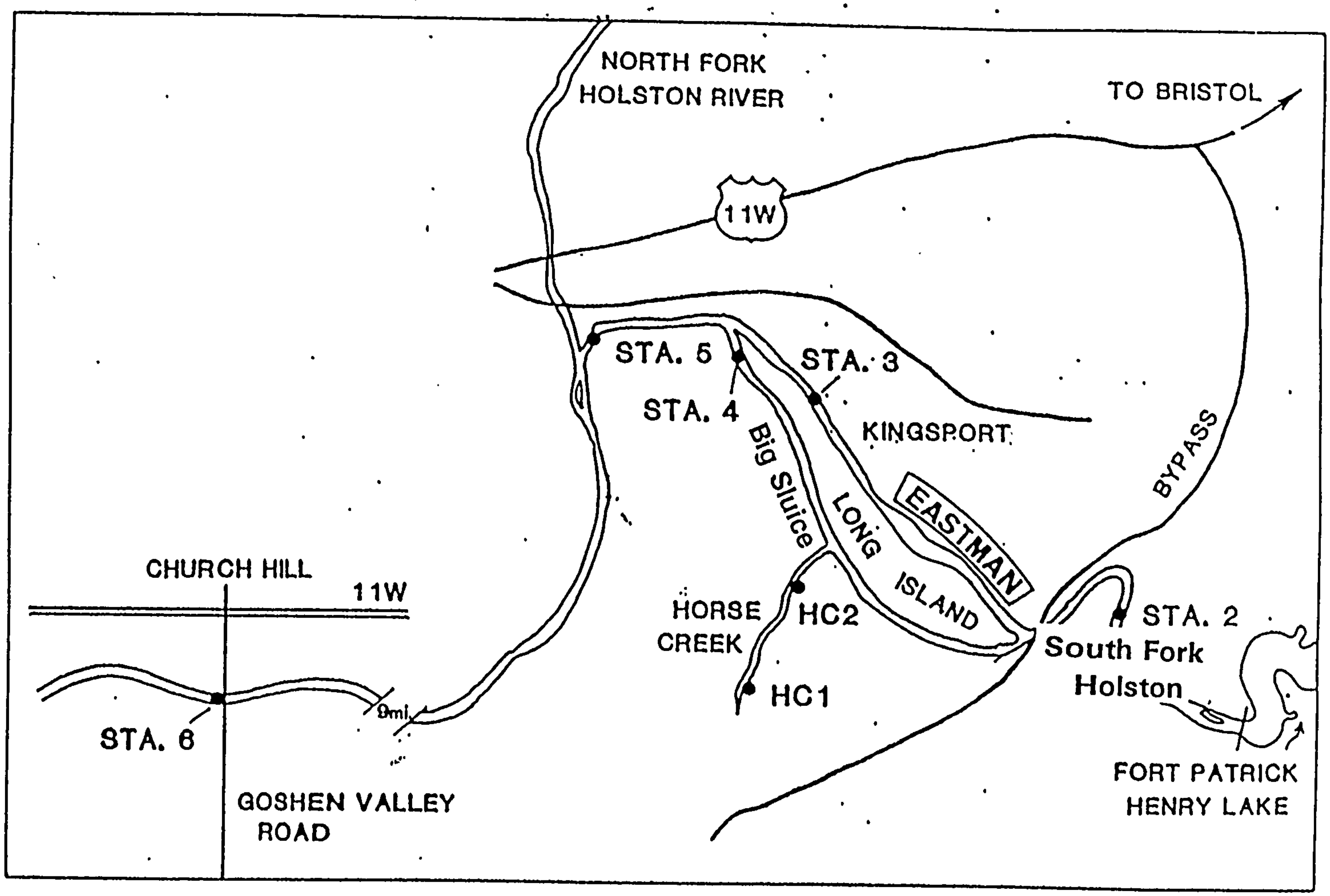


Figure 5.3-1 Sampling sites for 1990 studies on the South Fork and mainstream Holston River, Big Sluice and Horse Creek.

Table 5.3-1. Mean Concentrations for Water Quality Indicator Parameters, June 6-July 24, 1990.

Parameter	STATION				CRITERIA
	2	3	4	5	
Temperature, °C	16.1	20.5	21	21.5	< 30.5
Dissolved Oxygen	3.6	4.4	9.9	5.0	> 5.0
pH, units	7.0	7.2	8.0	7.5	6.5-8.5
Dissolved Residue	114	165	-	173	< 2,000
Suspended Residue	6.1	6.3	5.6	17.4	< 80
Ammonia	ND	0.23	0.015	0.05	< 0.66
Arsenic	ND	ND	ND	ND	< 0.072
Cadmium	ND	ND	ND	ND	< 0.002
Chromium	ND	ND	ND	ND	< 0.1
Copper	ND	ND	ND	ND	< 0.02
Lead	ND	ND	ND	ND	< 0.05
Nickel	ND	ND	ND	ND	< 0.056
Zinc	ND	ND	ND	ND	< 0.1
Mercury	ND	ND	ND	ND	< 0.0002
Phosphorus	0.01	0.07	0.05	0.03	< 0.2
Nitrate/Nitrite	0.68	0.65	0.54	0.68	< 0.2
Biochemical Oxygen Demand	1.3	1.8	1.2	1.1	< 5.0
Fecal Coliforms, colonies/100ml	97	1538	102	1000	< 200

All concentrations in mg/L unless noted

5.3.2 Ground Water

5.3.2.1 Hydrology

In 1989, Eastman initiated a study by Geraghty & Miller, Inc. to characterize the hydrogeology at the Eastman facility. The purpose of the study was to better determine the local patterns and rates of ground-water movement in the principal water-bearing units, identify areas of groundwater recharge and discharge, and determine the amount of groundwater discharge to the surface-water bodies. The study area included the entire Eastman facility, except that portion south of John B. Dennis Highway underlain by the Knox Group. The principal water-bearing units in the study area include the bedrock strata comprised of the Sevier Shale and overlying unconsolidated deposits derived from the weathering of the underlying shale and from deposition by rivers and streams. The shale unit is present beneath the entire study area; whereas, the unconsolidated unit is locally important adjacent to Horse Creek, Big Sluice, and South Fork Holston River.

The scope of the investigation included the installation of twelve piezometer clusters and seven single piezometers designed to provide information about the magnitude and direction of vertical and horizontal hydraulic gradients in the bedrock and the unconsolidated units, and hydrologic testing of the piezometers to determine representative hydraulic conductivity values for each unit. The locations of these piezometers are shown in Figure 5.3-2. A program of water-level monitoring was conducted for three months to determine representative vertical and horizontal hydraulic gradients in the saturated zone.

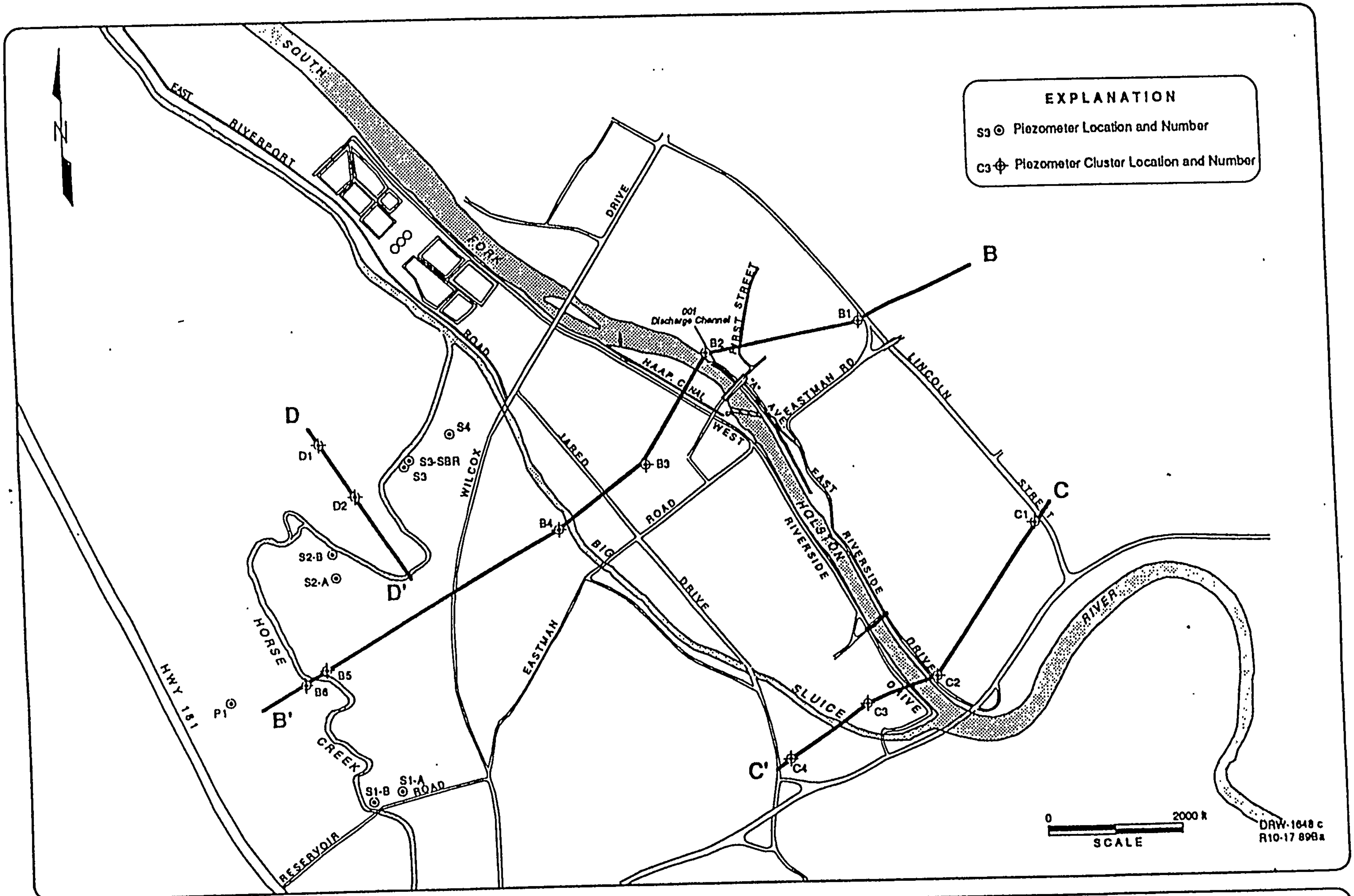


Figure 5.3-2. Piezometer Locations for Study

Vertical hydraulic gradients were determined at each piezometer cluster based on water-level measurements taken on August 22, 1989. The magnitude of the gradients ranged from 0.001 to 0.18. Generally, the direction of the vertical gradients were upward along Horse creek, the Big Sluice, and the South Fork Holston River. Downward vertical gradients were observed along the center of Long Island, caused by the relief of the water table between the Big Sluice and the South Fork Holston River. Vertical gradients located next to the South Fork Holston River, were observed to change from upward to downward, and are likely to be strongly influenced by changes in river stage. These data confirm that the South Fork Holston River, the Big Sluice, and Horse Creek represent discharge boundaries for ground water in the bedrock and unconsolidated units beneath the Eastman facility.

Slug tests were conducted in 30 of the 41 piezometers that were installed to determine hydraulic conductivity of the bedrock and the unconsolidated zones. Results of these tests show that the shallow bedrock zone has the highest mean hydraulic conductivity (7.1 ft/day or 2.5×10^{-3} cm/sec), which is significantly greater than the mean hydraulic conductivities of the deeper bedrock zones (0.34 ft/day or 1.2×10^{-4} cm/sec and 0.17 ft/day of 5.9×10^{-5} cm/sec). The mean hydraulic conductivity of the unconsolidated sediments on Long Island, determined from slug tests in two piezometers, is 6.2 x 10^{-3} ft/day (2.2 x 10^{-6} cm/sec). The unconsolidated sediments along Horse Creek have a mean hydraulic conductivity of 1.4 ft/day (4.9 x 10^{-4} cm/sec).

Estimates of horizontal ground-water flow rates and discharge were made based on the calculated values of hydraulic conductivity and hydraulic gradient. The estimates of ground-water discharge were compared to surface-water flows. The volume of ground water discharging from the main plant area to the South Fork Holston River across a face 150-feet deep and 7,000-feet long was estimated to be approximately 1.7 ft^3/sec compared to the average flow in the river which is approximately 2,600 ft^3/sec. Similarly, it was estimated that approximately 1.0 ft^3/sec of ground water discharges to both the river and the sluice from Long Island, where the proposed project would be located. Ground-water discharge to the Big Sluice from Horse Creek Valley was estimated to be approximately 0.08 ft^3/sec. Average flow in the Big Sluice below Horse Creek is approximately 320 ft^3/sec. These calculations probably overestimate discharge because the hydraulic conductivity of the shallow bedrock zone was applied to the entire 150 feet vertical section, when in fact, it has been shown that the hydraulic conductivity decreases with depth in the bedrock.

Figures 5.3-2, 5.3-3, 5.3-4, 5.3-5, and 5.3-6 are included to show the geology of Long Island that affect groundwater transport and the direction of groundwater flows. Figure 5.3-2 shows the locations of the piezometers and the cross sections BB' and CC'. Since the proposed project site lies halfway between these two cross sections, geology and groundwater flows are shown for both cross sections.

5.3.2.2 Ground Water Quality

The proposed demonstration project would be located on South Long Island. Ground water beneath South Long Island is shallow, occurring between 10 to 20 feet below ground surface. A geotechnical exploration of a site 350 feet southwest of the proposed plant site showed the water table at 10 to 11 feet below grade (S & ME, 1992). The uppermost water-bearing zone in this area is a heterogeneous mixture of fill and poorly sorted, unconsolidated alluvial deposits containing abundant cobbles. At the site referenced above, the depth of this layer ranges from 25 to 32 feet below grade. Monthly water-level measurements from piezometers in this area show that the water table occurs year round in the unconsolidated zone. The Sevier Shale underlies the unconsolidated zone at depths ranging from 15 to 30 feet. Again the exploration referenced above identified the residuum starting at depths of 25 to 32 feet with the bedrock at 27 to 35 feet. Ground water beneath South Long Island moves from a ground-water high along the island center toward the adjacent South Fork Holston River and Big Sluice where it discharges (Geraghty and Miller, 1990).

Currently, there are four monitor wells, ILS-1, ILS-2, ILS-3, and ILS-4, located on South Long Island (Plate 5.3-1) which monitor ground water in the unconsolidated zone. Historical data are available for these wells (Table 5.3-2) on chemical constituents which could have been released to the groundwater. Except for one anomalous

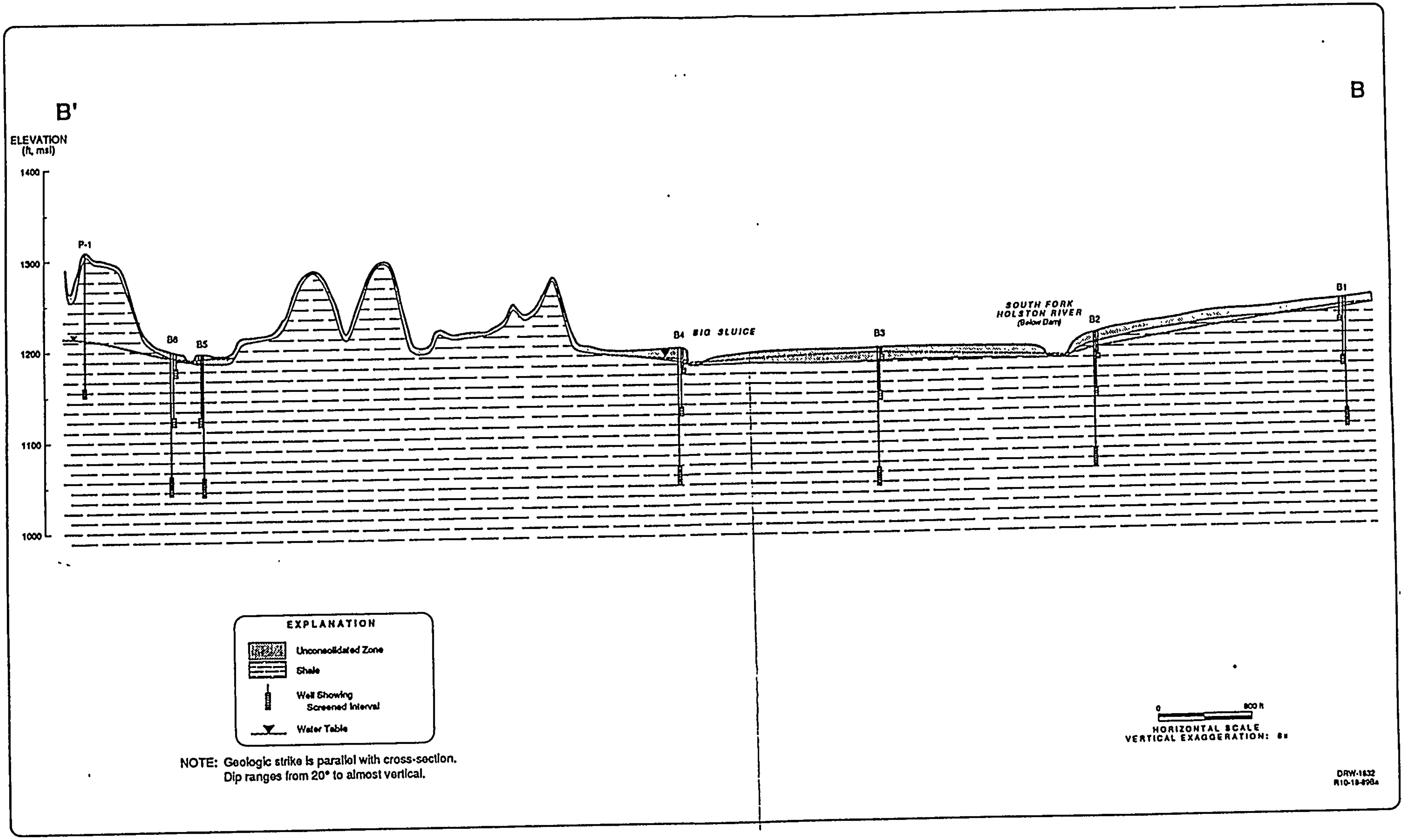
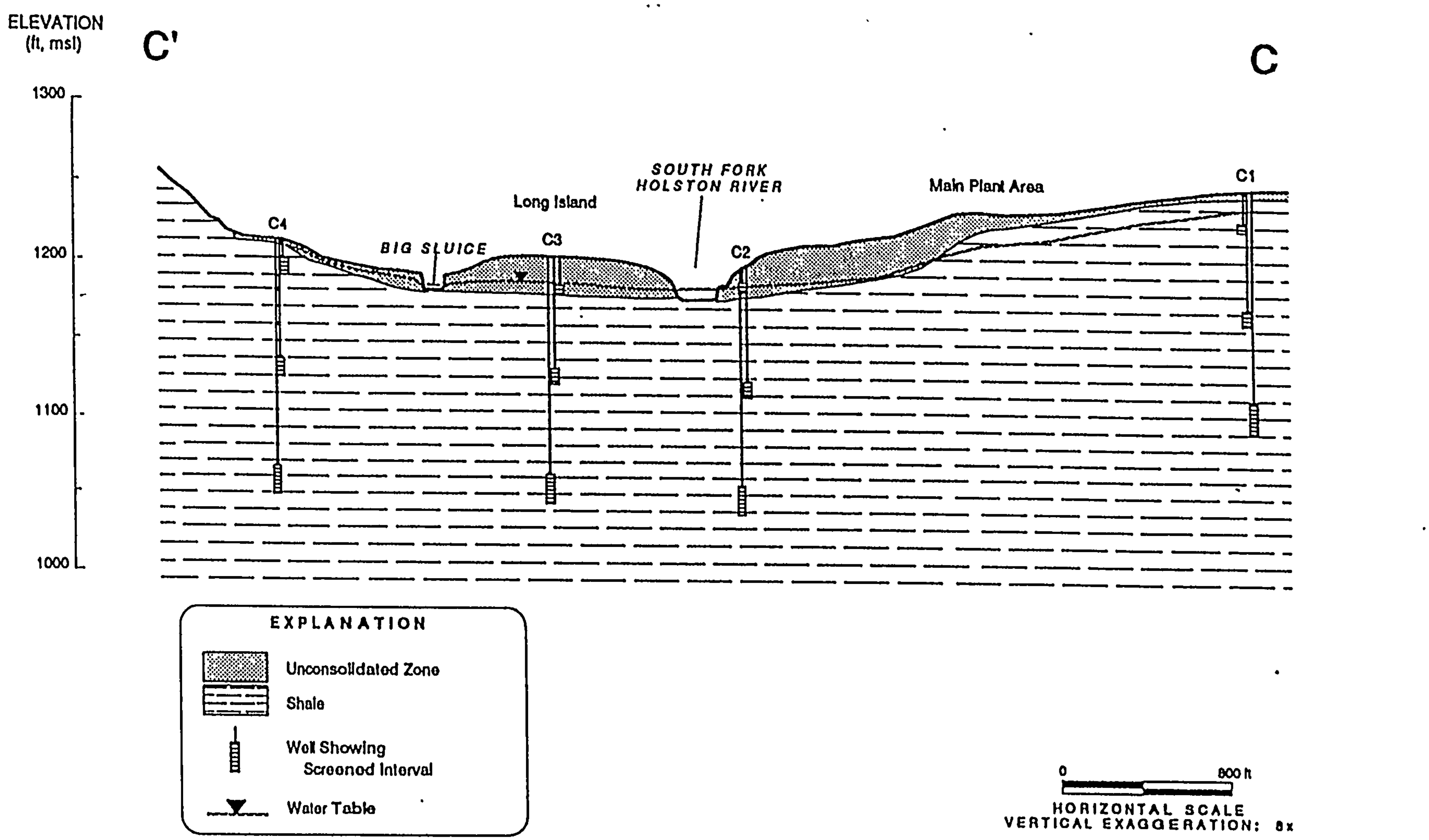


Figure 5.3-3. Hydrogeologic Cross section B-B' (see Figure 5.3-2)



NOTE: Geologic strike is parallel with cross-section.
Dip ranges from 20° to almost vertical.

Figure 5.3-4. Hydrogeologic Cross section C-C' (see Figure 5.3-2)

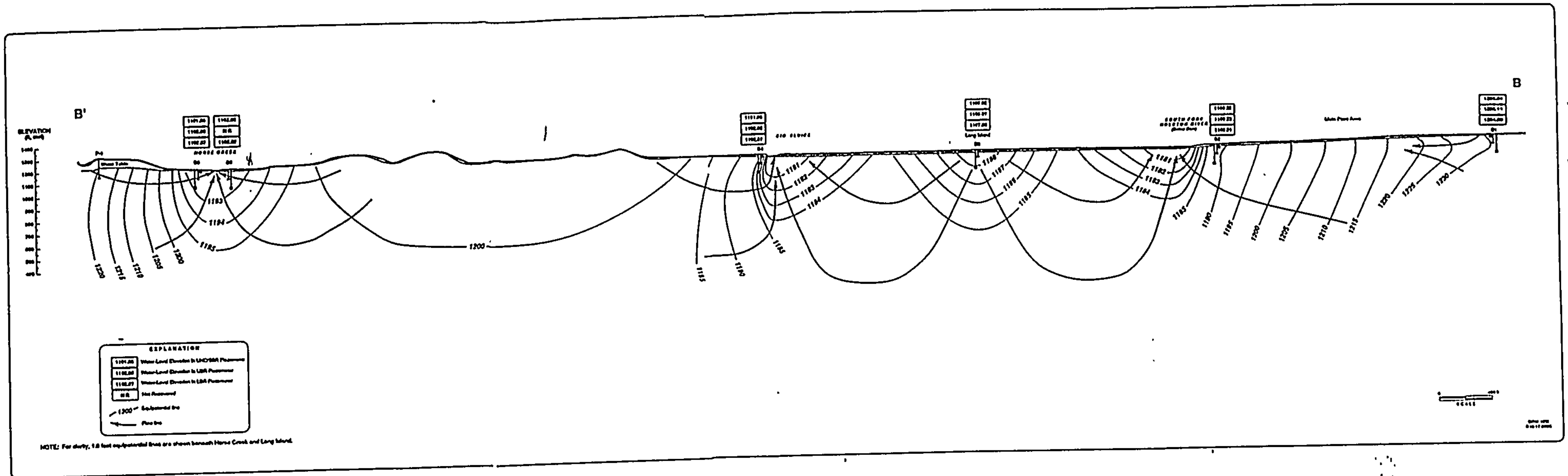


Figure 5.3-5. Hydraulic-Head Distribution and Groundwater Flow Pattern Along Cross section B-B'

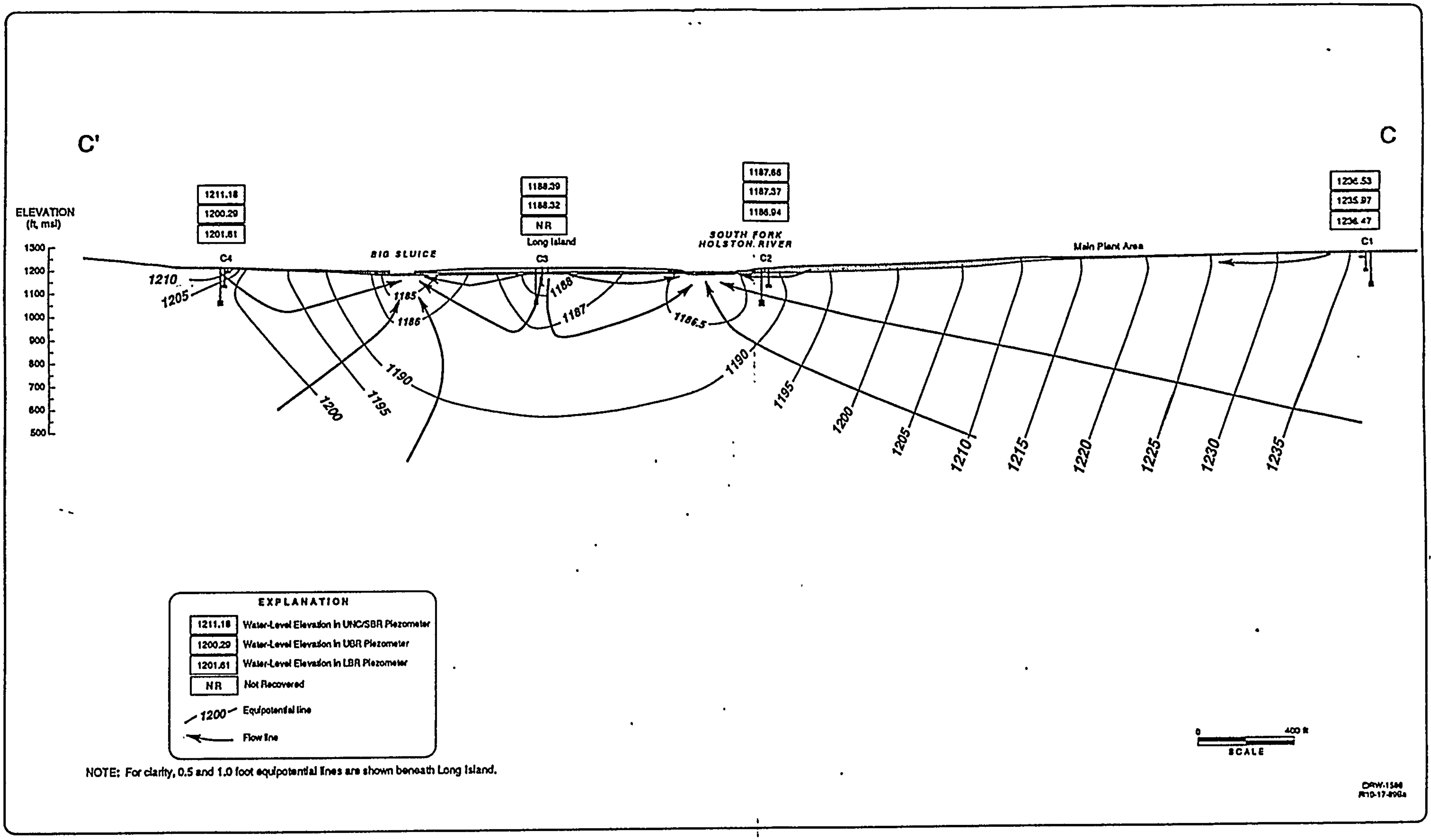


Figure 5.3-6. Hydraulic-Head Distribution and Groundwater Flow Pattern Along Cross section C-C'

methanol occurrence, all organic constituents were below the detection limit and copper and zinc concentrations showed a variability common at concentrations at or near detection limits.

The South Long Island wells are not in an appropriate location to monitor ground water near the proposed Liquid Methanol Demonstration project, so no definite conclusions can be made regarding the groundwater closer to the proposed project site. However, Eastman will be conducting a Resource Conservation and Recovery Act (RCRA) Facility Investigation. This investigation is required of all sources permitted to manage RCRA-hazardous waste. As part of the RCRA investigation, there are plans to install a perimeter ground-water monitoring system for the Eastman facility. This system is designed to monitor ground water discharging from the Eastman facility to the nearby surface waters. There is a proposed perimeter monitoring well which would serve as a suitable monitoring location for the proposed facility (Plate 5.3-1). Installation of the well and the commencement of monitoring has been approved by EPA Region IV and will be completed by the fall of 1994.

Table 5.3-2. Ground-Water Monitoring Data

Sample Date & Parameter	Units	ILS-1	ILS-2	ILS-3	ILS-4
Ground-Water Elevations					
10/3/85	Feet	1184.3	1181.5	1185.3	1186.9
12/9/85	Feet	1185.0	1182.5	1186.1	1187.8
2/19/86	Feet	1184.9	1182.7	1186.2	1188.1
4/23/86	Feet	1184.5	1181.6	1185.7	1187.5
6/18/86	Feet	1184.8	1181.6	1185.5	1187.3
8/29/86	Feet	1184.3	1182.1	1185.6	1187.1
Xylene					
10/3/85	mg/L	ND	ND	ND	ND
12/9/85	mg/L	ND	ND	ND	ND
2/19/86	mg/L	ND	ND	ND	ND
4/23/86	mg/L	ND	ND	ND	ND
6/18/86	mg/L	ND	ND	ND	ND
8/29/86	mg/L	ND	ND	ND	ND
Methanol					
10/3/85	mg/L	ND	ND	ND	ND
12/9/85	mg/L	ND	ND	ND	ND
2/19/86	mg/L	ND	ND	ND	ND
4/23/86	mg/L	ND	ND	ND	ND
6/18/86	mg/L	ND	ND	ND	ND
8/29/86	mg/L	ND	ND	ND	ND
Toluene					
10/3/85	mg/L	ND	ND	ND	ND
12/9/85	mg/L	ND	ND	ND	ND
2/19/86	mg/L	ND	ND	ND	ND
4/23/86	mg/L	ND	ND	ND	ND
6/18/86	mg/L	ND	ND	ND	ND
8/29/86	mg/L	ND	ND	ND	ND
Acetone					
10/3/85	mg/L	ND	ND	ND	ND
12/9/85	mg/L	ND	ND	ND	ND
2/19/86	mg/L	ND	ND	ND	ND
4/23/86	mg/L	ND	ND	ND	ND
6/18/86	mg/L	ND	ND	ND	ND
8/29/86	mg/L	ND	ND	ND	ND

Table 5.3-2. Ground-Water Monitoring Data (cont.)

Sample Date & Parameter	Units	ILS-1	ILS-2	ILS-3	ILS-4
Copper					
10/3/85	mg/L	0.029	0.044	0.034	0.011
12/9/85	mg/L	0.015	0.046	0.064	0.013
2/19/86	mg/L	0.011	0.026	0.010	0.021
4/23/86	mg/L	0.026	0.034	0.014	0.027
6/18/86	mg/L	0.077	0.080	0.026	0.011
8/29/86	mg/L	0.014	0.010	0.005	0.011
Zinc					
10/3/85	mg/L	0.02	0.04	0.02	0.01
12/9/85	mg/L	0.01	0.02	0.02	0.01
2/19/86	mg/L	0.02	0.06	ND	0.03
4/23/86	mg/L	0.03	0.06	ND	0.02
6/18/86	mg/L	0.03	0.03	0.01	0.01
8/29/86	mg/L	0.01	ND	ND	0.01

4 Aug 90 Ba - Tennessee Eastman, Kingsport, Tennessee

NOTE: a) ND = Not Detected above 1.0 mg/L for organic constituents, 0.01 mg/L for copper and zinc.
b) All analyses performed by TEC's Services Analytical Laboratory.
c) From Tennessee Eastman Company, 1987. Results of Site Investigation for Inactive Landfill Sites (Appendix B).

5.3.3 Water Demand for Eastman

Water is used at Eastman for process cooling, facility services and steam generation. Figure 5.3-7 provides a water flow diagram for the facility. Average daily water demand is 406 million gallons per day (MGD). The majority of this water (378.5 MGD) is used for heat removal in a once-through, non-contact cooling system. This water is returned to the South Fork Holston River through outfalls 001, 004, 005 and 006 which are permitted under the National Pollutant Discharge Elimination System (NPDES).

Water treated by sand filtration (27.5 MGD) is used as process water. Wastewater generated by the processes is collected and treated in an industrial wastewater treatment facility by neutralization, grit removal, equalization and activated sludge followed by secondary clarification. Treated water is then returned to the river by NPDES permitted outfall 002.

5.4 Terrestrial and Aquatic Ecological Resources

5.4.1 General Ecological Characteristics

The proposed demonstration unit would be located on a 0.6 acre plot within the 1,046 acre Eastman manufacturing complex (Figure 5.4-1). The land on which the project is to be constructed has been backfilled with 6 feet of fill and surfaced with gravel. The plot is bordered on the east by Building 354 which houses a methyl acetate process. To the southeast is a building with a control room, laboratory and offices and the Building 347 gate house, change house and waiting room. On the west, Park Drive separates the proposed facility from another manufacturing complex which includes the Building 474 Hydrogenation Reactor and Pump House, the Building 473 Tank farm and

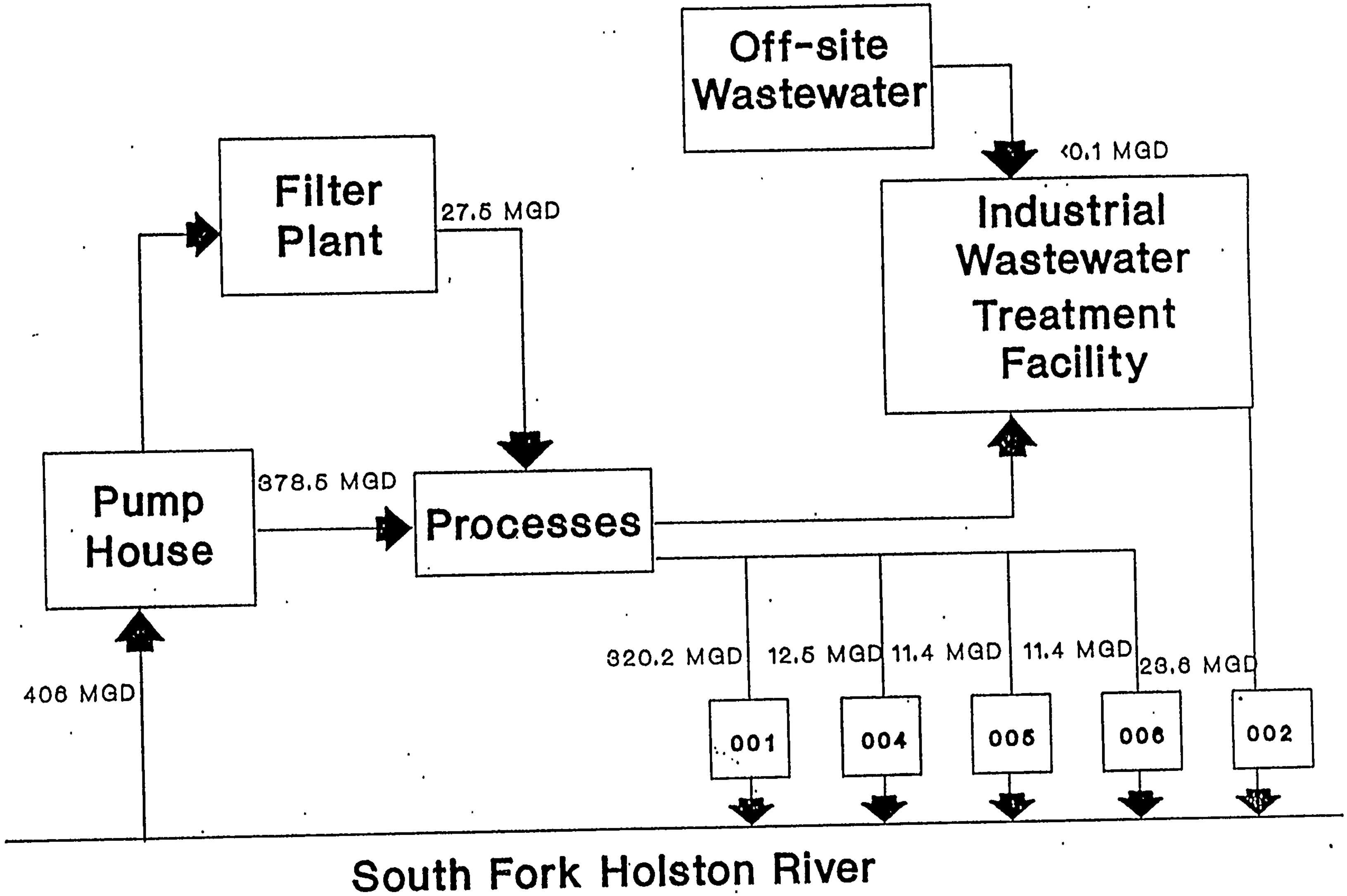


Figure 5.3-7 Summary Schematic of Water Flow
TENNESSEE EASTMAN

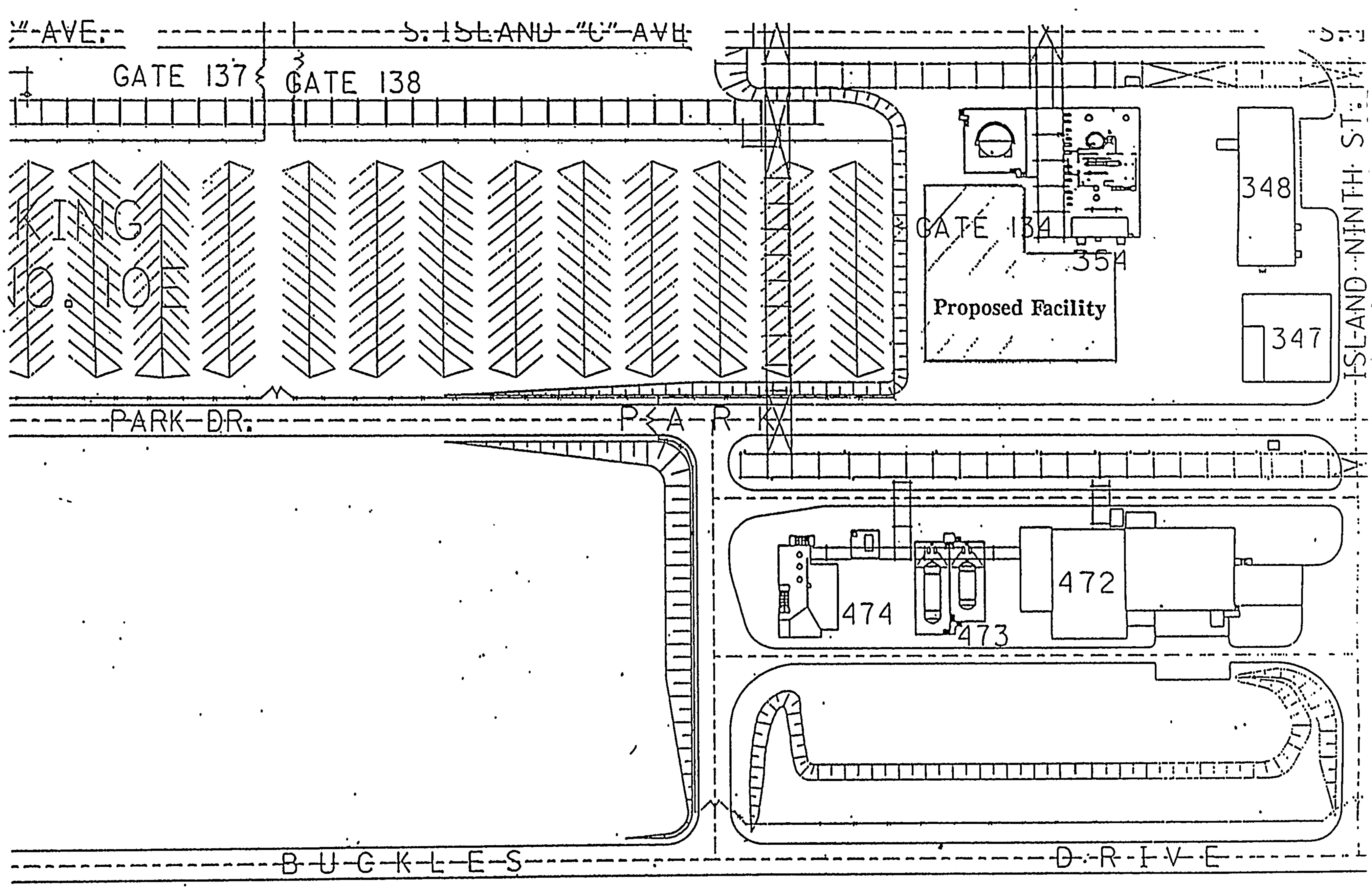


Figure 5.4-1 Site Map for Proposed Facility

Building 472 Manufacturing Facility. Finally, to the northwest there is a large gravel parking lot. A gravel cover exists in all areas between these buildings. There are no plantings of grass or landscape shrubs available for wildlife habitat.

Outside the boundary of the Eastman manufacturing complex on Long Island and within 1,000 feet of the proposed project site there are three occupied private residences and two open fields less than one acre which are maintained with planted grass covers. The nearest ecological habitats of any significance are the South Fork Holston River and the Big Sluice which border Long Island. These surface waters provide habitat for aquatic life and birds as described in the following sections. Both sections of the river are shallow with riffles and pools and some areas of dense aquatic vegetation. In the proximity of the plant, the South Fork is between 200 and 500 feet wide and the depth varies from 1 to 10 feet. The Big Sluice is 50 to 100 feet wide and the depth ranges 1 to 4 feet.

5.4.2 Aquatic Resources

The Holston River system in the vicinity of Kingsport, Tennessee is complex, and biological communities are potentially affected by an array of changes to the system. Dams on the upper river affect both upstream and downstream reaches. Some effects are difficult to document because flow fluctuations resulting from dam operation may introduce short-term changes in distributions of mobile organisms and may affect comparability of samples taken from different locations or under different flow conditions. Impounding has destroyed much riverine habitat, restricting the opportunity for making upstream-downstream comparisons to estimate biological impacts. In addition, several industrial and municipal point sources may affect biological communities. Major point sources are Eastman (SFHRM 3.5 and 4.5), Mead Paper

(SFHRM 2.3 and 2.5), Holston Army Ammunition Plant (SFHRM 4.0), and the City of Kingsport wastewater treatment plant (SFHRM 2.2). The locations of these inputs and habitat characteristics in the receiving waters make it difficult to assess effects of individual inputs on comparable biological communities.

In the summer of 1990, the Academy of Natural Sciences of Philadelphia completed the fifth in a series of comprehensive river surveys on the South Fork Holston River, the Big Sluice and Horse Creek. Academy scientists studied water chemistry, the populations of algae and aquatic macrophytes, non-insect macroinvertebrates, insects and fish. In general, the Academy results indicated poorer water quality at the upstream locations near Fort Patrick Henry Dam and Eastman with improved conditions at downstream locations. Overall the water quality at all sampling locations was improved in 1990 compared to earlier surveys. (Academy, 1992). This can be attributed to installation or improvements of wastewater treatment facilities and the reduction of the number of point sources.

Figure 5.3-1 provides a map of the sampling stations used by the Academy. Station 2 is upstream of Eastman on the South Fork Holston River. Stations 3, 5, and 6 are downstream on the main channel of the river. Station 4 is on the Big Sluice and Stations HC1 and HC2 are on small tributary stream, Horse Creek. The following sections provide listings of plants and animals collected at these sampling locations.

5.4.2.1 Algae and Aquatic Macrophytes

In an aquatic ecosystem such as the Holston River, algae and aquatic macrophytes (aquatic plants) perform several roles central to the establishment and maintenance of the biota. Although there are many sources of energy for riverine ecosystems, algae and aquatic plants, through the process of photosynthesis, transform the sun's energy into forms readily usable by other aquatic organisms. Aquatic plants also support growth and reproductive activities of various species of invertebrates and fish (Academy, 1992).

The structure of algal and aquatic macrophyte communities may be used, as an indicator of conditions in aquatic environments. Because most algae and aquatic macrophytes (plants) are not mobile, their community structure is assumed to be adapted to previously existing conditions, or conditions present when the communities were formed. Algal and aquatic macrophyte community composition, as determined by the species present, their number and abundance, can explain many effects of alterations to the riverine ecosystems. The particular ecological tolerances of many species, especially algae known as diatoms, can be used to characterize aquatic environments such as the Holston River (Academy, 1992).

Table 5.4-1 provides a listing of the algae and aquatic macrophytes collected during the Academy survey. The algal and aquatic macrophyte communities observed at all stations were indicative of areas affected by enrichment by nutrients. Severe pollution of organic material not broken down, which was observed in previous studies, was not observed during 1990 (Academy, 1992).

Table 5.4-1. List of taxa of algae and aquatic macrophytes collected at zones on the Holston River, sluice and Horse Creek near Kingsport, Tennessee in 1990. (X = present; – = not present.)

	Holston R.					Horse Cr.	
	2	3	4	5	6	1	2
Phylum Cyanophyta							
Class Myxophyceae							
Order Chroococcales							
Family Chroococcaceae							
Agmenellum quadruplicatum (Menegh.) Breb.	—	—	X	—	—	—	—
Undetermined coccoid Cyanophyta	—	—	—	—	X	—	—
Family Chamaesiphonaceae							
Entophysalis lemaniae (Ag.) Dr. & Daily	—	—	—	—	—	—	X
Order Hormogonales							
Family Oscillatoriaceae							
Microcoleus vaginatus (Vauch.) Gom.	X	X	X	X	X	—	X
Schizothrix calcicola (Ag.) Gom.	—	X	X	X	X	X	X
Family Nostocaceae							
Nostoc commune Vauch.	—	—	—	—	X	—	—
Phylum Chrysophyta							
Class Xanthophyceae							
Order Vaucheriales							
Family Vaucheriaceae							
Vaucheria sp.	X	X	X	X	X	—	—
Phylum Bacillariophyta							
Class Bacillariophyceae							
Order Centrales							
Family Biddulphiaceae							
Biddulphia laevis Ehr.	—	—	—	—	—	X	—
Family Coscinodiscaceae							
Cyclotella meneghiniana Kuetz.	—	—	X	—	—	—	X
C. pseudostelligera Hust.	X	X	X	X	X	—	—
C. stelligera Cl. ex Grun.	—	X	—	—	—	—	—
Melosira ambigua (Grun.) O. Muell.	X	X	X	X	—	—	—
M. italica (Ehr.) Kuetz.	—	X	X	—	—	—	—
M. italica v. tenuissima (Grun.) O. Muell.	X	—	—	—	—	—	—
M. varians Ag.	X	X	X	X	X	X	X
Skeletonema potamos (Weber) Hasle	X	X	X	X	—	—	—
Stephanodiscus astrea v. minutula (Kuetz.) Grun.	X	X	—	X	—	—	—
S. hantzschii Grun.	X	X	—	X	—	—	—
S. minutus H. L. Sm.	X	X	X	X	X	—	—
Order Pennales							
Family Fragilariaceae							
Diatoma tenue v. elongatum Lyngb.	X	X	—	X	—	—	—

Table 5.4-1. (continued). List of taxa of algae and aquatic macrophytes collected at zones on the Holston River, sluice and Horse Creek near Kingsport, Tennessee in 1990. (X = present; – = not present.)

	Holston R.					Horse Cr.	
	2	3	4	5	6	1	2
D. vulgare Bory	—	—	—	—	X	—	—
Fragilaria construens (Ehr.) Grun.	X	—	—	—	—	—	—
F. crotonensis Kitton	X	X	—	X	—	—	—
F. pinnata Ehr.	X	X	X	X	X	—	—
F. vaucheriae (Kuetz.) Peters.	X	X	X	X	X	—	—
Opephora martyi Herib.	X	—	—	—	—	—	—
Synedra pulchella v. *lacerata* Hust.	X	—	—	—	—	—	—
Synedra rumpens Kuetz.	X	X	X	X	—	—	—
S. rumpens v. *familiaris* (Kuetz.) Hust.	X	—	—	—	—	—	—
S. rumpens v. *meneghiniana* Grun.	X	—	X	X	—	—	—
S. tenera W. Sm.	X	X	—	X	—	—	—
S. ulna (Nitz.) Ehr.	X	—	—	—	—	—	—
Family Achnanthaceae							
Achnanthes affinis Grun.	—	—	X	—	—	—	—
A. clevei Grun.	—	—	—	—	—	X	—
A. lanceolata (Breb.) Grun.	—	—	—	—	—	X	—
A. lanceolata v. *dubia* Grun.	X	X	X	X	—	X	—
A. linearis v. *pusilla* Grun.	X	—	—	—	—	—	—
A. minutissima Kuetz.	X	X	X	X	X	X	X
A. pinnata Hust.	—	—	—	—	—	X	—
Cocconeis pediculus Ehr.	X	X	X	X	X	X	X
C. placentula v. *euglypta* Ehr.	X	X	X	X	X	X	X
C. placentula v. *lineata* Ehr.	X	X	—	X	X	—	—
Rhoicosphenia curvata (Kuetz.) Grun.	X	X	X	X	X	X	X
Family Naviculaceae							
Caloneis bacillum (Grun.) Meresch.	—	—	—	—	—	—	X
Frustulia vulgaris (Thwaites) DeT.	—	—	—	—	X	—	—
Gyrosigma attenuatum (Kuetz.) Rabh.	—	—	—	—	—	X	X
G. scalproides (Rabh.) Cl.	—	—	—	—	—	X	X
G. spencerii (Quek.) Griff. & Henf.	—	—	—	—	—	X	X
Navicula biconica Patr.	—	—	—	—	X	—	—
N. canalis Patr.	—	—	—	—	—	X	—
N. capitata Ehr.	—	—	—	—	—	—	X
N. cincta v. *rostrata* Reim.	—	X	—	—	—	—	X
N. cryptocephala Kuetz.	X	X	—	X	—	X	X
N. cryptocephala v. *exilis* (Kuetz.) Grun.	X	—	X	X	X	X	X
N. cryptocephala v. *veneta* (Kuetz.) Rabh.	—	—	X	X	X	X	X
N. graciloides X. Mayer	X	X	X	X	X	X	X
N. gregaria Donk.	—	X	—	X	X	X	X
N. lanceolata (Ag.) Kuetz.	—	—	—	—	—	X	X
N. luzonensis Hust.	—	—	—	—	X	X	—

Table 5.4-1. (continued). List of taxa of algae and aquatic macrophytes collected at zones on the Holston River, sluice and Horse Creek near Kingsport, Tennessee in 1990. (X = present; – = not present.)

	Holston R.					Horse Cr.	
	2	3	4	5	6	1	2
N. menisculus Schum.	–	–	–	–	–	X	–
N. minima Grun.	X	X	X	X	X	X	X
N. mutica Kuetz.	X	–	X	X	–	–	–
N. neoventricosa Hust.	X	X	–	X	–	–	–
N. ochridana Hust.	–	–	X	X	X	–	–
N. paratunkae Peters	–	–	–	–	X	–	–
N. pelliculosa (Breb. ex Kuetz.) Hilse	–	–	X	X	X	X	–
N. peregrina (Ehr.) Kuetz.	–	–	–	–	–	X	–
N. pupula Kuetz.	–	–	–	–	–	X	X
N. pupula v. *mutata* (Krasske) Hust.	–	–	–	–	–	X	X
N. rhynchocephala v. *germainii* (Wallace) Patr.	–	–	X	–	–	X	X
N. salinarum v. *intermedia* (Grun.) Cl.	X	X	X	X	X	X	X
N. secreta v. *apiculata* Patr.	X	X	–	X	X	X	X
N. seminulum Grun.	–	X	–	X	X	–	–
N. symmetrica Patr.	–	–	–	X	X	X	X
N. tripunctata (O.F. Muell.) Bory	X	X	X	X	X	X	X
Navicula tripunctata v. *schizonemoides* (V.H.) Patr.	–	–	–	–	–	X	X
Family Gomphonemaceae							
Gomphoneis herculeana (Ehr.) Cl.	X	–	–	–	–	–	–
Gomphonema clevei Fricke	X	X	X	X	X	X	X
G. olivaceum (Lyngb.) Kuetz.	–	–	–	–	–	X	X
G. parvulum (Kuetz.) Kuetz.	X	X	X	X	X	X	X
Family Cymbellaceae							
Amphora ovalis v. *pediculus* (Kuetz.) V.H. ex Det.	–	X	X	X	–	X	X
A. perpusilla (Grun.) Grun.	X	X	X	X	X	X	X
A. submontana Hust.	X	X	–	–	X	–	X
Cymbella affinis Kuetz.	X	–	X	X	X	X	X
C. minuta Hilse ex Rabh.	X	X	X	X	X	X	–
C. prostrata v. *auerswaldii* (Rabh.) Reim.	X	–	–	–	–	–	–
Reimeria sinuata (Greg.) Kociol. & Stoerm.	–	X	–	–	–	X	–
R. sinuata fo. *antiqua* (Grun.) Kociol. & Stoerm.	–	–	–	–	X	X	X
Family Nitzschiaceae							
Nitzschia amphibia Grun.	–	X	–	–	X	X	–
N. clausii Hantz.	–	–	–	–	X	–	–
N. dissipata (Kuetz.) Grun.	X	X	X	X	X	X	X
N. dissipata v. *media* Hantz.	–	–	–	X	X	X	X
N. frustulum Kuetz.	X	X	X	X	X	–	X
N. frustulum v. *perminuta* Grun.	X	X	X	X	X	–	–
N. frustulum v. *subsalina* Hust.	X	X	X	X	X	–	–
N. kuetzingiana Hilse	X	X	X	X	X	X	X
N. palea (Kuetz.) W. Sm.	–	X	X	X	X	X	X

Table 5.4-1.(continued). List of taxa of algae and aquatic macrophytes collected at zones on the Holston River, sluice and Horse Creek near Kingsport, Tennessee in 1990. (X = present; – = not present.)

	Holston R.					Horse Cr.	
	2	3	4	5	6	1	2
N. parvula Lewis	X	X	—	—	—	—	—
N. recta Hantz.	—	—	—	—	—	X	X
N. sinuata (W. Sm.) Grun.	X	—	—	—	—	—	—
N. sociabilis Hust.	—	—	X	—	—	X	X
Family Surirellaceae							
Surirella minuta Breb.	—	—	—	—	—	X	X
Phylum Euglenophyta							
Class Euglenophyceae							
Order Euglenales							
Family Euglenaceae							
Euglena sp.	—	—	X	—	—	—	—
Phylum Chlorophyta							
Class Chlorophyceae							
Order Tetrasporales							
Family Tetrasporaceae							
Tetraspora gelatinosa (Vauch.) Desvaux	—	—	X	—	—	—	—
Order Chlorococcales							
Family Scenedesmaceae							
Scenedesmus ecornis (Ralfs) Chodat	—	—	X	—	—	—	—
S. quadricauda (Turp.) Kuetz.	—	—	X	—	—	—	—
Order Chaetophorales							
Family Chaetophoraceae							
Stigeoclonium lubricum (Dillw.) Kuetz.	—	X	—	X	X	X	—
Order Oedogoniales							
Family Oedogoniaceae							
Oedogonium sp.	—	X	X	X	X	—	X
Order Siphonocladales							
Family Cladophoraceae							
Cladophora glomerata (L.) Kuetz.	X	X	X	—	X	X	X
Order Zygnematales							
Family Zygnemataceae							
Spirogyra sp.	—	—	—	—	—	—	X
Family Desmidiaceae							
Closterium sp.	X	X	X	—	—	—	—
Cosmarium sp.	—	X	—	—	—	—	—
Phylum Spermatophyta							
Subdivision Angiospermae							
Class Monocotyledoneae							
Family Zosteraceae							
Potamogeton crispus L.	—	X	X	—	X	—	—
P. nodosus Poiret	—	—	—	X	X	—	—

Table 5.4-1. (continued). List of taxa of algae and aquatic macrophytes collected at zones on the Holston River, sluice and Horse Creek near Kingsport, Tennessee in 1990. (X = present; – = not present.)

	Holston R.					Horse Cr.	
	2	3	4	5	6	1	2
P. pectinatus L.	—	X	—	X	—	—	—
Family Alismataceae							
Alisma subcordatum Raf.	—	X	—	—	—	—	—
Family Hydrocharitaceae							
Elodea canadensis Michx.	X	—	X	X	X	—	—
Vallisnera americana Michx.	—	—	—	X	X	—	—
Family Cyperaceae							
Eleocharis erythropoda Steud.	—	—	—	—	X	—	—
Scirpus tabernaemontanii Gmel.	—	—	—	—	—	—	X
Family Pontederiaceae							
Heteranthera dubia (Jacq.) MacM.	—	X	—	—	X	—	—
Class Dictyledoneae							
Subclass Archichlamydeae							
Family Polygonaceae							
Rumex obtusifolius L.	—	—	—	X	—	—	—
Polygonum c.f. *punctatum* Ell.	X	—	—	—	—	—	—
Family Cruciferae							
Rorippa sylvestris (L.) Bess.	X	—	—	—	—	—	—
Subclass Metachlamydeae							
Family Acanthaceae							
Justica americana (L.) Vahl	—	—	X	—	—	X	X

5.4.2.2 Non-Insect Macroinvertebrates

Biological inventories are widely recognized as establishing necessary baseline data against which important comparisons with later investigations can be made to discern environmental changes. Traditionally, benthic non-insect macroinvertebrates have been chosen as reliable indicators of water pollution because many species exhibit sedentary habits, some taxa of which are long-lived with low reproductive rates, while others exhibit complex, easily interrupted reproductive life histories and different tolerances to stress. Together, the group possesses phylogenetic, physiological, behavioral and ecological diversity with a sensitivity to a wide range of ecological perturbations. Alterations in community composition and population sizes can disturb the food web and alter an aquatic ecosystem's ability to regulate water quality by eliminating microorganisms, nutrients, and suspended materials. Consequently, studies of benthic macroinvertebrates are an important component of synoptic surveys which are designed for environmental impact assessment (Academy, 1992).

Table 5.4-2 lists the species of non-insect macroinvertebrates which were collected at the Academy sampling stations during the 1990 survey. Water quality, as evidenced by increased species diversity, was improved at the downstream stations (Zones 5 and 6) as compared to the upstream zones. Overall, the 1990 survey documented improved conditions for macroinvertebrates compared to earlier surveys (Academy, 1992).

Table 5.4-2. List of taxa of noninsect macroinvertebrates collected July 1990 at zones on the Holston River, sluice and Horse Creek, Hawkins and Sullivan counties, Tennessee. (X = present; – = not present; * = consists of one or more undetermined crayfish taxa and not counted in the species totals.)

Taxa	Holston R. 2	3	4	5	6	Horse Ck. 1	2
Phylum Porifera							
Class Demospongiae							
Order Haplosclerina							
Family Spongillidae							
Undet. sp.	X	X	X	X	X	—	—
Phylum Platyhelminthes							
Class Turbellaria							
Order Tricladida							
Family Dugesiidae							
Dugesia tigrina (Girard)	X	—	X	X	X	X	X
Cura foremanii (Girard)	—	X	—	X	—	—	—
Phylum Ectoprocta							
Class Phylactolaemata							
Family Plumatellidae							
Plumatella repens (Linnaeus)	X	X	X	X	X	—	—
Phylum Nematoda							
Class Adenophorea							
Undet. sp.	X	—	—	—	—	—	—
Phylum Nematomorpha							
Class Gordioidea							
Family Gordiidae							
Gordius sp.	X	—	—	—	—	—	—
Phylum Annelida							
Class Oligochaeta							
Order Tubificida							
Family Tubificidae							
Undet. sp.	—	X	X	—	—	—	—
Order Lumbriculida							
Family Lumbriculidae							
Lumbriculus variegatus (Muller)	X	X	X	X	X	X	—
Class Hirudinea							
Order Pharyngobdellida							
Family Erpobdellidae							
Erpobdella p. punctata (Leidy)	—	X	X	X	—	—	—

Table 5.4-2. (continued). List of taxa of noninsect macroinvertebrates collected July 1990 at zones on the Holston River, sluice and Horse Creek, Hawkins and Sullivan counties, Tennessee. (X = present; – = not present; * = consists of one or more undetermined crayfish taxa and not counted in the species totals.)

	Holston R.					Horse Ck.	
Taxa	2	3	4	5	6	1	2
Undet. sp.	—	—	—	—	—	—	X
Order Rhynchobdellida							
Family Glossiphoniidae							
Desserobdella phalera (Graf)	—	—	—	—	—	X	X
Helobdella triserialis (Blanchard)	—	X	X	—	—	—	—
Placobdella papillifera (Verrill)	X	X	—	—	—	—	—
Phylum Mollusca							
Class Gastropoda							
Order Mesogastropoda							
Family Viviparidae							
Campeloma decisum (Say)	—	—	X	X	X	—	—
Family Pleuroceridae							
Pleurocera uncialis hastatum (Anthony)	—	—	X	X	X	X	X
Leptoxis praerosa (Say)	—	—	—	—	X	—	—
Family Pomatiopsidae							
Pomatiopsis lapidaria (Say)	X	—	—	—	—	—	—
Order Stylommatophora							
Family Succineidae							
Succinea ovalis (Say)	—	—	—	—	X	—	—
Order Basommatophora							
Family Lymnaeidae							
Fossaria obrussa (Say)	X	X	X	—	—	—	—
Family Planorbidae							
Micromenetus dilatatus (Gould)	—	X	X	X	—	—	—
Family Physidae							
Physella heterostropha pomila (Conrad)	X	X	X	X	X	X	X
Family Ancylidae							
Laevapex diaphanus (Haldeman)	—	—	—	—	X	—	—
Ferrissia rivularis (Say)	X	X	X	X	X	X	X
Class Bivalvia							
Order Unionida							
Family Unionidae							
Fusconaia barnesiana (Lea)	—	—	—	—	—	—	*
Pleurobema coccineum (Conrad)	—	—	—	—	—	*	—
Villosa v. vanuxemensis (Lea)	—	—	—	—	—	*	—
Order Veneroida							
Family Sphaeriidae							
Pisidium sp.	—	X	X	—	—	—	—

Table 5.4-2. (continued). List of taxa of noninsect macroinvertebrates collected July 1990 at zones on the Holston River, sluice and Horse Creek, Hawkins and Sullivan counties, Tennessee. (X = present; -- = not present; * = consists of one or more undetermined crayfish taxa and not counted in the species totals.)

	Holston R.					Horse Ck.	
Taxa	2	3	4	5	6	1	2
Musculium securis (Prime)	—	—	—	X	—	—	—
Sphaerium fabale (Prime)	—	—	X	—	—	—	—
S. striatinum (Lamarck)	—	—	X	—	—	X	X
Family Corbiculidae							
Corbicula fluminea (Muller)	X	X	X	X	X	X	X
Phylum Arthropoda							
Class Crustacea							
Order Isopoda							
Family Asellidae							
Caecidotea sp.	X	—	X	X	X	—	—
Order Amphipoda							
Family Hyalellidae							
Hyalella azteca (Saussure)	—	—	—	—	X	—	—
Family Crangonyctidae							
Crangonyx sp.	X	X	X	X	X	—	—
Order Decapoda							
Family Cambaridae							
Orconectes rusticus (Girard)	X	X	X	X	X	X	X
Cambarus bartonii (Fabricius)	X	—	—	X	—	X	X
C. longirostris Faxon	X	—	X	X	X	X	X
Total	17	16	21	18	17	11	11

5.4.2.3 Aquatic Insects

Aquatic insects are a particularly appropriate group to study in biological assessments of streams and rivers. Most insects have moderate generation times (e.g., several months to several years), so that they can serve as biological integrators of environmental conditions on time scales that are useful for assessing water quality. Since most insects are not highly mobile, their persistence at a given location can be used to evaluate the ecological suitability of particular sites. Because different insect taxa vary in their tolerance of particular kinds of water pollution, variations in their distribution and abundance can be used to interpret patterns of water quality. Thus, it is possible to use the relative abundance of various insect taxa as an indicator of water quality conditions (Academy, 1992).

Table 5.4-3 provides a list of the species of aquatic insects collected during the Academy's 1990 survey. One of the most striking results of this study was the large increase in the number of aquatic insect taxa obtained in the 1990 qualitative collections relative to previous surveys. Averaged across all zones, the number of taxa obtained in 1990 was about 2-3 fold greater than in previous years.

All indications are that the observed increase in the number of taxa collected during 1990 was due to improvements in water quality and habitat characteristics that provided suitable conditions for a larger variety of aquatic insects (Academy, 1992).

Table 5.4-3. Species list of insects found in the 1990 qualitative samples of Horse Creek and Holston River.

Zone:	2	3	4	5	6	HC1	HC2
Class Hexapoda							
Group Insecta							
Order Ephemeroptera							
Family Baetidae							
Baetis spp.	—	X	X	X	X	X	X
Family Oligoneuriidae							
Isonychia spp.	—	—	—	—	X	X	X
Family Heptageniidae							
Leucrocuta spp.	—	—	—	—	—	—	X
Stenacron spp.	—	—	—	—	X	X	X
Stenonema spp.	—	—	X	—	X	X	X
Family Leptophlebiidae							
Choroterpes spp.	—	—	—	—	—	X	X
Habrophlebiodes spp.	—	—	—	—	—	—	X
Family Ephemerellidae							
Serratella spp.	—	—	X	—	X	X	—
Family Tricorythidae							
Tricorythodes spp.	—	—	X	X	X	X	X
Family Caenidae							
Caenis spp.	—	—	X	—	—	X	X
Order Odonata							
Family Gomphidae							
Ophiogomphus sp.	—	—	—	—	—	—	X
Family Aeshnidae							
Aeshna sp.	X	—	—	—	—	—	—
Boyeria vinosa	—	—	X	—	X	X	X
Family Macromiidae							
Macromia sp.	—	—	—	—	—	X	—
Family Corduliidae							
Somatochlora sp.	—	—	—	—	—	—	X
Family Calopterygidae							
Calopteryx sp.	X	—	—	—	—	—	—
Hetaerina americana	—	—	X	—	—	X	X
Family Coenagrionidae							
Argia spp.	—	X	—	—	X	X	—
Enallagma spp.	—	X	X	—	X	X	X
Ischnura spp.	—	—	—	—	—	X	X
Order Plecoptera							
Family Perlidae							
Acroneuria sp.	—	—	—	—	—	—	X
Order Hemiptera							
Family Nepidae							

Table 5.4-3. (continued). Species list of insects found in the 1990 qualitative samples of Horse Creek and Holston River.

Zone:	2	3	4	5	6	HC1	HC2
Ranatra sp.	—	—	—	—	X	—	—
Family Belostomatidae							
Lethocerus uhleri	—	—	—	—	X	—	—
Family Corixidae							
Un. Corixidae	—	—	—	—	—	X	—
Corisella spp.	X	—	—	—	—	—	X
Sigara spp.	—	—	—	—	—	X	—
Trichocorixa spp.	X	—	—	X	X	X	—
Family Mesoveliidae							
Mesovelia mulsanti	—	—	—	—	—	X	X
Family Hydrometridae							
Hydrometra sp.	—	—	—	X	—	—	—
Family Veliidae							
Rhagovelia spp.	—	—	X	—	—	X	—
Family Gerridae							
Gerris spp.	X	—	—	—	X	—	X
Rheumatobates spp.	X	—	X	X	X	—	X
Trepobates spp.	—	—	—	—	X	X	X
Order Neuroptera							
Suborder Megaloptera							
Family Sialidae							
Sialis sp.	X	—	—	—	—	—	X
Family Corydalidae							
Corydalus cornutus	—	—	X	—	—	X	X
Nigronia sp.	—	—	—	—	—	—	X
Suborder Neuroptera							
Family Sisyridae							
Climacia sp.	—	X	—	—	—	—	—
Order Coleoptera							
Family Haliplidae							
Peltodytes sp. (A)	X	—	—	X	X	—	—
Family Dytiscidae							
Hydroporus sp. (A)	—	—	X	—	—	—	X
Laccophilus sp. (A)	X	—	—	—	X	—	—
Family Gyrinidae							
Dineutus spp. (A)	X	—	X	—	X	—	—
Gyrinus spp. (A)	X	—	—	X	X	—	—
Gyrinus spp. (L)	—	—	—	—	X	—	—
Family Hydrophilidae							
Berosus spp. (A)	X	—	—	X	X	—	—
Paracymus spp. (A)	—	—	—	—	X	—	—
Tropisternus spp. (A)	—	—	—	—	X	—	X

Table 5.4-3. (continued). Species list of insects found in the 1990 qualitative samples of Horse Creek and Holston River.

Zone:	2	3	4	5	6	HC1	HC2
Tropisternus spp. (L)	—	—	—	—	X	—	—
Family Scirtidae							
Cyphon sp. (L)	—	—	—	—	—	—	X
Family Elmidae							
Ancyronyx variegata (A)	—	—	X	—	X	—	X
Dubiraphia vittata (A)	—	—	X	X	—	X	X
Macronychus glabratus (A)	—	—	—	—	X	X	X
Macronychus sp. (L)	—	—	—	—	X	—	—
Optioservus spp. (L)	X	—	—	—	—	—	—
Stenelmis crenata (A)	—	—	X	X	X	X	X
Stenelmis sp. (L)	—	—	X	—	—	X	X
Family Psephenidae							
Psephenus herricki (L)	—	—	X	—	—	—	X
Order Diptera							
Family Tipulidae							
Tipula spp.	X	—	—	—	—	—	—
Antocha sp.	X	—	—	X	X	X	—
Hexatoma sp.	—	—	—	—	—	—	X
Limnophila sp.	X	—	—	—	—	—	—
Pilaria sp.	—	—	—	—	—	—	X
Family Chaoboridae							
Eucorethra sp.	—	—	—	X	—	—	—
Family Simuliidae							
Simulium sp.	X	X	X	X	X	—	X
Family Chironomidae							
Subfamily Tanypodinae							
Ablabesmyia mallochi	—	—	X	—	—	—	—
Clinotanypus sp. cf. *pinguis*	—	—	—	—	—	—	X
Conchapelopia sp.	X	—	—	—	—	X	—
Meropelopia sp.	X	—	—	—	—	—	—
Natarsia sp. A sensu Roback	—	—	—	—	—	X	—
Procladius sp.	—	X	—	—	—	—	—
Psectrotanypus (P.) *dyari*	X	—	—	—	—	—	—
Subfamily Orthocladiinae							
Cardiocladius obscurus	—	—	X	—	X	X	—
Corynoneura sp. near *taris*	—	—	—	—	X	—	—
Cricotopus bicinctus	X	X	X	X	X	—	—
Cricotopus sp. cf. *junus*	X	X	X	—	—	—	—
Cricotopus sp. cf. *tremulus*	X	X	X	—	—	—	—
Cricotopus triannulatus	X	—	—	X	—	X	X
Cricotopus trifascia	X	X	X	X	—	—	—
Cricotopus sylvestris	X	X	—	—	—	X	—
Hydrobaenus sp.	—	—	—	—	—	X	X

Table 5.4-3.(continued). Species list of insects found in the 1990 qualitative samples of Horse Creek and Holston River.

Zone:	2	3	4	5	6	HC1	HC2
Synorthocladius sp.	X	—	X	—	—	—	—
Thienemanniella sp. near *xena* Roback	—	—	X	—	X	—	X
Tvetenia discoloripes	—		X	—	X	—	—
Subfamily Chironominae							
Tribe Chironomini							
Chironomus sp.	—	X	—	X	—	X	X
Cryptochironomus sp.	—	X	X	X	X	—	X
Dicrotendipes fumidus	X	X	X	X	X	—	—
Dicrotendipes modestus	—	X	—	—	—	—	X
Microtendipes sp.	—	—	X	—	—	—	—
Phaenopsectra sp.	X	—	X	—	—	—	X
Polypedilum sp.	X	X	X	X	X	X	X
Stenochironomus sp.	—	—	—	X	—	—	—
Stictochironomus sp.	X	—	—	—	—	—	—
Tribe Tanytarsini							
Paratanytarsus sp.	—	—	X	—	—	—	X
Rheotanytarsus sp.	—	—	X	X	X	X	X
Tanytarsus sp.	—	—	X	X	—	X	X
Stratiomyidae							
Stratiomys sp.	—	—	—	—	—	—	X
Family Empididae							
Chelifera sp.	X	—	—	—	—	—	—
Hemerodromia sp.	—	X	X	—	—	—	—
Family Dolichopodidae							
Dolichopus sp.	X	—	—	—	—	—	—
Family Muscidae							
Un. Muscidae sp.	X	—	—	—	—	—	—
Order Trichoptera							
Family Hydropsychidae							
Cheumatopsyche spp.	X	—	X	—	X	X	X
Hydropsyche spp.	—	—	X	—	X	X	X
Family Hydroptilidae							
Hydroptila spp.	—	—	X	—	—	—	—
Family Brachycentridae							
Micrasema sp.	—	—	X	—	—	—	—
Family Leptoceridae							
Oecetis sp.	—	—	—	—	—	X	—
Triaenodes sp.	—	—	—	—	—	—	X
Total Taxa	35	17	40	23	38	38	51

5.4.2.4 Fish

The abundance and diversity of fish species are important factors in assessing the health of a body of water. Fish occupy the highest trophic level in the aquatic food chain and therefore are often used as an indicator of the overall health of the system.

During the 1990 Academy study, thirty-one species of fish were collected from the South Fork Holston River and Big Sluice zones and twenty-four species were collected in Horse Creek. Generally, the abundance of fishes and numbers of different species collected were greater at the zones on the Big Sluice, and the downstream zones when compared to the upstream zones near the Fort Patrick Henry Dam and Eastman. Variation in fish fauna and densities among the zones may be due to the effect of dam operations, the presence of industrial and municipal discharges and differences in available habitat (Academy, 1992).

Table 5.4-4 list the species of fish collected during the 1990 survey. Historically, the numbers and diversity of fishes collected in the South Fork Holston River have increased dramatically since earlier surveys, most notably at zones downstream of Kingsport. Demonstrable improvements in water quality are reflected by increases in the variety of fishes collected during the most recent surveys. In 1965, the river downstream of Kingsport supported only three species of fish, whereas in 1990, nineteen fish species were recorded. Water quality improvements, such as increases in dissolved oxygen, are also indicated by the return of relatively sensitive gamefish to

Table 5.4-4. Occurrence of species of fish in samples by various collecting techniques from stations on the Holston River, South Fork Holston River, and Horse Creek, in the vicinity of Kingsport, Tennessee, July 1990. Collecting techniques are: backpack electroshocking (B), electroshocking from boat (E), gill nets (G), traps (T), trot-lines (R), dip nets (H), seines (S), and angling (A). Zone designations are for left bank only (L), right bank (R), and the upper reaches of the zone (U).

	Station/Zone								
Species	2	3L	3R	4	5L	5U	6	HC1	HC2
Dorosoma cepedianum	G	-	-	B	-	-	-	-	-
Onchorhynchus mykiss	A	-	-	-	-	-	-	-	-
Campostoma anomalum	B	-	-	BS	BH	TB	B	B	B
Cyprinella galactura	-	-	-	B	-	-	-	-	B
Cyprinella spiloptera	-	-	-	-	-	-	B	B	B
Cyprinus carpio	-	-	H	-	-	E	-	-	-
Luxilus chrysocephalus	TG	-	-	S	-	TGH	T	TB	B
Nocomis micropogon	-	-	-	-	B	-	B	-	-
Notropis amblops	-	-	-	-	-	-	-	B	B
Notropis leuciodus	-	-	-	-	-	-	B	-	-
Notropis sp. (sawfin shiner)	-	-	-	-	B	-	-	-	-
Notropis stramineus	-	-	-	-	-	-	-	B	-
Notropis telescopus	-	-	-	BS	B	H	-	B	B
Pimephales notatus	-	-	-	S	-	-	-	-	HB
Rhinichthys atratulus	-	-	-	B	H	B	B	B	-
Carpiodes carpio	-	-	-	-	-	EG	-	-	-
Catostomus commersoni	BGH	B	B	S	-	B	-	B	B
Hypentelium nigricans	-	B	-	BS	B	B	B	B	B
Moxostoma erythrurum	-	-	-	-	-	-	-	T	-
Ameiurus natalis	-	BT	BH	BH	BH	BGL	BT	H	-
Gambusia affinis	-	-	BH	-	-	H	-	B	B
Ambloplites rupestris	-	B	-	BTSH	BH	BRT	BGT	B	B
Lepomis auritus	-	-	-	T	-	BT	B	B	B
Lepomis macrochirus	B	-	B	B	-	ET	-	TB	B
Lepomis megalotis	BG	-	B	B	B	AE	B	B	B
Lepomis microlophus	-	-	T	-	-	-	-	-	-
Micropterus dolomieu	G	-	-	B	BH	B	B	-	-
Micropterus punctulatus	G	-	-	S	-	-	-	B	B
Micropterus salmoides	B	-	-	-	-	-	-	-	-
Etheostoma blennioides	-	-	-	B	-	-	B	B	B
Etheostoma camurum	-	-	-	-	-	-	B	-	-
Etheostoma rufilineatum	-	-	-	BS	-	-	B	B	HB
Etheostoma simoterum	BH	B	BH	BS	B	B	B	B	HB
Percina caprodes	-	-	-	-	-	-	-	B	-
Cottus carolinae	B	-	-	HB	B	B	B	B	HB
Number of species	12	5	8	20	12	17	17	22	19
		10			19				

the area. The South Fork Holston River now supports a population of fishes that includes small-mouth bass, rock bass, bluegill and yellow bullhead catfish (Academy, 1992).

5.4.3 Wildlife Resources

The river banks along the South Fork Holston, Big Sluice and Horse Creek provide suitable habitat for a variety of bird species. While no biological surveys have been conducted to specifically document the presence of birds on the South Fork Holston or Big Sluice, data are available for a marsh which borders Horse Creek. This marsh is approximately one mile northwest of the proposed facility. The proposed facility location does not offer the habitat needed by these birds. However, it is conceivable that the species of birds frequenting the marsh might also visit the shorelines of the nearby surface waters.

Table 5.4-5 lists the species of birds observed at the marsh. Fifteen of the 29 species observed during the study were judged to be permanent residents of the area. These included the American goldfinch (Spinus tristis), robin (Turdus migratorius), grackle (Quiscalus quiscula), meadowlark (Sturnella magna), mockingbird (Mimus polyglottos), mourning dove (Zenaidura macroura), song sparrow (Melospiza melodia) and starling (Sturnus vulgarus) (Coats, 1976).

Table 5.4-5. Bird Species Observed at Meadowview Marsh, April 8, 1976 to May 24, 1976

Common Name	Scientific Name	Permanent Resident (P) or Migratory (M)
American Bittern	Botaurus lentiginosus	(P)
American Goldfinch	Spinus tristis	(P)
American Kestrel	Falco sparverius	(P)
American Robin	Turdus migratorius	(P)
American Woodcock	Philohela minor	(M)
Barn Swallow	Hirundo rustica	(M)
Blue-Wing Teal	Anas discors	(M)
Chimney Swift	Chaetuna pelagica	(M)
Common Gallinule	Gallinula chloropus	(M)
Common Grackle	Quiscalus quiscula	(P)
Common Snipe	Capella gallinago	(P)
Eastern Kingbird	Tyrannus	(M)
Eastern Meadowlark	Sturnella magna	(P)
Green Heron	Butorides virescens	(M)
Killdeer	Charadrius vociferus	(P)
Long-Billed Marsh Wren	Telmatodytes palustris	(M)
Mallard	Anas platyrhynchos	(P)
Mourning Dove	Zenaidura macroura	(P)
Northern Mockingbird	Mimus polyglottos	(P)
Purple Martin	Progne subis	(M)
Red-Winged Blackbird	Agelaius phoeniceus	(P)
Rough-Wing Swallow	Stelgidopteryx ruficollis	(M)
Song Sparrow	Melospiza melodia	(P)
Sora	Porzana carolina	(M)
Starling	Sturnus vulgarus	(P)
Swamp Sparrow	Melospinza georgiana	(P)
Tree Swallow	Iridoprocne bicolor	(M)
Virginia Rail	Rallus limicola	(M)
Wood Duck	Aix sponsa	(M)

Migratory species were also observed. These included woodcock (Philohela minor), teal (Anus ors), chimney swift (Chaelura pelogica), green heron (Butorides virescens), ple martin (Progne subis), sora (Porzana Carolina) and wood duck (Aix spansa) (F ns, 1966).

Other spe ncluding both permanent residents and migratory birds were observed cc cted nests and produced young at the marsh. These birds included mal'rd (latyrhynchos), red-winged blackbird (Agelaius phoeniceus) and virginia llu ola) (Coats, 1976).

5.4. Th ned, Endangered or Special Concern Species

According State of T nnessee Department of Environment and Cons vation, Ecologica ices Divisi and the U.S. Fish and Wildlife Service, there are no recorded ened or en angered species in the vicinity of the proposed project site (Christie, and Barcla). Species of aquatic and terrestrial wildlife which have been docu ted as bei present in the Kingsport area are identified in previous sections of chapter e tled Aquatic Resources and Wildlife Resources.

5.5 Community Resources

5.5.1 Land Use

Bristol, TN and VA, Johnson City TN, and Kingsport TN comprise what is called the Tri-Cities area located in Northeast Tennessee. Bristol is located in Sullivan County, TN and Washington County, VA, Kingsport is located in Sullivan and Hawkins County, TN, and Johnson City is located in Washington County, TN. The area is a mountainous region with forests. Rivers in the area are the Roan, Clinch, and the North and South Forks of the Holston. The Tennessee Valley Authority operates four dams in the area, Fort Patrick Henry, Boone, South Holston, and Watauga. Parts of the Jefferson National Forest, Warriors Path State Park (TN), and Natural Tunnel State Park (VA) are located within 20 miles of the proposed project site.

Major businesses in the region are agriculture, glass manufacturing, book making, chemical, fibers, plastics, explosives, and paper production.

There are 9 universities and colleges in the area, with the largest being East Tennessee State University located in Johnson City.

5.5.2 Zoning

Eastman is zoned Heavy Industrial by Sullivan County and General Industrial by the City of Kingsport. The area immediately surrounding Eastman is zoned varying classes of Industrial, Business, or Residential. Figure 5.5-1 shows the general zoning classifications on the Eastman plant site and the surrounding area.

5.5.3 Socioeconomic Resources

In 1990 the population of Kingsport was 37,988, and Sullivan County's population was 148,800. Caucasians comprise 94.3% and 97.9% of the population in Kingsport and Sullivan County, respectively. In 1991 per capita income for Sullivan County residents was $16,583, slightly higher than the Tennessee per capita income ($16,478) and lower than the United States per capita income ($19,091)(1994). According to the Tennessee Dept. of Economic and Community Development, the total employment for Sullivan County is 71,400. From 1982 to 1991, 103 projects for new plants or expansions were completed in Sullivan County totaling $2.13 trillion. Retail sales in 1992 were $1.24 trillion for Sullivan Country and $879 billion in Kingsport.

Aside from manufacturing and retail, agriculture accounts for much economic activity in Kingsport and Sullivan County. Major agricultural products from Sullivan County are tobacco, small grains, and strawberries. Other natural resources found in the area are limestone and timber.

Kingsport's public school system consists of 7 elementary schools, 2 middle schools, and 1 senior high school with total enrollment of 5,900. There are 6 private schools, 2 vocational-technical schools, and 3 colleges in the area.

The City of Kingsport maintains a 92-officer police force and a 95-person fire department. In addition, the city provides water supply, sewage treatment, and solid waste disposal.

Table 5.5-1 gives other socioeconomic information on Kingsport and the surrounding area.

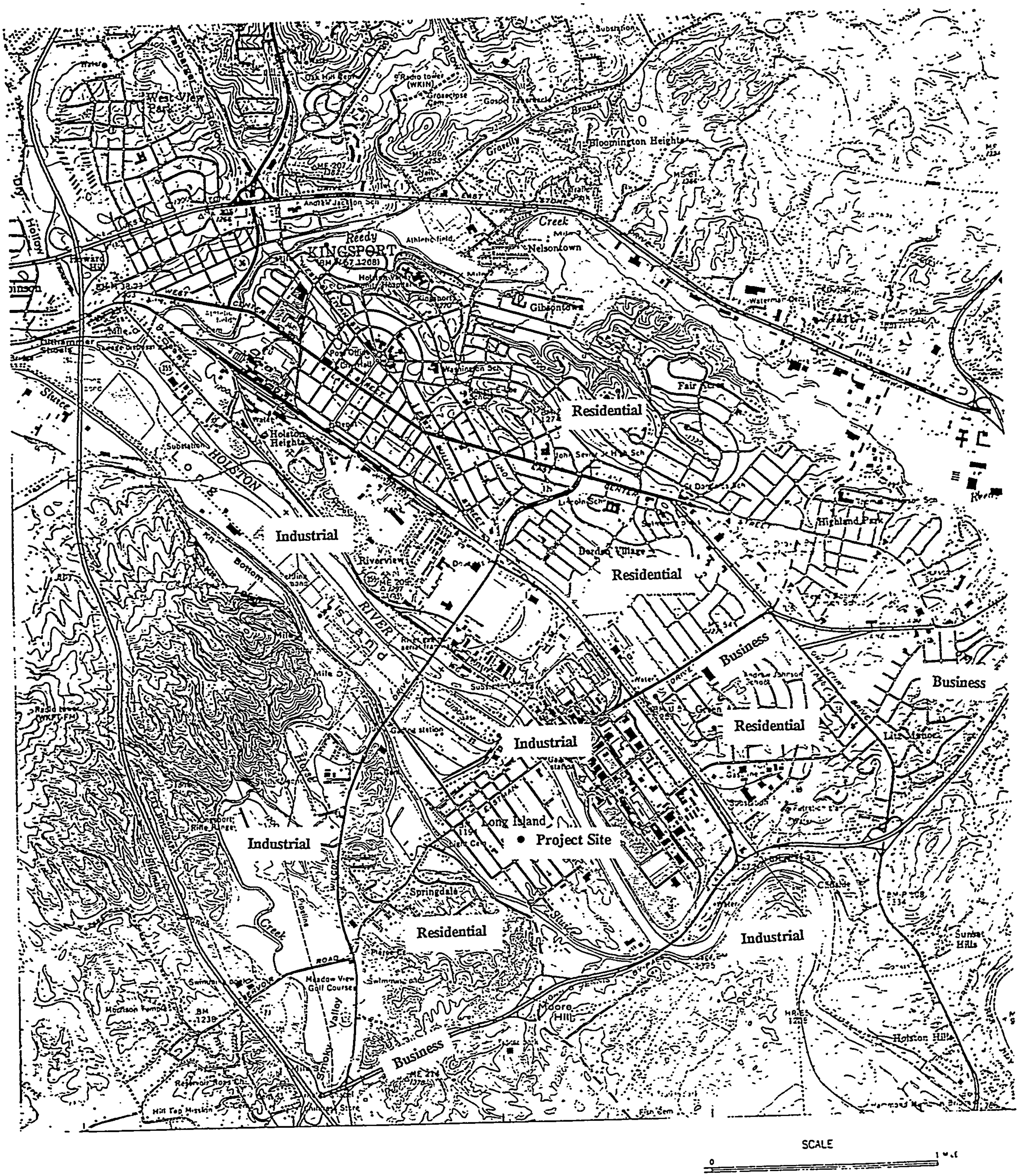


Figure 5.5-1. General Zoning Districts

Table 5.5-1. Miscellaneous information on Kingsport

(Tennessee Community Data 1993)

	Number	Related Info
Hospitals	3	Beds = 885
Doctors	338	
Dentists	54	
Nursing Homes	7	Beds = 965
Churches	138	
Parks	15	
Golf Courses	3	
Swimming Pools	5	
Country Clubs	1	
Theaters	10	
Bowling Alleys	2	
Hotels & Motels	12	
Largest Meeting Room Capacity	1,100	
Restaurants	94	
Banks and Savings & Loans	13	
Newspapers	2	
Television Stations	5	
Radio Stations	20	

Eastman Chemical Company is a major employer in Kingsport, Tennessee with a large work force. Approximately 13,000 people are currently employed (approximately one-third the population of Kingsport). According to 1992 statistics (Eastman):

- Eastman had a total annual payroll of $654 million in 1992.
- Eastman paid $35.3 million in taxes to the local and state governments.
- Four-hundred-twenty-five million dollars of materials and services were purchased from local firms including coal from Virginia and Kentucky.
- Eastman contributed approximately $2 million to communities where it had facilities including $643,000 to the Kingsport area. About half of that amount was given to colleges and universities in those areas.

5.5.4 Transportation

Eastman has excellent transportation facilities. It has its own rail service and operates 5 diesel locomotives over 37 miles of company track and makes approximately 5,000 railcar movements per week. Highway access to the plant is good due to its connection via John B. Dennis Highway to I-181 leading into I-81. Eastman also has readily available access to other major roads, such as State Roads 36 (Ft. Henry Dr.), 126 (Wilcox Dr. and Memorial Blvd.), and 93 (John B. Dennis Hwy.) and U.S. Highway 11W

(Stone Dr.). Figure 5.5-2 shows rail access into Eastman while Figure 5.5-3 shows the major highway accesses. Eastman also owns and operates more than 525 motor vehicles, 240 trailers and tankers, and 560 forklifts. There are more than 28 miles of paved roads within the plant area. For business travel, Tri-Cities Airport is located less than 30 miles away from the plant site, also shown on Figure 5.5-3. American Eagle, Delta, and USAir flights are available at the airport.

During an average operating day there are approximately 7,600 employees and 2,500 contractors located on site. To accommodate this number of employees Eastman has a parking capacity of 10,990 outside and 1,255 inside plant spaces. In addition, the number of tractor-trailer spaces at the plant is between 450 and 500.

5.5.5 Noise

Eastman has actively monitored noise emissions at selected Eastman perimeter locations since 1980. Since the perimeter boundaries have changed significantly on Long Island (where the proposed Liquid Phase Methanol demonstration unit site is to be located), three new metering sites were added for the 1993 survey. Site number 16, shown on Figure 5.5-4, and approximately 500 ft from the LPMEOH site would be the location most affected by the proposed Liquid Phase Methanol demonstration unit.

There have been no noise complaints from Eastman facilities on Long Island in the past two years. However, there have been sporadic complaints regarding other parts of the plant site, particularly during construction, start-ups, or emergency shut downs. Each of these complaints has been investigated and corrective actions taken, such as installation of lagging, silencers, or enclosures or initiating repairs of equipment. The proposed demonstration site is buffered from the community on all four sides. An

Eastman parking lot borders the proposed site on the north and the existing Eastman manufacturing facility borders the south, west and east sides of the proposed site.

5.5.6 Visual Resources

Eastman is located on the south side of Kingsport. The Kingsport City limits cut through the plant site. Kingsport has restaurants, shopping centers, schools, churches, residential areas, gas stations, and other businesses indicative of any small to mid-size city in the U.S. Many manufacturing industries are located in Kingsport and in Sullivan County immediately surrounding the plant site. Among these are AFG, Holston Defense, Air Products and Chemicals, Inc., Mead Paper, and Arcata Graphics. Bays Mountain Nature Preserve and Planetarium, a Kingsport city park is located on Bays Mountain, south of the plant site. The major visual resource at Bays Mountain is the view from a firetower on top of the mountain; however, the firetower faces northwest, and Eastman cannot be seen from it.

Located on the Eastman plant site itself are manufacturing buildings, office buildings, laboratories, pilot plant areas, tank farms, cooling towers, distillation towers, stacks for boilers, and other structures common at chemical, plastic, and fibers manufacturing facilities. The entire plant site can be seen from various elevated locations within a few miles of the site, with some of the more prominent features being the stacks for the plant's powerhouses.

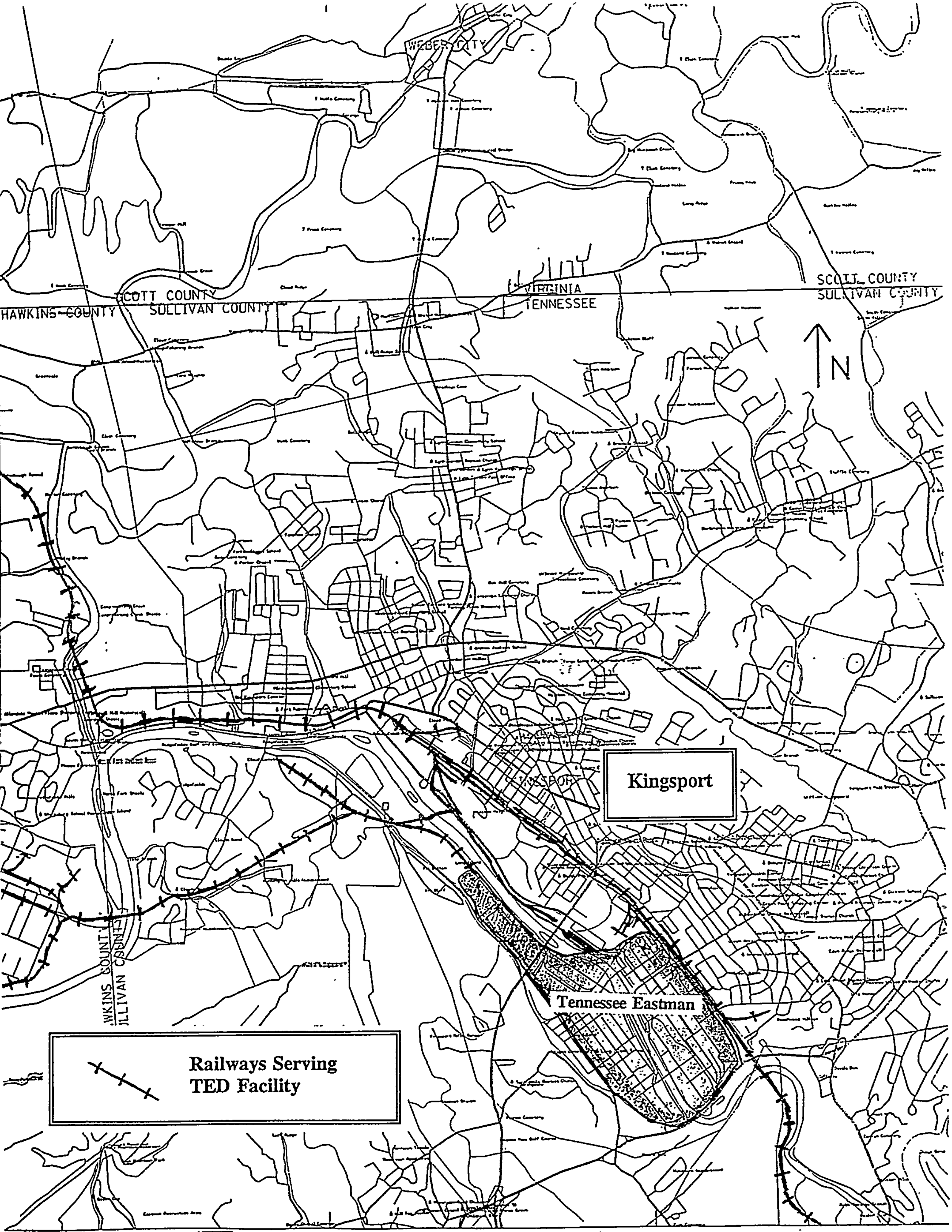


Figure 5.5-2 Rail Access to Tennessee Eastman Division

5.5.7 Cultural Resources

The proposed project site is located within the Eastman manufacturing, which has operated in Kingsport since 1920. The proposed project site is located on Long Island, a tract of land bordered by the South Fork of the Holston River and the Big Sluice.

Sites within one mile of the proposed project site listed in the National Register of Historic Places are shown in Table 5.5-2 (National Register, 1989).

A paper written about Long Island indicates that American Indians, mainly Cherokees, traveled across the island and that the island was used as a neutral zone for settling disputes between tribes (Bernard, 1987). White men moved to the island in 1810 after the land was ceded in a treaty. During the 1800s and early 1900s, it is believed the island was used for agricultural purposes. Beginning in the 1920s, plots of land were sold. Some of the new owners continued to farm their property while others built homes and worked in the plants of a growing Kingsport industrial community. One of these plots was an 11.2 acre plot sold to R.F. and C.W. Carter in 1926.

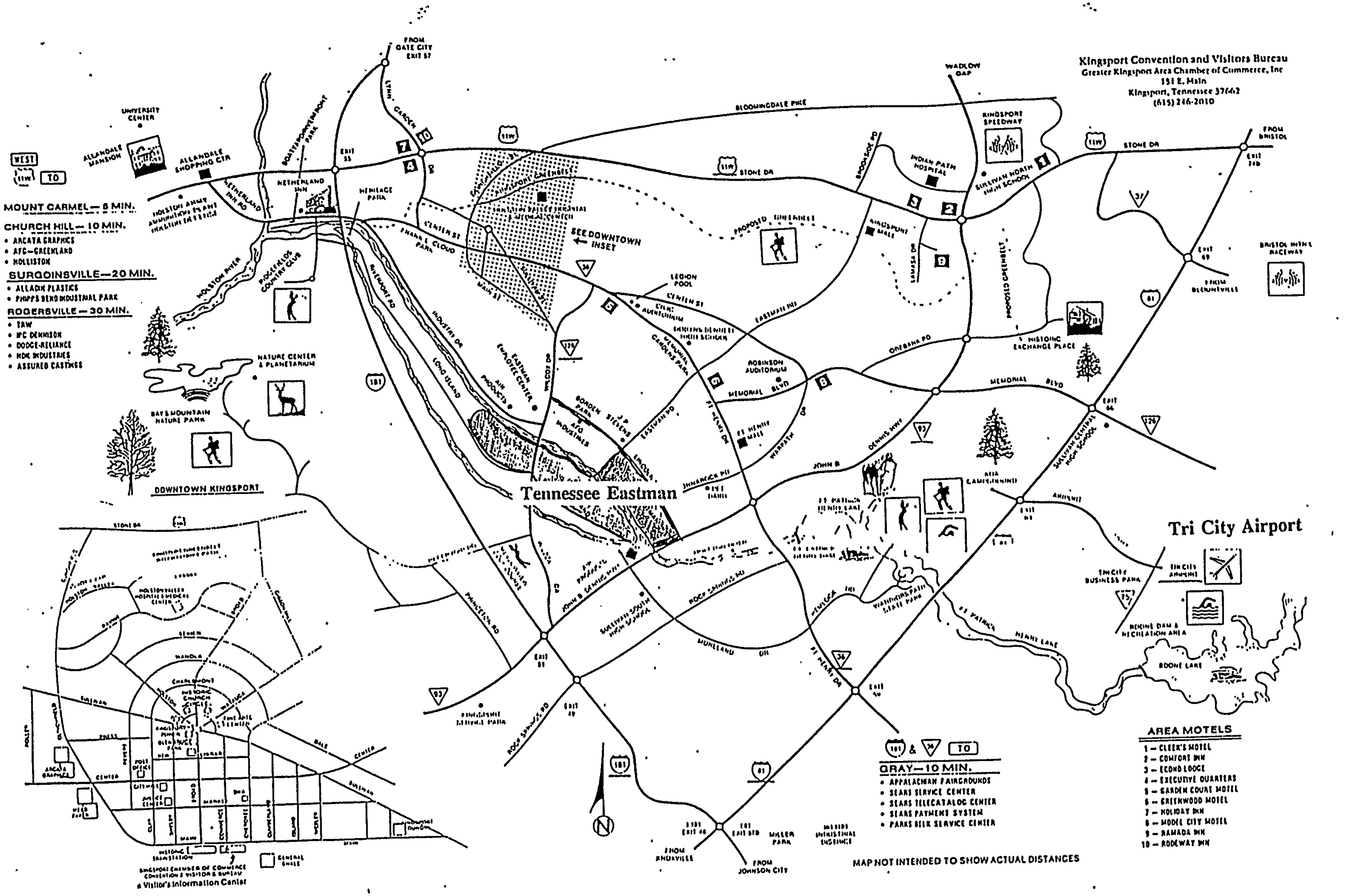


Figure 5.5-3 Interstates and Other Major Roadways in Kingsport

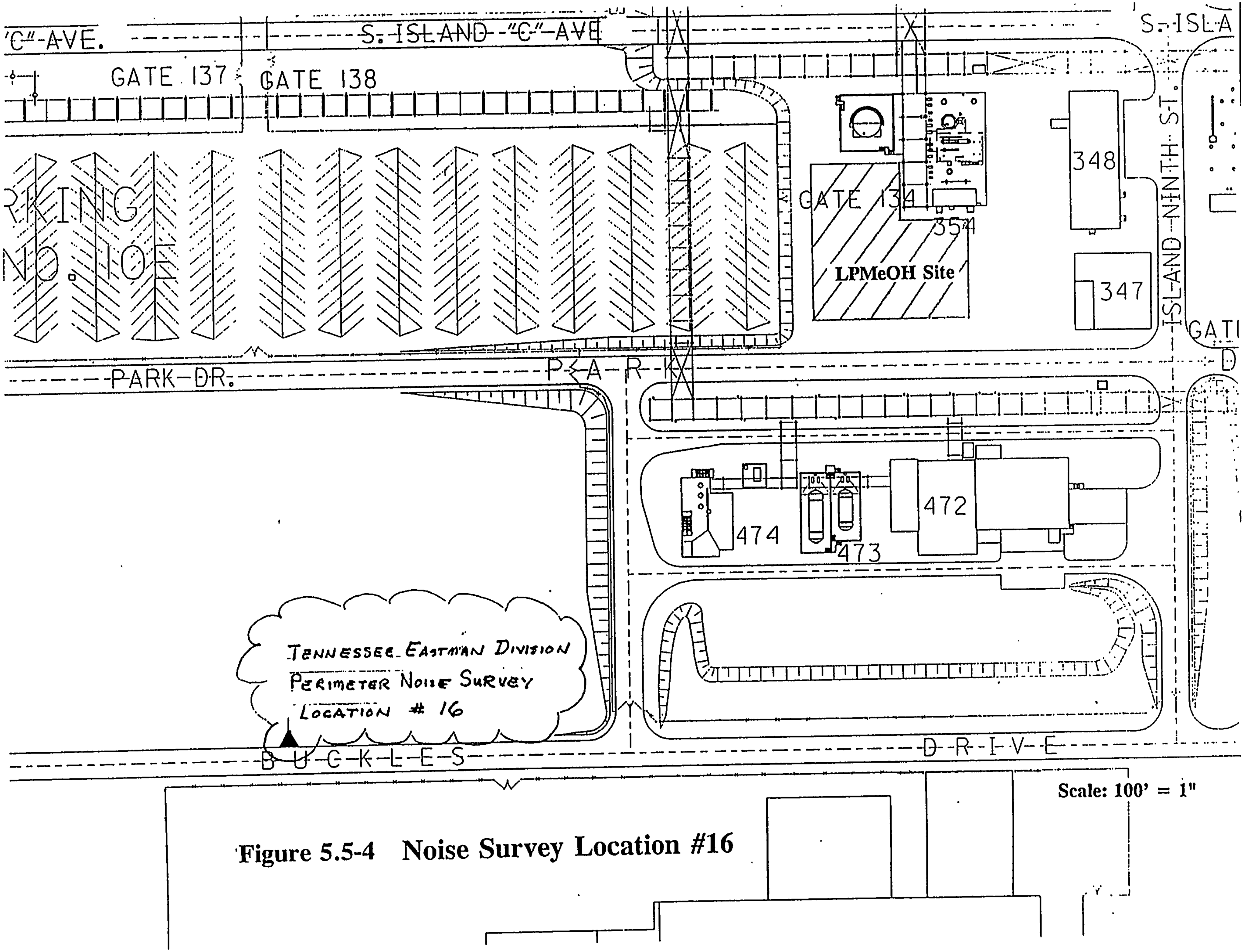


Figure 5.5-4 Noise Survey Location #16

Table 5.5-2. Sites Listed in the National Register of Historic Places

Site	Location	Date Listed
Church Circle District	Center of Kingsport, along Sullivan St.	4/11/73
Clinchfield Railroad Station	101 E. Main St., Kingsport	4/24/73
J. Fred Johnson house	1322 Watauga Ave., Kingsport	4/11/73
Roseland	South of Kingsport on Shipp St.	4/2/73
Stone-Penn House	1306 Watauga St. Kingsport	11/15/84
Long Island of the Holston	South Fork of the Holston River, Kingsport vicinity	10/15/66

This plot was sold to Tom C. Childress who immediately sold it to the then-Tennessee Eastman Corporation (TEC) in 1941. TEC graded and seeded the property and the property was called the "Big Field." The proposed demonstration site is located on this plot. Other manufacturing development within 200 ft of the proposed demonstration site include four chemical manufacturing facilities, one of which is Eastman's existing methanol plant and an employee parking lot.

A major archaeological find was unearthed on Eastman property in 1979, 1980, and 1981 by a local amateur archaeologist (Yancey, "Local man...", 1981). The archaeological site is located nearly a mile from the proposed project site in a rock shelter near the start of the Big Sluice, shown in Figure 5.5-5. Artifacts found at the archaeological site indicate it was visited by man as early as 10,000 B.C. and included 750 projectile points, 11 skeletons, seven fireplaces, and 8,000 pottery fragments

(Yancey, "Dean found...", 1981). Artifacts from the site were turned over to the University of Tennessee and Eastman provided an $11,000 grant to the university to complete studies on the site (Edwards, 1981). A masters' thesis and two papers in the Tennessee Anthropological Newsletter have been written about the site (Faulkner, 1994).

There are several recreational areas located in Kingsport and the surrounding area. Most of these facilities are located within two miles of the proposed project site. Among these are:

- The Kingsport City and some Sullivan County schools, most of which have playgrounds, playing fields, basketball courts, and/or tennis courts.
- Three golf courses - Meadowview, Warriors' Path, and Ridgefields Country Club.
- Netherland Inn and Complex
- The Kingsport city parks, including Bays Mountain Nature Center and Planetarium
- The Exchange Place
- Warriors' Path State Park
- The Eastman ball fields (adjacent to plant site) and recreation area at Bays Mountain.

5.6 Energy Resources

The Eastman site has 24 boilers in four powerhouses that generate steam for process requirements and electricity generation. Twenty-one of the boilers are coal-fired while the remaining three are natural gas-fired. Together they produce an average of 3.4 million lb/hr of steam. Approximately 67%, or 2.3 million lb/hr, of this steam is used for process requirements, such as heating, turbine drives, and vacuum systems.

Eastman generates much of the electricity required for its manufacturing processes, maintenance activities, distribution systems, laboratories, and office areas. Approximately 1.1 million lb/hr of steam is used to generate 120 MW of electricity for the facility. In addition, the facility purchases an average of 11-12 MW from the local power company, Kingsport Power.

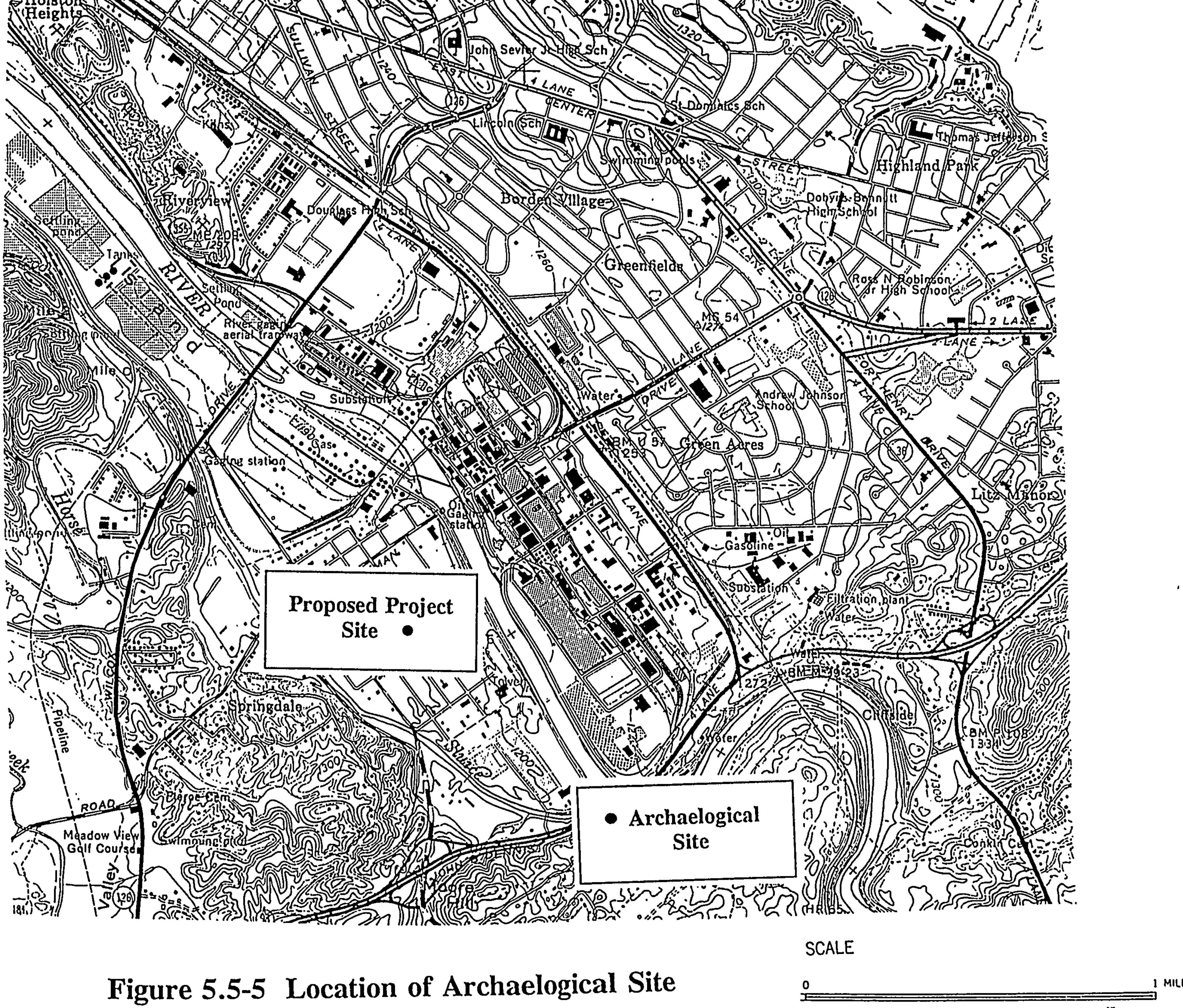


Figure 5.5-5 Location of Archaelogical Site

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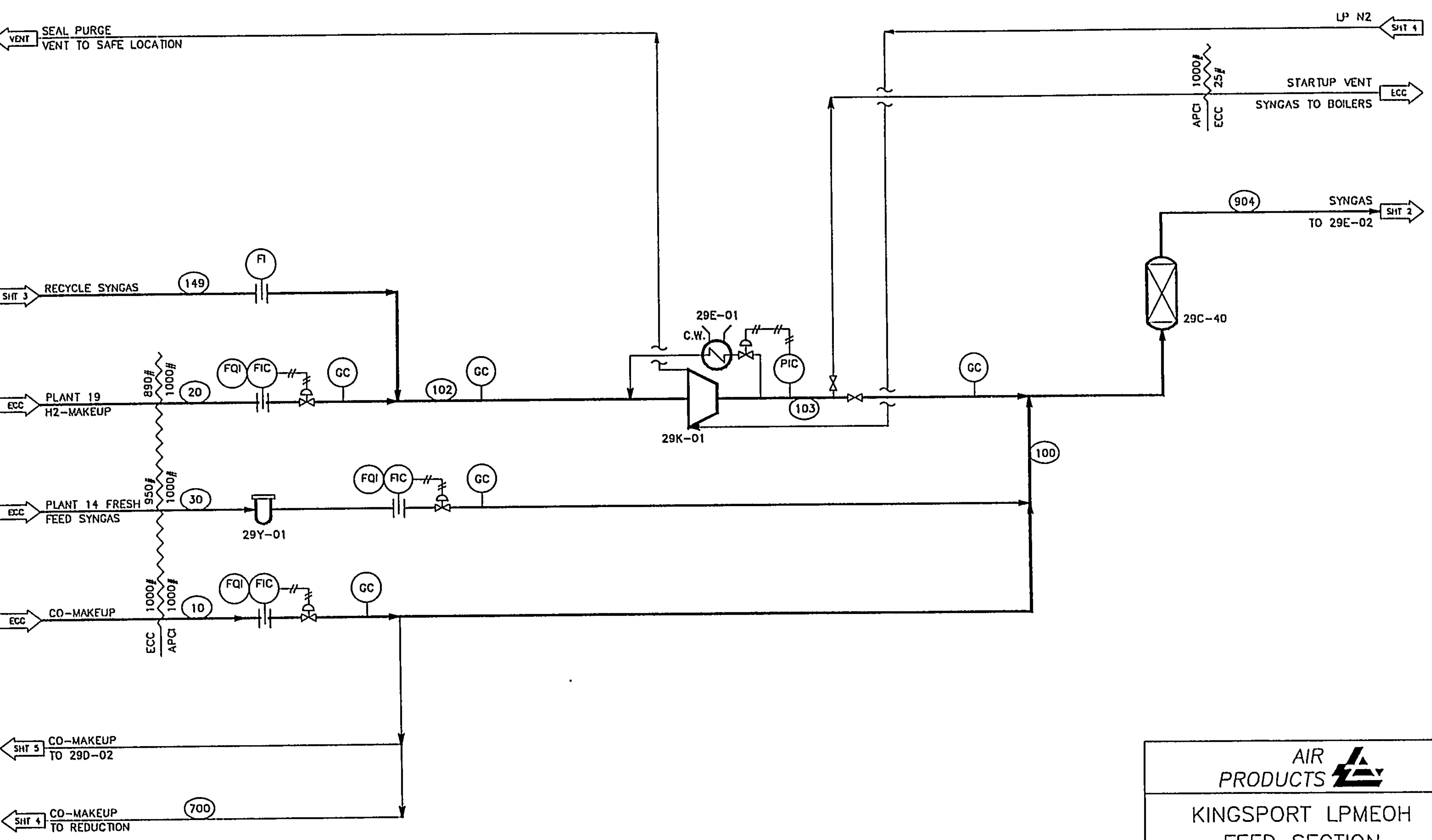
6.0 ENVIRONMENTAL IMPACTS

6.1 Air Resources

6.1.1 Air Pollutant Emissions and Controls

The proposed project would result in very small increases of carbon monoxide gas and of volatile organic emissions with no increases of sulfur dioxide and nitrogen oxides to the atmosphere. The new unit would be integrated into the existing production facility and would benefit from the use of existing air emission control equipment. There would be no changes in emissions from the coal gasification system which supplies the feedstock to the liquid phase methanol unit. The process flow diagram is shown in Figure 6.1-1, and integration with existing Eastman processes is shown in Figure 6.1-2.

The largest emissions from the proposed project consists of purge streams from 29C-03 (H.P. Methanol Separator), 29C-11 (Methanol Stabilizer Reflux Drum), and 29C-21 (Methanol Rectifier Reflux Drum), streams 148 and 211. An intermittent stream will vent periodically from 29C-31 (Reduction Catalyst Accumulator) during catalyst reduction. These streams vent to a waste gas header, where waste gases from various Eastman processes on Long Island are combusted in an on-site boiler. If the proposed project is built, one waste gas stream from the current methanol process would be eliminated and the above mentioned streams would be added to the waste gas header. Changes in the overall waste gas header flow are shown on Table 6.1-1, which shows a percent increase from 3.3% to 21.8%, depending on



NOTE: LOCATION OF 29C-40 GUARD BED IS SUBJECT TO CHANGE PENDING FINAL RESULTS OF FEED STREAM ANALYSIS

9/27/94	JMR/CMC	VES	WRB	TEC	ADB	DPD	GAM	DPB	ECH	JLD
DWG DATE	PROCESS ENGINEER	PROCESS APPROVAL	BUSINESS AREA REPRESENTATIVE	SYSTEMS ENGINEER	PSG TECHNOLOGY	PROJECT ENGINEER	PROCESS CONTROLS	ENGINEERING SAFETY	PRODUCTION & DELIVERY	MACHINERY

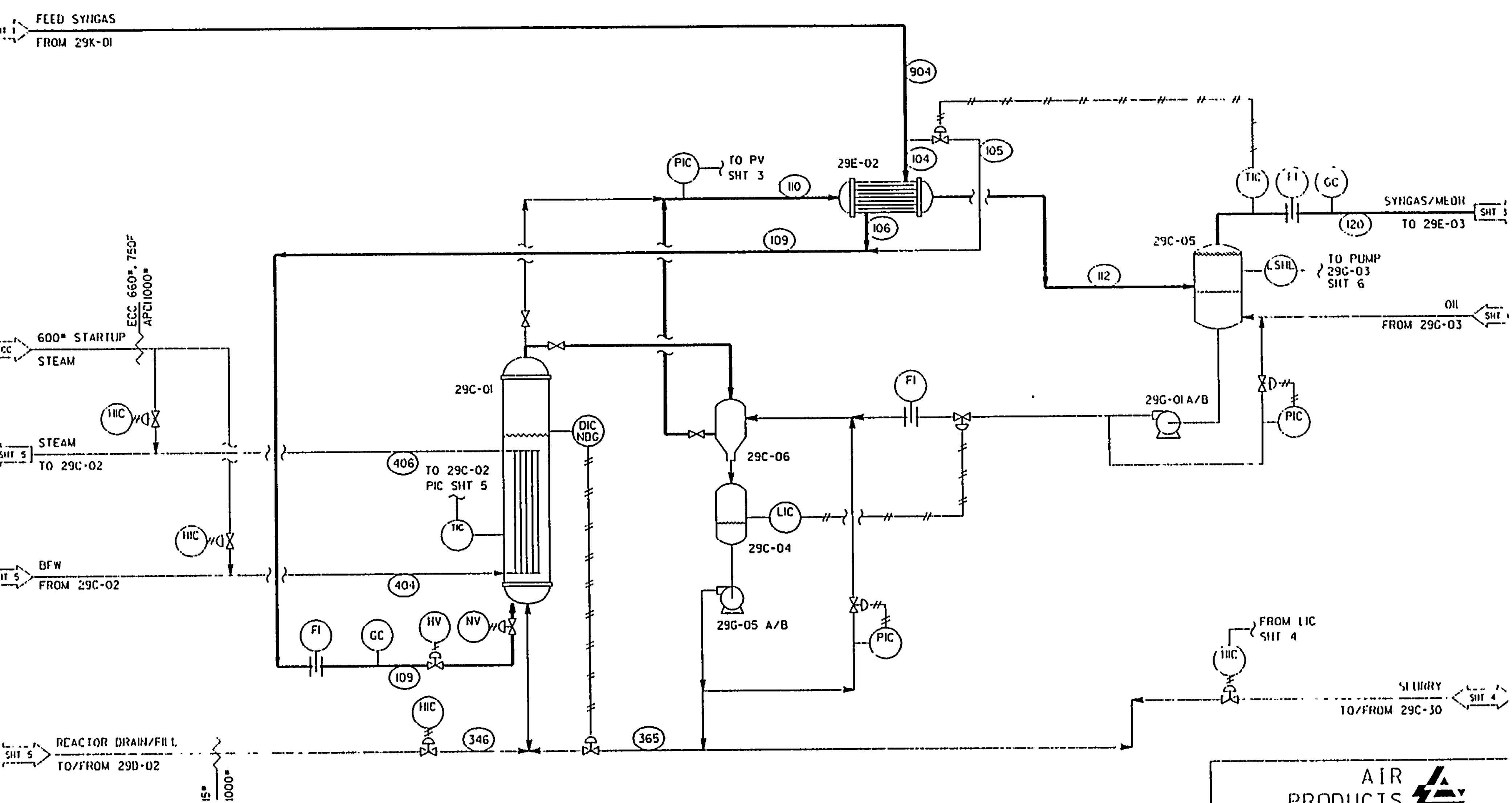
AIR PRODUCTS

KINGSPORT LPMEOH
FEED SECTION

DRG. NO. LPM1 | SHEET NO. 1
00-3-8215 | REV. NO 0*

FIG 6.1-1

Rev 3/8/95



6/16/94	JMR	VES	WRB	TEC	ADB	DPD	GAM	DPB	ECH	JLD
DWG DATE	PROCESS ENGINEER	PROCESS APPROVAL	BUSINESS AREA REPRESENTATIVE	SYSTEMS ENGINEER	PSG TECHNOLOGY	PROJECT ENGINEER	PROCESS CONTROLS	ENGINEERING SAFETY	PRODUCTION & DELIVERY	MACHINERY

AIR PRODUCTS

KINGSPORT LPMEOH
SYNTHESIS SECTION

DRG. NO. LPM2
00-3-8215
SHEET 2
REV. NO. 0

FIG 6.1-1

Rev 3/8/95

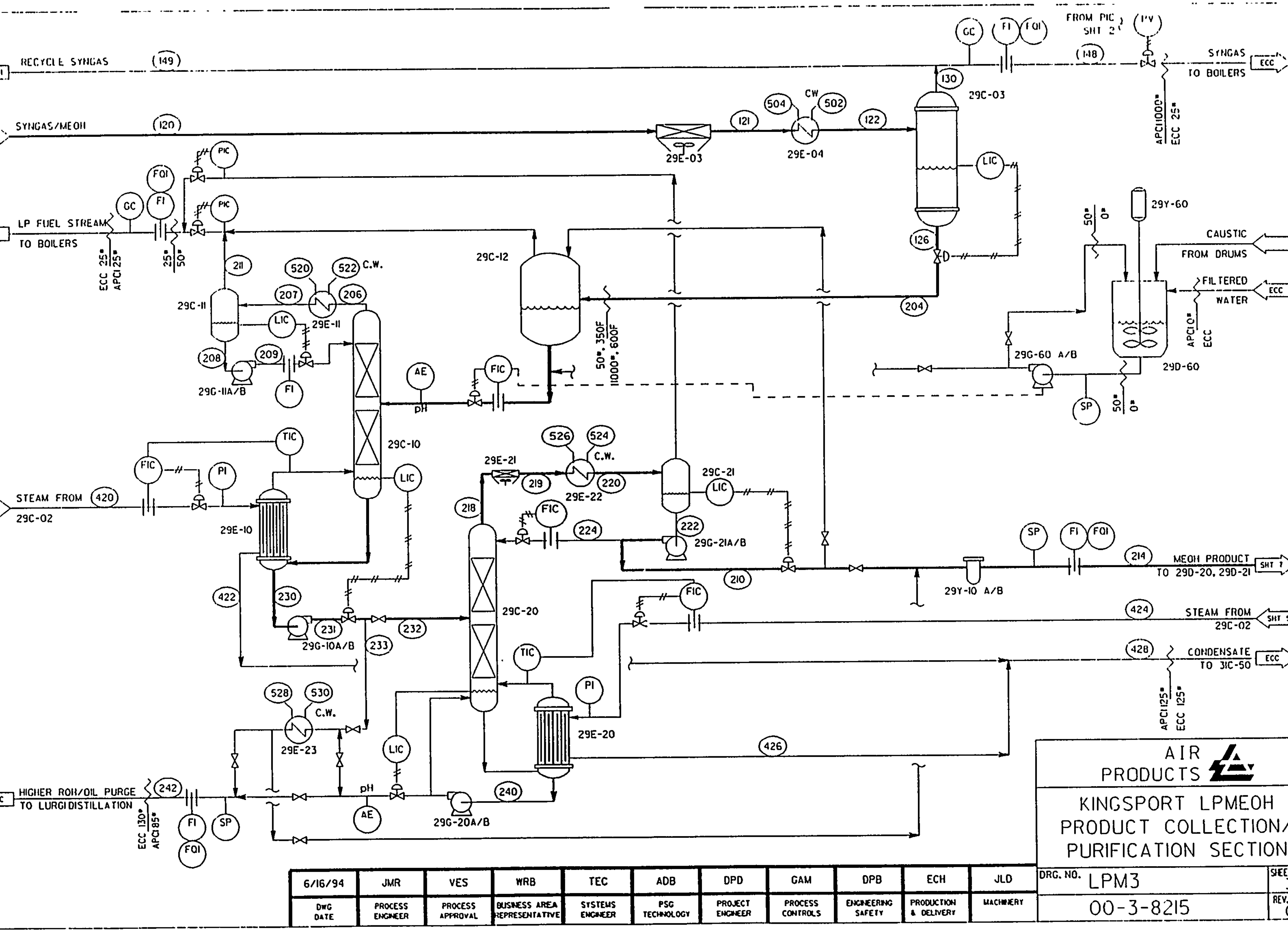
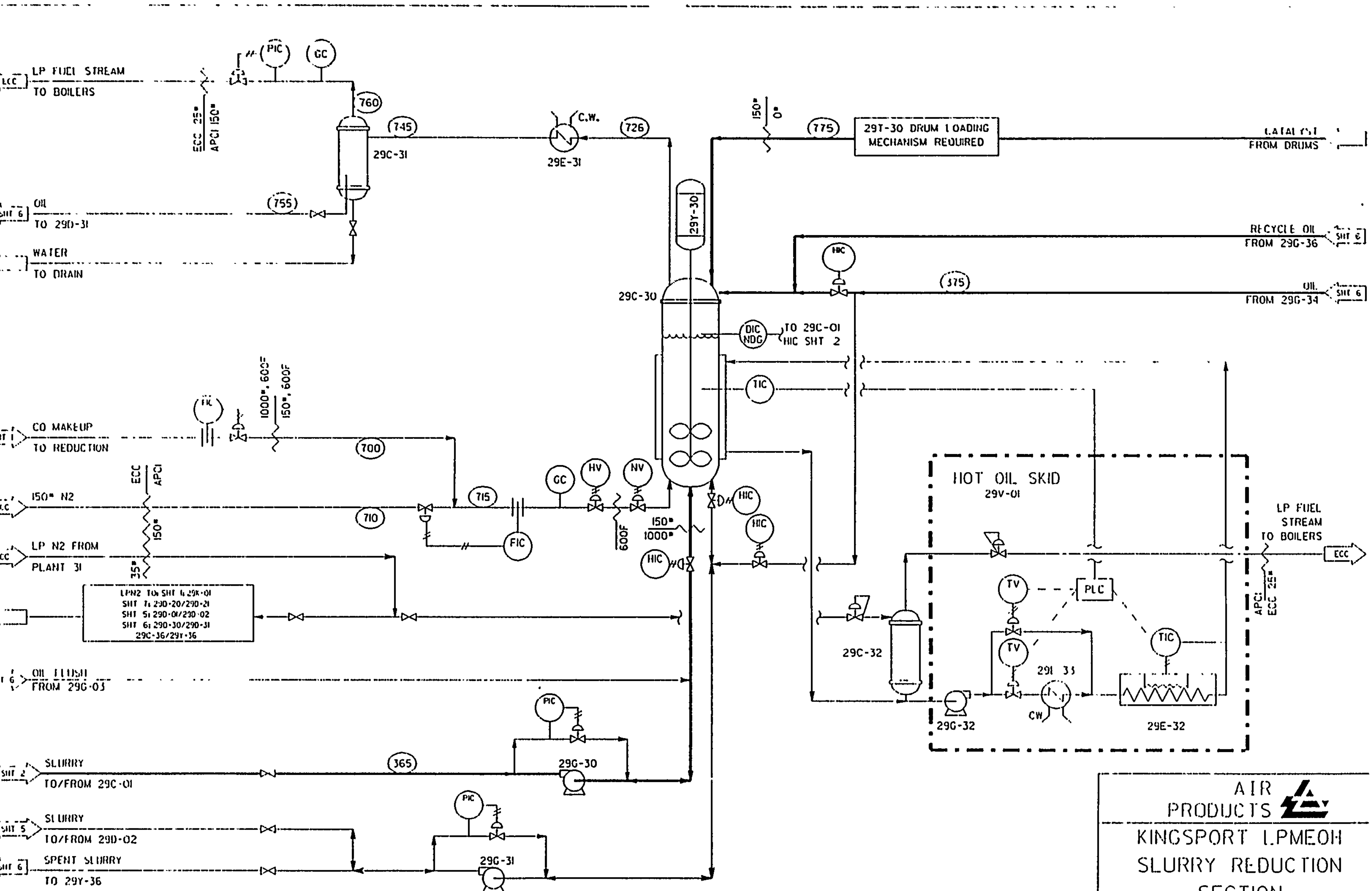


FIG 6.1-1

Rev 3/8/95



6/16/94	JMR	VES	WRB	TEC	ADB	DPD	GAM	DPB	ECH	JLD
DWG DATE	PROCESS ENGINEER	PROCESS APPROVAL	BUSINESS AREA REPRESENTATIVE	SYSTEMS ENGINEER	PSG TECHNOLOGY	PROJECT ENGINEER	PROCESS CONTROLS	ENGINEERING SAFETY	PRODUCTION & DELIVERY	MACHINERY

AIR PRODUCTS

KINGSPORT LPMEOH SLURRY REDUCTION SECTION

DRG. NO. LPM4

00-3-8215

SHEET 4

REV. NO. 0

FIG 6.1-1

Rev 3/8/95

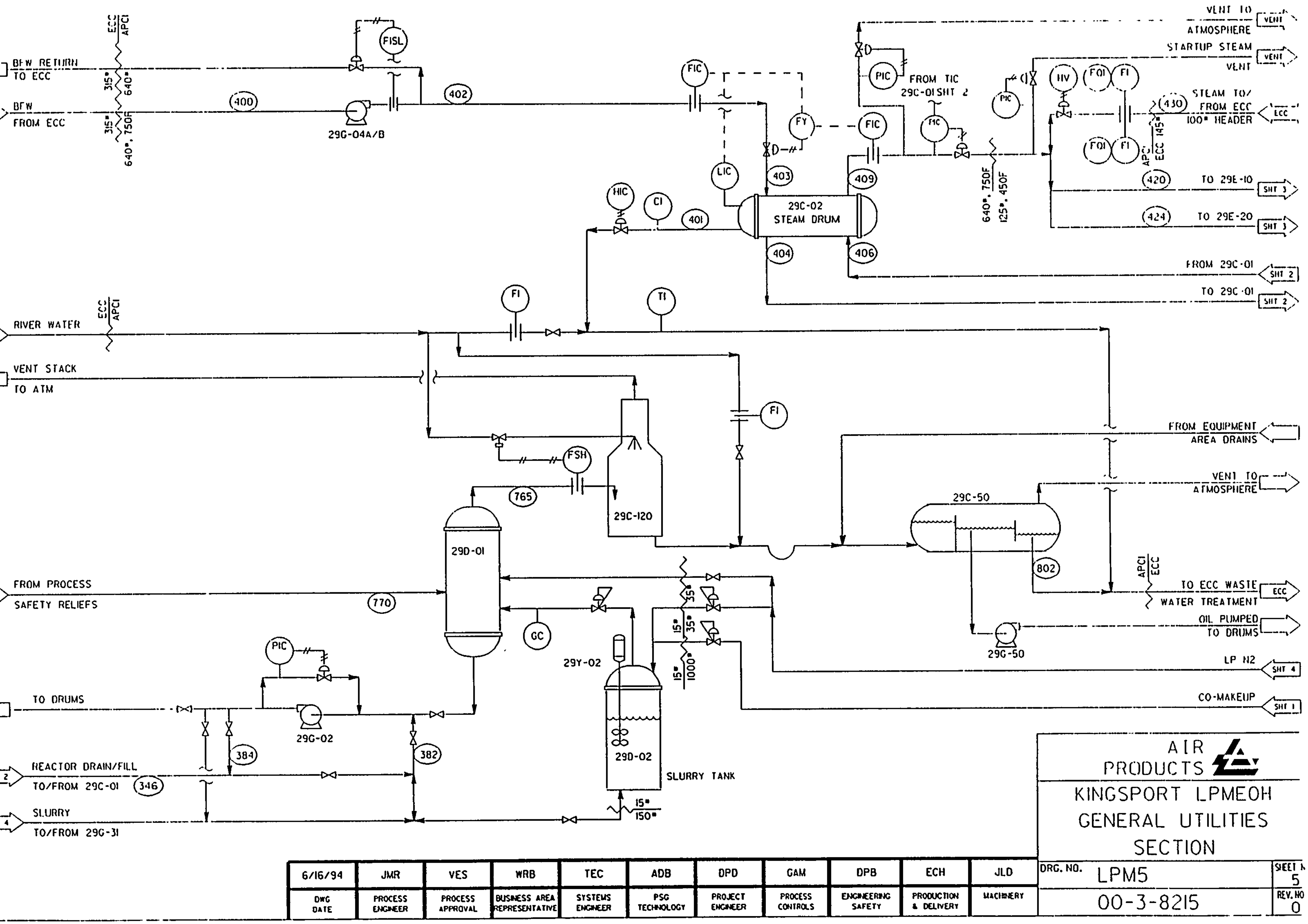


FIG 6.1-1

Rev 3/8/95

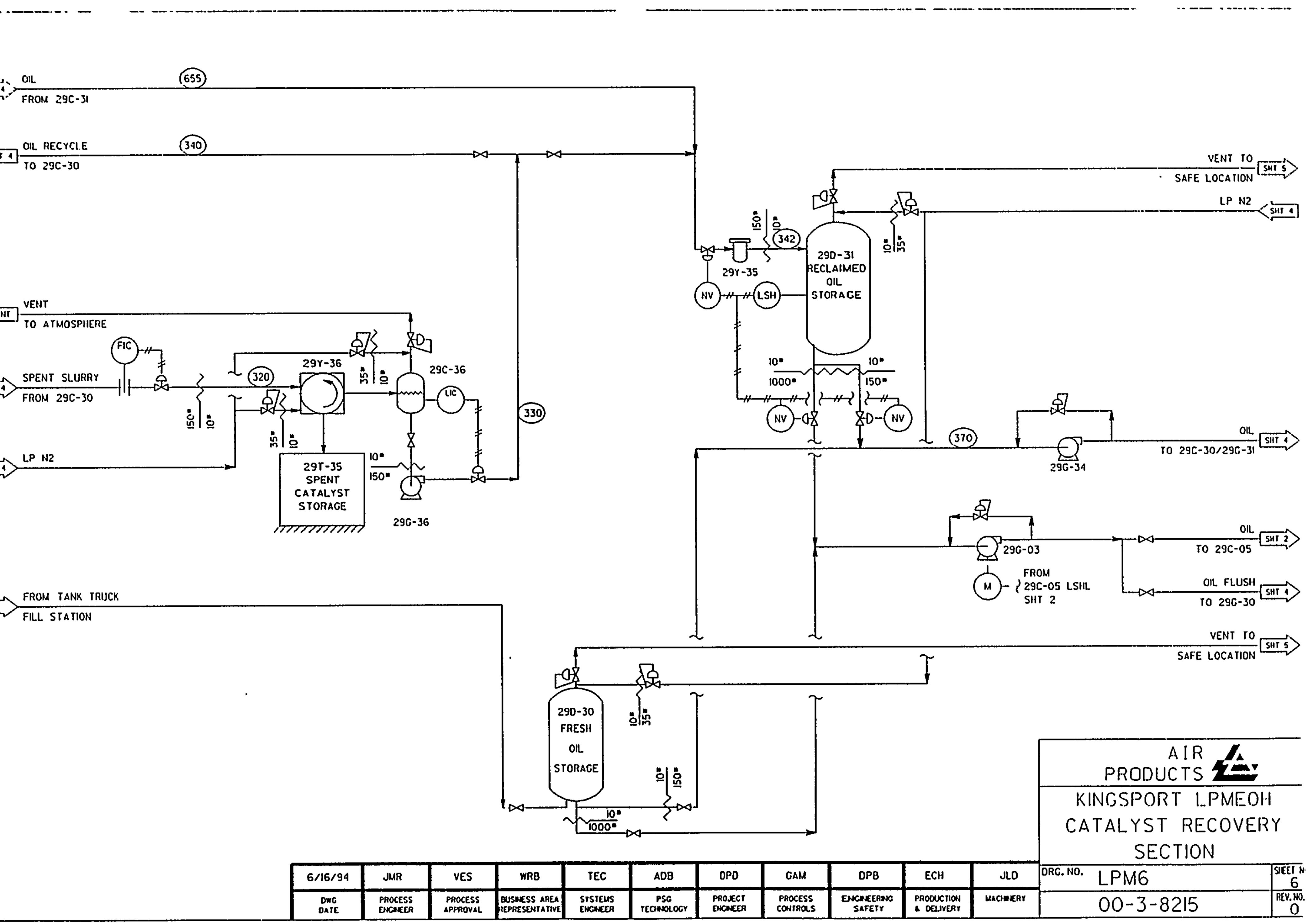


FIG 6.1-1

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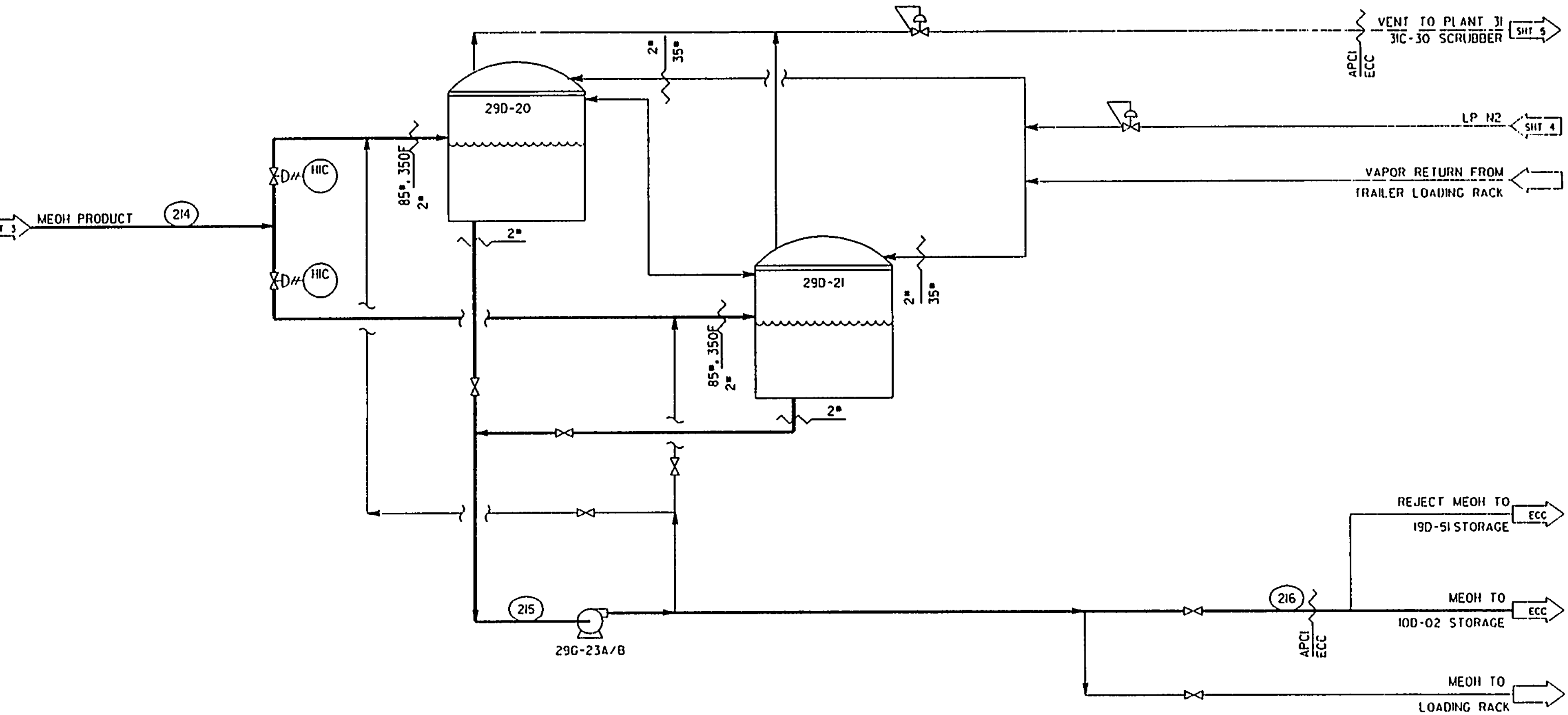

AIR PRODUCTS

KINGSPORT LPMEOH
PRODUCT STORAGE
SECTION

6/16/94	JMR	VES	WRB	TEC	ADB	DPD	GAM	DPB	ECH	JLD	DRG. NO. LPM7	SHEET NO 7
DWG DATE	PROCESS ENGINEER	PROCESS APPROVAL	BUSINESS AREA REPRESENTATIVE	SYSTEMS ENGINEER	PSG TECHNOLOGY	PROJECT ENGINEER	PROCESS CONTROLS	ENGINEERING SAFETY	PRODUCTION & DELIVERY	MACHINERY	00-3-8215	REV. NO. 0

FIG 6.1-1

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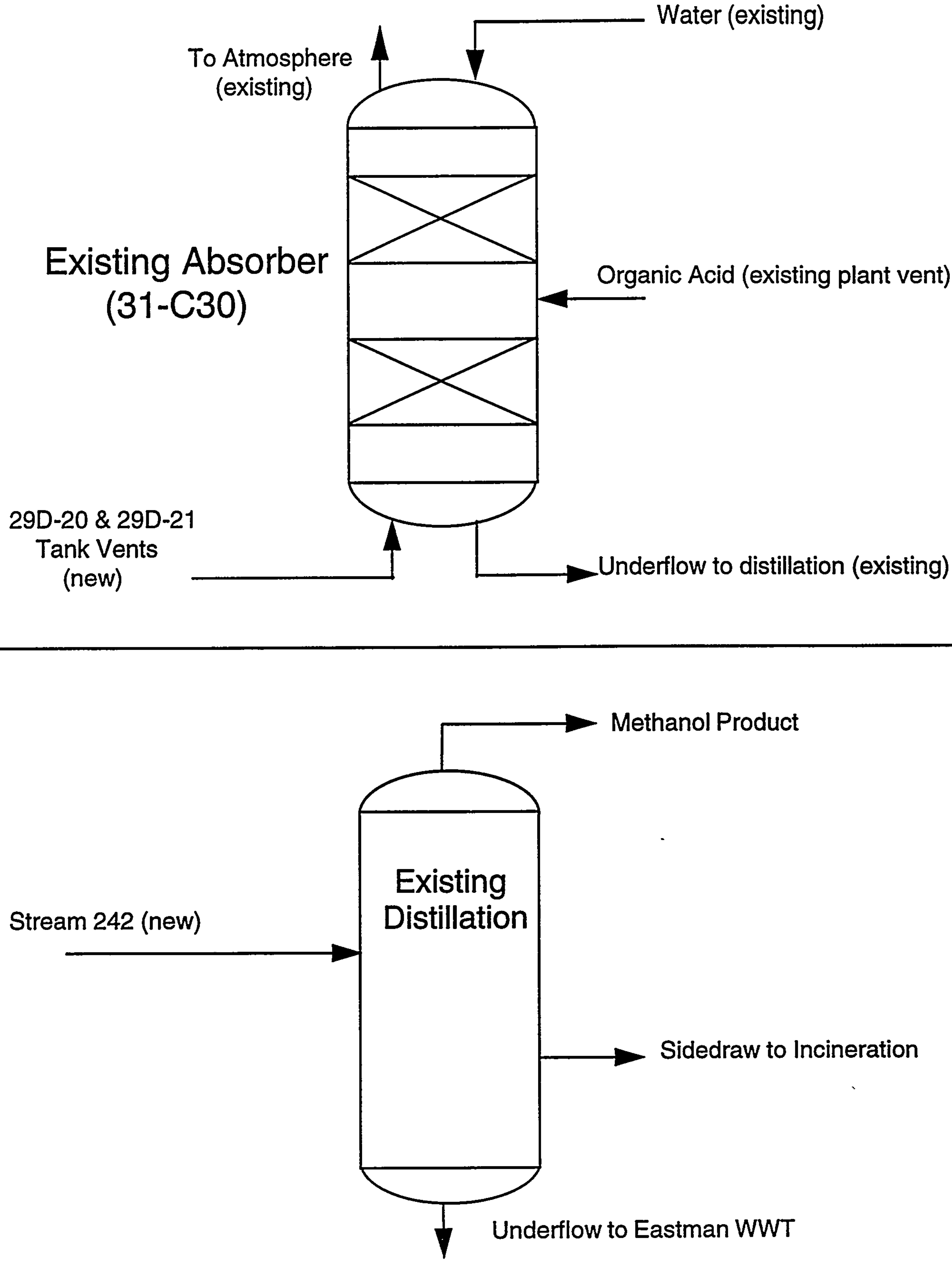

Figure 6.1-2 Integration with Existing Eastman Process

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the conditions and the units compared. In current air regulations (such as New Source Performance Standards), this control strategy of venting gases to an on-site boiler is considered equivalent to controlling emissions by using a thermal oxidizer.

Table 6.1-1. Changes in the Waste Gas Header Stream

	Before LPMEOH™	After LPMEOH™	Percent Change
Waste Gas to boilers			
Calculated maximum, lb/hr	32,327	38,059	+17.7
acfh (40 C, 26 psia)	397,000	410,000	+3.3
Calculated average, lb/hr	12,132	14,785	+21.8
acfh (40 C, 26 psia)	154,000	165,000	+7.1
Permitted waste gas to boilers			
Maximum, acfh	594,000	594,000	0
Average, acfh	489,000	489,000	0

Five storage tanks would be expected to be built for the new demonstration unit. The two methanol storage tanks would be vented through an existing absorber. The three mineral oil tanks would be vented to the atmosphere. The storage tank emissions are shown on Table 6.1-2 and are all volatile organic compounds.

Table 6.1-2. Tank Emissions

Tank	ton/yr	lb/yr
29D-20[1]	.036	72.5
29D-21[1]	.036	72.5
29D-02[2]	<0.005	< 10
29D-30[2]	<0.005	< 10
29D-31[2]	<0.005	< 10

[1] Emissions controlled by existing absorber

[2] Vented to atmosphere

Emissions from the absorber are currently permitted for .526 ton/year of volatile organic compounds and are calculated to increase by .073 tons per year due to the addition of 29D-20 and 29D-21. Because of low volatility of mineral oil, the emissions are negligible from the mineral oil tanks.

Fugitive emissions from the pumps, valves, connectors, compressor seals, and pressure relief devices have been calculated. The emissions estimates are based on stratified emission factors and available equipment leak monitoring data on processes at Eastman's manufacturing facility. The equipment leak emissions estimates are shown on Table 6.1-3.

Table 6.1-3. Equipment Leak Emissions

Pollutant	Current, ton/year[1]	LPMEOH™, ton/year	LPMEOH™, % of current[2]
CO	38.1	2.1	5.5
Volatile Organic Compounds (VOC)	73.1	7.3	10
other[3]	6.3	1.42	6.7
Total	117.5	10.8	8.3

[1] all permitted equipment leak emissions from Eastman manufacturing facilities on Long Island

[2] (LPMEOH™ emissions/ current emissions) * 100%

[3] includes particulates, hydrogen, sulfur compounds and nitrogen compounds

These emissions are estimated to be between 5 and 10% of the current emissions level from manufacturing facilities on Long Island. The VOC emissions include 5.4 ton/year of methanol, which is listed as a hazardous air pollutant (section 112 of the Clean Air Act). These emissions would be minimized by the proper selection of materials and components designed for low levels of chemical leakage. In addition, vapor balancing would be installed in the trailer loading area. Also, equipment leak emissions would be monitored by a leak detection and repair program that will be proposed in the monitoring plan.

6.1.2 Air Quality Impact Analysis

Although dispersion modeling would likely not be required in the permitting process because the CO emissions are well below levels that would trigger a Prevention of Significant Deterioration (PSD) analysis, dispersion modeling techniques have been used to evaluate impacts from the proposed project. The ISCST model was used to predict the one-hour and eight-hour concentrations of carbon monoxide for comparison with the NAAQS.

The ISCST model dated 90436 was downloaded from EPA's electronic bulletin board service. The model was run in the rural mode and with regulatory option selected. Meteorological data collected on-site at the Kingsport facility was used with the model. Eastman measured wind speed, wind direction, temperature, and sigma theta (an estimate of wind speed changes which is used to estimate turbulence) were processed for use in dispersion models by Jim Clary and Associates of Plano, Texas. Upper air data from Nashville were used for mixing height. Hourly surface data from the Tri-City Airport were substituted as necessary for missing on-site data (less than 5% of total met data was not collected on-site).

Modeling was initiated with a 500-meter grid originating at the UTM coordinates 359000 East and 4040500 North. The grid extended 5 kilometers in the easterly and northerly directions with receptors placed at 500-meter intervals. Receptors were not placed within Eastman property boundaries.

The fugitive carbon monoxide emissions are modeled as a point source having no upward momentum and ambient temperature. Source height is assumed to be 10 feet above ground level. Emission parameters are given in Table 6.1-4.

The predicted concentrations, which are listed in Table 6.1-5, are less than 1% of the NAAQS. The maximum predicted one-hour concentration is 155 μg/m^3, which represents an increase that is very small compared with the one-hour standard of 40,000 μg/m^3. The maximum predicted eight-hour concentration increase is 25 μg/m^3, which is compared with the standard of 10,000 μg/m^3.

The predicted concentrations are added to monitored concentrations for an analysis of total air quality impact. These numbers show that the predicted maximum one-hour concentration would be 8,320 μg/m^3, and the eight-hour concentration would be 5,582 μg/m^3.

6.1.3 Fugitive Dust Analysis

Proposed construction activities may result in the generation of some fugitive dust. These emissions are expected to be minimal. The construction would not involve moving large quantities of earth. The site is less than an acre in size and would not require recontouring.

The site has a gravel cover and precautions would be taken to eliminate dust generation such as watering. Support caissons would be drilled and there would be shallow excavations for building foundations, but no other earth moving activities would occur.

Construction is projected to last 14 months. Post construction activities are not expected to generate fugitive dust.

Table 6.1-4. Carbon Monoxide Source Characteristics for Dispersion Modeling Analysis

Source	Location		Height m	Dia. m	Velocity m/s	Temp °F
	UTM-E	UTM-N				
Fugitives	361470	4042380	3.04	0.01	0.01	293

Table 6.1-5. Carbon Monoxide Dispersion Modeling Results

Averaging Interval	Modeled Concentration μg/m^3	Monitored Concentration μg/m^3	Total Concentration μg/m^3	NAAQS μg/m^3
1 hour	155	8,165	8,320	40,000
8 hour	25	5,557	5,582	10,000

6.2 Earth Resources

6.2.1 Construction Related Impacts

The proposed construction site would be a 0.6 acre plot within the existing 1,046 acre Eastman manufacturing complex. The proposed site has already been leveled, graded and backfilled with approximately six feet of compacted shale and a six-inch gravel cover. In addition, there is no vegetation on the proposed site area. Any soil disturbance during construction would be limited to drilling for caissons and shallow excavation for the building and equipment foundations. Soil from these excavations would be removed as it is produced so as to protect the existing gravel cover and to minimize the potential for soil erosion. If needed, existing storm drains would be sand-bagged to prevent sediment loss.

Since the plot is level and has a gravel cover, no other construction related impacts on physiography, geology or soils are anticipated.

6.2.2 Operational Impacts

Following construction activities, the operation and maintenance of the proposed project is not expected to affect any existing earth resources.

The existing gravel cover would remain and paved access roads would be constructed. Accidental discharge control would be managed through a variety of constructed features. All process areas would be built over concrete pads with curbing. The curbed areas would drain to the Eastman interceptor sewer, which transports process wastewater to an industrial wastewater treatment system.

Methanol day tanks would be placed in diked areas with a gravel cover. All oil tanks would be constructed over concrete pads in diked areas. Drainage from all diked areas would be connected to the interceptor sewer.

6.3 Water Resources

6.3.1 Construction Related Impacts

Construction of the proposed project is not expected to impact existing surface water or groundwater resources. The proposed site has already been leveled, graded and backfilled with compacted shale and a gravel cover. The potential for soil erosion and impacts on surface water would be minimized by removing cuttings from caisson excavations as they are produced and, if needed, by sand-bagging existing storm drains. The first phase of construction, following the placement of caissons, would be the pouring of concrete pads and curbing with drains to the interceptor (wastewater) sewer system. Once the pads are in place, any precipitation falling on the process, materials handling and storage areas would be collected and routed to the wastewater treatment plant by the interceptor sewer system.

6.3.2 Operational Impacts

Potential impacts on surface water or groundwater due to the operation of the proposed facility are related to water used for cooling, process wastewater and stormwater runoff.

STORMWATER FLOWS
LPMEOH™

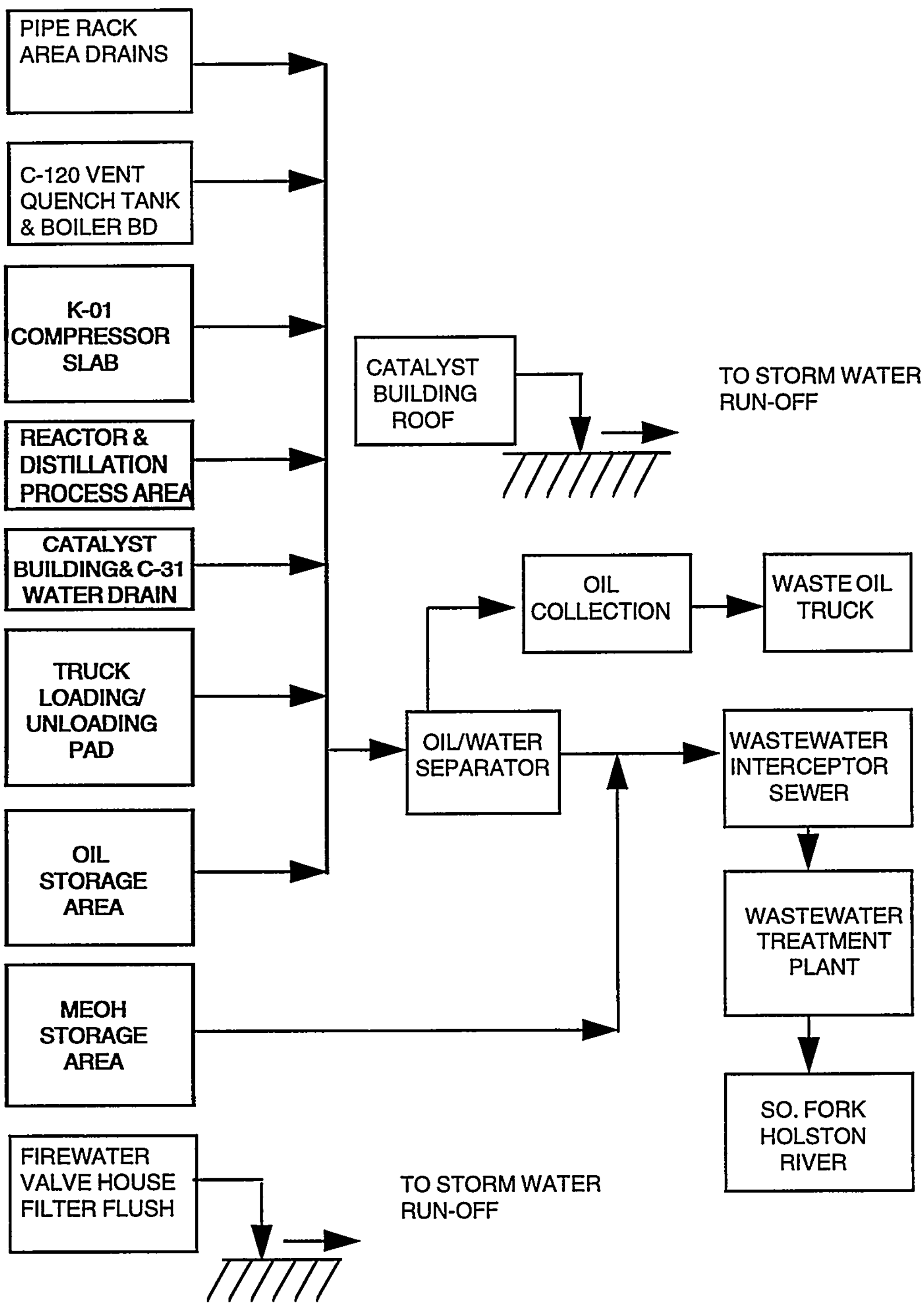

FIGURE 6.3-1 LPMEOH STORM WATER RUN OFF FSF 8/7/96

Stormwater runoff from the proposed demonstration unit is not expected to have any effect on surface water or groundwater resources. Runoff in areas unaffected by the manufacturing operation would be collected by an existing stormwater drainage system and routed to the South Fork Holston River. Areas potentially influenced by manufacturing would have collection systems for precipitation routed to an oil/water separator before discharge to Eastman's wastewater treatment system. These areas include process areas, the catalyst building, oil tank truck unloading pad, methanol storage area and the oil storage area. A schematic diagram of this collection system is provided in Figure 6.3-1.

The process flow diagram and integration with Eastman processes are shown in Figures 6.1-1 and 6.1-2. The underflow from 29E-20, stream 230, will be sent to the distillation system in the existing methanol process, also shown in the process flow diagram. Currently, the underflow from the existing distillation process is discharged to Eastman's wastewater treatment system. Distillation of stream 230 is expected to increase Biochemical Oxygen Demand (BOD) from this underflow by 27.2 lb/hr or 4180 lb/day and the total flow by 0.8 gpm or 0.00115 million gallons per day (MGD). Eastman's wastewater treatment system treats wastewater by neutralization, grit removal, equalization, activated sludge and final clarification prior to discharge to the South Fork Holston River. During 1993, Eastman's wastewater treatment facility operated in 100 percent compliance with a discharge permit issued by the State of Tennessee. The most recent data compilation on flow and BOD shows that on average the facility receives 23 MGD with a BOD content averaging 155,000 lb/day with a range of 82,000 to 378,000 lb/day.

The proposed demonstration unit is projected to contribute 0.42 percent of the existing average BOD load to the treatment plant and 0.005 percent of the flow. These discharges would not have any affect on the treatment plant or on the quality of its discharge to the South Fork Holston River.

Likewise, cooling water discharges from the proposed demonstration unit are expected to be small, totaling 8,000 gal/day of cooling tower blowdown or 0.002 percent of the current Eastman capacity for cooling water discharge to the South Fork Holston River. The blowdown will discharge from a permitted outfall; consequently, no adverse effect from these discharges is anticipated.

6.4 Management of Waste Generated

6.4.1 Construction Waste

The largest waste generated during construction will be miscellaneous construction debris. Although difficult to quantify and highly variable, it is estimated that 3,000 to 5,000 cubic yards of waste will be generated. This type of waste is generated managed regularly at Eastman. The primary disposal option is the non-hazardous on-site landfill (see Chapter 7 for further discussion).

6.4.2 Operational Wastes

Several waste streams will be generated during operation of the proposed demonstration unit.

One new liquid waste stream would be expected for the proposed demonstration unit. Miscellaneous waste oils will be managed through energy recovery in on-site boilers permitted to burn waste liquids. The primary source of waste oils is expected to be an oil/water separator. The separator is planned as a pretreatment step for stormwater runoff collected from the facility prior to discharge to the interceptor sewer. Secondary sources are oils and lubricants generated through maintenance activities. Initial estimates for this stream are 13,000 lb/yr.

An existing liquid waste stream will be increased. The existing distillation system used for further separation of stream 230 has a sidedraw used for purging of impurities. This stream is managed through energy recovery in on-site boilers. The increase in this stream is estimated to be 42.2 lb/hr or 324,000 lb/yr.

Two solid waste streams are expected for the proposed demonstration unit. The first is the spent methanol catalyst from 29T-35. This stream is a cake of the catalyst (which contains zinc, aluminum, and copper) wet with the oil used in the process. Estimates of this waste stream are currently at 68,000 lb/yr. The stream would be generated weekly, biweekly, or monthly. Management of this waste may include a number of options. Emphasis would be placed on recycling and re-use. Air Products is currently looking for a metals reclaimer to recycle the catalyst. The second and less desirable option would be incineration in Eastman's on-site incineration facility with residual ash disposal in a permitted hazardous waste disposal facility (see Chapter 7 for further discussion on these facilities).

The second solid waste stream would be activated carbon-carbonyl adsorbent from the guard beds, 29C-40A/B. This stream would be generated on a semiannual or annual frequency and is expected to be 10,000 lb/yr. If possible, the carbon would be regenerated and reused. Alternate options include disposal through incineration.

The proposed unit will be designed to produce 260 ton/day of methanol, which equals 520,000 lb/day or 166,400,000 lb/yr (assuming 320 day/yr operation). The total quantity of the wastes mentioned in this section is 416,000 lb/yr or 0.25% of the production. This is also 0.29% of the amount of wastes incinerated at Eastman in 1992. These waste streams are typical of wastes already being managed successfully at Eastman. No adverse environmental impacts would be anticipated due to the management of wastes from the proposed project.

6.5 Ecology

The construction and operation of the proposed project is not expected to have any impact on the local ecology. No unusual ecological resources have been identified at the project site. The proposed site, currently inside the industrial complex and idle, is filled and gravelled, with no vegetative growth. There are no state or federal threatened or endangered species known to be present at the proposed site, nor is the proposed site the habitat of any such species. The 0.6 acre parcel would be altered as a result of the development of the proposed plant, but this action should not be significant for ecological reasons.

A letter has been received from the U.S. Fish and Wildlife Service (USFWS). This letter states the USFWS anticipates no project-related adverse impacts to wetland resources or to listed or proposed threatened or endangered plant or animal species. The letter also states that the review requirements of Section 7 of the

Endangered Species Act have been fulfilled. A copy of this letter is located in Appendix V.

6.6 Community Resources

6.6.1 Land Use

The proposed project would use approximately 0.6 acre for a methanol demonstration unit. This demonstration unit would be located next to other chemical manufacturing plants, one of which is also a methanol unit. The proposed project site has been owned by Eastman since 1941 and has been prepared in anticipation of locating a chemical manufacturing plant on the site. Use of the land for the proposed project would be consistent with the surrounding Eastman facility and with its expected future use.

6.6.2 Zoning

The proposed project site would be located in an area which is zoned Heavy Industrial by the government of Sullivan County, TN. The portion of Eastman which lies within the Kingsport city limits is zoned General Industrial. The proposed project would not impact current zoning designations.

6.6.3 Socioeconomics

The capital expenditure, approximately $30 million, would be a large capital project for Eastman and would have a positive influence on the employees of Eastman and the local contract employees that work on the capital project. It is estimated that between 50 and 150 jobs (mostly local) would be required during construction and startup, and that 10 jobs would be required during operation of the facility. According to present figures, approximately $130 million would be spent during the four-year demonstration period in operating expenditures. Operating expenditures pay for items such as raw materials, utilities, catalysts, solvents, insurance, operation and maintenance labor, and replacement parts. Although difficult to quantify the benefit, this project would nonetheless have a positive effect on the maintenance and operations labor, providers of replacement parts, and suppliers of raw materials (e.g., coal from southwest Virginia and Kentucky), catalyst, and solvents. Naturally, those benefited by the project would pass those benefits on to their workers and suppliers, which in turn would have a beneficial effect on the local economy.

Another socioeconomic consideration is a movement that has recently surfaced called environmental justice or environmental equity. It is reportedly the opinion of minority groups (and under discussion at EPA) that releases of toxics tend to be concentrated in areas where poor and/or minority populations occur. Whether this theory has merit in other areas, it does not apply for Eastman or the Kingsport area. Based on income, minority population, and the stake Eastman has in Kingsport and northeast Tennessee region, concerns about environmental equity are unfounded based on Eastman's work to become a good neighbor to the citizens of Kingsport environmentally. Employees of Eastman naturally have concerns about Eastman's impacts on the surrounding community because 91% of Eastman's Kingsport-based workforce lives in Sullivan County or the counties immediately surrounding Sullivan County (Washington and Hawkins County, TN and Scott County, VA). Among the actions done by Eastman and Air Products to become better neighbors to the surrounding community are:

1. Participation in the Chemical Manufacturers Association's Responsible Care® Program

Each of this program's ten guiding principles help CMA's member companies to be better neighbors. The guiding principles and a copy of Eastman's 1993 Responsible Care® Progress Report and Air Products' report on environmental, health, and safety policy are included in Appendix VI.

2. Participation in EPA's 33/50 program

The 33/50 program is a voluntary program which participating companies commit to meet total (air, water, solid) emissions reduction goals for 17 specific compounds. Currently, Eastman is scheduled to meet the 50% reduction goal by 1995.

3. Establishment of a Community Advisory Panel

This panel, established in 1990 by Eastman, meets every other month to discuss Eastman's impact on the local community and Eastman's communication with the surrounding community. The panel has members of environmental/conservation groups, the business community, local government, and neighbors. Activities done at past Community Advisory Panel meetings include tours of Eastman facilities, progress reports on specific projects, and assessing Eastman communication with the surrounding community. An agenda and follow-up letter for the March 14, 1994 meeting are also included in Appendix VI.

4. Establishment of phone number so the general public may register concerns or complaints

The phone number, 229-CARE, was established in 1991 to provide the general public with an avenue to register complaints or ask about Eastman operations.

Phone calls received range from concerns about health, safety, and environmental issues and requests for environmental reports and tours to questions about the plants in flower beds around the plant.

5. Monitoring of Eastman impacts on the South Fork of the Holston River

Eastman has funded extensive river studies by the Philadelphia Academy of Natural Sciences. The latest study was completed in 1990 and results clearly show decreasing impacts from Eastman and other dischargers along the South Fork of the Holston.

Table 6.6-1 shows information comparing Sullivan County and Kingsport with the nation and Tennessee.

Table 6.6-1. Comparison of the Nation, Tennessee, Sullivan County, and Kingsport

Parameter	National Average	Tennessee Average	Sullivan County	Kingsport
% minority in population	19.7[1]	17.0[1]	2.1[2]	5.7[2]
per capita income[3]	$19,091	$16,478	$16,583	NA

[1] Famighetti, 1993.

[2] Tennessee Community Data, October, 1993.

[3] Ray, 1994.

The Sullivan County and Kingsport minority population percentage is much less than the national average. Although the Sullivan County per capita income is lower than the nation's, it is slightly higher than the Tennessee state per capita income.

6.6.4 Transportation

Construction of the LPMEOH™ demonstration unit would require a maximum of 150 construction workers to be onsite. With over 12,000 total parking spaces at the Eastman facility and slightly over 10,000 total employees on site on a given day, parking facilities are sufficient to handle additional vehicles from these employees.

Additional workers would park on Long Island, which is served by 1.5-mile, 4-lane Jared Drive. The southeast end of Jared Drive turns into Moreland Drive, another 4-lane road, and intersects with State Road 93 (John B. Dennis Hwy.). The northwest end of Jared Drive intersects with State Road 126 (Wilcox Dr.) and Riverport Road. The Sullivan County Highway Dept. foresees no significant impacts of this additional traffic (Ref. 1).

During operation of the demonstration unit, no more than ten workers are required to operate the demonstration unit. Consequently, minimal traffic impacts would occur due to additional operations employee traffic.

Another potentially significant transportation-related impact would be the additional tanker truck traffic for shipping the product to Acurex for fuel testing. Currently, it is estimated that 400,000 gallons of product would be shipped for off-site fuel testing. This translates into approximately 70 tanker truck loads over a one-year period. Currently, the department responsible for loading the tanker trucks handles between 35 and 50 tanker truck loads each day. This additional traffic is not expected to have any significant impacts.

6.6.5 Noise

Increased noise would result during the construction phase from equipment, machinery, and vehicle operations. The nearest resident is about 260 feet from the proposed site and the nearest Eastman perimeter monitoring site is about 500 feet from the proposed site. During operations, the loudest known noise source would be a recycle synthesis gas compressor to be purchased with a noise specification of no more than 85 dBA at 3 feet. This would calculate to a noise level of less than 50 dBA at the nearest residence and less than 45 dBA at the perimeter monitoring site. To put this into perspective, listening to a TV 10 feet away has an equivalent sound level of 55-60 dBA. This would not add to the existing perimeter noise levels at

Eastman. Tests will be conducted and appropriate sound abaitment provided to assure the noise level specified is not exceeded.

6.6.6 Visual Resources

The proposed project would not impact visual resources for the following reasons:

1. Many manufacturing industries are located in the area around Eastman. Manufacturing is common to Kingsport and is not inconsistent with the surrounding area.

2. The proposed project site would occupy 0.6 acre in a 1,000+ acre manufacturing facility. Therefore, it is expected to be insignificant compared with the remainder of the Eastman facility.

3. Structures for the proposed project would be similarly designed, constructed, and equal to or smaller in size than the structures currently around the proposed site.

6.6.7 Cultural Resources

According to a letter from the Tennessee State Historical Commission, dated March 13, 1994, the project "...will have no effect on the characteristics of the Long Island of the Holston which qualified the property for inclusion in the National Register of Historic Places." This letter, which is evidence of compliance with Section 106 of the National Historic Preservation Act, is included in Appendix V.

6.7 Energy Resources

Maximum steam usage of the proposed project, expected only during startups, would be between 35,000 and 40,000 lb/hr. Given the current steam production and capacity (about 3.4 million lb/hr), this would be a relatively insignificant use of steam, and no adverse effects on the steam system are expected.

Maximum electricity usage of the proposed project would be approximately 650 KW, with the average use being one-third of the maximum. Current electricity usage at Eastman's facilities is about 200 times this maximum, so again the use would be insignificant, no adverse effects on the Eastman facility's electrical system are expected.

6.8 Biodiversity

Biodiversity as it pertains to environmental protection considers the value of species and genetic diversity to the well being of the planet. Loss of biological diversity is thought to be harmful not only to the planet's ecological systems but to the existence of human life and the economic systems upon which it depends.

As has been discussed in this document, the proposed project would be built on developed property within an existing manufacturing complex. The infrastructure is in place to manage by-product streams through recycling, recovery, treatment and disposal in a way that minimizes any impacts on the local environment. Local effects on air, earth and water resources are expected to be insignificant and no impacts on existing aquatic and terrestrial wildlife are anticipated. Therefore, on a local level, no impacts on biodiversity are projected.

On a more global perspective, this project would be expected to demonstrate a commercial production process for the manufacture of clean fuel for automobiles, trucks, and electric power generating plants. Successful development and use of this fuel source would result in improved air quality and could conceivably result in maintaining or improving biodiversity by making conditions more favorable for species of life adversely impacted by pollutants released during combustion of standard fuels.

6.9 Pollution Prevention

Pollution prevention refers to reducing emissions to the environment as well as reducing the toxicity of emissions. The hierarchy established in the Pollution Prevention Act of 1990 is first to reduce emissions at the source through process changes or material substitution. Second is to recycle or reuse potential waste streams. Once options using the first two strategies have been exhausted, the third approach is to treat the waste stream. Finally disposal of any residual is the last approach on the hierarchy.

Eastman and Air Products are members of the Chemical Manufacturers Association and have initiated the Responsible Care® program. One of the many aspects of this program is pollution prevention.

The proposed action incorporates many pollution prevention principles. Among these are as follows.

- It would demonstrate the use of methanol as a fuel. Oxygenated fuels burn cleaner, thereby reducing air emissions from mobile and stationary sources.

- Integration of the LPMEOH™ process into an IGCC plant would provide a low-NOx, low-particulate combustion turbine/generator fuel while recovering sulfur, which would normally be emitted as SO_2 or as a component of the waste stream of an acid gas removal system.

- The mineral oil catalyst system provides better control of catalyst temperatures. Diluting the feed gas for temperature control would not be necessary. With better temperature control, process stability would be greater, resulting in less off-spec product and lower waste production.

- Heat liberated during the reaction would be used to make steam.

- The crude methanol product after reaction and condensation will be 96 to 97 weight % methanol. This is higher than the crude methanol product at a similar point in other methanol production processes; for example, the purity in the Lurgi process averages 92%.

- Unreacted gas from the process would be used as fuel for existing boilers.

- In addition, pollution prevention opportunities would be evaluated and implemented after operation of the facility has commenced.

6.10 Cumulative Impacts

6.10.1 Short-term Use of Environment

At present the proposed project site is used for short-term storage of equipment used in the operations or maintenance activities of the surrounding manufacturing areas. However, the site has been prepared for construction of a chemical production process and would most likely be used in the future for a separate production process or for expansion of an existing process in the event the proposed project is not built. The use of this site for the proposed project is consistent with the plans for the site and with the surrounding area.

6.10.2 Impact on Long-term Environmental Productivity

No significant impacts from the proposed project have been found. Air emissions from the project represent only a slight increase over those from the surrounding Eastman facility, and modeled ambient concentrations are well below significance levels. In addition, air emissions will be controlled by the use of an on-site boiler for purged gas streams, an existing absorber for storage tank emissions, and a leak detection and repair program for equipment leak emissions. BOD load to the Eastman wastewater treatment facility would increase, but the facility has enough capacity to treat this additional load. Current disposal facilities are sufficient to handle solid wastes from the proposed project without significant impacts. The proposed project is not expected to have significant impacts on the surrounding area in the long-term.

The proposed project has the potential to aid in the commercialization of a methanol production process. This process could be built into an IGCC power plant and the methanol used for the production of electricity. The process could also be used to produce methanol for automobiles, trucks, buses, and other mobile sources. Methanol is a clean-burning fuel; consequently, the proposed project could have a long-term impact in the reduction of emissions from power plants and mobile sources and has the potential for significant environmental benefits.

REFERENCES

Section 6.1

U.S. Environmental Protection Agency. "Guideline on Air Quality Models (Revised)." EPA-450/2-78-027R. Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, NC. 1986.

U.S. Environmental Protection Agency. "Industrial Source Complex (ISC) Dispersion Model User's Guide. Second Edition. Volume I and II (Revised)." EPA-450/4-88-002a,b. Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, NC. 1987.

Section 6.6.3

Famighetti, R. The World Almanac and Book of Facts, 1994. New York: St. Martin's Press, 1993.

"Tennessee Community Data, Kingsport, TN. October 1993." Tennessee Department of Economic and Community Development, Industrial Development Division, Blountville, TN.

Personal communication with Ken Ray, First Tennessee Development District, January 28, 1994.

Section 6.6.4

Personal communication with John R. LeSueur, Assistant Commissioner of Roads, Sullivan County Highway Department.

7.0 REGULATORY ENVIRONMENTAL REQUIREMENTS

7.1 Air Regulations

Pieces of process equipment are referenced in this section. The equipment can be found on the process flow diagram and Integration with Existing Eastman Process, Figure 6.1-1 and Figure 6.1-2, respectively.

7.1.1 Construction Permits

Not less than 90 days prior to the estimated starting date of construction on the proposed air contaminant source (the proposed project), a construction permit must be applied for, as required by the Tennessee Air Pollution Control Regulations, Rule 1200-3-9-.01. Fabrication, erection, or installation of the proposed air contaminant stationary source must not be undertaken until the construction permit has been received from the Tennessee Division of Air Pollution Control (TDAPC).

7.1.2 Operating Permits

Following receipt of the permit, and after completion of construction of the source, operation can begin. Within 30 days after startup, an operating permit application must be submitted as required by Tennessee Air Pollution Control Regulations, Rule 1200-3-9-.02(3)(b)(1).

7.1.3 Anticipated Permit Modifications

Title V of the Clean Air Act Amendments of 1990 will impact the permitting process, possibly as early as 1995, by requiring, among other things, that permitted air contaminant sources submit new air operating permit applications. The new Title V permits will contain more information than current permits. For example, when Title V operating permits are issued, they will be required to include statements clearly defining applicable requirements, along with a compliance plan for each. Regulations that will apply to the proposed project include New Source Performance Standards (NSPS) and Hazardous Organic NESHAPS (HON).

Operating permit modifications will be required on the permit for the existing absorber used for recovery of emissions from 29D-20 and 29D-21. Based on preliminary calculations, it is not believed that permit modification will be required for the on-site boilers used for control of purged gas streams.

7.1.3.1 New Source Performance Standards

New Source Performance Standards (NSPS), minimum technology-based standards, codified in the Environmental Protection Agency (EPA) regulations, 40 CFR Part 60, set forth performance standards and other requirements for sources constructed, modified or reconstructed after the effective date of the standard which will be mentioned in the applicable standard. Regulations originate at the federal (EPA) level after which they are delegated to the individual states for implementation. Regulations usually evolve through time periods during which some of the subparts are still regulated at the federal level, while some of the subparts are delegated to the state level. Such is the case with NSPS. The proposed project would be affected by the following NSPS Subparts.

7.1.3.1.1 Subpart NNN Distillation Operations, 40 CFR 60

Within 180 days of startup but not later than 60 days after achieving maximum production rate, a performance test required by § 60.8 and § 60.664 would be performed for each affected distillation unit, to demonstrate reduced emissions of (TOC) Total Organic Compounds (less methane and ethane) by 98 weight percent, or to a TOC concentration of 20 ppmv per § 60.662(a), by introducing each affected vent stream into the flame zone of on-site boilers. The distillation units 29C-10 and 29C-20 will be covered by this NSPS standard.

Notification requirements pursuant to § 60.7 would include: 1) date construction is commenced; 2) anticipated date of initial startup; 3) actual date of initial startup; and 4) physical or operational changes which may increase the emissions.

Monitoring requirements at § 60.663(c)(1) for use of a boiler to comply [§ 60.662(a)] would require use of a flow indicator that provides a record of vent stream flow to the boiler at least once every hour for each affected facility. Since the heat input design capacity of the boilers to be used for compliance is greater than 44 MW (150 million Btu/hr), only monitoring and recording periods of boiler operation (and having the records available for inspection) would be required.

Recordkeeping requirements at § 60.665 would require up-to-date, readily accessible continuous records of the equipment operating parameters, flow indication, records of all periods when the vent stream is diverted from the control device or has no flow rate. These records are to be made available to regulatory inspectors, if requested.

Reporting requirements at § 60.665(l) would require submission of semiannual reports to the Environmental Protection Agency, Region IV of the following recorded data: 1) exceedances of monitored parameters; 2) periods when the vent stream was diverted from the control device or had no flow rate; and 3) when the boiler was not in operation.

7.1.3.1.2 Subpart RRR Reactor Processes

Reporting, monitoring, and recordkeeping for NSPS reactors would parallel closely what would be done for Subpart NNN Distillation. The affected equipment is the reactor 29C-01. Emissions of TOC (less methane and ethane) would be reduced by 98 weight-percent, or to a TOC (less methane and ethane) concentration of 20 ppmv, on a dry basis corrected to 3 percent oxygen. The vent stream would be introduced to the flame zone of on-site boilers.

Monitoring to comply with § 60.702(a) would be accomplished by installing, calibrating, maintaining, and operating according to the manufacturer's specifications, a flow indicator [§ 60.703(c)(1)], and a temperature monitoring device in the firebox [§ 60.703(c)(2)]. Because the boiler capacity is greater than 44 MW (150 million Btu/hr), the periods of operation of the boilers would be monitored and recorded. These records would have to be readily available for inspection.

Reporting and recordkeeping requirements at § 60.705 are specific for each control device option identified and include notification requirements, performance test results and semi-annual reporting of certain monitored parameters. Records would be required to indicate and report periods when the boiler is not operating or when the vent stream is not routed to the boiler.

7.1.3.1.3 Subpart Kb Volatile Organic Liquid (VOL) Storage Vessels, 40 CFR 60.

Three of the five planned tanks, (29D-02, 29D-30, 29D-31) would have capacities less than 40 cubic meters (10,567 gallons) each, and therefore would be exempt from Subpart Kb. However, because of size, the two fixed-roof 30,000 gallon tanks (29D-20 and 29D-21), which would be vented through an absorber, would be subject to Subpart Kb. The closed vent system and absorber required at § 60.112b(a)(3)(i)-(ii) would be designed to collect all VOC vapors and gases and operated with no detectable emissions as indicated by an instrument reading of less than 500 ppm above background and visual inspections, as determined in TN Department of Environment and Conservation, Division of Air Pollution Control, Rule 1200-3-16.43(1)-(9), Equipment Leaks of VOC In the Synthetic Organic Chemical Manufacturing Industry (SOCMI). The absorber would be designed and operated to reduce inlet VOC emissions by at least 95 percent.

Notifications would include: 1) the date construction or reconstruction is started; 2) anticipated date of startup; 3) actual startup date; 4) any physical or operational change which may increase emission rate of any air pollutant to which a standard applies; 5) when continuous monitoring would begin; 6) when true vapor pressure exceeds 15 kPa (2.2 psia) for tanks greater than 19,813 gallons, but less than 39,890 gallons; and 7) when true vapor pressure exceeds 27.6 kPa (4 psia) for tanks greater than 19,813 gallons, but less than 39,890 gallons.

The following must be kept to meet recordkeeping requirements: 1) a copy of an operating plan [60.113b(c)(2)] documenting that the control device would be achieving the required control efficiency during maximum loading conditions; and 2) a record of the measured values of the parameters monitored in accordance with § 60.113b(c)(1)(i)-(ii).

The operating plan would be submitted as an attachment to the notification of the anticipated date of initial startup. Records to be maintained are: 1) the volatile organic liquid (VOL) stored; 2) the period of storage; and 3) the maximum true vapor pressure of the VOL during its period of storage. Readily accessible records showing the dimension of each storage tank and an analysis showing the capacity of each storage tank would have to be maintained for the life of the demonstration unit.

7.1.3.1.4 TN Department of Environment and Conservation, Division of Air Pollution Control, Rule 1200-3-16.43(1) - (9), Equipment Leaks of VOC In the Synthetic Organic Chemical Manufacturing Industry (SOCMI).

Compliance with this portion of the NSPS regulations would be accomplished by establishing a leak detection and repair (LDAR) program to monitor, report and keep records on emissions from pumps, valves, connectors, and pressure relief devices. Sampling connections would have to meet equipment standards to reduce emissions during sample purging.

7.1.3.2 Hazardous Organic NESHAPS (HON)

The HON regulation was published in the Federal Register on April 22, 1994. The HON has provisions similar to those in NSPS for reactors, distillation units, equipment leaks, and storage vessels. In most cases the HON provisions would supersede the NSPS requirements. In cases, where NSPS imposes more stringent requirements, the NSPS rules would remain. The HON also has provisions applying to transfer racks and wastewater streams.

7.2 Water Regulations

A copy of all the current water permits can be found in Appendix III. Monitoring requirements are discussed in Section 7.5.

As discussed in Section 6.3 process wastewater and stormwater runoff collected in areas influenced by the proposed project would be collected and transported by the interceptor sewer system to the Eastman industrial wastewater treatment plant. This treatment facility is capable of receiving these streams without any change in the quality of effluent currently discharged to the South Fork Holston River. The facility is currently allowed to discharge effluent through Outfall 002 under NPDES permit No. TN0002640 which was issued by the State of Tennessee Department of Environment and Conservation on September 1, 1993 (Appendix III). The permit expiration date is August 30, 1998.

Cooling water discharges would be discharged through Outfall 004 in accordance with NPDES permit No. TN002640. Stormwater runoff collected in areas not influenced by the manufacturing operation would be discharged through outfalls also permitted under the NPDES permit.

The existing Spill Prevention, Control and Countermeasure Plan for Eastman would be modified to include the proposed facility. As was described in previous sections, unloading and storage areas as well as process areas would have stormwater collection systems to prevent contaminated run-off from entering surface waters or infiltrating to ground water.

No new water permits or modifications of existing permits are required for the proposed project.

7.3 Solid Waste Requirements

Solid wastes generated at the proposed demonstration unit may be disposed of in several different ways. Monitoring requirements are found in Section 7.5. The permits are found in Appendix II.

On-Site Incineration Facility

Eastman maintains 2 rotary kiln incinerators and a liquid chemical destructor for treatment of non-hazardous and hazardous burnable wastes. This facility has a RCRA Part B permit. This facility may be used for disposal of the activated carbon guard beds and possibly the waste catalyst.

Hazardous liquid waste is also disposed of in three of Eastman's boilers, Nos. 23, 24, and 30. The boilers operate under interim status of the Resource and Conservation Recovery Act's Boiler and Industrial Furnace regulations, 40 CFR 266, Subpart H. Interim status means that the Environmental Protection Agency has not yet called for the permit applications, but that individual companies must interpret the rules to determine what compliance is, submit certification of compliance documentation, and operate within the conditions stated in the documentation. The boilers are currently operating within the conditions stated in the certification of compliance document; consequently, they are not operating under a permit because the permitting process has not been initiated by EPA.

Nonhazardous Landfill

Eastman operates an onsite Subtitle D (nonhazardous) waste landfill. The landfill accepts Eastman boiler flyash, construction and demolition debris, and special inert wastes. Special cells within the landfill accept asbestos insulation. The nonhazardous landfill has a solid waste permit and an air permit from the State of Tennessee. This landfill will accept the construction and demolition debris during construction of the proposed project.

Hazardous Waste Landfill

Currently, the residual ash from the incineration facility and other hazardous wastes for which landfilling is the only disposal alternative and that meet the RCRA Land Disposal Regulations (40 CFR 268) are shipped off-site to a hazardous waste landfill operated by Chem-Waste Management in Emelle, Alabama. A hazardous waste landfill is under construction at the Eastman facility. The facility is located 1 mile northwest of the proposed project site on Long Island and is expected to be completed by the fall of 1994. When completed, the landfill would accept the wastes currently sent to Emelle. Both facilities have RCRA Part B permits. Once operational, the onsite landfill would also have an air permit from the State of Tennessee. Residual ash from material burned in the incinerator would be sent to these landfills for final disposal.

7.4 Health and Safety Regulations

The proposed project would be covered under the appropriate Occupational Health and Safety Act (OSHA) regulations as well as applicable Tennessee state health and safety regulations. Examples of major applicable regulations follow.

OSHA Construction Standards, 29 CFR 1926

These standards would be followed during construction of the proposed project. Examples include standards on hoisting equipment, fall protection, and excavating, trenching, and shoring.

OSHA General Industry Standards, 29 CFR 1910

These standards would be followed during the design of the proposed project. Examples include standards for design of ladders, stairs, and grating, and the standards for control of hazardous energy (lockout/tagout procedures).

Process Safety Management (PSM), 29 CFR 1910.119

The regulations would be implemented for the LPMEOH™ demonstration unit. A process hazard analysis would be conducted on the proposed project. Process safety information and pre-startup safety review would be completed prior to startup. Operating procedures would be developed prior to startup, operations personnel would be trained in those procedures, and the procedures would be continuously revised. Management of Change procedures are in place for other Air Products and Eastman processes and would be implemented for the proposed project. The remainder of PSM's 14 points are general company policies and have been implemented within both Air Products and Eastman.

Chemical Hazard Communication, 29 CFR 1910.1200

A Hazard Communication Program would be implemented for the proposed project. This program would include hazard determinations methods, chemical labeling, material safety data sheets (MSDSs), personnel information and training, a list of hazardous chemicals in the workplace, and methods of informing company and contract employees of workplace hazards.

7.5 Environmental Monitoring Requirements

Air Monitoring Requirements

The proposed project would be affected by numerous Clean Air Act regulations - Maximum Achievable Control Technology (MACT) Standards, New Source Performance Standards (NSPS), and permitting requirements. Each of the vent streams that discharge to the waste gas header would be subject to either NSPS or MACT requirements (or both) and would require continuous flow monitoring. Vent streams from 29C-11, 29C-21, and 29C-03 will require this flow monitoring. Because boilers with heat input capacity of greater than 44 MW are used as the control device, the requirements are to monitor and record periods of operation for the boilers and periods when vent streams bypass the boilers.

The final storage tanks in the process, 29D-20 and 29D-21, would be subject to MACT and NSPS requirements. An existing absorber would be used as the control device, and may require monitoring to ensure it is providing the required removal efficiency defined by these regulations. Currently, monitoring of the absorber is not required by the operating permit, but monitoring operational parameters, for example, scrubbing liquid flows, scrubbing liquid temperature, or underflow specific gravity, may be required by one of the mentioned standards.

The remaining monitoring requirement would be monitoring pump seals, valves, connectors, pressure relief devices, agitators, sampling connection systems, compressors, and open-ended lines for leaks. Equipment leak monitoring is required by NSPS and by MACT. Most, if not all process components, in the proposed project would be subject to monitoring for leaks. Each type of component would be monitored on a regular basis (for example, monthly). Once it has been demonstrated that the occurrence of leaking components is low enough, the monitoring is required less frequently (for example, monthly to quarterly monitoring). When leaking components are found, repairs are to be made, usually within 15 days, and the component is rechecked to ensure the leak has been repaired.

Currently, permitting authorities (states, Indian governments, and local air pollution control boards) are submitting air operating permit programs to the EPA for approval. Permit applications submitted under these programs would be required from a greater number of facilities. The applications would be subject to greater amounts of public and neighboring-state review and comments. Although the permit program itself does not require additional control for permitted sources, the operating permit received from the permitting authority would require that sources can show compliance with the operating permit. The proposed project would require an operating permit; however, because the proposed project is subject to many other standards, additional monitoring would probably not be required to satisfy the conditions of the permit. Monitoring, recordkeeping, and reporting requirements from NSPS and MACT would be sufficient to ensure compliance with the operating permit.

Water Monitoring Requirements

No specific water monitoring would be required for the proposed project; however, the existing facilities for handling water and wastewater are subject to monitoring. The Eastman wastewater treatment facility is closely monitored to ensure compliance with its NPDES permit. Five parameters, flow, BOD, pH, NH3-N, and TSS, are monitored daily. Samples are taken and analyzed once per week for cyanide and the metals on the Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF) list. Samples are analyzed quarterly for the organic chemicals on this same list. Bimonthly acute and chronic toxicity monitoring (fathead minnow and ceriodaphnia) is required on the wastewater treatment plant effluent.

Outfalls that discharge cooling water and storm water are continuously monitored for flow, temperature, and pH. Along with the continuous monitoring, these outfalls are analyzed for suspended solids and oil and grease on a monthly basis and toxicity testing is done semiannually.

Eastman has outfalls that discharge stormwater and certain non-storm flows. Eastman semiannually monitors a representative number (10) of these outfalls during a storm event for flow, oil and grease, suspended solids, and pH. The NPDES permit also requires that a 48-hr toxicity test be conducted once on each of the ten monitored outfalls.

Solid Waste Monitoring Requirements

To comply with the operating permit for the Eastman incineration facility, all waste streams must be analyzed for 10 metals (arsenic, beryllium, cadmium, chromium, antimony, barium, lead, mercury, silver, and thallium), ash, chlorine, and heating value. Feed rates for each hazardous waste stream are set based on the results of the analyses. Periodic follow-up analyses are required for each waste stream; the frequency is determined by its variability. Individual streams require analyses on an annual basis, while mixed waste streams are sampled and analyzed quarterly. Liquid waste streams incinerated in Eastman's boilers are subject to the same analyses as those incinerated in the incineration facility. Again, feed rates are determined by the results of the analyses.

Waste streams to be landfilled are subject to the toxicity characteristic leachate procedure (TCLP) to determine if the waste is hazardous and needs to be disposed in a hazardous waste landfill. The final disposal method is determined based on the results of this analysis.

7.6 Other Required Permits

During the design and construction of the proposed project, several permits would be required.

Building Permit

Plans for the building layout, drawings for the electrical, fire protection, and HVAC system (all stamped by licensed professionals in the State of Tennessee) must be sent to the State Fire Marshall for review. Once reviews are complete and differences resolved, building permits would be granted.

Internal Permits

Eastman has a large number of internally-required permits for various situations. Most are issued for safety-related reasons and can be issued on a continuous basis or a job-specific basis. Examples of these internal permits are Safe Work Permit, Hot Work Permit, Excavation Permit, and Fire Protection Equipment Impairment Permit. The project would comply with Eastman's Kingsport permit requirements.

8.0 INTRODUCTION

The use of methanol as a fuel for mobile and stationary applications offers significant air quality and energy security benefits. Several demonstrations are being performed throughout the United States to develop and verify methanol fuel use in these applications and to quantify these benefits.[1,2] These demonstrations are all currently using chemical-grade methanol. The Air Products LPMEOH™ process produces a product which without further distillation can be used in these methanol fuel applications. This demonstration will evaluate the emissions and performance characteristics of the fuel methanol produced by the LPMEOH™ process.

8.0.1 Objective

The objective of this project task is to demonstrate the fuel methanol produced by the LPMEOH™ process in both mobile and stationary offsite demonstrations.

8.0.2 Approach

The fuel methanol product will be demonstrated in a variety of projects. The mobile projects involve transit buses and passenger vans. Transit bus demonstrations will occur at the Kanawha Valley Regional Transit Authority (KVRTA) in Charleston, West Virginia, and at the Los Angeles County Metropolitan Transportation Authority (LACMTA) in Los Angeles, California. A vanpool passenger van demonstration will occur at Hughes Aerospace in Los Angeles, California.

Stationary demonstrations include a standby electric power generation engine. This portable engine is operated in Los Angeles County by Valley DDC.

[1] *Performance and Emissions of Clean Fuels in Transit Buses with Cummins L-10 Engines,* SAE Technical Paper Series 931782, SP-982.

[2] *Chassis Dynamometer Emissions Testing Results for Diesel and Alternative-Fueled Transit Buses,* SAE Technical Paper Series 931783, SP-982.

Another stationary demonstration involves the conversion and operation of a firetube boiler at Hughes Aerospace in Los Angeles, California. In order to demonstrate the concept of coproducing methanol with electricity and burning methanol as load leveling dictates, methanol will also be tested in a utility turbine, assumed to be located in southern California. For these demonstrations, Acurex Environmental will support the vehicle and engine or equipment modifications for methanol fuel, design the appropriate fuel storage facility, install the facilities as appropriate, and arrange for fuel deliveries and/or fuel mixing as needed. In addition, Acurex Environmental will monitor the demonstrations, evaluate the data, and prepare reports. Acurex Environmental will coordinate fuel availability with Air Products.

Table 8-1 shows the location and size of the fueling facilities which will be used for the demonstrations. The quantity of fuel methanol that will be used at each of the demonstration sites is also shown in Table 8-1. Fuel methanol will be delivered in 6,250-gallon ISO containers and 8,500-gallon tank trucks; therefore, if a project requires a total of 60,000 gallons over a period of time, multiple shipments must be made. The total quantity of fuel listed in Table 8-1 indicates the fuel usage over a period of time; thus, storage tanks at each demonstration site may be smaller than the total fuel required, since the tanks may be refilled multiple times.

Fuel methanol will be displacing another fuel in all of the demonstration projects. Therefore, the emission impacts associated with baseline fuels in the existing environments are also presented in the following sections. In some cases, the new fuel methanol may displace either chemical-grade methanol (M100) or a conventional fuel such as natural gas or diesel. In these instances, we have shown the emission factors for both methanol and conventional fuels but based the impact analysis on the most reasonable interpretation of which fuel represents the existing environment. In the case of LACMTA buses, fuel methanol will displace chemical

Table 8-1. Demonstration sites and fueling facilities

Site	Location	Fueling Facility	Gallons
Los Angeles County Metropolitan Transportation Authority (LACMTA)	Los Angeles	Use existing facilities, 20,000-gal underground tank	60,000
Hughes Aerospace Vanpool and Firetube Boiler	Los Angeles	Use existing 20,000-gal underground tank	40,000
Valley DDC Standby Electric Power Generator	Los Angeles	Planned 10,000-gal above-ground tank	20,000
Utility turbine	Los Angeles	Use existing 20,000-gal underground tank	200,000
Kanawha Valley Regional Transit Authority (KVRTA)	West Virginia	Use existing facilities, 20,000 gal underground tank	80,000
Total			400,000

grade methanol, M100. M85 is currently used in the Hughes Aerospace vanpool. For this offsite test facility, fuel methanol will displace the M100 component of M85, but the gasoline component of M85 will still come from the same existing sources. Fuel methanol will displace natural gas in the firetube boiler demonstration. For the Valley DDC generator and KVRTA buses, fuel methanol will again displace M100 in existing applications. Fuel methanol will displace natural gas in the utility turbine.

8.1 ENVIRONMENTAL IMPACT OVERVIEW

This volume is organized into sections describing the impacts associated with methanol use in general, as well as the specific air quality impacts, permit requirements and regulations, and emergency response measures involved in each off-site test facility. The general impacts of methanol use, including methanol spills, flammability, and toxicity, are presented in Section 8.1.

Fuel methanol will be transported from Kingsport, Tennessee, to demonstration sites where it will be stored and used as fuel. Most of the offsite test facilities are in southern California, and these sites share the same fuel transportation pathway to Los Angeles. Figure 8-1 illustrates the general fuel transportation and distribution pathways for the Los Angeles area offsite test facilities. The fuel methanol is first transported from Kingsport to the Los Angeles railyard, and is then distributed locally to the offsite test facilities in the area, where it is stored and used. The empty transport containers are returned to the point of origin.

The West Virginia offsite test facility utilizes a different fuel transportation pathway than that of the Los Angeles sites. Figure 8-2 illustrates the fuel transportation pathway for the West Virginia site. The fuel methanol is trucked from Kingsport to Charleston, where it is stored and used. The empty tank trucks return to the point of origin.

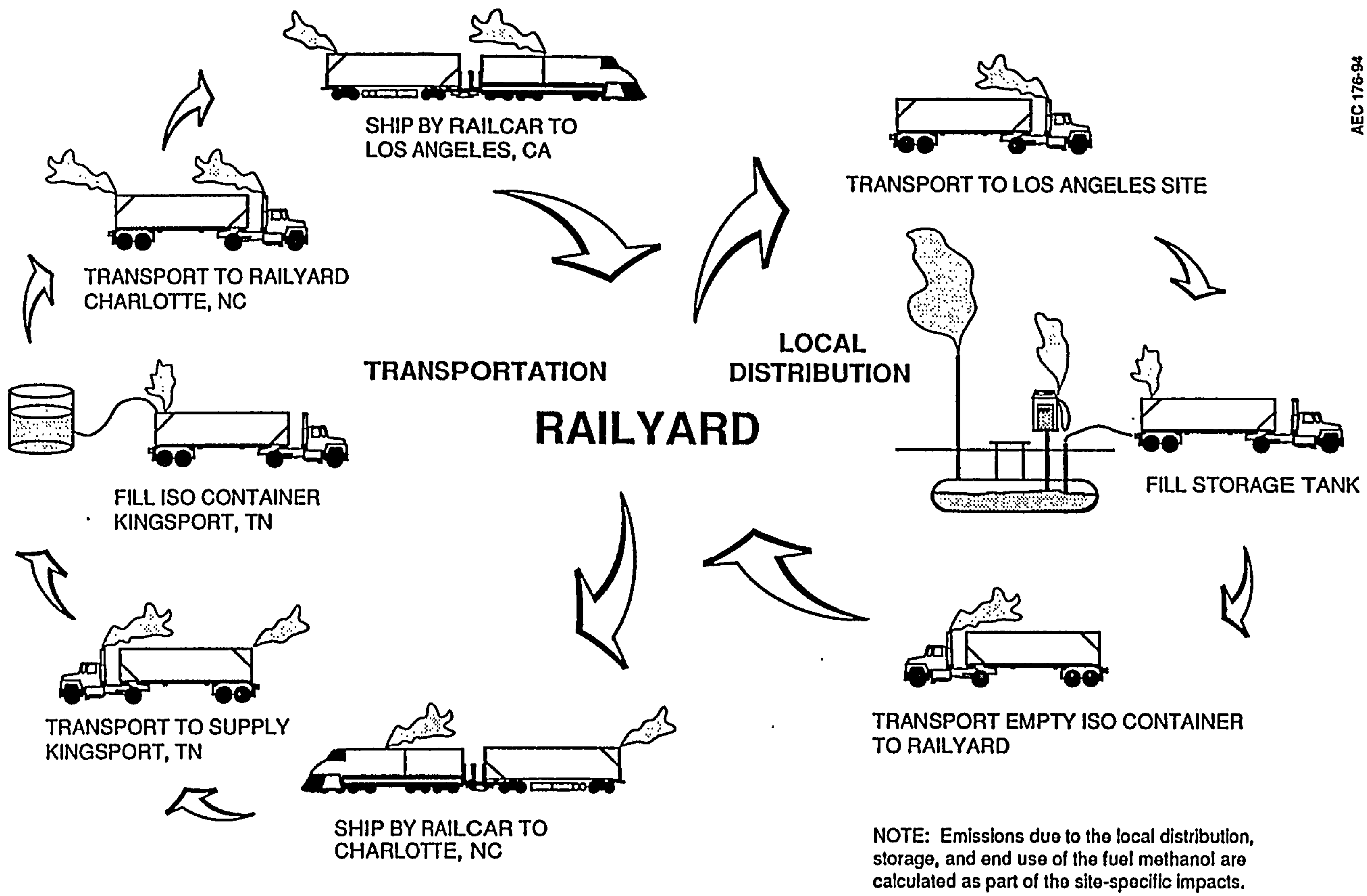

Figure 8-1. Fuel transportation pathway for Los Angeles offsite test facilities

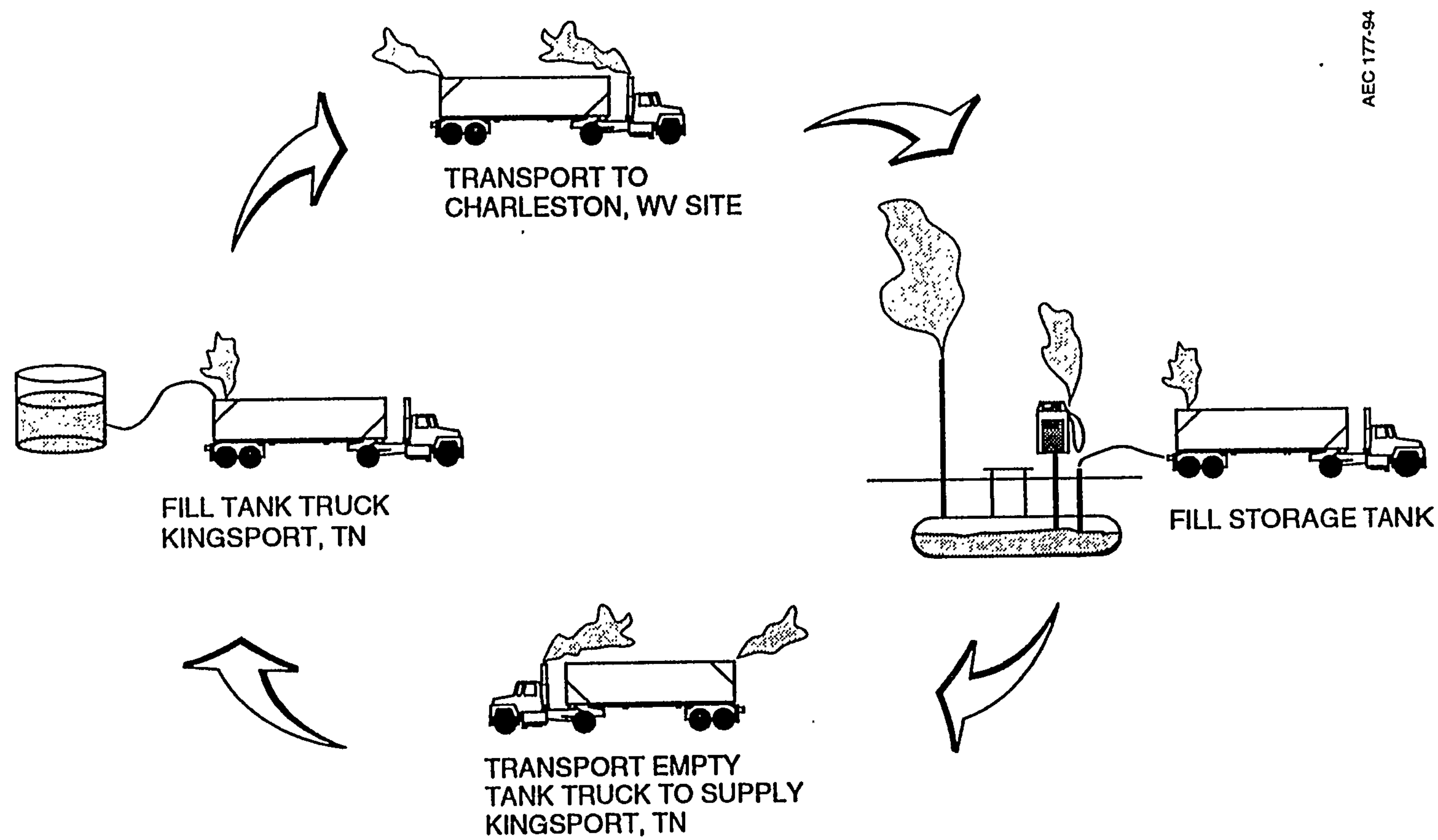

Figure 8-2. Fuel transportation pathway for West Virginia offsite test facility

The fuel transportation is discussed separately from the site-specific impacts of local fuel distribution (applicable to the Los Angeles offsite test facilities), storage, and use, as indicated in Table 8-2. The environmental impacts associated with transporting the fuel methanol to Los Angeles, California, and Charleston, West Virginia, are discussed in Section 8.2. The site-specific environmental impacts for the offsite test facilities are discussed in Sections 8.3 through 8.7. These sections also summarize transportation emissions.

8.1.1 Methanol Spills

Methanol spill hazards have been considered during a public workshop process conducted by California state agencies.[3] During hearings for California's Assembly Bill 234, Dr. Peter D'Eliscu, Professor at West Valley College, discussed methanol spills into bodies of water. He described the impact of methanol on the biota, indicating that some soils contain methanol all of the time. Dr. D'Eliscu believes that the data indicate that species will generally recover from methanol spills. All species eventually recover from methanol spills, although recovery times and severity of impact vary widely. Tolerance depends on the environment and on normal levels of exposure; most areas contain some amount of methanol naturally. In general, methanol spills in surface waters are expected to have less of an impact than petroleum spills and can be treated by increasing ambient oxygen and reseeding.

Actual methanol spills are rare and have not been documented. A typical methanol spill would result in the dispersion of methanol to the soil and surface water. In warm environments, most methanol from a spill would evaporate. Methanol that disperses through the soil would most likely result in some damage to

[3] *Environmental, Health and Safety Report*, California Advisory Board on Air Quality and Fuels, Volume III, Final Report, 1990.

Table 8-2. Site-specific emissions broken down by transportation and distribution

Site	Fuel Transportation	Fuel Distribution, Storage, and Use
LACMTA	Fill ISO container in Tennessee Truck ISO container to Charlotte, North Carolina Ship ISO container by rail to Los Angeles railyard Return empty ISO container to Tennessee Section 8.2.1	Truck ISO container from railyard to LACMTA Unload fuel Truck ISO container back to railyard Operate buses Section 8.3
Hughes Aerospace		Truck ISO container from railyard to Hughes Aerospace Unload fuel Truck ISO container back to railyard Operate vanpool and firetube boiler Section 8.4
Valley DDC		Truck ISO container from railyard to Valley DDC Unload fuel Truck ISO container back to railyard Operate electric power generator Section 8.5
Utility		Truck ISO container from railyard to utility Unload fuel Truck ISO container back to railyard Operate turbine Section 8.6
KVRTA	Fill tank truck in Kingsport, Tennessee Drive tank truck to Charleston, West Virginia Drive empty truck back to Kingsport, Tennessee Section 8.2.2	Unload fuel Operate buses Section 8.7

the flora and soil organisms which would be similar to a gasoline spill. In the case of a methanol spill, the environment would recover, as methanol rapidly biodegrades.

According to a U.S. Environmental Protection Agency (EPA) study, a methanol spill which reaches the groundwater will disperse rapidly because of its water solubility and rapid aerobic and anaerobic biodegradation.[4] A methanol spill could potentially create a toxic problem if the concentration remains above approximately 1,000 ppm. However, it is believed that any realistic spill scenario would not cause these high concentrations of methanol in the groundwater.

8.1.2 Methanol Flammability

Methanol's physical characteristics and flammability have been compared to other liquid fuels such as diesel, gasoline, and M85.[5] Methanol ignites much less readily in open and restricted spaces than gasoline, and the vapor produced is dispersed more rapidly. Methanol has the highest autoignition temperature of these four fuels and is therefore the least likely to surface ignite. However, based on its fuel properties, methanol is the most likely to ignite in an enclosed space. In order to prevent this occurrence in the fuel tank of a vehicle, a number of preventive measures can be taken to modify the fuel system. One such effective measure is to install a bladder type fuel tank such as used in airplanes and race cars.

In the case of a fire, methanol fires are less severe than gasoline or diesel fires. The low heat release makes the fire less likely to spread and cause personal injury. One key concern with pure methanol is the invisibility of its flame under well-lit conditions, which could lead to situations in which people would be unaware of an existing fire. It has been noted that "the flame is clearly visible at night and in less

[4] *Flammability and Toxicity Tradeoffs with Methanol Fuels,* SAE Technical Paper Series 872064.
[5] Ibid.

than fully lit conditions."[6] In addition, virtually anytime there is spilled fuel, the spill occurs on a combustible material which burns along with the methanol, providing smoke and a visible flame. The methanol flame can be made luminous throughout the length of the burn by adding aromatic hydrocarbons, as in gasoline; to date, this has only been successful when 15% gasoline has been added, forming M85. Aside from the issue of flame visibility, methanol fires are easier to extinguish than gas or diesel and do not produce the thick heavy black smoke characteristic of those fires, a hazard to firefighters.

8.1.3 Methanol Toxicity

The EPA study[7] also compared the toxic effects of the four fuels through contact mechanisms of inhalation, skin contact, and ingestion. Like gasoline, methanol is very toxic if high concentrations are inhaled. Methanol is also a severe hazard if it is absorbed into the skin in high amounts. Like both gasoline and diesel, methanol is highly toxic if ingested. However, unlike gas or diesel, methanol does occur naturally in the human body and there are antidotes to ingestion. One drawback of methanol is its lack of color, taste, or odor, which would provide a warning. Several different additives have been proposed for this reason, including hydrocarbons (as in M85), mercaptans for odor and a blue-violet dye for color (currently in use in Sweden), as well as bitrex, the most bitter substance known to man, for taste.

8.2 FUEL TRANSPORTATION

The fuel methanol produced in Kingsport, Tennessee, is shipped to the Los Angeles and Charleston offsite test facilities. All of the Los Angeles area offsite test facilities share the same fuel transportation pathway from the point of fuel methanol

[6] Ibid.

[7] *Flammability and Toxicity Tradeoffs with Methanol Fuels,* SAE Technical Paper Series 872064.

manufacture in Tennessee to delivery in Los Angeles. The impacts of this common fuel transportation pathway are presented in Section 8.2.1. The resulting air quality impacts due to this pathway have been apportioned to the individual offsite test facilities in the Los Angeles area according to the amount of the fuel methanol delivered to each site. Site-specific impacts — arising from local distribution, storage, and use of the fuel methanol — for each of the Los Angeles area offsite test facilities are discussed in Sections 8.3 through 8.6. Similarly, the impacts from the fuel transportation pathway for the Charleston, West Virginia, site are discussed in Section 8.2.2, and the localized site-specific impacts for this offsite test facility are discussed in Section 8.7.

8.2.1 Fuel Transportation to the Los Angeles Area Offsite Test Facilities

All of the Los Angeles area offsite test facilities share the same fuel transportation pathway from the point of fuel methanol manufacture in Tennessee to delivery in Los Angeles. The basic elements of the fuel methanol transportation pathway to Los Angeles are shown in Figure 8-1 and are as follows:

- Loading the fuel methanol into ISO containers at Kingsport, Tennessee
- Trucking the ISO containers to the railyard in Charlotte, North Carolina
- Shipping the ISO containers by rail to Los Angeles, California
- Returning the empty ISO containers by rail and truck to Kingsport, Tennessee

Current transportation plans for the shipment of the fuel methanol by this pathway include a travel distance of 462 miles by truck (231 miles each way from Kingsport, Tennessee, to Charlotte, North Carolina) and 7,248 miles by rail (3,624 miles each way from Charlotte, North Carolina, to Los Angeles, California).

After reaching the railyard in Los Angeles, the ISO containers holding the fuel methanol will be trucked to the individual demonstration sites where the fuel will be unloaded and stored for end use. The impacts associated with the local distribution and use of the fuel methanol at each of the individual demonstration sites, as well as those due to the current use of baseline fuels in the existing environments, are discussed in the sections for each offsite test facility.

Air Quality Impacts

The air quality impacts associated with the transportation of fuel methanol from Kingsport, Tennessee, to Los Angeles, California, arise from the following:

- Evaporative losses from the loading of the ISO containers
- Evaporative losses from the breathing of the ISO containers
- Exhaust emissions from the diesel trucks used to transport the ISO containers to Charlotte, North Carolina
- Exhaust emissions from the locomotives used to haul the ISO containers to Los Angeles

Returning the empty ISO containers to Tennessee has the following air impacts:

- Evaporative losses from the breathing of the ISO containers
- Exhaust emissions from the locomotives used to haul the ISO containers from Los Angeles, California, to Charlotte, North Carolina
- Exhaust emissions from the diesel trucks used to transport the ISO containers from Charlotte, North Carolina, to Kingsport, Tennessee

Baseline fuels are those fuels being displaced by the fuel methanol at the offsite test facilities. Because baseline fuels are already available in the Los Angeles area, the emissions associated with their production and shipment to the Los Angeles area were not included in this analysis. Thus, this analysis provides conservative estimates for the relative impact of the proposed project by maximizing the difference between the existing environment and the proposed scenario using fuel methanol. For purposes of this analysis, transportation of baseline fuels to Los Angeles consists only of loading the fuel into tank trucks for local distribution. The air quality impacts from transporting baseline fuels, therefore, are only those associated with the evaporative losses from the loading of fuel into tank trucks.

Evaporative Emissions

Table 8-3 lists several physical properties of gasoline, reformulated gasoline, methanol (M100), fuel methanol, and diesel No. 2. The gasoline and diesel values are taken from Table 4.3-2 of AP-42. The properties of fuel methanol are assumed to be identical to M100. Evaporative emissions from petroleum fuels are considered to be hydrocarbon emissions, while evaporative emissions from the fuel methanol are considered to be 100% methanol. Emission factors for these evaporative emissions are associated with working losses from the loading the tank trucks or ISO containers and breathing losses from the tank during fuel transportation. Working losses associated with transferring the fuel to the onsite tank for storage are accounted for in the local distribution of each site. In the case of M85, fuel methanol will be shipped to the on-site storage tank and gasoline will be shipped separately. The emissions associated with the fuel methanol shipment to be used for M85 fuel will be the same as those for other fuel methanol shipments. The emission factors for working and transit losses are listed in Table 8-3. Each of these emission factors is discussed below.

Working (Loading) Losses

The emission factors for working losses, associated with filling the ISO container with fuel, are calculated from principles of gas equilibrium using the following equation:

$$L_L = n * f * 1{,}000 \text{ gal}/1{,}000 \text{ gal} * MW * s * TVP / P$$

where:

L_L = Loading losses (lb/1,000 gal)

n = 1 lb-mole/ 379.6 ft^3 , derived from the ideal gas law at 60°F

Table 8-3. Evaporative emissions from fuel transportation

Parameter	Fuel				
	Gasoline	Reformulated Gasoline (RFG)	M100[a]	Fuel Methanol	Diesel No. 2
RVP (psia)	10.0	7.0	4.5	4.5	~0.022
True vapor pressure at 60°F (psia)	5.2	3.5	1.4	1.4	0.0074
Condensed vapor density (w) (lb/gal) at 60°F	5.1	5.2	6.6	6.6	6.1
MW of vapor	66	68	32	32	130
Saturation factors[b]	1.0	1.0	0.5	1.45	0.6
Emission Factors (lb/1,000 gal)					
Pollutant	HC	HC	Methanol	Methanol	HC
Tank truck loading without vapor controls working loss[c]	8.22	5.7	0.54	1.56	0.014
Tank truck loading with vapor controls working loss[c]	0.41	0.285	N.A.[d]	N.A.	N.A.
Tank truck transit breathing loss[e]	0	0	0	0.049	0
Total evaporative emission factors[f]	0.41	0.285	0.54	1.61	0.014

[a] Refers to methanol used as a fuel in the existing environment.
[b] Saturation factors are from Table 4.4-1 of AP-42 and refer to the type of loading. Gasoline and RFG were assumed to be loaded with a vapor balance system; diesel to undergo submerged loading dedicated normal service, and M100 and fuel methanol to use splash loading.
[c] Loading losses are calculated as shown on page 8-15.
[d] N.A. = Not available.
[e] Gasoline transit losses are "extreme" case transit losses from AP-42 Table 4.4-5; other fuel transit losses have been scaled according to their true vapor pressure and their density at 60°F.
[f] For gasoline and RFG, total is sum of loading losses with vapor controls and transit breathing losses.

f = Conversion factor, 1 ft^3/7.4805 gal

1,000 gal/1,000 gal provides a basis of 1,000 gal fuel

MW = Molecular weight, lb/lb-mole

s = Saturation factor (dimensionless), from Table 4.4-1 of AP-42, for calculating petroleum liquid loading losses (see Table 8-4)

TVP = True vapor pressure at 60°F (psia)

P = Atmospheric pressure = 14.7 psia

In using the above equation, several implicit assumptions are made. First, the temperature is assumed to remain constant at 60°F during the loading operation. This temperature is consistent with baseline assumptions in AP-42. Since vapor is transferred from stationary storage tanks with stable fuel temperatures, this temperature appears reasonable. Secondly, the saturation factors, s, are used for all fuels, even methanol, which is not a petroleum liquid. Table 8-4 summarizes the saturation factors that apply to fuels for this project. These saturation factors are EPA-suggested values developed from the principles of equilibrium. There are no values suggested for methanol, but the factors that affect equilibrium should be the same for methanol and gasoline. An s factor associated with any type of fuel loading that uses a vapor balance system is 1.0. A saturation factor for splash loading of a clean cargo tank was assumed for loading methanol into ISO containers. This value is greater than the s for vapor balance fuel transfer, and therefore provides a greater degree of conservatism. Baseline M100 tank trucks are filled in Los Angeles without vapor recovery. In this case, clean truck tanks are bottom filled at the storage terminal, which results in a saturation factor of 0.5. Gasoline trucks are filled using vapor recovery systems.

All loading losses are calculated with vapor controls where appropriate, assuming 95% efficiency of the vapor control. Thus, controlled working loss emission factors are calculated from the following:

Table 8-4. Saturation factors (s) for loading of tank containers

Mode of Operation	Application	Saturation Factor(s)
Submerged loading of a clean tank	Fill M100 tank truck	0.50
Submerged loading: dedicated service	Fill diesel tank truck	0.60
Splash loading: dedicated service	Fill fuel methanol ISO container	1.45
Vapor balance loading	Fill gasoline tank truck	1.0

$$L_L \text{ (control)} = L_L \text{ (uncontrolled)} * (1 - \text{eff}/100)$$

Transit (Breathing) Losses

Evaporative emissions are generated during transit as the fuel resides in tanks. AP-42 contains typical emission values from gasoline truck cargo tanks during transit, compiled from both theoretical and experimental techniques. Evaporative emissions depend upon a number of different parameters that affect the extent of venting from the cargo tank during transit, including the following:

- Vapor tightness of the tank
- Pressure relief valve settings
- Tank pressure at trip start
- Fuel vapor pressure
- Degree of fuel vapor saturation of space in tank

The fuel vapor pressure is the one variable that is known, but it varies with temperature. At this time, it is not possible to determine all the other variables for transportation of fuel methanol in the future. AP-42 lists both "typical" values for transit emissions and "extreme" values that could occur in the unlikely event that all determining factors combined to cause maximum emissions.

AP-42 does not contain transit emission factors for methanol, diesel, or reformulated gasoline. No emission factors for tank transit losses of methanol were found in other sources.

However, if we assume a direct correlation between the true vapor pressure of the fuel at a given temperature and the transit losses, we can estimate the evaporative transit emissions of methanol. A correction must also be made for the molecular weight of methanol. For example:

$$L_B = L_{B\ gasoline} * (TVP * MW)_{methanol} / (TVP * MW)_{gasoline}$$

where:

L_B emissions are transit emissions of methanol in lb/1,000 gal

$L_{B\ gasoline}$ = Transit breathing loss for gasoline

MW = Molecular weight (proportional to vapor density for ideal gases)

TVP = True vapor pressure of fuel at 60°F

Gasoline "extreme" transit emission losses for petroleum liquid rail cars and tank trucks are listed in Table 4.4-5 of AP-42. Transit losses occur both when the tank is full of liquid fuel and, on the return, when the tank is full of vapors. For 10 psi RVP gasoline, transit losses are 0.08 and 0.37 lb/1,000 gal for loaded and return with vapor operation, respectively. The TVP of gasoline at 60°F is 5.2 psia.

If all other determining factors are held constant, then the evaporative losses of methanol can be estimated using the appropriate molecular weight and true vapor pressure at 60°F. For example, for fuel methanol (TVP = 1.4 psia at 60°F, MW = 32), transit losses are approximated by the following equation:

Loaded with product: $L_{B\ fuel\ methanol} = 0.08 * (1.4 * 32)/ (5.2 * 66)$

$L_{B\ fuel\ methanol} = 0.01$ lb/1,000 gal (methanol)

Return with vapor: $L_{B\ fuel\ methanol} = 0.37 * (1.4 * 32)/ (5.2 * 66)$

$L_{B\ fuel\ methanol} = 0.048$ lb/1,000 gal (methanol)

Figure 8-3 illustrates the basis of the comparison of the impacts of fuel transport to Los Angeles. As shown in the figure, for the baseline (existing) fuels, only the loading of the fuel into the tank truck for local delivery is included in the analysis. This compares with the numerous emission sources included in the proposed project analysis and shown in Figure 8-1. Breathing or transit losses for all fuels except fuel methanol have been neglected; thus, the values of their breathing loss emissions are listed as zero in Table 8-3.

Figure 8-3. Transportation of baseline fuels to Los Angeles

Loading losses are not associated with transferring the ISO container from truck to train and back to a truck, since the fuel methanol is not transferred; only breathing losses are incurred. Evaporative emissions are also associated with transferring the fuel from the truck tank to the onsite storage tank, but these emissions will be estimated for each specific site in later sections.

Exhaust Emissions from Heavy-Duty Diesel Trucks

The emission factors for heavy-duty diesel trucks are calculated, normalizing the emission factors to a basis of 1,000 gallons of methanol delivered. The following equation is used:

$$A_n = B_n * C * D * E$$

where:

A_n = lb of pollutant n emitted per 1,000 gallons of methanol delivered

B_n = Grams per mile emission factor for pollutant n

C = Number of miles traveled per fuel delivery = 231 * 2 = 462 (distance from Kingsport, Tennessee, to Charlotte, North Carolina, and return to Kingsport with empty ISO container)

D = Number of deliveries made per 1,000 gallons of methanol delivered = 0.16 (assumes one delivery made with each ISO container carrying 6,250 gal of fuel)

E = lb per gram conversion factor = 0.0022

The values for the emission factors B_n and A_n are shown in Table 8-5.

The emission factors for HC, CO, and NO_x in Table 8-5 were derived from AP-42 values from Table 1.7.1, for nontampered exhaust emission rates for low-altitude heavy-duty diesel-powered vehicles. Vehicles of the model years 1991-2000

Table 8-5. Heavy-duty truck emission factors for fuel methanol transport

Emissions Parameter	Fuel	Fuel Economy (mpg)	Criteria Pollutants				
			HC	CO	NO_x	PM	SO_x
Emission factor (g/mi) B_n	No. 2 Diesel	5.3[a]	2.10[b]	9.93[b]	8.01[b]	1.21[c]	0.61[d]
Emission (lb/1,000 gal fuel methanol delivered) A_n	No. 2 Diesel	5.3[a]	0.34	1.61	1.30	0.20	0.10

[a] Based on the 1988 average for heavy-duty combination trucks in the U.S.[8]
[b]Emission factors for model year 1991-2000 heavy-duty diesel trucks with 50,000 miles.[9]
[c]Engineering estimate, based upon typical particulate formation from diesel engines where 0.2 wt % of fuel converts to particulate matter.[10]
[d]Engineering estimate, expressed as SO_2, based upon sulfur content of the fuel at 0.05 wt %.[11]

[8] *National Transportation Statistics, 1990 Annual Report,* DOT-TSC-RSPA-90-2.

[9] *Supplement A to Compilation of Air Pollutant Emission Factors, Volume II: Mobile Sources,* AP-42, January 1991.

[10] *Cost-Effectiveness of Diesel Fuel Modifications for Particulate Control,* SAE Technical Paper Series 870556.

[11] Ibid.

with 50,000 miles were used as an appropriate basis. The AP-42 emission factors were developed using a basic test procedure that assumes the following:

- Average speed of 20.0 mph, with 36% idle operation
- Average trip length of 6.4 miles
- NO_x emissions uncorrected for humidity

The emissions for each individual pollutant are calculated from the following equation:

$$\text{Emissions of pollutant i} = TF * SCF * BER$$

where:

F = Travel weighting fraction = 1 in this case (individual trucks, not an entire fleet)

SCF = Speed correction factor

BER = Base emission rate, found in Table 1.7.1 of AP-42

The speed correction factor would be calculated from the following equation (Table 1.7.6 of AP-42):

$$SCF (s) = EXP (A + B * s + C * s^{2})$$

where:

s = Average speed in mph

Table 1.7.6 lists the coefficients A, B, and C for the three pollutants. For example, the most conservative value of SCF would be based on a speed s of 2.5 mph. (This correlation for SCF is only valid in the range of 2.5 to 55 mph). To illustrate the effect of speed on overall emissions, the speed correction factors for HC, CO, and

NO_x, calculated from s = 2.5 mph, are shown in Table 8-6. In our estimations of actual emissions, an SCF of 1.0 was used, because the actual average speed is probably greater than 25 mph. The truck will travel on the freeway, but the actual driving cycle is unknown. In this case, an SCF = 1.0 is conservative because the actual truck speed is greater than 25 mph.

According to EPA, in the AP-42 document[12], heavy-duty diesel-powered vehicles have insignificant crankcase and all other evaporative HC emission components. Furthermore, heavy-duty diesel vehicles are not subject to the type of tampering used to develop emission factors for light-duty vehicles, and no tampering offsets are added to diesel vehicle emission factors. The temperature effect on the emissions from these vehicles is considered relatively insignificant; as there are no quantitative data on these effects, no temperature correction factor is used.

AP-42 contains no emission factors for PM or SO_X. Approximately 0.2 wt % of the diesel fuel burned in the engine forms directly emitted particulate.[13] Thus, the emissions of PM may be estimated from the following equation:

$$\text{PM emissions} = \rho\ /\text{mpg} * 0.002\ \text{lb PM/lb diesel} * 453.6\ \text{g/lb}$$

where:

ρ = Density of diesel No. 2 = 7.1 lb/gal at 60°F

mpg = 5.3 mi/gal[14]

PM emissions = 1.21 g/mi

[12] *Supplement A to Compilation of Air Pollutant Emission factors, Volume II: Mobile Sources (January 1991), Chapter 7, Heavy-Duty Diesel-Powered Vehicles.*

[13] *Cost-Effectiveness of Diesel Fuel Modifications for Particulate Control,* SAE Technical Paper Series 870556.

[14] *National Transportation Statistics, 1990 Annual Report,* DOT-TSC-RSPA-90-2.

Table 8-6. Sample speed correction factors for heavy duty diesel trucks (2.5 mph)

Pollutant	Speed(s) (mph)	SCF
HC	2.5	0.789
CO	2.5	3.26
NO_x	2.5	2.2

Similarly, SO_2 emissions are estimated using the sulfur content of the on-road fuel, assumed to be 0.05 wt %.[15] Assuming that all of the sulfur is converted to SO_2, the emissions are calculated from the following equation:

$$SO_2 \text{ emissions} = \rho/\text{mpg} * 0.0005 \text{ lb S/lb diesel} * 453.6 \text{ g/lb} * 2.0 \text{ g } SO_2/\text{g S}$$
$$= 0.61 \text{ g/mi}$$

where:

ρ and mpg are as defined above and 2.0 is the ratio of the molecular weights of SO_2 to S.

Exhaust Emissions from Freight Train Locomotives

The emission factors for freight train locomotives in terms of lb of pollutant emitted per 1,000 gallons of methanol delivered are calculated from the equation:

$$F_n = G_n * H * I * J$$

where:

F_n = lb of pollutant n emitted per 1,000 gallons of methanol delivered

G_n = lb of pollutant n emitted per gallon of diesel fuel consumed by the locomotive

H = Gallons of diesel fuel consumed per revenue ton mile = 0.00282 (based on the 1992 average for US rail freight).[16]

I = Revenue ton miles per ISO container

J = ISO containers used per 1,000 gallons of methanol delivered = 0.16

[15] *Cost-Effectiveness of Diesel Fuel Modifications for Particulate Control,* SAE Technical Paper Series 870556.

[16] *Railroad Facts, 1993 Edition,* Association of American Railroads.

I, the revenue ton miles per ISO container, is calculated per round trip. The weight of the fuel methanol = 6,250 gal x 6.6 lb/gal/2,000 lb/ton = 20.6 tons. The container weight is 4.4 tons. The total round trip distance traveled is 7,248 miles (based on a distance of 3,624 miles from Charlotte, North Carolina, to Los Angeles, California). The total weight shipped is the weight of the fuel methanol plus twice the ISO container weight (since the empty ISO container is shipped back) = 20.6 + (4.4 x 2) = 29.4 tons. Thus:

I = 29.4 tons x 3,624 miles = 106,500 ton miles/ISO container

The emission factors F_n and G_n are shown in Table 8-7. AP-42 lists the average emission factors G_n as well as emission factors for five specific engine categories. At this time, it cannot be determined which locomotive engine will be used. The individual engine types vary in the severity of their emissions depending upon the pollutant; for example. one engine may produce high levels of CO compared to the other engines, but may produce relatively low emissions of hydrocarbons. Thus, in order to produce realistic yet conservative emissions estimates, the average values are used to ensure that the emission factors will be representative of actual conditions.

Air Quality Impacts Summary for Fuel Transportation

Table 8-8 summarizes the emission factors for the transportation of the fuel methanol to the Los Angeles area. These emission factors are a sum of the evaporative losses, diesel truck exhaust from transport to North Carolina, and locomotive exhaust from shipping to Los Angeles by rail. The emissions from returning the empty ISO container tank are also included. The fuel methanol emission factors are compared with emission factors associated with the existing

Table 8-7. Average locomotive emission factors

Freight Train Locomotive Emissions Parameter	Criteria Pollutant				
	HC	CO	NO_x as NO_2	PM	SO_x as SO_2[a]
Emission factor[17] (lb/gal diesel fuel consumed) G_n[18]	0.094	0.130	0.370	0.025	0.057
Emissions (lb/1,000 gal fuel methanol delivered) F_n	9.04	12.50	35.57	2.40	5.48

[a]Based on a fuel sulfur content of 0.4 percent.

Table 8-8. Summary of emission factors for transport to Los Angeles

Fuel	Emission Factors (lb/1,000 gal of fuel delivered)					
	HC	Methanol	CO	NO_x	PM	SO_x
Fuel Methanol	9.38	1.61	14.11	36.87	2.60	5.58
Gasoline	0.41	0	0	0	0	0
Reformulated gasoline	0.28	0	0	0	0	0
M100[a]	0	0.54	0	0	0	0
Diesel No. 2	0.014	0	0	0	0	0
Natural gas	0	0	0	0	0	0

[a]M100 signifies methanol used as an existing fuel.

[17] *Compilation of Air Pollutant Emission Factors, Volume II: Mobile Sources,* AP-42, Fourth Edition, September 1985.

[18] Ibid, Table II-2.1.

(baseline) fuels. For the purposes of a conservative comparison, the environmental impact of transportation to Los Angeles for all other existing fuels besides fuel methanol are neglected; only evaporative emissions associated from loading the existing baseline fuels into tank trucks in Los Angeles are considered. These evaporative emissions from loading in Los Angeles are calculated as shown previously. Fuel methanol evaporative emissions are pure methanol; evaporative emissions from the other types of existing fuels are hydrocarbon (HC) substances. Since natural gas, the baseline fuel for utility turbines, is transported by pipeline, the emissions associated with its transportation are minimal. Emissions associated with the transportation of natural gas that are consistent with the point of delivery for the other fuels are zero.

This section identifies the emissions associated with transportation of fuel methanol and baseline fuels. The transportation stage results in a full ISO container or tank truck that is ready to deliver fuel to a site. The air quality impacts which are due to the final delivery of the fuels by trucks to the end-use sites will be included in the analysis of the site specific impacts for each of the Los Angeles area demonstration projects.

To calculate the projected air quality impacts due to the transportation of the fuel methanol from Kingsport to the railyard in Los Angeles, the overall transportation emission factors for fuel methanol are multiplied by the proposed quantities of fuel methanol (in thousands of gallons) to be delivered to each of the Los Angeles area offsite test facilities:

$$\text{Emissions (lb)} = \text{Emission factor (lb/1,000 gal)} * \text{Quantity of fuel (1,000 gal)}$$

The total emissions due to transport of fuel methanol to Los Angeles are summarized in Table 8-9. Similarly, to calculate the transportation air quality impacts of the

Table 8-9. Air quality impacts due to fuel methanol transportation to Los Angeles

Site	Demonstration Project	Fuel	Quantity (gal)	Emissions (lb)					
				HC	Methanol	CO	NO_x	PM	SO_x
LACMTA	Transit buses	Fuel methanol	60,000	562.8	96.6	846.6	2,212.2	156	334.8
Hughes Aerospace	Vanpool	Fuel methanol	20,000	187.6	32.2	282.2	737.4	52	111.6
		RFG	3,530[a]	1.0	0	0	0	0	0
	Firetube boiler	Fuel methanol	20,000	187.6	32.2	282.2	737.4	52	111.6
Valley DDC	Standby electric power generator	Fuel methanol	20,000	187.6	32.2	282.2	737.4	52	111.6
Southern California Utility	Utility turbine	Fuel methanol	200,000	1,876	322	2,822	7,374	520	1,116
Totals		Fuel methanol	320,000	3,001.6	515.2	4,515.2	11,798.4	832	1,785.6
		RFG	3,530	1.0	0	0	0	0	0

[a]Quantity of RFG needed to make/blend M85 from 20,000 gallons of methanol.

existing baseline fuels (from tank truck loading only, since transportation to Los Angeles has been neglected for these fuels) the evaporative emission factors for these fuels are multiplied by the quantities of fuel which would be displaced by the proposed project. Table 8-10 summarizes the air quality impacts due to existing fuel transportation to Los Angeles.

8.2.2 Fuel Transport to Charleston, West Virginia, Offsite Test Facility

The basic elements of the fuel methanol transportation pathway to the Charleston, West Virginia, offsite test facility are shown in Figure 8-2 and are as follows:

- Loading the fuel methanol into a tank truck at Kingsport, Tennessee
- Trucking the fuel to the site in Charleston, West Virginia
- Returning the empty tank truck to Kingsport, Tennessee

Current transportation plans for the shipment of the fuel methanol by the pathway include a travel distance of 418 miles by tank truck (209 miles each way from Kingsport, Tennessee, to Charleston, West Virginia).

After reaching the offsite test facility in Charleston, the fuel methanol will be unloaded and stored for end use. The impacts associated with the use of the fuel methanol at the site, as well as those due the current use of baseline fuels in the existing environment, are discussed in Section 8.7 as part of the site-specific impacts for the facility.

Air Quality Impacts

The air quality impacts associated with the transportation of fuel methanol from Kingsport, Tennessee, to Charleston, West Virginia, arise from the following:

- Evaporative losses from the loading of the tank trucks
- Evaporative losses from the breathing of the tank trucks
- Exhaust emissions from the diesel tank trucks used to transport the fuel methanol to Charleston, West Virginia

Table 8-10. Air quality impacts due to baseline fuel transportation

Site	Demonstration Project	Fuel	Quantity (gal)	Emissions (lb)					
				HC	Methanol	CO	NO_x	PM	SO_x
LACMTA	Transit buses	Methanol	60,000	0	32.4	0	0	0	0
Hughes Aerospace	Vanpool	Methanol	20,000	0	10.8	0	0	0	0
		RFG	3,530	1.0	0	0	0	0	0
	Firetube boiler	Natural gas	12,880[b]	0	0	0	0	0	0
Valley DDC	Standby electric power generator	Methanol	20,000	0	10.8	0	0	0	0
Southern California Utility	Utility turbine	Natural gas	128,800[b]	0	0	0	0	0	0
Totals		Methanol	100,000	0	54	0	0	0	0
		RFG	3,530	1.0	0	0	0	0	0
		Natural gas	141,680	0	0	0	0	0	0

[a]Quantity of RFG needed to make/blend M85 from 20,000 gallons of methanol.

[b]The units for natural gas quantities are expressed here in terms of therms, not gallons. The conversion is based on energy equivalency, where methanol has 64,000 Btu/gal (HHV) and there are 100,000 Btu/therm. For example, the utility boiler uses 200,000 gal methanol x 64,400 Btu/gal x therm/100,000 Btu = 128,800 therm.

The return of the empty tank trucks back to Tennessee has the following air quality impacts:

- Evaporative losses from the breathing of the tank trucks
- Exhaust emissions from the diesel tank trucks returning to Kingsport, Tennessee, from Charleston, West Virginia

The baseline fuel, neat methanol (M100), is already available in the Charleston area. For purposes of comparing the two fuels, the emissions associated with M100 production and shipment to the Charleston area were not included in this analysis. Thus, this analysis provides conservative estimates by maximizing the difference between the existing environment and the proposed scenario using fuel methanol. For the purposes of this analysis, the transportation of baseline M100 fuel to the Charleston site consists only of loading the fuel into tank trucks and local distribution. The air quality impacts from transporting baseline fuels, therefore, are only those associated with the evaporative losses from loading of the fuel into tank trucks and the exhaust from the diesel tank trucks which provide final delivery to the site.

Evaporative Emissions

The evaporative emissions from fuel methanol are considered to be 100% methanol. Emission factors for these evaporative emissions are associated with working losses from the loading of the tank trucks and breathing losses from the tanks during transportation. Working losses associated with transferring the fuel to the onsite tank for storage are accounted for in the site specific impacts. The assumptions and calculations used to develop the emission factors for these evaporative losses are the same as those discussed in Section 8.2.1, and the applicable evaporative emission factors for the proposed fuel methanol and the baseline fuel M100 are those presented in Table 8-3.

Exhaust Emissions from Heavy-duty Diesel Trucks

The emission factors for heavy-duty diesel trucks in terms of lb of pollutant emitted per 1,000 gallons of methanol delivered are calculated from the following equation:

$$A_n = B_n * C * D * E$$

where:

A_n= lb pollutant n emitted per 1,000 gallons of methanol delivered

B_n= Grams per mile emission factor for pollutant n

C = Number of miles traveled per fuel delivery

D = Number of deliveries made per 1,000 gallons of fuel methanol delivered

E = lb/gram conversion factor = 0.0022

It is assumed that the fuel methanol delivery system will utilize the existing infrastructure for fuel delivery, i.e., heavy-duty diesel trucks using low-sulfur diesel No. 2 fuel. Therefore, the emission factors, B_n, are the same for both the proposed project and the existing environment. These values are based on the same parameters, assumptions, and corrective factors as discussed previously in Section 8.2.1 for heavy-duty diesel truck exhaust emissions. The emission factors B_n are listed in Table 8-11.

In the case of the proposed project, the value for C is equal to 418 miles (twice the distance from Kingsport, Tennessee, to Charleston, West Virginia), and the value for D is equal to 0.11765 (based on one delivery made with each tank truck carrying 8,500 gallons of methanol). In the case of the existing environment, the value for C is equal to 10 miles (twice the distance from the local methanol fuel terminal to the offsite test facility in Charleston), and the value for D is equal to 0.11765 for the same reason as stated for the proposed project. The corresponding values for A_n based on these two scenarios are shown in Table 8-11.

Table 8-11. Heavy-duty truck emission factors for fuel transport

Emissions Parameter	Fuel	Fuel Economy (mpg)	Criteria Pollutants				
			HC	CO	NO_x	PM	SO_x
Emission factor (g/mi) B_n	No. 2 Diesel	5.3[a]	2.10[b]	9.93[b]	8.01[b]	1.21[c]	0.61[d]
Proposed project emissions (lb/1,000 gal fuel methanol) A_n	No. 2 Diesel	5.3[a]	0.227	1.074	0.867	0.131	0.066
Existing environment emissions (lb/1,000 gal M100) A_n	No. 2 Diesel	5.3[a]	0.005	0.026	0.021	0.003	0.002

[a]Based on the 1988 average for heavy-duty combination trucks in the U.S.[19]
[b]Emission factors for model year 1991-2000 heavy-duty diesel trucks with 50,000 miles.[20]
[c]Engineering estimate, based upon typical particulate formation from diesel engines where 0.2 wt % of fuel converts to particulate matter.[21]
[d]Engineering estimate, expressed as SO_2, based upon sulfur content of the on-road truck fuel at 0.05 wt %.[22]

[19] *National Transportation Statistics, 1990 Annual Report,* DOT-TSC-RSPA-90-2.

[20] *Supplement A to Compilation of Air Pollutant Emission Factors, Volume II: Mobile Sources,* AP-42, January 1991.

[21] *Cost-Effectiveness of Diesel Fuel Modifications for Particulate Control,* SAE Technical Paper Series 870556.

[22] Ibid.

Air Quality Impacts Summary for Fuel Transportation

Table 8-12 summarizes the emission factors for the transportation of the fuel methanol to the Charleston, West Virginia, offsite test facility. These emissions are the sum of the evaporative losses and diesel truck exhaust emissions. The emissions from returning the empty tank trucks are also included. The fuel methanol emission factors are compared with emission factors associated with the existing M100 fuel. Fuel methanol and M100 evaporative emissions are pure methanol, and are calculated as shown previously.

To calculate the projected air quality impacts due to the transportation of the fuel methanol from Kingsport, Tennessee, to the Charleston, West Virginia, site, the overall transportation emission factors for fuel methanol are multiplied by the proposed quantities of fuel methanol (in thousands of gallons) to be delivered to the offsite test facility:

Emissions (lb) = Emission factor (lb/1,000 gal) * Quantity of fuel (1,000 gal)

The total emissions due to transport of fuel methanol and the existing M100 are summarized in Table 8-13.

8.2.3 Permits/Regulations for Methanol Transport

Methanol is regulated by U.S. Department of Transportation Hazardous Materials Regulations as a Class 3 hazard FLAMMABLE LIQUID, UN1230, in domestic transportation published under 49 CFR:

- Part 172, (especially 172.101 which lists methanol)
- Part 173 (Shippers Requirements, especially 173.150 and 173.242)
- Part 174 (Railroad Handling, especially 174.63)
- Part 177 (Carriage by Highway)

Table 8-12. Summary of emission factors for fuel transport to Charleston, West Virginia

Fuel	Emissions Source	Emission Factors (lb/1,000 gal of fuel delivered)					
		HC	Methanol	CO	NO_x	PM	SO_x
Fuel methanol	Evaporative losses	0	1.61	0	0	0	0
	Diesel truck exhaust	0.227	0	1.074	0.867	0.131	0.066
	Totals	0.227	1.61	1.074	0.867	0.131	0.066
M100[a]	Evaporative losses	0	0.54	0	0	0	0
	Diesel truck exhaust	0.005	0	0.026	0.021	0.003	0.002
	Totals	0.005	0.54	0.026	0.021	0.003	0.002

[a]M100 signifies methanol used as an existing fuel.

Table 8-13. Air quality impacts due to fuel transportation to Charleston, West Virginia

Scenario	Fuel	Quantity (gal)	Emissions (lb)					
			HC	Methanol	CO	NO_x	PM	SO_x
Proposed project	Fuel methanol	80,000	18.16	128.80	85.92	69.36	10.48	5.28
Existing environment	M100	80,000	0.40	43.20	2.08	1.68	0.24	0.16

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Part 178, (especially Subparts H {Specification for Containers for Motor Vehicle Transportation} and J {Specification for Portable Tanks})

8.2.4 Spill/Emergency Response for Methanol Transport

Chemtrech monitors and responds to emergencies and spills relating to hazardous materials transport. They cover transportation for all carriers. Their emergency response number is (800) 424-9300. The fuel transporter, Union Pacific/Bulktainer, also has an emergency response team which will act in the case of any accident or spill which may occur during transit, covering both trucks and rail. The Union Pacific/Bulktainer emergency response team can be reached 24 hours/day, 7 days/week. Air Products also maintains a group of on-call consultants to advise emergency response teams on the necessary measures to take in the event of an accident for a given fuel/cargo. This service is also operational at all times and can be reached at (800) 523-9374.

8.3 LACMTA TRANSIT BUS DEMONSTRATION

This proposed project involves the operation of two transit buses in the Los Angeles area. The transit buses will be standard 40-ft coaches equipped with Detroit Diesel Corporation 6V-92TA engines, running on neat methanol (M100). The methanol version of this engine was the first of its kind to be certified under the 1991 emissions standards for both California and United States general use, rather than having been granted an exemption. Like the diesel version of the 6V-92TA engine, the methanol engine is a two-stroke, direct-injection design. The methanol version operates with a higher compression ratio, special air system components, and glow plugs, and produces 253 hp at 2,200 rpm. The LACMTA currently operates more than 300 methanol-powered transit buses in the Los Angeles area and is expected to increase its operational fleet over the course of the next year.

No construction or installation of methanol-compatible fueling facilities will be required at the LACMTA facility that will operate the fuel methanol demonstration transit buses because a 20,000-gallon underground methanol fuel tank and fuel dispensing system are already in place. Both the ISO containers used to transport the fuel methanol and the underground fuel storage tank at the LACMTA facility are equipped with Stage 1 vapor recovery systems. Stage 1 vapor recovery returns vapor from the fuel storage tank to the tank truck as the vapor is displaced from the fuel storage tank during filling. The LACMTA methanol fuel dispensing system is also equipped with Stage 2 vapor recovery. Stage 2 vapor recovery returns vapor from the vehicle fuel tank to the fuel storage tank as the vapor is displaced from the vehicle fuel tank during filling.

The existing environment is considered to consist of the following operations:

- Hauling M100 from the San Pedro terminal to the LACMTA facility using heavy-duty diesel tank trucks
- Onsite unloading of fuel into an underground storage tank, tank storage, and fuel dispensing operations
- Returning the tank trucks to the San Pedro terminal
- Operating methanol-powered transit buses

The proposed offsite test facility operations are considered to consist of the following:

- Hauling of the ISO containers from the Los Angeles railyard to the LACMTA facility on heavy-duty diesel trucks
- Onsite unloading of fuel into an underground storage tank, tank storage, and fuel dispensing operations
- Hauling the ISO container from LACMTA back to the Los Angeles railyard
- Operating methanol-powered transit buses

The emissions associated with transporting the fuel to the Los Angeles area — in this case, the rail terminal for fuel methanol and the San Pedro terminal for M100 — are estimated in Section 8.2.

8.3.1 Air Quality Impacts

Fuel methanol will displace methanol (M100), so the air quality impacts of both fuel methanol and M100 are examined. The air quality impacts associated with the use of fuel methanol in this transit bus demonstration project arise from the following:

- Evaporative losses from unloading the methanol from the ISO container into the LACMTA storage tank
- Evaporative losses from dispensing the methanol into LACMTA buses
- Evaporative losses from methanol storage tank breathing
- Exhaust emissions from the diesel trucks (using low-sulfur fuel) during round trip transport of the ISO containers from the railyard to the LACMTA facility
- Exhaust emissions from the regular duty operation of the methanol transit buses

The air quality impacts associated with the use of the baseline fuel (methanol, M100) in the existing environment arise from these same sources, except that the diesel truck exhaust emissions will come from tank trucks instead of trucks hauling ISO containers.

Evaporative Emissions

Site-associated evaporative emissions of both fuel methanol and M100 are due to the following:

- Unloading the fuel from tank trucks or ISO containers into an underground fuel storage tank
- Underground tank breathing

- Vehicle refueling: displacement and spillage

Evaporative losses associated with filling the underground storage tank (loading losses) are calculated in the same manner as presented in Section 8.2. This method is applicable in this case also because it is derived from first principles and does not depend on any tank-specific parameters. Gasoline and methanol unloading systems will consist of a vapor balance system; therefore the appropriate saturation factor, s, for these fuels is 1.0. Diesel loading systems are submerged loading systems (s =0.6). The specific emission factor associated with losses for each type of fuel are listed in Table 8-14.

Vapor emissions also come from underground tank breathing (breathing losses), which are due to fuel evaporation and barometric pressure changes. The frequency of fuel withdrawal affects the quantity of these emissions, because fresh air enhances evaporation. AP-42[23] lists an emission factor for underground tank breathing and emptying for gasoline. The AP-42 values for gasoline were corrected for true vapor pressure at 60°F and the vapor molecular weight (related to the fuel density of an ideal gas) for methanol emissions. 60°F is a reasonable temperature because the underground storage tanks remain at a fairly constant temperature. Breathing losses are calculated according to the following equation:

$$L_{UST} = EF_{gasoline} * MW_{methanol}/MW_{gasoline} * TVP_{methanol}/TVP_{gasoline}$$

where:

L_{UST} = Evaporative losses from the underground storage tank

EF = The breathing loss emission factor for gasoline from AP-42

[23] *Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources,* AP-42, Fourth Edition, Table 4.4-7, September 1985.

Table 8-14. Evaporative emission factors for the LACMTA facility

Parameter	Fuel			
	Gasoline	M100[a]	Fuel methanol	No. 2 Diesel
RVP (psia)	10.0	4.5	4.5	~0.022
True vapor pressure at 60°F (psia)	5.2	1.4	1.4	0.0074
Condensed vapor density (w) (lb/gal) at 60°F	5.1	6.6	6.6	6.1
MW of vapor	66	32	32	130
Saturation factors[b]	1.0	1.0	1.0	0.6
Emission Factors (lb/1,000 gal)				
Pollutant	**HC**	**Methanol**	**Methanol**	**HC**
Tank truck unloading without vapor controls working loss[c]	8.22	1.07	1.07	0.014
Tank truck unloading with vapor controls working loss[c]	0.41	0.054	0.054	N.A.[d]
Underground tank breathing	1.0	0.13	0.13	~ 0
Vehicle fueling working loss	1.1	0.144	0.144	0.002
Vehicle fueling spillage[e]	0.7	0.82	0.82	0.89
Total Evaporative Emission Factors[f]	3.21	1.15	1.15	0.91

[a]Refers to methanol used as a fuel in the existing environment.
[b]Saturation factors are from Table 4.4-1 of AP-42 and refer to the type of loading. Gasoline and methanol are loaded using a vapor balance system; diesel is loaded using a submerged loading system.
[c]Unloading losses are calculated as described in Section 8.2.
[d]N.A. = Not available.
[e]Gasoline spillage losses are from AP-42 Table 4.4-7; methanol and diesel losses have been corrected for density at 60°F (based on values from Table 4.3-2 of AP-42):

0.7 lb/1,000 gal x 6.6 lb/gal / 5.6 lb/gal = 0.82 lb/1,000 gal.

[f]Totals are based on vapor controls.

MW = The vapor molecular weight

TVP = The true vapor pressure in psia at 60°F

For example, an underground storage tank filled with methanol would have the following emission factor for evaporative losses from underground tank breathing:

$$L_{UST} = 1.0 \times 32/66 \times 1.4/5.2 = 0.13 \text{ lb methanol/1,000 gal}$$

Refueling activities also produce evaporative emissions from vapors displaced from the vehicle tank by dispensed fuel. According to AP-42, the quantity of displaced vapors depends on fuel temperature, fuel tank temperature, vapor pressure, and dispensing rate. AP-42 contains an emission factor for gasoline vehicle displacement losses, but does not have any emission factors for methanol displacement. Therefore, the AP-42 value is corrected for vapor pressure and density of methanol (at 60°F):

$$L_{dispensing} = EF_{gasoline} * MW_{methanol}/MW_{gasoline} * TVP_{methanol}/TVP_{gasoline}$$

where:

$L_{dispensing}$ are the dispensing losses and all other terms are defined as above

During fuel dispensing into vehicles, vapor recovery systems will be used to capture vapors with a vapor return hose (Stage 1 vapor recovery). Methanol is dispensed onto vehicles with vapor return lines from the vehicles (Stage 2 vapor recovery).

AP-42 defines spillage loss as "contributions from prefill and postfill nozzle drip and from spit-back and overflow from the vehicle's fuel tank filler pipe during filling." Spillage loss depends upon several factors including service station characteristics, tank configuration, and operator techniques. AP-42 does not list emission factors specifically for spillage of methanol. However, the volume of spillage during vehicle fueling should be independent with respect to fuel type. Thus, by assuming a constant volume spilled per gallon dispensed, the emission factor for spillage is corrected for density to reflect each specific fuel. Since spilled fuel lands on the vehicle or pavement, the spillage is counted as an evaporative emission.

Table 8-14 summarizes the emission factors for tank truck unloading, underground breathing, and fuel dispensing and spillage.

Exhaust Emissions from Heavy-duty Diesel Trucks

The emission factors for heavy-duty diesel trucks in terms of lb of pollutant emitted per 1,000 gallons of methanol delivered are calculated from the equation:

$$A_n = B_n * C * D * E$$

where:

A_n = lb of pollutant n emitted per 1,000 gallons of methanol delivered

B_n = Grams per mile emission factor for pollutant n

C = Number of miles traveled per fuel delivery

D = Number of deliveries made per 1,000 gallons of methanol delivered

E = lb per gram conversion factor = 0.0022

It is assumed that the fuel methanol delivery system will utilize the existing infrastructure for fuel delivery, i.e., heavy-duty diesel trucks using low-sulfur diesel No. 2. Therefore, the emission factors, B_n, are the same for both the proposed project and the existing environment. These values are based on the same parameters, assumptions, and corrective factors discussed in Section 8.2 for heavy-duty diesel truck exhaust emissions. The emission factors B_n are listed in Table 8-15.

In the case of the proposed project, the value for C is equal to 16 miles (twice the distance from the railyard to the LACMTA facility), and the value for D is equal to 0.16 (based on one delivery made for each ISO container carrying 6,250 gallons of fuel methanol). The environmental impact of shipping fuel methanol to LACMTA will be minimal since only 10 total trips will be required. Since LACMTA is in an industrial area, the trucks are not expected to pass through any residential neighborhoods.

In the case of the existing environment, the value for C is equal to 64 miles (twice the distance from the methanol fuel terminal in San Pedro to the LACMTA facility), and the value for D is equal to 0.11765 (based on one delivery made for each tank truck carrying 8,500 gallons of M100). The corresponding values for A_n based on these two scenarios are shown in Table 8-15.

The values of the emission factors in Table 8-15 use a speed correction factor of 1.0, based on a probable average speed of the trucks of 25 mph.

Methanol Transit Bus Emissions

This demonstration project involves the substitution of chemical-grade methanol with fuel methanol. No published data are currently available that describe the differences, if any, between the emissions of vehicles operating on fuel methanol and chemical-grade methanol. However, for the purposes of this analysis, the most probable scenario has been assumed, that there are no significant differences in the emissions of the criteria pollutants (HC, CO, NO_x, and PM) between chemical-grade methanol and fuel methanol over the same vehicle duty cycle. Therefore, no net air quality impact is anticipated due to the exhaust emissions of the transit buses during their operation on fuel methanol.

Table 8-15. Heavy-duty truck emission factors for the Los Angeles area

			Criteria Pollutants				
Emissions Parameter	**Fuel**	**Fuel Economy (mpg)**	**HC**	**CO**	**NO_x**	**PM**	**SO_x**
Emission factor (g/mi) B_n	No. 2 Diesel	5.3[a]	2.10[b]	9.93[b]	8.01[b]	1.21[c]	0.61[d]
Proposed project emissions (lb/1,000 gal fuel methanol) A_n	No. 2 Diesel	5.3[a]	0.012	0.056	0.45	0.006	0.003
Existing environment emissions (lb/1,000 gal M100) A_n	No. 2 Diesel	5.3[a]	0.035	0.164	0.133	0.020	0.010

[a]Based on the 1988 average for heavy-duty combination trucks in the U.S.[24]
[b]Emission factors for model year 1991-2000 heavy-duty diesel trucks with 50,000 miles.[25]
[c]Engineering estimate, based upon typical particulate formation from diesel engines where 0.2 wt % of fuel converts to particulate matter.[26]
[d]Engineering estimate, expressed as SO_2, based upon sulfur content of the on-road truck fuel at 0.05 wt %.[27]

[24] *National Transportation Statistics, 1990 Annual Report,* DOT-TSC-RSPA-90-2.

[25] *Supplement A to Compilation of Air Pollutant Emission Factors, Volume II: Mobile Sources,* AP-42, January 1991.

[26] *Cost-Effectiveness of Diesel Fuel Modifications for Particulate Control,* SAE Technical Paper Series 870556.

[27] Ibid.

AP-42 does not include emission factor estimates for transit buses powered by methanol fuel. The original diesel transit bus emission factors in AP-42 were based on chassis dynamometer tests performed over the EPA duty cycle. Similar tests have been performed recently at the LACMTA Emission Testing Facility on methanol transit buses over the Central Business District (CBD) duty cycle. Although different than the EPA cycle, the CBD cycle is representative of the downtown Los Angeles routes which the methanol buses will typically drive. The emission results from these tests should therefore yield good estimates of the in-use emissions (air quality impacts) of the fuel methanol transit buses. Table 8-16 lists composite emission factors from chassis dynamometer testing on LACMTA transit buses with 1992 DDC 6V-92TA methanol engines. For comparison, diesel emission factors are also included in the table.

The emission factors for methanol transit buses in terms of lb of pollutant emitted per 1,000 gallons of methanol consumed are calculated from the equation:

$$F_n = G_n * H * I$$

where:

- F_n = lb of pollutant n emitted per 1,000 gallons of methanol consumed
- G_n = Grams per mile emission factor for pollutant n
- H = Fuel economy (mpg) of the methanol buses = 1.21
- I = lb per 1,000 gram conversion factor = 2.205

The values for G_n and F_n are shown in Table 8-16.

Air Quality Impacts Summary for the LACMTA Demonstration

The emissions from the various components of the proposed demonstration project and the existing environment are summarized in Table 8-17. These emissions include the following:

Table 8-16. Methanol transit bus emission factors

Exhaust Emissions Parameter	Fuel Economy (mpg)	Pollutants					
		HC	Methanol	CO	NO_X	PM	SO_X
Methanol emission factor (g/mi) G_n[a]	1.21[b]	0	0.72[c]	0.21	9.60	0.25	0
Diesel emission factor (g/mi)[d]	3.0[b]	20	0	7.1	25.4	1.1	0.60[e]
Methanol-fueled transit bus emissions (lb/1,000 gal) F_n		0	1.92	0.56	25.61	0.67	0
Diesel emissions (lb/1,000 gal)		13.2	0	46.9	167.6	7.26	3.96

[a]Values taken from three sets of tests of CBD cycle results for MTA methanol buses 1291 and 1276 with DDC 6V-92TA engines.[28] Emissions data for M100 buses are based on those buses equipped with the correct engine control software and representing a production engine.
[b]Values are for LACMTA M100 and control diesel buses powered by DDC 6V-92TA engines.[29]
[c]In Reference 28, methanol is reported as HC and measured by FID. This exhaust constituent is primarily methanol.
[d]Values taken from tests of CBD cycle results for LACMTA diesel bus 2039 with DDC 6V-92TA engine.[30]
[e]Engineering estimate, expressed as SO_2, based upon sulfur content of the fuel at 0.05 wt %.[31]

28 *Chassis Dynamometer Emissions Testing Results for Diesel and Alternative-Fueled Transit Buses,* SAE Technical Paper Series 931783, SP-982.

29 *Alternate Fuels Section Status Report, July - September 1992,* Southern California Rapid Transit District (now LACMTA).

30 Ibid.

31 *Cost-Effectivness of Diesel Fuel Modifications for Particulate Control,* SAE Technical Paper Series 870556.

Table 8-17. Summary of emission factors for the LACMTA test facility

Emissions Source	Emissions (lb/1,000 gal of fuel methanol delivered and used)					
	HC	Methanol	CO	NO_x	PM	SO_x
Fuel Methanol						
Evaporative losses	0	1.15	0	0	0	0
Heavy-duty diesel Trucks	0.012	0	0.056	0.045	0.006	0.003
Methanol transit buses	0	1.92	0.56	25.61	0.67	0
Fuel transport to Los Angeles	9.38	1.61	14.11	36.87	2.60	5.58
Totals	9.39	4.68	14.73	62.53	3.28	5.58
Methanol (M100)						
Evaporative losses	0	1.15	0	0	0	0
Heavy-duty diesel trucks	0.035	0	0.164	0.133	0.02	0.01
Methanol transit buses	0	1.92	0.56	25.61	0.67	0
Fuel transport	0	0.54	0	0	0	0
Total for M100	0.035	3.61	0.724	25.74	0.69	0.0

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The emissions due to transporting the fuel methanol from Kingsport, Tennessee, to Los Angeles, California or loading the M100 into tank trucks at the San Pedro terminal (see Tables 8-8 and 8-10)

- Heavy-duty diesel truck exhaust emissions due to hauling the fuel methanol ISO containers from the railyard to the LACMTA facility or the tank trucks of M100 from the San Pedro terminal (see Table 8-15)
- The evaporative losses for fuel methanol and the baseline chemical-grade methanol due to onsite fuel unloading, tank breathing, and fuel dispensing (see Table 8-14)
- The methanol transit bus exhaust emissions due to regular operation of the buses (see Table 8-16)

The air quality impacts for the proposed test facility and the existing environment are summarized in Table 8-18. These values were calculated by multiplying the total emission factor for each type of methanol (in Table 8-17) by the respective quantities of fuel (in thousands of gallons) to be delivered and used at the site. The differences between emissions associated with the existing environment and emissions associated with the proposed test facility are denoted as "Delta."

8.3.2 Permits/Regulations for LACMTA Test Facility

LACMTA requires no permits to operate its methanol buses. The DDC 6V-92TA methanol engines are certified for operation by the California Air Resources Board (ARB). Because the LACMTA methanol fueling facilities are already in place and operational, all the necessary permits have been acquired:

- A check-off permit from the Los Angeles City Fire Department for successfully meeting the plan check requirements for underground storage tanks

Table 8-18. Air quality impact summary for the LACMTA project

Scenario	Fuel	Quantity (gal)	Emissions (lb)					
			HC	Methanol	CO	NO_x	PM	SO_x
Proposed project	Fuel methanol	60,000	563.5	280.8	883.8	3,751.8	196.8	334.8
Existing environment	Chemical-grade M100	60,000	2.1	216.6	43.4	1,544.6	41.4	0.6
Delta			561.4	64.2	840.4	2,207.2	155.4	334.2

•

A series of permits from the California South Coast Air Quality Management District (SCAQMD) allowing the construction of the fuel tanks, the operation of the fuel tanks, and the dispensing of fuel from the tanks

Copies of these permits are on file at the operating divisions of the LACMTA.

8.3.3 Spill/Emergency Response

The LACMTA has an existing emergency spill response plan in place containing procedures for handling vehicle fuel spills. In the event of a spill, whether it occurs at the bus yard or on the streets of Los Angeles, the LACMTA provides a 24 hours/day, 7 days/week emergency hotline. The hotline can be reached at (213) 972-6111 and is staffed by trained personnel able to direct emergency crews. This service works in concert with the Los Angeles Fire Department and copies of the plan are on file at the operating divisions of the LACMTA.

8.4 HUGHES AEROSPACE VANPOOL

This proposed project involves the operation of five vanpool passenger vans in the Los Angeles area. The vans will be medium- or light-duty vehicles equipped with spark-ignited engines in the 100 to 160 hp range, possibly the Ford 4.9L engine. The vans are projected to be 1996 models that meet ARB transitional low-emission vehicle (TLEV) standards. The vans will be operated on a blend of methanol with 15 percent gasoline (M85). In the proposed project, the fuel methanol will replace the M100 component of the M85 fuel. At the time of the demonstration, the gasoline available in the Los Angeles area will be Phase 2 reformulated gasoline (RFG). Therefore, the gasoline component of the fuel will be the same for the baseline M85 as well as for the proposed fuel methanol M85.

The Hughes Aerospace facility has an existing 20,000-gallon underground tank for the storage of methanol. A separate underground storage tank is used to store gasoline. The methanol and gasoline are blended to make M85 immediately before dispensing fuel into the vehicles.

Both the ISO containers used to transport the fuel methanol and the underground fuel storage tank at the Hughes Aerospace facility are equipped with Stage 1 vapor recovery systems, which return vapor from the fuel storage tank to the tank truck as vapor is displaced from the fuel storage tank during filling. The Hughes Aerospace facility is also equipped with a Stage 2 vapor recovery system, which returns vapor from the vehicle fuel tank to the fuel storage tank as the vapor is displaced from the vehicle during filling.

8.4.1 Air Quality Impacts

Fuel methanol will displace the methanol (M100) in the M85 fuel. The gasoline component of the fuel (RFG) is the same for both types of M85. The air quality impacts of M85 using fuel methanol, and M85 using M100, are compared.

The air quality impacts associated with the use of fuel methanol at this offsite test facility arise from the following:

- Evaporative losses from unloading the fuel methanol from the ISO containers and the RFG from the tank trucks into the Hughes Aerospace facility underground storage tanks
- Evaporative losses from dispensing fuel methanol-M85 into the vans (the fuel methanol and RFG are mixed during dispensing)
- Evaporative losses from fuel methanol and RFG storage tank breathing
- Exhaust emissions from the diesel trucks (using low-sulfur fuel) during transport of the ISO containers from the railyard, and tank trucks from the San Pedro terminal, to the Hughes Aerospace facility
- Exhaust emissions from the regular duty operation of the M85 passenger vans

The air quality impacts associated with the use of the baseline fuel, M85, in the existing environment arise from the same sources as those listed above, with one exception. The diesel truck exhaust emissions will come exclusively from tank trucks instead of trucks hauling ISO containers.

Evaporative Emissions

Site-associated evaporative emissions of fuel methanol-M85 and baseline M85 are due to unloading the fuel from tank trucks or ISO containers into an underground fuel storage tank. Hydrocarbon and methanol vapors will be captured with a vapor return hose (Stage 1 recovery), and fuel is dispensed into vehicles with vapor return lines from the vehicles (Stage 2 recovery). The AP-42 emission factors for tank truck unloading and dispensing of fuel methanol, methanol (M100), RFG, and gasoline are shown in Table 8-19. The evaporative emission factors shown in Table 8-19 were developed based upon the same parameters, assumptions, and corrective factors discussed in Section 8.3.1.

Exhaust Emissions

The exhaust emissions associated with the Hughes Aerospace vanpool offsite test facility are due both to the heavy-duty diesel trucks used for transport of M85 fuel stocks to the Hughes Aerospace facility, and to the passenger van emissions. These exhaust emissions are discussed below.

Heavy-duty Diesel Trucks

The emission factors for heavy-duty diesel trucks used to transport methanol and RFG to the Hughes facility in terms of lb of pollutant emitted per 1,000 gallons of methanol or RFG delivered are calculated from the equation:

$$A_n = B_n * C * D * E$$

Table 8-19. Evaporative emission factors for the Hughes vanpool project

	Emissions (lb/1,000 gal)			
Evaporative Emissions Source	**Gasoline**	**Reformulated Gasoline (RFG)**	**M100**	**Fuel Methanol**
Tank truck unloading with vapor controls working loss	0.41	0.285	0.054	0.054
Underground tank breathing	1.0	0.693	0.13	0.13
Vehicle fueling working loss	1.1	1.463	0.144	0.144
Vehicle fueling spillage	0.7	-	0.82	0.82
Total	3.21	2.441	1.15	1.15

where:

A_n = lb of pollutant n emitted per 1,000 gallons of fuel delivered

B_n = Grams per mile emission factor for pollutant n

C = Number of miles traveled per fuel delivery

D = Number of deliveries made per 1,000 gallons of fuel delivered

E = lb per gram conversion factor = 0.0022

It is assumed that the fuel methanol delivery system will utilize the existing infrastructure for fuel delivery, i.e., heavy-duty diesel trucks using low-sulfur diesel fuel No. 2. Therefore, the emission factors, B_n, are the same for both the proposed project and the existing environment. These values are based on the same parameters, assumptions, and corrective factors discussed in Section 8.2 for heavy-duty truck exhaust emissions.

In the case of the proposed project, the value for C is equal to 36 miles (the round trip distance from the railyard to the Hughes Aerospace facility), and the value for D is equal to 0.16 (based on one delivery made with each ISO container carrying 6,250 gallons of fuel methanol). In the case of the existing environment, the value for C is also equal to 36 miles (the round trip distance from the methanol fuel terminal in San Pedro to the Hughes Aerospace facility), and the value for D is equal to 0.11765 (based on one delivery made with each tank truck carrying 8,500 gallons of methanol). The emission factors A_n and B_n are shown in Table 8-20.

The delivery of RFG to the Hughes site by diesel-fueled tank trucks is the same for both the proposed project and the existing environment. The value for C is equal to 36 miles (the round trip distance from the San Pedro fueling terminal to the Hughes facility), and the value for D is equal to 0.11765 (based on one delivery made for each tank truck carrying 8,500 gallons of gasoline).

Table 8-20. Heavy-duty truck exhaust emissions for the Hughes M85 vanpool

Emissions Parameter	Fuel	Fuel Economy (mpg)	Criteria Pollutants				
			HC	CO	NO_x	PM	SO_x
Emission factors (g/mile) B_n	No. 2 diesel	5.3[a]	2.10[b]	9.93[b]	8.01[b]	1.21[c]	0.61[d]
Proposed Project							
Emissions (lb/1,000 gal fuel methanol delivered) A_n	No. 2 diesel	5.3[a]	0.027	0.126	0.102	0.015	0.008
Emissions (lb 1,000 gal RFG delivered) A_n	No. 2 diesel	5.3[a]	0.020	0.093	0.075	0.011	0.006
Existing Environment							
Emissions (lb/1,000 gal M100 delivered) A_n	No. 2 diesel	5.3[a]	0.020	0.093	0.075	0.011	0.006
Emissions (lb/1,000 gal RFG delivered) A_n	No. 2 diesel	5.3[a]	0.020	0.093	0.075	0.011	0.006

[a]Based on the 1988 average for heavy-duty combination trucks in the U.S.[32]
[b]Emission factors for model year 1991-2000 heavy-duty diesel trucks with 50,000 miles.[33]
[c]Engineering estimate, based on typical particulate formation from diesel engines where 0.2 wt % of fuel converts to particulate matter.[34]
[d]Engineering estimate, expressed as SO_2, based upon sulfur content of the onroad truck fuel at 0.05 wt %.[35]

[32] *National Transportation Statistics, 1990 Annual Report,* DOT-TSC-RSPA-90-2.

[33] *Supplement A to Compilation of Air Pollutant Emission Factors, Volume II: Mobile Sources,* AP-42, January 1991.

[34] *Cost-Effectiveness of Diesel Fuel Modifications for Particulate Control,* SAE Technical Paper Series 870556.

[35] Ibid.

Passenger Van Emissions

This demonstration project involves the substitution of M100 chemical-grade methanol with fuel methanol (fuel-grade methanol) for the methanol component of M85. No published data are currently available that describe the differences, if any, between the emissions of vehicles operating on fuel methanol and M100. For the purposes of this analysis, the most probable assumption has been made, namely that there are no significant differences in the emissions of the criteria pollutants HC, CO, NO_x, and PM between chemical-grade methanol and fuel methanol over the same vehicle duty cycle. Therefore, no net air quality impact is anticipated due to the exhaust emissions of the passenger van during its operation on an M85 blend of fuel methanol and RFG as compared with baseline M85.

The emission factors for M85-fueled passenger vans in terms of lb of pollutant emitted per 1,000 gallons of fuel consumed are calculated from the equation:

$$F_n = G_n * H * I$$

where:

F_n = lb of pollutant n emitted per 1,000 gallons of M85 consumed

G_n = Grams per mile emission factor for pollutant n

H = Fuel economy (mpg) of the M85 passenger vans = 8.0[36]

I = lb per 1,000 gram conversion factor = 2.205

The values for G_n and F_n are shown in Table 8-21.

AP-42 does not include emission factor estimates for passenger vans powered by methanol or M85. Because the van will be a 1996 model, it is assumed

36 Personal communication with Hughes motorpool staff.

Table 8-21. Passenger van exhaust emission factors

Exhaust Emissions Parameter	Fuel Economy (mpg)	Pollutant				
		HC[a]	CO	NO_x	PM	SO_x
TLEV standard[b] (g/mi) G_n	8.0	0.125	3.40	0.40	0	N.A.[c]
Emissions (lb/1,000 gal M85 fuel consumed) F_n		2.2	59.8	7.05	0	0.96[d]

[a]ARB standard is for non-methane organic gas (NMOG).
[b]ARB 1996 standards for TLEVs.
[c]N.A. = Not available.
[d]SO_x emissions based on sulfur content of RFG at 80 ppm by weight maximum, converted to SO_2.[37]

[37] ARB, *California Phase 2 Reformulated Gasoline Specifications: Proposed Regulations for RFG, Technical Support Doc.*, October 4, 1991.

that, regardless of its fuel composition, it will meet the ARB TLEV emission standards, shown in Table 8-21. Table 8-21 also shows the TLEV standard converted to emissions in lb/1,000 gal, based on a fuel economy of 8.0 mpg for the vehicle.

Air Quality Impacts Summary for the Hughes Aerospace Vanpool Demonstration

The emission factors for the various components of the proposed demonstration project are summarized in Table 8-22. These emissions include the following:

- Emissions associated with transporting the fuel methanol from Kingsport, Tennessee, to Los Angeles, California (see Table 8-8)
- Evaporative emissions associated with the loading of RFG into tank trucks at the San Pedro terminal (see Table 8-8)
- Heavy-duty diesel truck exhaust emissions from local transport of the ISO containers with fuel methanol from the railyard, and tank trucks with RFG from the San Pedro terminal to the Hughes Aerospace facility (see Table 8-20)
- Evaporative losses of fuel methanol and gasoline due to fuel unloading, tank breathing, fuel mixing, and fuel dispensing (see Table 8-19)
- Exhaust emissions from the regular-duty operation of the fuel methanol-M85 passenger van (see Table 8-21)

For comparison, the emission factors associated with the use of baseline M85 in the passenger vans are also summarized in Table 8-22. These baseline emissions include the following:

- Evaporative emissions associated with the loading of methanol (M100) and RFG into tank trucks at the San Pedro terminal (see Table 8-8)

Table 8-22. Summary of emission factors for Hughes vanpool

Scenario	Fuel	Emissions Source	Emissions (lb/1,000 gal of fuel)					
			HC	Methanol	CO	NO_X	PM	SO_X
Proposed project	RFG	Fuel transport Evaporative losses Truck exhaust	2.74	0	0.093	0.075	0.011	0.006
	Fuel methanol	Fuel transport to Los Angeles Evaporative losses Truck exhaust	9.407	2.76	14.236	36.972	2.615	5.588
	M85	Passenger van operation	0	2.2[a]	59.8	7.05	0	0.96[b]
Existing environment	RFG	Fuel transport Evaporative losses Truck exhaust	2.74	0	0.093	0.075	0.011	0.006
	M100	Fuel transport Evaporative losses Truck exhaust	0.020	1.69	0.093	0.075	0.011	0.006
	M85	Passenger van operation	0	2.2[a]	59.8	7.05	0	0.96[b]

[a]The ARB standard is for non-methane organic gases (NMOG). It is reported here as methanol because that is the primary constituent of the exhaust.
[b]SO_X emissions based on sulfur content of RFG at 80 ppm by weight maximum, converted to SO_2.[38]

[38] ARB, *California Phase 2 Reformulated Gasoline Specifications: Proposed Regulations for RFG, Technical Support Doc.*, October 4, 1991.

Heavy-duty diesel truck exhaust emissions due to transport of the tank trucks carrying the methanol and gasoline to the Hughes facility (Table 8-20)

- Evaporative losses of methanol and gasoline due to fuel unloading, tank breathing, fuel mixing, and fuel dispensing (see Table 8-19)
- Exhaust emissions from the regular duty operation of the baseline M85-fueled passenger van (see Table 8-21)

The total air quality impacts for the proposed project and the existing environment are summarized in Table 8-23. These values were calculated by multiplying the emission totals in Table 8-22 by the respective quantities of fuel (in thousands of gallons) to be delivered and used at the site. The differences between emissions associated with the existing environment and emissions associated with the proposed project are denoted as "Delta."

8.4.2 Hughes Aerospace Firetube Boiler

A firetube boiler at the Hughes Aerospace facility will be converted from natural gas to operate on fuel methanol. There has been very little operating experience with methanol firing in stationary sources, because until recently, the demand for methanol's environmental benefits was not sufficient to justify the increased cost. However, with the fuel oil phaseout in the South Coast Air Basin, methanol is a viable backup fuel for stationary sources. This demonstration of a fuel-methanol-fired firetube boiler will provide valuable technical experience with methanol combustion in stationary sources.

Air Quality Impacts

Fuel methanol will displace natural gas, so the air quality impacts of both fuels are examined. The air quality impacts associated with fuel methanol use at this offsite test facility arise from the following:

Table 8-23. Air quality impact summary for the Hughes vanpool

Scenario	Fuel	Quantity (gal)	Emissions (lb)					
			HC	Methanol	CO	NO_x	PM	SO_x
Proposed project	RFG	3,530	9.67	0	0.33	0.26	0.04	0.02
	Fuel methanol	20,000	188.14	55.20	284.72	739.44	52.30	111.76
	M85	23,530	0	51.77	1,407.09	165.89	0	22.59
Totals			197.81	106.97	1,692.14	905.59	52.34	134.37
Existing environment	RFG	3,530	9.67	0	0.33	0.26	0.04	0.02
	M100	20,000	0.4	33.80	1.86	1.50	0.22	0.12
	M85	23,350	0	51.77	1,407.09	165.89	0	22.59
Totals			10.07	85.57	1,409.28	167.65	0.26	22.73
Delta			187.74	21.90	282.86	737.94	52.08	111.64

Exhaust emissions from the diesel trucks handling local delivery of the ISO containers to the Hughes facility

- Evaporative losses from unloading the fuel methanol from the ISO containers into the Hughes storage tank
- Evaporative losses from fuel storage tank breathing and fueling spillage
- Emissions associated with the operation of the firetube boiler

The air quality impacts associated with the use of the baseline fuel, natural gas, in the existing environment are assumed to consist only of emissions associated with the operation of the firetube boiler. Because the natural gas fuel is piped directly to the boiler facility, local transportation and evaporative emissions are considered negligible and are approximated as zero for the purposes of this analysis.

Evaporative Emissions

Site-associated evaporative emissions of fuel methanol are due to the following:

- Unloading of the fuel methanol from ISO containers into the underground fuel storage tank
- Underground tank breathing
- Boiler fueling losses

For the purposes of this analysis, fuel working losses and spillage losses are assumed to be equivalent to emission factors from AP-42 for vehicle fueling. The evaporative emission factors shown in Table 8-24 were developed based upon the same parameters, assumptions, and corrective factors discussed in Section 8.3.1.

Exhaust Emissions

Exhaust emissions associated with the Hughes Aerospace fuel-methanol-fired firetube boiler demonstration project are due to the heavy-duty diesel trucks

Table 8-24. Evaporative emission factors for the Hughes firetube boiler

Emissions Source	Emissions (lb/1,000 gal fuel methanol)
Tank truck unloading with vapor controls working loss	0.054
Underground tank breathing	0.13
Boiler fueling working loss	0.144
Boiler fueling spillage	0.82
Total	1.15

transporting ISO containers of fuel methanol from the railyard to the Hughes Aerospace facility.

The emission factors for heavy-duty diesel trucks in terms of lb of pollutant emitted per 1,000 gallons of fuel methanol delivered are calculated from the following equation:

$$A_n = B_n * C * D * E$$

where:

A_n= lb of pollutant n emitted per 1,000 gallons of fuel methanol delivered

B_n= Grams per mile emission factor for pollutant n

C = Number of miles traveled per fuel delivery

D = Number of deliveries made per 1,000 gallons of fuel methanol delivered

E = lb per gram conversion factor = 0.0022

The emission factors, B_n, are based on the same parameters, assumptions, and corrective factors discussed in Section 8.2 for heavy-duty diesel truck exhaust emissions.

In the case of the proposed project, the value for C is equal to 40 miles (twice the distance from the railyard to the Hughes facility), and the value for D is equal to 0.16 (based on one delivery made for each ISO container carrying 6,250 gallons of fuel methanol).

The emission factors A_n and B_n are shown in Table 8-25. As a conservative estimate, the emissions associated with transportation of the natural gas, the baseline operating scenario, are assumed to be zero.

Boiler Operation Emissions

Emissions estimates for methanol-fired boilers are not available in AP-42.

Table 8-25. Heavy-duty truck emission factor for the Hughes firetube boiler

Emissions Parameter	Fuel	Fuel Economy (mpg)	Pollutants				
			HC	CO	NO_x	PM	SO_x
Emission factor (g/mile) B_n	No. 2 diesel	5.3[a]	2.10[b]	9.93[b]	8.01[b]	1.21[c]	0.61[d]
Proposed project emissions (lb/1,000 gal fuel methanol) A_n	No. 2 diesel	5.3[a]	0.03	0.14	0.11	0.02	0.01

[a]Based on the 1988 average for heavy-duty combination trucks in the U.S.[39]
[b]Emission factors for model year 1991-2000 heavy-duty diesel trucks with 50,000 miles.[40]
[c]Engineering estimate, based upon typical particulate formation from diesel engines where 0.2 wt % of fuel converts to particulate matter.[41]
[d]Engineering estimate, expressed as SO_2, based upon sulfur content of the onroad truck fuel at 0.05 wt %.[42]

39 *National Transportation Statistics, 1990 Annual Report,* DOT-TSC-RSPA-90-2.

40 *Supplement A to Compilation of Air Pollutant Emission Factors, Volume II: Mobile Source,* AP-42, January 1991.

41 *Cost-Effectiveness of Diesel Fuel Modifications for Particulate Control, SAE Technical Paper Series 870556.*

42 Ibid.

Therefore, AP-42 emission factors for natural gas are used to approximate the criteria pollutant emissions (CO, PM, and SO_x) from the methanol-fired boiler. The NO_x and HC emissions are estimated by multiplying the AP-42 emission factor for NO_x (or HC) by the ratio of the measured NO_x (or HC) emissions from a methanol-fired utility boiler to NO_x (or HC) emissions from a natural-gas-fired utility boiler.[43] Thus, NO_x and HC emissions are estimated through the following equation:

$$\text{Emissions (lb/1,000 gal)} = \text{EF} \times \text{Ratio} \times \text{HHV} \times 1{,}000$$

where:

EF = AP-42 derived emission factor for NO_x or HC from commercial boilers (lb NO_x/MMBtu natural gas) using HHV of natural gas = 103,000 Btu/scf

Ratio = NO_x from methanol-fired utility boiler (lb/MMBtu)/NO_x from diesel-fired boiler (lb/MMBtu)

HHV = Higher heating value of methanol = 64,800 Btu/gal

The emission factors and emissions estimates based on the above equation are shown in Table 8-26.

Air Quality Impacts Summary

The emission factors for the various components of the proposed project are summarized in Table 8-27. These emissions include the following:

- Emissions associated with transporting the fuel methanol from Kingsport, Tennessee, to Los Angeles, California (see Table 8-8)

[43] Weir, Alexander, et al., *Investigation of Methanol as a Boiler Fuel for Electric Power Generation,* EPRI Project AP 2554, Southern California Edison Company, Rosemead, California, August 1982.

Table 8-26. Emission factors from operation of the Hughes firetube boiler

Emission Factor	Criteria Pollutants				
	HC	CO	NO_x	PM	SO_x
Natural gas (lb/MMBtu)[a]	0.0058	0.021	0.1	0.012	0.0006
Fuel methanol (lb/MMBtu)[b]	0.0018	0.021	0.0216	0.012	0
Natural gas (lb/100 scf)[c]	0.006	0.002	0.01	0.001	0.00006
Fuel methanol (lb/1,000 gal)[d]	0.117	1.36	1.4	0.78	0

[a]From AP-42, July 1993, for a commercial boiler (0.3 to <10 MMBtu/hr).
[b]Assumed to be same as natural gas for CO and PM. $SO_x = 0$. NO_x and HC emission factors are calculated as product of natural gas emission factor and ratio of methanol/natural gas utility boiler emissions from source test data.
[c]Multiply emission factor by HHV of natural gas = 103,000 Btu/100 scf.
[d]Multiply lb/MMBtu by HHV of methanol = 64,800 Btu/lb.

Table 8-27. Summary of emission factors for the Hughes firetube boiler

Emissions Source	Criteria pollutant emissions (lb/1,000 gal)					
	HC	Methanol	CO	NO_x	PM	SO_x
Proposed project - fuel methanol						
Transport to Los Angeles	9.38	1.61	14.11	36.87	2.60	5.58
Evaporative emissions	0	1.15	0	0	0	0
Heavy-duty diesel trucks	0.03	0	0.14	0.11	0.02	0.01
Fuel-methanol-fired boiler	0.12	0	1.36	1.4	0.78	0
Total	9.53	2.76	15.61	38.38	3.40	5.59
Baseline scenario - natural gas (lb/100 scf)						
Transport to Los Angeles	0	0	0	0	0	0
Evaporative emissions	0	0	0	0	0	0
Heavy-duty diesel trucks	0	0	0	0	0	0
Natural-gas-fired boiler	0.006	0	0.002	0.01	0.001	0.00006
Total	0.006	0	0.002	0.01	0.001	0.00006

Heavy-duty diesel truck exhaust emissions from local transport of the ISO containers from the railyard to the Hughes facility (see Table 8-25)

- Evaporative losses due to fuel unloading, tank breathing, and fuel dispensing (see Table 8-24)
- Exhaust emissions from the regular-duty operation of the fuel-methanol-fired firetube boiler (see Table 8-26)

For comparison, the emission factors associated with the use of baseline natural gas are also summarized in Table 8-27. The baseline emissions include boiler operation emissions only.

The total air quality impacts for the proposed project and the existing environment are summarized in Table 8-28. These values were calculated by multiplying the total emission factors shown in Table 8-27 by the respective quantities of fuel to be used at the site. The differences between the emissions associated with the existing environment and those associated with the proposed test facility are denoted as Delta in Table 8-28. Because the baseline fuel in this case is natural gas, a volume of gas with an energy content equivalent to 20,000 gallons of methanol has been utilized in calculating baseline emissions for the boiler.

8.4.3 Permits/Regulations

Hughes Aerospace requires no permits to operate its M85 passenger vans, the engines of which are ARB-certified for operation. Likewise, Hughes requires no permits to operate its firetube boiler on methanol rather than natural gas. Because the Hughes Aerospace methanol fueling facilities are already in place and operational, all of the necessary permits have been acquired:

- A check-off permit from the Los Angeles City Fire Department for successfully meeting the plan check requirements for underground storage tanks

Table 8-28. Air quality impacts summary for the Hughes firetube boiler

Scenario	Fuel	Quantity	Emissions (lb)					
			HC	Methanol	CO	NO_x	PM	SO_x
Proposed project	Fuel methanol	20,000 gal	190.6	55.2	312.2	767.6	68.0	111.8
Baseline scenario	Natural gas	1.23×10^6 scf[a]	73.8	0	24.6	123	12.3	0.74
Delta			116.8	55.2	287.6	644.6	55.7	111.1

[a]Based on equivalent energy contents. HHV fuel methanol = 64,800 Btu/gal; HHV natural gas = 103,000 Btu/100 scf.

A series of permits from SCAQMD allowing the construction of the fuel tanks, the operation of the fuel tanks, and the dispensing of fuel from the tanks

Copies of these permits are on file at the Hughes Aerospace facility.

8.4.4 Spill/Emergency Response

Hughes Aerospace must prepare an emergency spill response plan containing procedures on handling vehicle fuel spills. Copies of this plan will be made available at the Hughes Aerospace facility.

8.5 VALLEY DDC STANDBY ELECTRIC POWER GENERATOR

A Valley DDC standby electric power generator, currently fueled with M100, will be operated on fuel methanol. This generator is typically used at construction sites in the Los Angeles area to provide accessory power for work crews. For the purposes of this analysis, the generator is assumed to be equivalent to a DDC 6V-92TA methanol engine, the powerplant upon which it is based. Although the Valley DDC facility currently has a 1,000-gallon aboveground tank, equipped with a Stage 1 recovery system, used for methanol (M100) storage, there are plans to install a 10,000-gallon aboveground storage tank with vapor recovery by the time the proposed project begins.

8.5.1 Air Quality Impacts

Fuel methanol will displace methanol (M100), so the air quality impacts of both fuel methanol and M100 are examined. The air quality impacts associated with the use of fuel methanol at this offsite test facility arise from the following:

- Evaporative losses from unloading the fuel methanol from the ISO containers into the Valley DDC storage tank
- Evaporative losses from dispensing the fuel methanol into the generator
- Evaporative losses from storage tank breathing

- Exhaust emissions from heavy-duty diesel trucks during the round-trip transport of the ISO containers from the railyard to the Valley DDC facility
- Exhaust emissions from the regular operation of the generator

The air quality impacts associated with the use of the baseline fuel (methanol, M100) in the existing environment arise from these same sources, except that the diesel truck exhaust emissions will come from tank trucks instead of trucks hauling ISO containers.

Evaporative Emissions

Site-associated evaporative emissions of both fuel methanol and M100 are due to the following:

- Unloading the fuel from ISO containers or tank trucks into the aboveground storage tank
- Storage tank breathing
- Generator (vehicle) refueling, displacement, and spillage

The evaporative emission factors shown in Table 8-29 were developed based upon the same parameters, assumptions, and corrective factors discussed in Section 8.3.1.

Exhaust Emissions

The exhaust emissions associated with the Valley DDC standby generator offsite test facility are due to the heavy-duty diesel trucks used for transporting the fuel methanol from the railyard to the Valley DDC facility. The emission factors for heavy-duty diesel trucks in terms of lb of pollutant emitted per 1,000 gallons of fuel methanol delivered are calculated from the following equation:

$$A_n = B_n * C * D * E$$

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Table 8-29. Evaporative emission factors for the Valley DDC standby generator

Evaporative Emissions Source	Emissions (lb/1,000 gal)	
	M100	Fuel Methanol
Tank truck unloading with vapor controls unloading loss	0.054	0.054
Tank breathing	0.13	0.13
Vehicle fueling working loss	0.144	0.144
Vehicle fueling spillage	0.82	0.82
Total	1.15	1.15

where:

A_n = lb of pollutant n emitted per 1,000 gallons of methanol delivered

B_n = Grams per mile emission factor for pollutant n

C = Number of miles traveled per fuel delivery

D = Number of deliveries made per 1,000 gallons of methanol delivered

E = lb per gram conversion factor = 0.0022

The fuel methanol delivery system will utilize the existing infrastructure for fuel delivery, i.e., heavy-duty diesel trucks using low-sulfur diesel fuel No. 2. Therefore, the emission factors, B_n, are the same for both the proposed project and the existing environment. These values are based on the same parameters, assumptions, and corrective factors discussed in Section 8.2 for heavy-duty truck exhaust emissions.

In the case of the proposed project, the value for C is equal to 38 miles (twice the distance from the railyard to the Valley DDC facility), and the value for D is equal to 0.16 (based on one delivery made with each ISO container carrying 6,250 gallons of fuel methanol).

In the case of the existing environment, the value for C is equal to 48 miles (twice the distance from the San Pedro terminal to the Valley DDC facility), and the value for D is equal to 0.11765 (based on one delivery made with each tank truck carrying 8,500 gallons of M100). The values of the emission factors A_n and B_n are shown in Table 8-30.

Generator Operation Emissions

Emissions from the standby generator are estimated using AP-42 emission factors for the DDC 6V-92TA engine. AP-42 does not have emission factors for this engine fueled on methanol, but it does contain emission factors for this engine with diesel fuel oil No. 2. Previous bus demonstrations using this engine, however, have measured the emissions from this engine fueled on both diesel fuel No. 2 and

Table 8-30. Heavy-duty truck emission factors for the Valley DDC facility

Emission Parameters	Fuel	Fuel Economy (mpg)	Criteria Pollutants				
			HC	CO	NO_x	PM	SO_x
Emission factors (g/mile) B_n	No. 2 diesel	5.3[a]	2.10[b]	9.93[b]	8.01[b]	1.21[c]	0.61[d]
Proposed project emissions (lb/1,000 gal fuel methanol) A_n	No. 2 diesel	5.3[a]	0.028	0.133	0.107	0.016	0.008
Existing environment emissions (lb/1,000 gal M100) A_n	No. 2 diesel	5.3[a]	0.026	0.123	0.100	0.015	0.008

[a]Based on the 1988 average for heavy-duty combination trucks in the U.S.[44]
[b]Emission factors for model year 1991-2000 heavy-duty diesel trucks with 50,000 miles.[45]
[c]Engineering estimate, based upon typical particulate formation from diesel engines where 0.2 wt % of fuel converts to particulate matter.[46]
[d]Engineering estimate, expressed as SO_2, based upon sulfur content of the onroad truck fuel at 0.05 wt %.[47]

44 *National Transportation Statistics, 1990 Annual Report,* DOT-TSC-RSPA-90-2.

45 *Supplement A to Compilation of Air Pollutant Emission Factors, Volume II: Mobile Sources,* AP-42, January 1991.

46 *Cost-Effectiveness of Diesel Fuel Modifications for Particulate Control,* SAE Technical Paper Series 870556.

47 Ibid.

methanol.[48] For the purposes of this analysis, emission factors for a methanol-fueled generator are calculated by multiplying the diesel emission factors from AP-42 for this engine by the ratio of methanol to diesel emissions for each of the criteria pollutants from in-use test data. The following equation summarizes this approach:

$$\text{Emissions (lb/1,000 gal)} = \text{EF} \times \text{Ratio}_n \times \text{mpg} \times \text{C} \times 1{,}000$$

where:

- EF = AP-42 emission factor for 6V-92TA engine fueled on diesel fuel No. 2, g/mi
- Ratio_n = (g/mi methanol-engine emissions)/(g/mi diesel engine emissions) x (mpg methanol/mpg diesel), for pollutant n (refer to Table 8-16)
- mpg = mi/gal diesel = 3.0; mi/gal methanol = 1.2
- C = lb/g conversion = 0.0022

The emission factors for the methanol-fired generator developed in this manner are shown in Table 8-31. For comparison, the emission factors for diesel fuel No. 2 from AP-42 are also shown.

This proposed project involves the substitution of chemical-grade methanol with fuel methanol. No published data are currently available that describe the differences, if any, between the emissions of vehicles or engines operating on fuel methanol and chemical-grade methanol. However, for the purposes of this analysis, the most probable scenario — that there are no significant differences in the emissions of the criteria pollutants (HC, CO, NO_x, and PM) between chemical-grade methanol and fuel methanol over the same duty cycle — has been assumed.

[48] Dunlap, L. S., et al., LACMTA, *Chassis Dynamometer Emissions Testing Results for Diesel and Alternative-Fueled Transit Buses,* SAE Technical Paper Series 931783, SP-982.

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Table 8-31. Emissions from operation of the Valley DDC standby generator

Fuel	Fuel economy (mpg)	Criteria Pollutants					
		HC	Methanol	CO	NO_x	PM	SO_x
Diesel No. 2 emission factor (g/mi)[a]	3.0[b]	3.1	0	26.2	27.7	4.77	N.A.[c]
Diesel No. 2 emissions (lb/1,000 gal)	3.0[b]	20.5	0	173	183	31.5	7.19[d]
Methanol emissions (lb/1,000 gal)	1.21[b]	0	2.98[e]	2.1	27.8	2.9	0

[a]AP-42.
[b]Fuel economy values for LACMTA M100 and control diesel buses powered by DDC 6V-92TA engines.[49]
[c]N.A. = Not available.
[d]Engineering estimate, based on maximum sulfur content of diesel = 0.05 wt %, converted to SO_2.
[e]Calculated "hydrocarbon" exhaust emissions for methanol-fueled generator are primarily methanol (see Note c of Table 8-16).

49 *Alternate Fuels Section Status Report, July-September 1992,* Southern California Rapid Transit District (now LACMTA).

Therefore, no net air quality impact is anticipated due to the exhaust emissions of the electric generator during its operation on fuel methanol.

Air Quality Impacts Summary

The emission factors from the various components of the proposed project and the existing environment are summarized in Table 8-32. These emissions include the following:

- Emissions associated with transporting the fuel methanol from Kingsport, Tennessee, to Los Angeles, California (see Table 8-8)
- Heavy-duty diesel truck exhaust emissions from local transport of the ISO containers from the railyard to the Valley DDC facility (see Table 8-30)
- Evaporative losses due to fuel unloading, tank breathing, and fuel dispensing (see Table 8-29)
- Exhaust emissions from the regular-duty operation of the fuel-methanol-powered standby electric generator (see Table 8-31)

For comparison, the emission factors associated with the use of the baseline fuel M100 are also summarized in Table 8-32. These emissions include the following:

- Emissions associated with loading the M100 into tank trucks at the San Pedro terminal (see Table 8-8)
- Heavy-duty diesel truck exhaust emissions due to transporting the M100 from the San Pedro terminal to the Valley DDC facility (see Table 8-30)
- Evaporative losses due to fuel unloading, tank breathing, and fuel dispensing (see Table 8-29)
- Exhaust emissions from the regular-duty operation of the fuel-methanol-powered standby electric generator (see Table 8-31)

Table 8-32. Summary of emission factors for the Valley DDC standby generator

Emissions Source	Criteria Pollutant emissions (lb/1,000 gal)					
	HC	Methanol	CO	NO_x	PM	SO_x
Proposed Project — Fuel Methanol						
Transport to Los Angeles	9.38	1.61	14.11	36.87	2.60	5.58
Evaporative emissions	0	1.15	0	0	0	0
Heavy-duty diesel trucks	0.028	0	0.133	0.107	0.016	0.008
Fuel-methanol-powered generator	0	2.98	2.1	27.8	2.9	0
Total for projected project	9.41	5.74	16.34	64.78	5.52	5.59
Baseline Scenario — M100						
Evaporative emissions	0	1.69	0	0	0	0
Heavy-duty diesel trucks	0.026	0	0.123	0.100	0.015	0.008
M100-fueled generator	0	2.98	2.1	27.8	2.9	0
Total for baseline scenario	0.026	4.67	2.22	29.90	2.92	0.008

The air quality impacts for the proposed offsite test facility and the existing environment are summarized in Table 8-33. These values were calculated by multiplying the total emission factor for each type of methanol (in Table 8-32) by the respective quantities of fuel to be delivered and used at the site. The differences between emissions associated with the existing environment and emissions associated with the proposed test facility are denoted as Delta.

8.5.2 Permits/Regulations

No permit is required to use fuel methanol rather than M100 in the Valley DDC standby generator. However, Valley DDC will require the following permits in order to install their planned 10,000-gallon aboveground storage tank:

- A check-off permit from the Los Angeles City Fire Department for successfully meeting the plan check requirements for aboveground storage tanks
- A series of permits from SCAQMD allowing the construction of the fuel tank, the operation of the fuel tank, and the dispensing of fuel from the tank

8.5.3 Spill/Emergency Response

Valley DDC must prepare an emergency spill response plan containing procedures on handling vehicle fuel spills. Copies of this plan will be made available at the Valley DDC facility.

8.6 UTILITY TURBINE

A utility turbine will be converted from natural gas to fuel methanol operation. The utility is located in El Segundo, California, a distance of 20 miles from the Los Angeles railyard terminal.

Although the utility does not currently use methanol to fuel its turbine for electricity generation, there is a methanol underground storage tank onsite to provide methanol as a process fuel for other utility operations.

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Table 8-33. Air quality impact summary for the Valley DDC standby generator

Scenario	Fuel	Quantity (gal)	Emissions (lb)					
			HC	Methanol	CO	NO_x	PM	SO_x
Proposed project	Fuel methanol	20,000	188.2	114.8	326.8	1,295.6	110.4	111.8
Baseline scenario	M100	20,000	0.52	93.4	44.4	598.0	58.4	0.16
Delta			187.7	21.4	282.4	697.6	52.0	111.6

The ISO containers used to transport the fuel methanol, and the underground fuel storage tank at the utility, are equipped with Stage 1 vapor recovery systems that return vapor from the fuel storage tank to the ISO container (or tank truck) as vapor is displaced from the fuel storage tank during filling.

8.6.1 Air Quality Impacts of the Utility Turbine Project

Air quality impacts of the fuel methanol-fired utility turbine arise from emissions associated with the transport of the fuel methanol from Kingsport, Tennessee, to Los Angeles (discussed in Section 8.2.1), as well as site-specific emissions associated with the use of fuel methanol in the utility turbine. These site-specific impacts arise from the following emission sources:

- Exhaust emissions from heavy-duty diesel trucks during the round-trip transport of the ISO containers from the railyard to the utility in El Segundo
- Evaporative emissions associated with transferring the fuel methanol, storing it in an underground storage tank, and dispensing it to the turbine
- Exhaust emissions from turbine operation

The baseline fuel, natural gas, is transported via pipeline to the utility turbine site. Therefore, as a conservative estimate, emissions associated with transport to Los Angeles, local distribution, and storage of the baseline fuel are assumed to be zero for the purposes of this analysis.

Evaporative Emissions

Site-associated evaporative emissions of fuel methanol are due to unloading the fuel from ISO containers into an underground fuel storage tank. Vapors will be captured with a vapor return hose (Stage 1 vapor recovery). The evaporative emission factors for fuel methanol, shown in Table 8-34, were developed based on the same parameters, assumptions, and corrective factors as discussed previously in

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Table 8-34. Evaporative emission factors for the utility turbine

Evaporative Emissions Source	Emissions	
	Fuel Methanol (lb/1,000 gal)	Natural Gas (lb/100 scf)
Tank truck loading with vapor controls working loss	0.054	0
Underground tank breathing	0.13	0
Dispensing working loss	0.144	0
Dispensing spillage	0.82	0
Total	1.15	0

Section 8.3.1 for the LACMTA offsite test facility. Dispensing fuel working loss refers to the working losses associated with transferring the methanol from the underground storage tank to the turbine. These values are assumed to be equivalent to the vehicle fuel working losses from AP-42. Dispensing fuel spillage emission factors are assumed to be equivalent to emission factors from AP-42 for vehicle fueling. The evaporative emissions from the existing environment, using natural gas, are assumed to be zero.

Exhaust Emissions (Local Distribution)

Exhaust emissions associated with the proposed utility turbine project are due to the heavy-duty diesel trucks used for transport of the fuel methanol from the railyard to the utility in El Segundo.

The emission factors for heavy-duty diesel trucks in terms of lb of pollutant emitted per 1,000 gallons of fuel methanol delivered are calculated from the equation:

$$A_n = B_n * C * D * E$$

where:

A_n = lb pollutant n emitted per 1,000 gallons fuel methanol delivered

B_n = Grams/mile emission factor for pollutant n

C = Number of miles traveled per fuel delivery

D = Number of deliveries made per 1,000 gallons of fuel methanol delivered

E = lb per gram conversion factor = 0.0022

The fuel delivery system will utilize heavy-duty diesel trucks using low-sulfur diesel fuel No. 2. The emission factors, B_n, are based on the same parameters, assumptions, and corrective factors discussed in Section 8.2.1 for heavy-duty diesel truck exhaust emissions. The emission factors, B_n, are listed in Table 8-35.

In the case of the proposed project, the value for C is 40 miles, (twice the distance from the railyard to El Segundo), and the value for D is equal to 0.16 (based on one delivery made with each ISO container carrying 6,250 gallons of fuel methanol). The corresponding values for A_n based on this scenario are also shown in Table 8-35. As indicated earlier, the emissions associated with the transportation of the natural gas, the baseline operating scenario, are assumed to be zero in order to provide a conservative estimate of the impact of the proposed project.

Turbine Operation Emissions

Emissions estimates for methanol-fired utility turbines are not available in AP-42. However, an emissions test of a methanol-fueled gas turbine was conducted by Detroit Diesel Allison on a 501-K turbine.[50] The emissions of NO_x, CO, and HC (as CH_4) from this test were converted into emission factors (units of mass of pollutant emitted per mass of methanol) using test parameters.[51] For the purposes of this analysis, the emissions from a fuel methanol utility turbine are assumed to be identical to those from the methanol turbine in this referenced study. PM and SO_x emissions were not measured in this test and are assumed to be negligible. The derived methanol turbine emission factors are shown in Table 8-36.

The baseline operating scenario is assumed to be a large natural gas turbine with selective catalytic reduction and water injection. The emission factors for the existing environment are taken from AP-42 and are listed in Table 8-36.

[50] Detroit Diesel Allison, *Methanol Fueled Gas Turbine Emission Test: Final Report.*

[51] Calculations are given in Appendix A.

Table 8-35. Heavy-duty truck emission factors for the utility turbine facility

Emissions Parameter	Fuel	Fuel Economy (mpg)	Criteria Pollutants				
			HC	CO	NO_x	PM	SO_x
Emission factor (g/mi) B_n	No. 2 diesel	5.3[a]	2.10[b]	9.93[b]	8.01[b]	1.21[c]	0.61[d]
Proposed project emissions (lb/1,000 gal methanol) A_n	No. 2 diesel	5.3[a]	0.030	0.14	0.113	0.017	0.0086
Existing environment emissions (lb/100 scf natural gas) A_n	Natural gas	N.A.[e]	0	0	0	0	0

[a]Based on 1988 average for heavy-duty combination trucks in U.S.[52]
[b]Emission factors for model year 1991-2000 heavy-duty diesel trucks with 50,000 miles.[53]
[c]Engineering estimate based upon typical particulate formation from diesel engines where 0.2 wt % of fuel converts to particulate matter.[54]
[d]Engineering estimate, expressed as SO_2, based upon sulfur content of on-road truck fuel at 0.05 wt %.[55]
[e]N.A. = Not available.

52 *National Transportation Statistics, 1990 Annual Report,* DOT-TSC-RSPA-90-2.

53 *Supplement A to Compilation of Air Pollutant Emission Factors, Volume II: Mobile Sources,* AP-42, January 1991.

54 *Cost-Effectiveness of Diesel Fuel Modifications for Particulate Control,* SAE Technical Paper Series 870556.

55 Ibid.

Table 8-36. Emission factors from operation of the utility turbine

Emission Factor	Criteria Pollutants				
	HC	CO	NO_x	PM[a]	SO_x[a]
Natural gas[b] (lb/MMBtu)	0.0172	0.0084	0.03	0	0
Fuel methanol[c] (lb/MMBtu)	0.0004[d]	0.0026	0.011	0	0
Natural gas[e] (lb/100 scf)	0.0018	0.00086	0.0031	0	0
Fuel methanol (lb/1000 gal)	0.173[d]	1.13	4.52	0	0

[a]PM and SO_x emissions are assumed to be negligible for both natural gas and methanol-fired turbine.
[b]Emission factors from AP-42, July 1993, for large gas turbines with selective catalytic reduction and water injection.
[c]Converted using HHV of methanol = 64,800 Btu/lb.
[d]As methane.
[e]Converted using HHV of natural gas = 103,000 Btu/lb.

Air Quality Impacts Summary for Utility Turbine

The overall air quality impact of the proposed utility boiler demonstration project using fuel methanol includes the following emission sources:

- The evaporative and exhaust emissions associated with transporting the fuel methanol from Kingsport, Tennessee, to Los Angeles, California (Table 8-8)
- The exhaust emissions from heavy-duty diesel truck transport of the fuel methanol from the Los Angeles railyard to the El Segundo facility (Table 8-35)
- The evaporative losses for fuel methanol due to fuel unloading, tank breathing, and fuel dispensing (Table 8-34)
- The utility turbine emissions during operation with fuel methanol (Table 8-36)

The emissions associated with the existing environment, the utility turbine operating with natural gas, includes only th e emissions associated with operation of the utility turbine itself. Because the natural gas is assumed to be transported via pipeline, there are no associated transport, local distribution, or fuel dispensing losses or emissions.

The emission factors for the proposed demonstration project and the existing environment are summarized in Table 8-37.

The air quality impacts for the proposed offsite test facility and the existing environment are summarized in Table 8-38. These values were calculated by multiplying the total emission factor for each pollutant (in Table 8-37) by the respective quantities of fuel to be delivered and used at the site. The differences between emissions associated with the existing environment and emissions associated with the proposed test facility are denoted as "Delta" in Table 8-38.

Table 8-37. Summary of emission factors for the utility turbine

Emissions Parameter	Emissions					
	HC	Methanol	CO	NO_X	PM	SO_X
Proposed Project	**(lb/1,000 gal fuel delivered and used)**					
Fuel methanol transport to Los Angeles	9.38	1.61	14.11	36.87	2.60	5.58
Local distribution exhaust emissions	0.03	0	0.14	0.113	0.017	0.0086
Evaporative losses	0	1.15	0	0	0	0
Utility turbine operation	0.173	0[a]	1.13	4.52	0	0
Total for proposed project	9.583	2.76	15.38	41.50	2.62	5.59
Existing Environment	**(lb/100 scf delivered and used)**					
Transport of natural gas to Los Angeles	0	0	0	0	0	0
Local distribution to site	0	0	0	0	0	0
Evaporative losses	0	0	0	0	0	0
Utility turbine operation	0.0018	0	0.00086	0.0031	0	0
Total for existing environment	0.0018	0	0.00086	0.0031	0	0

[a]The amount of methanol in turbine exhaust emissions is not known, but is assumed to be accounted for in the HC emissions.

Table 8-38. Air quality impact summary for the utility turbine

Scenario	Fuel	Quantity	Emissions (lb)					
			HC	Methanol	CO	NO_X	PM	SO_X
Proposed project	Fuel methanol	200,000 gal	1,917	552	3,076	8,300	524	1,118
Existing environment	Natural gas	8.35×10^7 scf	1,503	0	718	2,588	0	0
Delta			414	552	2,358	5,712	524	1,118

8.6.2 Permits/Regulations

The utility is required to obtain several permits before they may operate the fuel methanol turbine. These required permits include the following:

- Check-off permit from the Los Angeles City Fire Department containing plan check requirements for underground storage tanks
- Series of permits from SCAQMD allowing the construction and operation of fuel tanks
- Permit from SCAQMD allowing the turbine to be operated on methanol

8.6.3 Spill/Emergency Response

The utility is currently developing their emergency response plan. In the event of a spill, the utility immediately notifies the Los Angeles City Fire Department.

8.7 KANAWHA VALLEY REGIONAL TRANSPORTATION AUTHORITY (KVRTA) — WEST VIRGINIA DEMONSTRATION PROJECT

This proposed project involves the operation of three methanol-fueled transit buses in the Charleston, West Virginia, area. The transit buses are standard 35-foot coaches equipped with Detroit Diesel Corporation 6V-92 engines, currently running on neat methanol (M100). The three methanol coaches operate in the downtown Charleston area as well as outside of town.

No construction or installation of methanol-compatible fueling facilities will be required at the KVRTA facility that will operate the fuel methanol demonstration transit buses because a 20,000-gallon underground methanol fuel tank and fuel dispensing system are already in place. Both the tank trucks used to transport the fuel methanol and the underground fuel storage tank at the KVRTA facility are equipped with Stage 1 vapor recovery systems. Stage 1 vapor recovery returns vapor from the fuel storage tank to the tank truck as the vapor is displaced from the fuel storage tank during filling. The KVRTA methanol fuel dispensing system is equipped with Stage 2 vapor recovery. Stage 2 vapor recovery returns vapor from the vehicle fuel tank to the fuel storage tank as the vapor is displaced from the vehicle fuel tank during filling.

8.7.1 Air Quality Impacts

Fuel methanol will displace methanol (M100), so the air quality impacts of both fuel methanol and M100 are examined. The air quality impacts associated with the use of fuel methanol at this offsite test facility arise from the emissions associated with the transport of the fuel methanol to Charleston, West Virginia from Kingsport, Tennessee (which were discussed in Section 8.2.2 and will be summarized here), as well as the site specific emissions associated with use of the fuel methanol in the three transit buses.

The site-specific air quality impacts associated with the use of fuel methanol in this transit bus demonstration project arise from the following emission sources:

- Evaporative losses from unloading the methanol from the tank truck into the KVRTA storage tank
- Evaporative losses from dispensing the methanol into KVRTA buses
- Evaporative losses from methanol storage tank breathing
- Exhaust emissions from the regular duty operation of the methanol transit buses

The air quality impacts associated with the use of the baseline fuel (M100) in the existing environment arise from the same sources as those listed above for the proposed fuel methanol.

Evaporative Emissions

Table 8-39 shows the emission factors from AP-42[56] for tank truck unloading and fuel dispensing for both M100 and fuel methanol, since fuel methanol will be

[56] *Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources,* AP-42, Fourth Edition, September 1985.

Table 8-39. Evaporative emission factors for the KVRTA facility

Evaporative Emissions Source	Emissions (lb/1,000 gal)	
	M100	Fuel Methanol
Tank truck unloading with vapor controls working loss	0.054	0.054
Underground tank breathing	0.13	0.13
Vehicle fueling working loss	0.144	0.144
Vehicle fueling spillage	0.82	0.82
Total	1.15	1.15

displacing M100 currently used at KVRTA. Both fuel methanol and M100 will be unloaded from tank trucks into an underground fuel storage tank. Vapors will be captured with a vapor return hose (Stage 1 vapor recovery). Methanol is dispensed onto vehicles with vapor return lines from the vehicles (Stage 2 vapor recovery). Spillage during vehicle fueling is not predicted to change with fuel type by AP-42, so this value remains the same for both fueling scenarios. The evaporative emission factors shown in Table 8-39 were developed based upon the same parameters, assumptions, and corrective factors as discussed previously in Section 8.3.1 for the LACMTA offsite test facility.

Methanol Transit Bus Emissions

This demonstration project involves the substitution of M100 (chemical-grade methanol) with fuel methanol (fuel-grade methanol). No published data is currently available which describes the differences, if any, between the emissions of vehicles operating on the two fuels. For the purposes of this analysis, the most probable assumption has been made, that there are no significant differences in the emissions of the criteria pollutants (HC, CO, NO_x, and PM) between chemical grade methanol and fuel methanol over the same vehicle duty cycle. Therefore, no net air quality impact is anticipated due to the exhaust emissions of the transit buses during their operation on fuel methanol.

AP-42 does not include emission factor estimates for transit buses powered by methanol fuel. The original diesel transit bus emission factors in AP-42 were based on chassis dynamometer tests performed over the EPA duty cycle. Similar tests have been performed recently at the LACMTA Emission Testing Facility on methanol transit buses over the Central Business District (CBD) duty cycle. Although different than the EPA cycle, the CBD cycle is representative of the downtown Charleston routes which the methanol buses will typically drive. The emission results from these tests should therefore yield good estimates of the in-use emissions (air quality impacts) of the fuel methanol transit buses. Table 8-40 lists composite emission factors from chassis dynamometer testing on MTA transit buses with 1992 DDC 6V-92TA methanol engines.

The emission factors for methanol transit buses in terms of lb of pollutant emitted per 1,000 gallons of methanol consumed are calculated from the equation:

$$F_n = G_n * H * I$$

where:

F_n = lb of pollutant n emitted per 1,000 gallons of methanol consumed

G_n = Grams per mile emission factor for pollutant n

H = Fuel economy (mpg) of the methanol buses = 1.21[57]

I = lb per 1,000 gram conversion factor = 2.205

The emission factors G_n and F_n are presented in Table 8-40.

Air Quality Impacts Summary for the KVRTA Demonstration

The overall air quality impact of the proposed project using fuel methanol includes the following emission sources:

- The evaporative and exhaust emissions associated with transporting the fuel methanol from Kingsport, Tennessee, to Charleston, West Virginia (Table 8-12)
- The evaporative losses for fuel methanol due to fuel unloading, tank breathing, and fuel dispensing (Table 8-39)
- The methanol transit bus exhaust emissions due to regular operation of the buses (Table 8-40)

[57] *Alternate Fuels Section Status Report, July - September 1992,* Southern California Rapid Transit District (now LACMTA).

Table 8-40. Methanol transit bus emission factors

Exhaust Emissions from M100 and Fuel Methanol Transit Buses	Criteria Pollutants					
	HC	Methanol	CO	NO_x	PM	SO_x
Emission factor[a] (g/mi) G_n	0	0.72[b]	0.21	9.60	0.25	0
Emissions (lb/1,000 gal of methanol consumed) F_n	0	1.92	0.56	25.61	0.67	0

[a]Values taken from three sets of tests of CBD cycle results for LACMTA methanol buses 1291 and 1276 with DDC 6V-92TA engines.[58] Emissions data for M100 buses are based on those buses equipped with the correct engine control software and representing a production engine.

[b]In Reference (58), methanol is reported as HC and measured by FID. This exhaust constituent is primarily methanol.

[58] *Chassis Dynamometer Emissions Testing Results for Diesel and Alternative-Fueled Transit Buses,* SAE Technical Paper Series 931783, SP-982.

Similarly, the emissions associated with the existing environment, the three M100-fueled buses, include the following sources:

- The evaporative and exhaust emissions associated with local transport of the M100 fuel within the Charleston area (Table 8-12)
- The evaporative losses of M100 due to fuel unloading, tank breathing, and fuel dispensing (Table 8-39)
- The methanol transit bus exhaust emissions due to regular operation of the buses (Table 8-40)

The emissions for the proposed demonstration project and the existing environment are summarized in Table 8-41.

The air quality impacts for the proposed offsite test facility and the existing environment are summarized in Table 8-42. These values were calculated by multiplying the total emission factor for each type of methanol (in Table 8-41) by the respective quantities of fuel (in thousands of gallons) to be delivered and used at the site. The differences between emissions associated with the existing environment and emissions associated with the proposed test facility are denoted as "Delta" in Table 8-42.

8.7.2 Permits/Regulations

KVRTA requires no permits to operate its methanol buses. Neither are any special permits required from local fire departments or the air pollution control district.

8.7.3 Spill/Emergency Response

The KVRTA is currently developing its emergency spill response plan. In the event of a spill, the KVRTA immediately notifies the West Virginia Department of Natural Resources (DNR).

Table 8-41. Summary of emissions factors for the KVRTA facility

Emissions Source	Emissions (lb/1,000 gal of fuel delivered and used)					
	HC	Methanol	CO	NO_x	PM	SO_x
Proposed Project						
Fuel methanol transport to Charleston	0.227	1.61	1.074	0.867	0.131	0.066
Evaporative losses	0	1.15	0	0	0	0
Fuel methanol transit bus operation	0	1.92	0.56	25.61	0.67	0
Totals for the proposed project	0.23	4.68	1.63	26.48	0.80	0.07
Existing Environment						
Local M100 transport within Charleston area	0.005	0.54	0.026	0.021	0.003	0.002
Evaporative losses	0	1.15	0	0	0	0
M100 transit bus operation	0	1.92	0.56	25.61	0.67	0
Totals for the existing environment	0.005	3.61	0.59	25.63	0.67	0.002

Table 8-42. Air quality impact summary for the KVRTA facility

Scenario	Fuel	Quantity (gal)	Emissions (lb)					
			HC	Methanol	CO	NO_x	PM	SO_x
Proposed project	Fuel Methanol	80,000	18.2	374.4	130.7	2,118.2	64.1	5.3
Existing environment	M100	80,000	0.4	288.8	46.9	2,050.5	53.8	0.2
Delta			17.8	85.6	83.8	67.7	10.3	5.1

APPENDIX A

DETERMINATION OF METHANOL-FUELED TURBINE EMISSION FACTORS

A.1 CONVERTING TEST DATA FROM METHANOL TURBINE (DETROIT DIESEL ALLISON) INTO EMISSION FACTORS

At maximum continuous rating (MC), the following parameters apply:

- Air flowrate (Wa) = 2.32 kg/s
- Fuel flowrate (Wf) = 368 kg/hr
- NO_X emissions = 19.17 ppmv
- CO emissions = 7.74 ppmv
- HC emissions = 2.11 ppmv

Emission factors desired units are mass emissions/volume fuel.

Step 1. Convert emissions (ppmv) to emissions ($\mu g/m^3$).

From ideal gas law:

$\mu g/m^3$ air = ppm_i x MW_i x p/RT

where:

MW_i = Molecular weight of compound i

p = 1,000 mb at STP

R = 0.08314 mb m^3/ K mole

T = 293 K

For example, for NO_X emissions:

$\mu g/m^3$ = 19.17 ppmv NO_X x 46 μmole/mole x 1,000/(0.08314*293)

= 36,200 μg NO_X/m^3 air

Similarly, CO emissions = 8,896 μg CO/m^3 air

and HC emissions = 1,386 μg HC/m^3 air (assuming all HC is molecular weight of methane)

Step 2. Use air and fuel flowrates to convert emissions to a per fuel basis.

Note: at STP (assumed), 1 mole of an ideal gas = 24 L volume

Simply convert units and multiply by the air flowrate/fuel flowrate.

For example, for NO_x emissions:

36,200 μg NO_x/m^3 air x m^3 air/1,000 L x 24 L air/mole air x mole air/29 g air x

1,000 g air/kg air x 2.32 kg air/s x 3,600 s/hr x hr/368 kg methanol x 10^{-6} g/μg

= 0.68 g NO_x/kg methanol

For CO: 0.17 g CO/kg methanol

For HC (as CH_4): 0.026 g HC/kg methanol

Step 3. Convert emission factors from g pollutant/kg methanol to lb pollutant/MMBtu.

Assume that HHV methanol = 64,800 Btu/lb

This conversion involves unit conversions from g and kg to lb.

For example, for NO_x:

0.68 g NO_x/kg methanol x lb NO_x/453.6 g NO_x x kg methanol/2.2 lb methanol

x lb methanol/64,800 Btu x 10^6 Btu/MMBtu

= 0.011 lb NO_x/MMBtu

Similarly, CO emissions = 0.0026 lb CO/MMBtu

and HC (as CH_4) = 0.0004 lb HC/MMBtu

Step 4. Convert emission factors from g pollutant/kg methanol to lb pollutant/1,000 gal methanol.

Assume density of methanol liquid = 0.796 kg/L

For example, for NO_x:

0.68 g NO_x/kg methanol x 0.796 kg methanol/L methanol x 1,000 L/264.17 gal

x lb NO_x/453.6 g x 1,000 gal/1,000 gal

= 4.52 lb NO_x/1,000 gal methanol

Similarly, CO = 1.13 lb CO/1,000 gal methanol and HC = 0.173 lb HC/1,000 gal methanol

A.2 CONVERSION OF NATURAL GAS EMISSION FACTORS FROM AP-42 TO UNITS OF lb/100 scf

Assume HHV of natural gas = 103,000 Btu/100 scf

Total HC = TOC (as methane) plus NMHC = 0.014 + 0.0032 = 0.0172 lb/MMBtu

0.0172 lb/MMBtu x MMBtu/10^6 Btu x 103,000 Btu/100 scf = 0.00177 lb HC/100 scf

Similarly, CO = 0.0084 lb/MMBtu x MMBtu/10^6 Btu x 103,000 Btu/100 scf

= 0.000865 lb CO/100 scf

and NO_x = 0.03 lb/100 scf x MMBtu/10^6 Btu x 103,000 Btu/100 scf = 0.0031 lb/100 scf

A.3 CALCULATION OF AMOUNT OF NATURAL GAS EQUIVALENT TO 200,000 GALLONS OF METHANOL

HHV of natural gas = 103,000 Btu/100 scf

HHV of methanol = 64,800 Btu/lb

Density of methanol = 6.64 lb methanol/gal methanol

200,000 gal methanol x 6.64 lb methanol/gal methanol x 64,800 Btu/lb methanol x 100 scf/103,000 Btu = 8.35 x 10^7 scf natural gas

9.0 PROVISIONAL PROCESS PLANT ADDITION FOR THE PRODUCTION OF DIMETHYL ETHER (DME)

9.1 BACKGROUND

A part of the stated technical objectives of the proposed LPMEOH™ demonstration is to install equipment in order to produce a dimethyl ether (DME) and methanol co-product. Although the final design for this equipment will not be done until Air Products has sufficient data on the reactor/catalyst system, and after market studies have been conducted, a 'best guess' process design case has been prepared for this EIV.

DME is a gas at ambient conditions with properties similar to propane. It is currently manufactured by the catalytic dehydration of methanol. The production of DME from synthesis gas is a natural extension of the LPMEOH™ process in that three reactions occur concurrently in a single liquid phase reactor; these reactions are methanol synthesis, methanol dehydration, and water-gas shift. This can significantly improve the overall conversion of coal-derived synthesis gas to a storable blend of methanol and DME.

DME has several potential commercial uses. In a storable blend with methanol the mixture can be used as a peaking fuel in IGCC electric power generating facilities. A small amount of DME can also be used to increase the vapor pressure of methanol being used as a diesel engine fuel. The resulting higher volatility is expected to provide beneficial "cold-start" properties to the methanol fuel. Blends of methanol and DME can also be used as a chemical feedstock for the synthesis of chemicals or new, oxygenate fuel additives.

For this project Air Products proposes to demonstrate the slurry reactor's capability to produce DME as a mixed co-product with methanol in a commercial size reactor.

Design Verification Testing (DVT) is required to provide additional data for the engineering design and to understand the economics of DME production. The DVT plan will be coordinated with and utilize the resources of the DOE's Liquid Fuels Program as technology experts. The essential DVT steps required for project decision making regarding the methanol/DME enhancement are:

1. Confirm catalyst activity and stability in the lab. A DME program decision point will follow this work to be completed in July 1996.

2a. Develop Engineering data in the lab. This data will be needed to proceed with designs to developing process economics.

2b. Confirm markets and economics. This includes tests as a replacement for M100 in diesel engines and marketplace acceptance, IGCC energy storage economics, and chemical feedstock process economics.

The above activities will be funded under the proposed LPMEOH™ Process Demonstration Program.

Based on the technology status determined in Step 1 and the market and economic data from the above, a decision on the continuation of the DME Program will be made. This decision will be made by December 1996.

3. Run Proof-of-Concept tests in the LaPorte AFDU. This work will be done in late 1996 and in 1997; it will be funded under the proposed LPMEOH™ Process Demonstration Program. Following this work and assimulation of the data, a final decision will be made by March 1998 on whether the DME demonstration at Kingsport will be implemented.

The decisions shown above will be made jointly by the Partnership and the DOE. The go/no-go implementation decision must be made in time such that the necessary design, procurement, construction and commissioning of the additional equipment can be completed in time for (Phase 3, Task 2) operation at the end of the primary LPMEOH™ Process demonstration period.

9.2 PROCESS DESCRIPTION

The Simplified Process Flow Diagram, Fig. 9.2-1 shows the major equipment in the synthesis loop and product separation train. Fig. 9.2-2 shows the composition and flowrates for both the Design Methanol Production Case as well as the anticipated DME Case. For the DME Case selected, the reactor feed rate (Stream 1) is 93% of the Design Methanol Case; methanol in the Raw Methanol Stream (Stream 3) drops from 266 TPD to 198 TPD and a net 27 TPD of DME (Stream 2-Stream 1) is produced in the reactor.

By adding up to 5 wt% alumina (dehydration catalyst) to the methanol catalyst already in the reactor, we will produce an outlet stream which is approximately 0.4 DME/methanol on the molar basis. When this stream is cooled the liquid which condenses (Stream 3) contains 8.8 lbs DME/91.2 lbs methanol; or 8.8 wt% DME on a total DME and methanol basis. This approximates the 8 wt% target that was set in the joint objectives.

Most of the unreacted synthesis gas, now containing most of the DME, will be recycled back to the reactor while a purge gas (Stream 4) containing approximately 7 TPD of DME will be sent to the boilers as fuel.

The reactor loop will be operated in a very similar manner as in the methanol operating period. Additional equipment, probably an additional stripping column, will need to be added to the crude methanol purification; this equipment will be needed to separate the DME from the methanol product. Some modifications to the analytical equipment will be needed to record the Liquid Phase DME (LPDME) Process performance.

9.3 ENVIRONMENTAL IMPACTS

9.3.1 Air Pollution Emissions and Controls

9.3.1.1 Waste Gas Flows

Since we are burning the net DME product produced, the gas streams to the boilers have increased compared to the base methanol case from a total of 48 MMBTU/hr (HHV) to 66 MMBTU/hr. These streams are the sum of streams 4 and 6 shown in Fig. 9.2-2. These streams will be going to Boiler #30 or #31 which have design input heat duties of 780 MMBTU/hr and 880 MMBTU/hr, respectively. The net effect here will be to reduce coal firing compared to the base methanol case by an additional 21 MMBTU/hr (approximately 21 TPD of coal).

Total air emissions should decrease with the cleaner fuel.

9.3.1.2 Storage Tank Emissions

These are shown in Table 6.1-2 and remain unchanged for the DME Demonstration.

9.3.1.3 Equipment Leak Emissions

These emissions are calculated based on the number of valves, flanges, etc. in the process. These in turn are estimated based on the number of pieces process equipment. Our estimate for the DME case for these emissions is based on using ratio of the reactor feed compositions (Fig. 9.3-1). An MSDS for DME is found at the end of this section. DME is nontoxic.

The DME production case is expected to be run for up to six months at the very end of the four-year demonstration period as a substitution for the base methanol operation (Phase 3, Task 2.1).

9.3.1.4 Fugitive Dust

The DME equipment construction will involve no major excavation work and no dust emissions are expected.

9.3.2 Operational Impacts

Storm water will remain unchanged from the base methanol case described in Paragraph 6.32.

The process stream described in Paragraph 6.3.2 as the under flow from Eastman's distillation will be further increased from the base methanol case. The increase adds an additional 0.4 gpm to the 0.8 gpm increase of the base methanol case and an additional 2100 lb/day of BOD compared to the 4180 lb/day increase in the base methanol case.

The oil waste stream will remain the same as described in Paragraph 6.4.2. The existing (prior to the LPMEOH™ Process Demonstration) liquid waste stream also referred to in Paragraph 6.4.2 will decrease compared to the base methanol case. Our estimate for this <u>decrease</u> is 84,000 lb/year. The DME case would produce 240,000 lb/yr of additional waste for energy recovery in the onsite boilers compared to 324,000 lb/yr additional waste for the base methanol case.

The solid waste streams generated will remain unchanged from those shown in Paragraph 6.4.2.

9.3.3 Ecology

Remains the same as described in Paragraph 6.5

9.3.4 Community Resources

Remains the same as described in Paragraph 6.6.

9.3.5 Energy Resources

Remains the same as described in Paragraph 6.7.

9.3.6 Bidiversity

Remains the same as described in Paragraph 6.8.

9.3.7 Pollution Prevention

Remains the same as described in Paragraph 6.9.

9.3.8 Other Impacts

During the DME Process Demonstration, Eastman will have to import additional methanol onto the site. In the base methanol case there was also an increase required, this was 30 TPD. For DME this will increase by 68 TPD bringing the total to 98 TPD.

9.3.9 Cumulative Impacts

Remains the same as described in Paragraph 6.10.

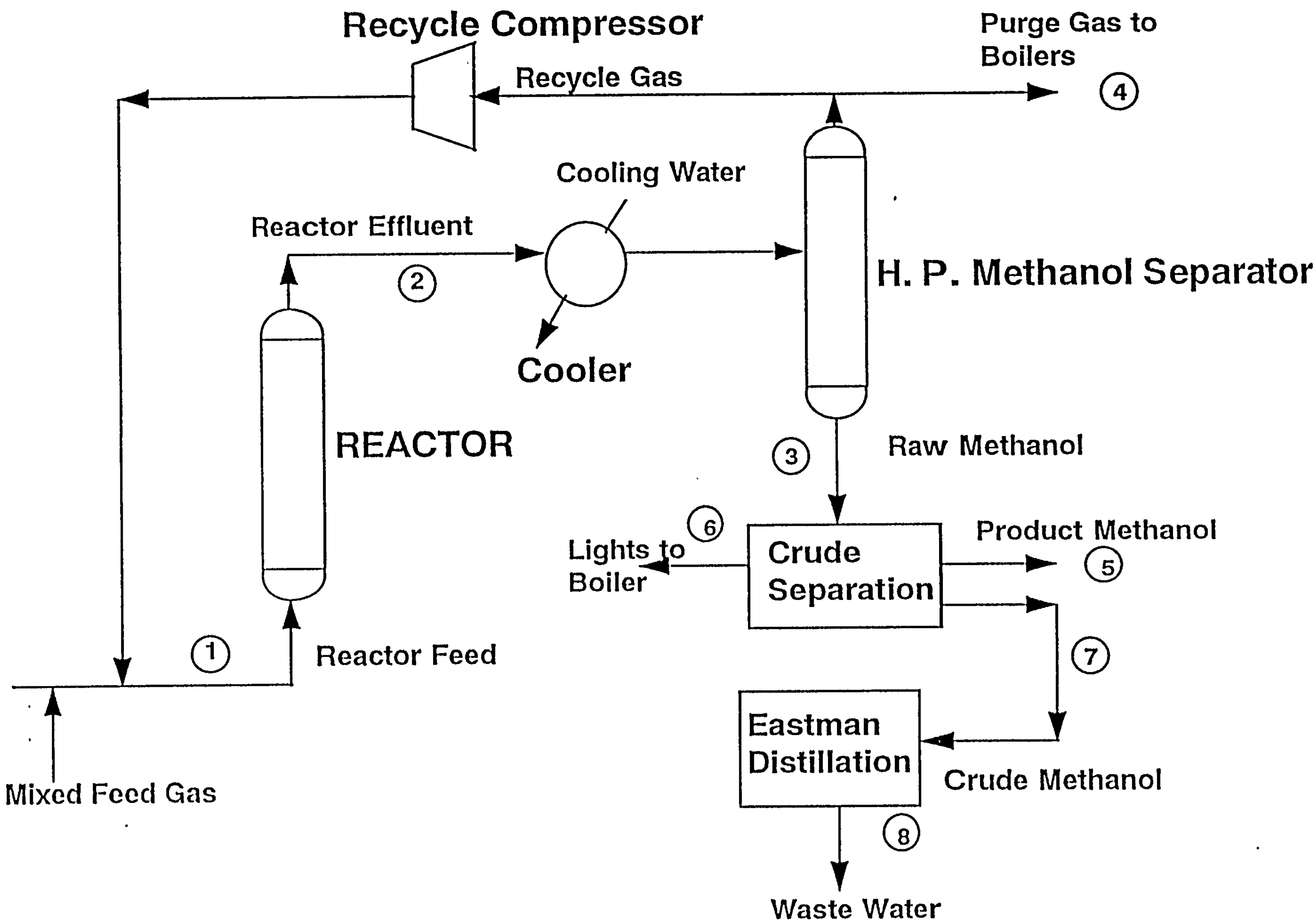


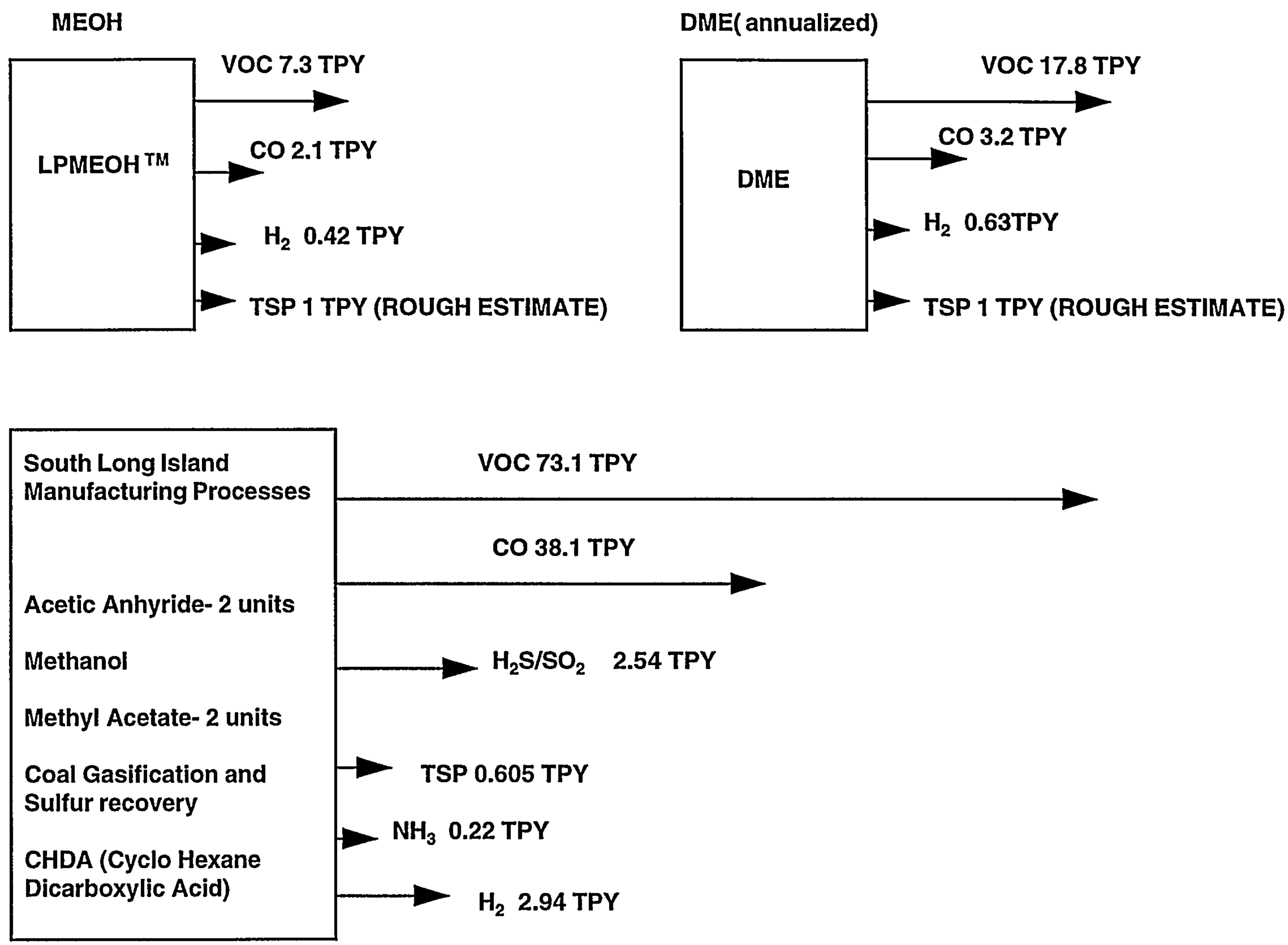
Fig. 9.2-1 Simplified Flow Diagram

Comparison of DME Case With Design Methanol Case

Stream Number	1	1	2	2	3	3	4	4
Stream	Reactor Feed	Reactor Feed	Reactor Effluent	Reactor Effluent	Raw Methanol	Raw Methanol	Purge Gas to Boilers	Purge Gas to Boilers
Case	DME	MEOH	DME	MEOH	DME	MEOH	DME	MEOH
(volume %)								
H2 %	61	60	52	50	0	0	59	58
CO %	19	25	12	20	0	0	14	22
CO2%	12	9	15	11	4	4	16	13
DME %	2	0	4	0	6	0	3	0
MEOH %	0	1	10	13	83	92	0	1
Water %	0	0	1	<1	7	3	0	<1
Moles/Hr	6729	7235	5494	5829	625	753	383	438
DME T/D	80		107		20	0	7	0
MEOH T/D					198	266	1	2
MMBTU(HHV)/Hr							42	45
Stream Number	5	5	6	6	7	7	8	8
Stream	Product Methanol	Product Methanol	Lights to Boiler	Lights to Boiler	Crude Methanol	Crude Methanol	Waste Water	Waste Water
Case	DME	MEOH	DME	MEOH	DME	MEOH	DME	MEOH
(volume %)								
H2 %	0	0	3	8	0	0		
CO %	0	0	3	7	0	0		
CO2%	0	0	34	63	0	0		
DME %	0	0	56	0	0	0		
MEOH %	99.9	99.9	2	12	73	89		
Water %	0	0	0	0	27	11		
MeAc %	0	0	<1	1	0	0		
MeFormate %	0	0	2	4	0	0		
Moles/hr	388	520	66	42	171	190		
DME T/D	0	0	20	0	0	0		
MEOH T/D	149	200	0	0	48	65		
MMBTU(HHV)/Hr			24	3				

FIG. 9.2-2

9/23/94 FSF



EQUIPMENT LEAK AND OTHER FUGITIVE EMISSIONS MANUFACTURING PROCESSES- SOUTH LONG ISLAND

Fig. 9.3-1

FSF 5/15/96

10.0 CLARIFICATION

The following documents were provided to clarify and expand on statements in the EIV:

1. 9 September 1994 letter from F. Frenduto to K. Khonsari/M. Dean
2. 25 October 1994 lettr from F. Frenduto to K. Khonsari
3. 29 November 1994 letter from F. Frenduto to K. Khonsari
4. 7 February 1995 letter from F. Frenduto to K. Khonsari
5. 6 March 1995 letter from F. Frenduto to K. Khonsari

Air Products and Chemicals, Inc.
7201 Hamilton Boulevard
Allentown, PA 18195-1501

Telephone (610) 481-4911
Telex: 847416

9 September 1994

AIR PRODUCTS

Mrs. Karen Khonsari/Mrs. Mara Dean
U.S. Department of Energy/PETC
P.O. Box 10940
Pittsburgh, PA 15236

Dear Karen/Mara:

Attached is our response to your questions ("Issues/Concerns identified at 18 August 1994 LPMNT Meeting"). We have restated the questions (except for the tables) to make it a little easier handle. We will follow through with the few missing items as discussed in the text. If you have any questions, please call.

The following are the attachments that are also included:

- MSDS for BASF Catalyst
- Methanol Specifications
- Modified Photo (Plate 2.2)
- Incinerated Wastes Diagram
- Equipment Leak Emissions Diagram
- Six Colored Photographs of the Eastman Facility (1 set only)

I am anxious to get some feedback on the revised Acurex package and would like to setup a meeting to discuss both the Acurex work and the EA/EIV work process.

Very truly yours,

Frank

Frank S. Frenduto
Project Engineer

FSF/jlm
letter6

Attachments

cc: W. Brown
L. Daniels (EMN)
D. Drown
R. Kornoski (DOE) w/o Attachments
R. Vannice (EMN)

1. *Are there any soil testing results for the proposed 0.6 acre project site area? Special interest in lead, asbestos, and other contaminants since this area is currently used for equipment storage.*

   No soil testing of this nature has been done.

2. *Correct EIV to consistently state that the proposed project site is 0.60 acres (there are still instances where the project site is identified as 0.34 acres).*

   0.6 acres is correct. We will correct the 0.34 acre references in all EIV updates.

3. *If the composition of the catalyst is proprietary, please notify us (do not send it, just tell us it is proprietary). If it is proprietary, arrangements will have to be made for someone from APCI to visit Eastman (or vise versa) to obtain the data necessary to resolve concerns regarding copper, zinc and any other materials present if the catalyst is incinerated. The EA would then merely contain a statement(s) regarding the consequences of incinerating the catalyst without divulging enough information to reveal the catalyst composition if it is considered to be proprietary information.*

   If the composition is not proprietary, please send it.

   Attached is the MSDS for the BASF Catalyst. The main components of the catalyst, zinc, copper and aluminum, are not restricted as feeds in the incinerator operating permits.

4. *It is currently unclear how much methanol is currently produced and purchased. Please correct/complete (wee need x) the following table.*

   Production from LPMEOH and the turned-down Eastman methanol plant will be 30 ton/day less than the Eastman methanol plant alone. In order to convey this, the table should read:

	Currently	For Project
Produced Lurgi	500	210 (not 240)
Produced LPMEOH	0	260
Total	500	470

   To show that the impact of this 30 T/D shortfall is small, we will provide (soon) a value for all of the "traffic" into the Eastman site.

5. *"Grades" need to be defined (in terms of purity) and used consistently: chemical grade methanol, fuel grade methanol, process grade methanol.*

   We recognize the problem you point out and have set the following conventions for naming the methanol streams within the LPMEOH™ Process. We will review the text and use this convention in all EIV updates. The stream numbers given refer to the PFD.

Raw Methanol	- Stream #204 leaving 29C-03 H.P. Methanol Separator
Crude Methanol	- Stream #242 Bottoms of Methanol Rectifier Columns (29C-20) to Eastman Distillation in Plant 19.
Fuel Methanol	- Stream #233 Bottoms of Methanol Stabilizer Column for use in off-site fuel demonstrations.
Product Methanol	- Stream #214 Top of Methanol Rectifier Column (29C-20) used by Eastman directly in downstream processes.

Specifications

Raw Methanol	- No specification.
Crude Methanol and Product Methanol	- Set contractually between Air Products and Eastman. (See attached)
Fuel Methanol (Wt%)	- 99.8% (min.) total alcohols; 0.2% max, water; 0.__% max mineral oil.

6. *Storage of DME and the formation/lack of formation of organic peroxides - were there any formed? If so, were there any associated storage problems? If not, what prevented the formation of organic peroxides? → Gary to follow up on.*

   The formation of organic peroxides are not a problem with DME in storage. We will follow up with some technical references (next week) supporting this.

7. *Carbon bed materials → What is composition? Carbon? Zinc? Combination? Other? Is there an operating plan developed for the treatment of these materials prior to disposal - for example, will the material be heated to release the carbonyls to the atmosphere?*

   The need for guard bed(s), to protect the methanol catalyst from trace compounds that might reduce its activity, are currently under study. We are conducting analytical tests on the feed gas streams that comprise the synthesis gas to the LPMEOH Plant.

   Our best guess at the moment is that we would have a single bed of activated carbon which would protect the catalyst from iron carbonyl and nickel carbonyl. Based on the data to date, it is reasonable to design the bed for a four year operating period; that is the bed would last for the entire demonstration period without being replaced or reactivated in any way. At the end of the period we would incinerate the activated carbon in the on-site incinerator. Incineration would oxidize the carbonyls to iron and nickel oxide and CO_2. Procedures will be developed for handling the contaminated material in a safe manner.

We anticipate that the size of this bed would be less than 10,000 lbs. of activated carbon.

8. *The Guard bed is not shown on the PFD. Please include it.*

   The EIV (pg. 6-23) referred to guard beds 29C-40 A/B, which as you point out didn't get included on the PFD. As mentioned in the answer to question 7 above, we are not sure that a guard bed is required at all. Our best guess for the moment is that a single bed of 10,000 lbs. of activated carbon would last for the entire demonstration period.

   This bed, if needed, would be placed immediately in front of exchanger 29E-02 shown on Page 2 of the PFD.

9. *For the groundwater monitoring wells 1L.S3 and 1LS4, please provide updated data. The data provided are eight years old and more current data are needed to assess the quality. Also, is there any portion of the project which will affect the groundwater quality?*

   The data included in the EIV is all the data obtained for those two wells. Two important pieces of information are in the EIV:

   1. It is stated (p. 5-31) that these are not appropriate wells to measure groundwater for the LPMEOH site.

   2. A RCRA Facilities Investigation is currently underway at the Eastman site. Once monitoring data is released to the EPA, this data can also be used in the EIV.

   Future impacts on groundwater are not foreseen at this time. Appropriate diking and engineering controls are planned for the facility to prevent releases that would affect groundwater quality.

10. *Need the envelope of technology for each of the affected resources. Please provide a diagram indicating the equipment and associated emissions - for example, for air resources, how much of Long Island does the envelope contain? For cooling water, is the baseline (envelope) the entire plant? A schematic of each envelope would be most helpful.*

The baselines with which we compare emissions are as follows:

Water and Wastewater: The entire Eastman facility is used as the baseline. The best figure showing this is Figure 5.3-7 (p. 35) in the EIV.

Solid waste incineration and disposal: Again, the entire Eastman facility is used as the baseline.

Air emissions: The baseline used is all the chemical production processes on the South End of Long Island. This includes at least eight manufacturing processes (I say "at least" because you could logically divide some of the processes into smaller ones). Attached is a diagram that shows the equipment leak and other fugitive emissions for the LPMEOH Plant relative to these other facilities. These were chosen because they are in the general area of the LPMEOH site.

11. *Has Eastman issued any public information about the proposed project? What are Eastman's plans to do so, if any?*

    No information has been issued regarding the project at this time. The current plan is to publicize in the local paper and to present it to, and to receive comments from, our community advisory panel, when business agreements between Eastman and APCI are complete,

12. *Need a baseline of existing noise levels? How do the existing noise levels compare with the OSHA or any local noise ordinance regulations? What are the anticipated noise levels during construction? How will the noise levels during operation compare to OSHA standards or local noise ordinance regulations (include immediate area of the project as well as the nearest receptor)? Is the closest residence occupied?*

    We are still formulating a response to this question.

13. *To better assess the impact or lack of impact on visual resources of the proposed project, please submit a computer rendering or an artist rendering showing the proposed project on South Long Island.*

    Air Products is preparing a three dimensional sketch of the LPMEOH Plant. We will use this to develop the rendering which will incorporate this into the Long Island setting. This will take a few weeks.

14. *Please provide better photos and maps of the proposed site.*

    Additional photographs are attached.

15. *Please contact the Local Planning Commission to find out if there is any planned industry for the area - needed to assess long term cumulative impacts.*

The Sullivan Co. Industrial Commission knows of no plans for the new manufacturing or industry in the Kingsport area.

16. *Have any environmental audits been conducted on Long Island, in particular, South Long Island? If so, what were the results?*

Audits are done periodically at all Eastman facilities, but are generally records audits and not those in which samples are analyzed. This is not to say that sampling is never done, but that it is done for compliance with permits, performance tests, and various process improvement and waste minimization projects.

Results of internal audits are done to improve company processes, are not generally available for review by internal and external parties not directly involved in the audit.

17. *Please provide a block diagram map of existing process areas on South Long Island, for example, indicate parking lot, Lurgi unit, gasifier, storage tanks, etc.*

As discussed, we have modified Plate 2.2 (pg. 2-8 in the EIV) to include more "tags" to identify the facilities referred to in the text. This modified photo is attached.

I. Air Emissions Table

- PSD trigger for CO is 100 TPY.

- PSD trigger for VOC is 40 TPY.

- There are PSD triggers for various N and S compounds, but nothing that LPMEOH would emit. The N, S, H compound that LPMEOH emits is hydrogen gas (0.42 TPY).

- No particulate emissions have been calculated; this was an oversight (but not a big one) as there will be a small particulate emissions during catalyst unloading once/week or once/2 weeks. A rough estimate for this is less than 1 TPY. We will provide a calculated value later.
- PSD triggers for particulates are 25 TPY for TSP and 15 TPY for PM_{10}.

- For particulates, the significant average concentration for both TSP and PM_{10} is 10 $\mu g/m^3$ for a 24-hour average. The PSD increments for PM_{10} in a Class II area are 17$\mu g/m^3$ for an annual average and 30 $\mu g/m^3$ for a 24-hour average.

- The EIV states the maximum CO increases, which are well below the 575 µg/m³ significant average concentration (8 hour average). There is no increment for CO.

- There is no increment or significant average concentration for VOC.

- Eastman does not "consult" with the National Park Service on air permitting. The TDAPC handles comments on permits from all parties, including the Park Service. At present, the application for an air permit would initiate communication with the Park Service and would be handled through the TDAPC.

II. Water Effluent Table

- 155,000 lbs./day represents the average BOD entering the Eastman treatment plant, not the permitted effluent BOD. Please make sure the table makes this clear.

- A copy of Eastman's NPDES permit has been included in Appendix III of the EIV. This has all of the needed permit limits. Please let us know if you have difficulty finding the limits or if you did not receive a copy of our NPDES permit.

III. Solids Table

Methanol Catalyst

- The catalyst from LPMEOH will be purged once every one or two weeks. The disposal options are in order of preference:

    1. Send the catalyst to a company that could recover the metals.
    2. Incinerate on-site, ash disposal on-site.

  Given the widely varying feed to our incineration system and given the small quantity of catalyst to be incinerated, there will be no change in the stack gases from the incineration system. Attached is a diagram that shows the LPMEOH Plant wastes relative to total incinerated materials.

  There is no one disposal method for the catalyst from the existing facility. Once the changeout is complete, it is tested to determine whether it is RCRA-hazardous. If it tests as nonhazardous, our options are to send it to a company that could recover the metals or to landfill the material in a nonhazardous landfill. If it tests as RCRA-hazardous, our only option is to landfill in a hazardous landfill. The quantity of catalyst we currently generate varies between 35,000 and 60,000 lbs/yr.

- Incinerator Ash

  The incinerator ash will be disposed of in the on-site landfill regardless of whether this project is approved. The table makes it appear that we will have to build an on-site landfill because of this project. Change disposal of incinerator ash for No Action Alternative to on-site landfill (just like the Proposed Action). In addition, since the on-site landfill has nothing to do with this project, why is it even shown on this table?

- Guard Bed Catalyst

  Please see answers to questions 7 and 8.

MATERIAL SAFETY DATA SHEET

BASF Corporation Chemicals Division
100 Cherry Hill Road, Parsippany, New Jersey 07054, (201) 316-3000

BASF

PRODUCT NUMBER: 826931 BASF Catalyst S3-86

SECTION I

*Registered Trademark

TRADE NAME: BASF Catalyst S3-86

CHEMICAL NAME: Copper Oxide Catalyst

SYNONYMS: Low Pressure Methanol Synthesis Catalyst

FORMULA: N/A

CHEMICAL FAMILY: Heterogeneous Catalysts

MOL. WGT.: N/A

SECTION II - INGREDIENTS

COMPONENT	CAS NO.	%	PEL/TLV - SOURCE
BASF Catalyst S3-86		100	Not established
Contains:			
Copper Oxide	1317-38-0	61.6	1 mg/m3 as Cu ACGIH, OSHA (Trans/Final)
Zinc Oxide	1314-13-2	21.6	5 mg/m3;10 mg/m3 STEL ACGIH 5 mg/m3 OSHA (Trans/Final)
Alumina	1344-28-1	4.8	10 mg/m3 ACGIH 5 mg/m3 OSHA (Trans/Final)
Water	7732-18-5		
Graphite	7782-42-5		2.5 mg/m3 ACGIH OSHA Final 20 mppcf OSHA (Trans)

All components are in TSCA inventory.
SARA Title III Sect. 313: Listed.

SECTION III - PHYSICAL DATA

BOILING/MELTING POINT @760 mm Hg: N/A	pH: ~8.5 (100 g/l water)
VAPOR PRESSURE mm Hg @20 C: N/A	
SPECIFIC GRAVITY OR BULK DENSITY: 1300 kg/m3	
SOLUBILITY IN WATER: 0.1 g/l @ 20 C	Color:Dk. Brown

APPEARANCE 5x5 mm tablets ODOR: None INTENSITY: N/A

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (TEST METHOD): N/A

AUTOIGNITION TEMP: N/A

FLAMMABILITY LIMITS IN AIR (% BY VOL) LOWER: N/A UPPER: N/A

EXTINGUISHING MEDIUM	Use water fog, alcohol foam or dry chemical extinguishing media.
SPECIAL FIREFIGHTING PROCEDURES	Firefighters should be equipped with self-contained breathing apparatus and turnout gear.
UNUSUAL FIRE AND EXPLOSION HAZARDS	None.

EMERGENCY TELEPHONE NUMBER

CHEMTREC 800-424-9300 201-316-3000

THIS NUMBER IS AVAILABLE DAYS, NIGHTS, WEEKENDS,AND HOLIDAYS

PRODUCT NUMBER: 826931 BASF Catalyst S3-86

SECTION V - HEALTH DATA

TOXICOLOGICAL TEST DATA:

TOXICOLOGICAL TEST DATA:	RESULT:
BASF Catalyst S3-86	
Rat, Oral LD50	4650 mg/kg
Rabbit, Skin Irritation	Non-irritating
Rabbit, Eye Irritation	Moderately irritating

EFFECTS OF OVEREXPOSURE:

Contact with the powder or its dusts may result in moderate irritation of the eyes and mechanical irritation of the skin. Inhalation of dusts causes respiratory irritation. Chronic overexposure to copper compounds can lead to anemia, and damage to the liver, kidneys, lungs, and spleen. Gamm-alumina, a form of aluminum oxide, was fibrogenic when injected into the lungs of animals; however, aluminum oxide has not been implicated as a cause of lung disease in humans. Inhalation of zinc fumes may cause "metal fume fever". Symptoms of metal fume fever include metallic taste, dryness, and irritation of the throat, difficult breathing, weakness, fatigue, and fever. Thirteen of nineteen workers in a zinc powder factory were reported to exhibit inflammation of the upper respiratory tract after 2-3 years of employment. Ingestion of zinc oxide powder may cause gastric disturbances.
Existing medical conditions aggravated by exposure to this material:
No information found for this mixture.

FIRST AID PROCEDURES:

Eyes-Immediately wash eyes with running water for 15 minutes. If irritation develops, consult a physician.
Skin-Wash affected areas with soap and water. Remove and launder contaminated clothing before reuse. If irritation develops, consult a physician.
Ingestion-If swallowed, dilute with water and immediately induce vomiting. Never give fluids or induce vomiting if the victim is unconscious or having convulsions. Get immediate medical attention.
Inhalation-Move to fresh air. Aid in breathing, if necessary, and get immediate medical attention.

SECTION VI - REACTIVITY DATA

STABILITY: Stable.
CONDITIONS TO AVOID: N/A

CHEMICAL INCOMPATIBILITY: N/A

HAZARDOUS DECOMPOSITION PRODUCTS: N/A

HAZARDOUS POLYMERIZATION: Does not occur
CONDITIONS TO AVOID: N/A

CORROSIVE TO METAL: No | **OXIDIZER:** No

SECTION VII - SPECIAL PROTECTION

RESPIRATORY PROTECTION:
If dusts are generated, wear a NIOSH/MSHA approved dust mask.

EYE PROTECTION: Chemical goggles or side-shield safety glasses.

PROTECTIVE CLOTHING: Gloves and protective clothing as necessary to prevent skin contact.

VENTILATION: Local exhaust required to control to P.E.L.

OTHER: Clean clothing should be worn daily.
Shower after handling.

PRODUCT NUMBER: 826931 BASF Catalyst S3-86

SECTION VIII - ENVIRONMENTAL DATA

ENVIRONMENTAL TOXICITY DATA:

None available.

SPILL AND LEAK PROCEDURES:

Spills should be contained and placed in suitable containers for disposal.
This material is not regulated under RCRA or CERCLA ("Superfund").

HAZARDOUS SUBSTANCE SUPERFUND: No **RQ (lbs):**

WASTE DISPOSAL METHOD:

Landfill in a licensed facility.
Do not discharge into waterways or sewer systems without proper authority.

HAZARDOUS WASTE 40CFR261: No **HAZARDOUS WASTE NUMBER:**

CONTAINER DISPOSAL:

Dispose of in licensed facility.
Recommend crushing or other means to prevent unauthorized reuse.

SECTION IX - SHIPPING DATA

D.O.T. PROPER SHIPPING NAME (49CFR172.101-102)

None

HAZARDOUS SUBSTANCE (49CFR CERCLA LIST)

No.

REPORTABLE QUANTITY (RQ) N/A

D.O.T. HAZARD CLASSIFICATION (CFR172.101-102)

PRIMARY
None

SECONDARY
None

D.O.T. LABELS REQUIRED (49CFR172.101-102)

None

D.O.T. PLACARDS REQUIRED (CFR172.504)
None

POISON CONSTITUENT (49CFR172.203(K))
None

BILL OF LADING DESCRIPTION

Chemicals, NOIBN (Not Regulated By D.O.T.)

CC NO. 354

UN/NA CODE N/A

DATE PREPARED: 3 / 31 / 87 **UPDATED:** 7 / 6 / 89

WHILE BASF CORPORATION BELIEVES THE DATA SET FORTH HEREIN ARE ACCURATE AS OF THE DATE HEREOF, BASF CORPORATION MAKES NO WARRANTY WITH RESPECT THERETO AND EXPRESSLY DISCLAIMS ALL LIABILITY FOR RELIANCE THEREON. SUCH DATA ARE OFFERED SOLELY FOR YOUR CONSIDERATION, INVESTIGATION, AND VERIFICATION.

SECTION X - PRODUCT LABEL

BASF Catalyst S3-86

WARNING:
CONTAINS COPPER OXIDE (CAS No.: 1317-38-0); ALUMINA (CAS No.: 1344-28-1); ZINC OXIDE (CAS No.: 1314-13-2).
CONTACT WITH EYES OR SKIN MAY RESULT IN IRRITATION.
INGESTION MAY RESULT IN GASTRIC DISTURBANCES.
INHALATION OF DUSTS MAY IRRITATE THE RESPIRATORY TRACT.
GAMMA ALUMINA, A FORM OF ALUMINUM OXIDE, WAS FIBROGENIC WHEN INJECTED INOT THE LUNGS OF ANIMALS.
CHRONIC OVEREXPOSURE TO COPPER COMPOUNDS CAN LEAD TO ANEMIA AND DAMAGE TO THE LIVER, KIDNEYS, LUNGS AND SPLEEN.
INHALATION OF ZINC OXIDE FUMES MAY CAUSE METAL FUME FEVER, SYMPTOMS OF WHICH INCLUDE METALLIC TASTE, DRYNESS AND IRRITATION OF THE THROAT, DIFFICULTY IN BREATHING, WEAKNESS, FATIGUE AND FEVER.

Avoid contact with eyes, skin or clothing. Avoid breathing dusts. Use with local exhaust. Wear a NIOSH/MSHA-approved dust respirator, chemical goggles, gloves, coveralls, apron, boots and other protective clothing as necessary to prevent contact. Shower after handling. Clean clothing should be worn daily.

FIRST AID:
Eyes-Immediately wash eyes with running water for 15 minutes. If irritation develops, consult a physician.
Skin-Wash affected areas with soap and water. Remove and launder contaminated clothing before reuse. If irritation develops, consult a physician.
Ingestion-If swallowed, dilute with water and immediately induce vomiting. Never give fluids or induce vomiting if the victim is unconscious or having convulsions. Get immediate medical attention.
Inhalation-Move to fresh air. Aid in breathing, if necessary, and get immediate medical attention.

IN CASE OF FIRE: Use water fog, alcohol foam or dry chemical extinguishing media. Firefighters should be equipped with self-contained breathing apparatus and turnout gear.

EMPTY CONTAINERS: All labeled precautions must be observed when handling, storing and transporting empty containers due to product residues. Do not reuse this container unless it is professionally cleaned and reconditioned.

DISPOSAL: Spilled material, unused contents and empty containers must be disposed of in accordance with local, state and federal regulations. Refer to our Material Safety Data Sheet for specific disposal instructions.

IN CASE OF CHEMICAL EMERGENCY: Call CHEMTREC day or night for assistance and information concerning spilled material, fire, exposure and other chemical accidents. 800-424-9300

ATTENTION: This product is sold solely for use by industrial institutions.

Refer to our Technical Bulletin and Material Safety Data Sheet regarding safety, usage, applications, hazards, procedures and disposal of this product. Consult your supervisor for additional information.

CAS Nos.: Graphite: 7782-42-5
Made in West Germany
Intermediates and Fine Chemicals
0489

Methanol Specifications

Product	Product Methanol	Crude Methanol
Properties		
methyl alcohol	99.8% min	80% min
color, pcs	5 max	
specific gravity @ 20/20 C	0.792 - 0.793	
water content	0.2% max	20% max
acidity, as acetic	0.003% max	
reducing substances, KMnO4	30 min @ 15 C	
acetone	30 ppm max	30 ppm max
other alcohols	1000 ppm max	1.0% max
ethanol	200 ppm max	1.0% max
other impurities	500 ppm max	0.1% max
methyl formate	50 ppm max	30 ppm max
alkalinity, as NH_3	3 ppm max	
oil		1.0% max
formic acid		30 ppm max
non volatiles		0.05% max

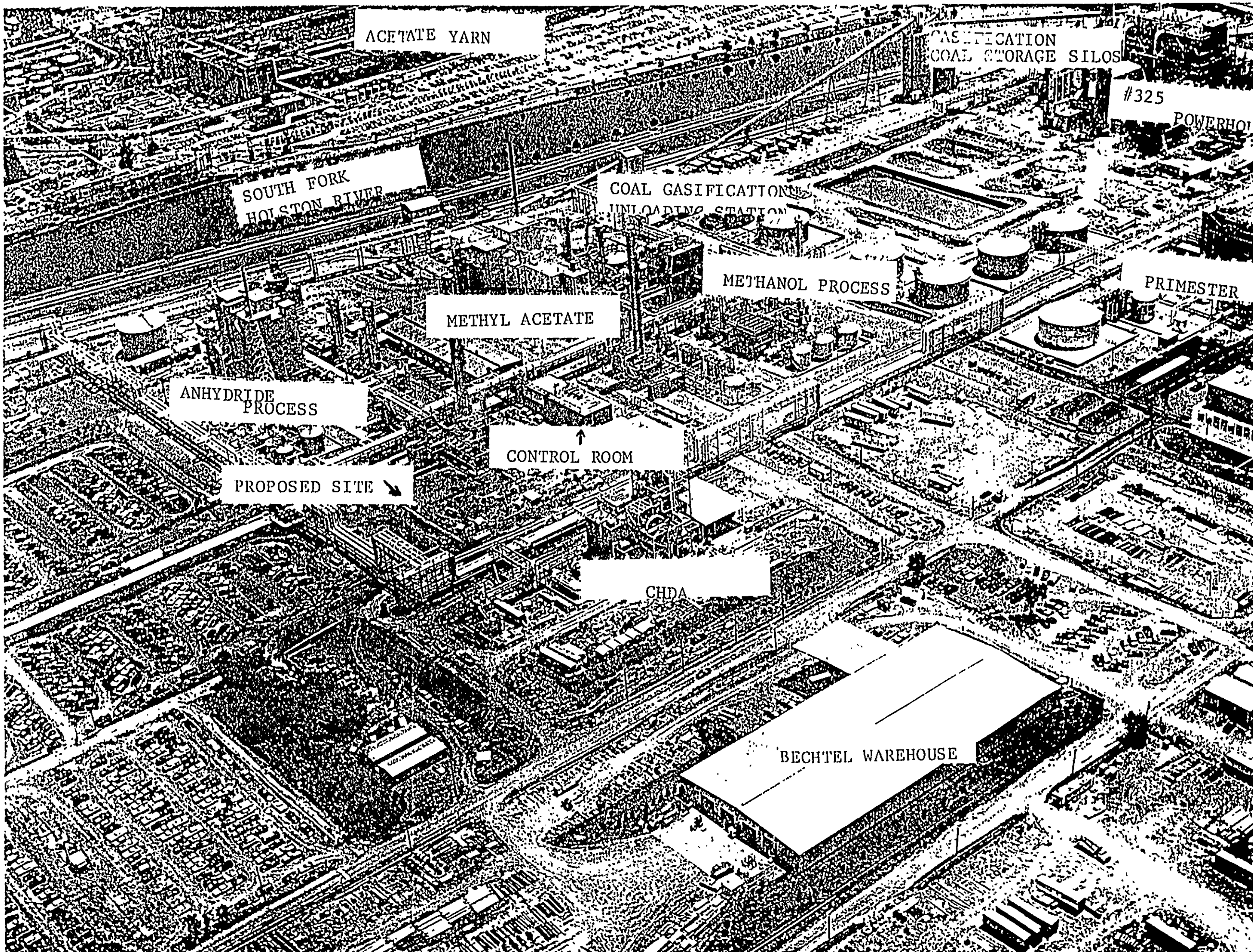
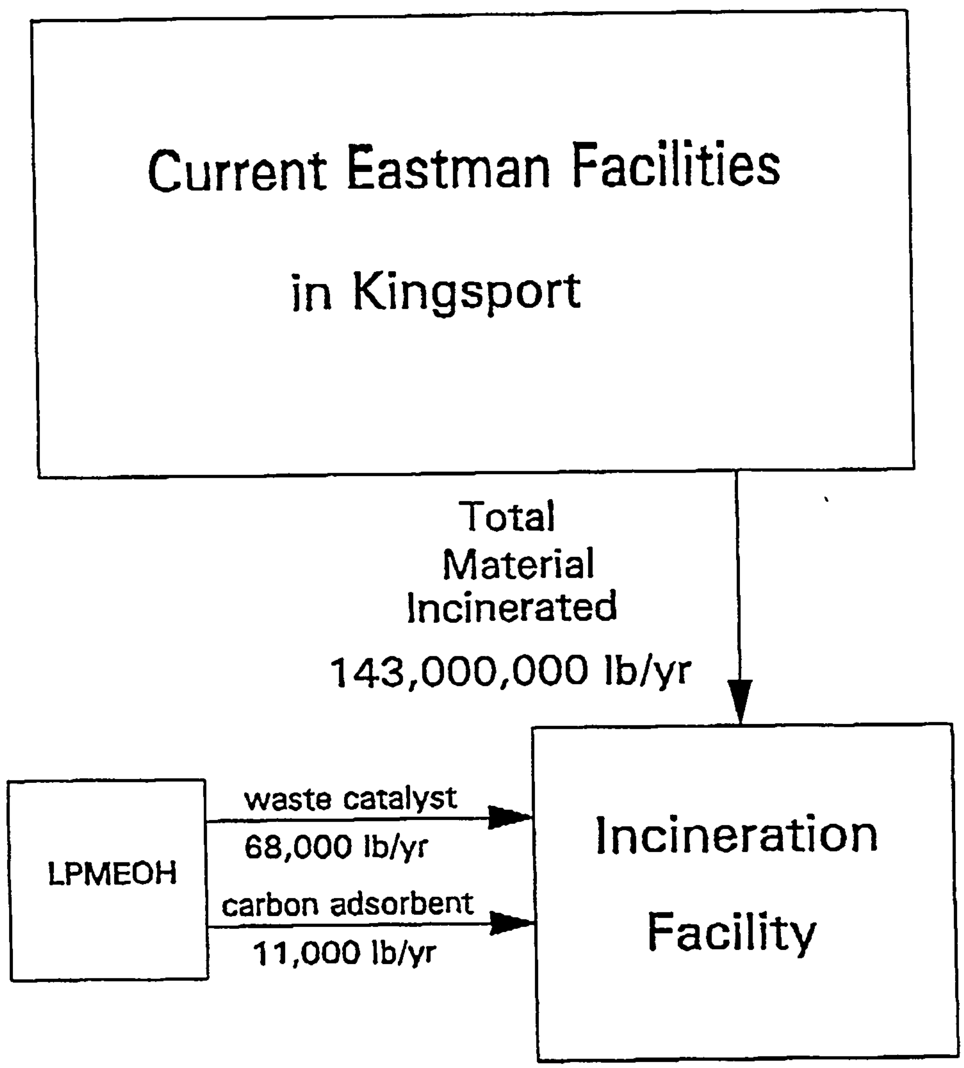
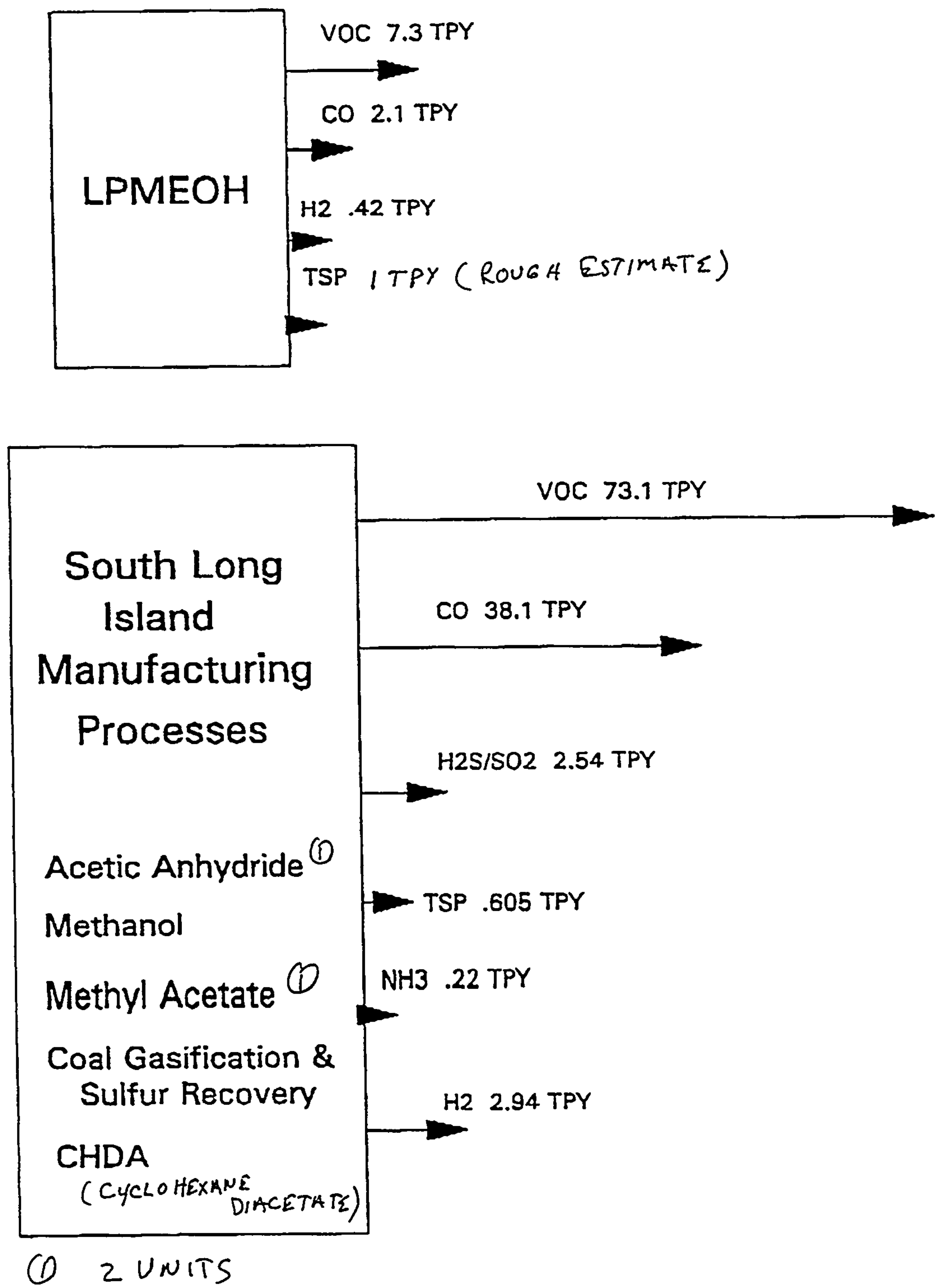


PLATE 2.2 AERIAL PHOTOGRAPH OF LONG ISLAND



Incinerated Wastes for Current Eastman Facilities and LPMEOH



Equipment Leak and Other Fugitive Emissions Manufacturing Processes - South Long Island

Air Products and Chemicals, Inc.
7201 Hamilton Boulevard
Allentown, PA 18195-1501

Telephone (610) 481-4911
Telex: 847416

25 October 1994

AIR PRODUCTS

Mrs. Karen M. Khonsari
U.S. Department of Energy/PETC
P.O. Box 10940
Pittsburgh, PA 15236

Subject: Cooperative Agreement DE-FC22-92P90548
Kingsport Liquid Phase Methanol Demonstration
EIV Questions

Dear Karen:

Attached is a memo from Ryan Vannice providing information on some of the outstanding questions relating to the EIV. His number one item confirms that we should use the information we have to frame the 30 T/D methanol import. The second item relates to the noise question. I hope this is adequate, but please feel free to contact Ryan for clarification.

I am also enclosing a Kingsport "1994 Facts and Figures" document that you might find useful.

Please call if you have any questions.

Sincerely,

Frank

Frank S. Frenduto
Project Engineer

FSF/jlm
c:\fsf\let11

Attachment

cc: W. Brown
L. Daniels (EMN)
D. Drown
E. Heydorn
W. Jones (EMN)
R. Moore
R. Vannice (EMN)

MEMORANDUM

TO: Frank Freduto/David Drown, APCI DATE: October 14, 1994

FROM: Ryan Vannice

SUBJECT: Responses to DOE Requests from Sept. 29 EIV Review Meeting

COPIES TO: Jerry Bewley, Larry Daniels, project file, Joe Davis

---

Please forward this to Karen Khonsari and/or Mara Dean.

I had two items to check into - other numbers to be used to indicate activity in the plant and any further information on noise issues.

1. An attempt had been made to do a material balance around the Tennessee Eastman facility using numbers from purchasing, accounting, and sales. Based on the results, the accuracy and/or the quantity of data collected was inadequate. This effort took at least 150 hours to put together. Therefore, I recommend that we use the information we have.

2. The next topic we identified was more information on noise. Outside of the OSHA workplace standards, I could find no quantitative regulatory noise limits for industrial sources. Kingsport and the State of Tennessee have regulations which address noise as a "nuisance." In order to constitute a nuisance, by definition, plant noise would have to be offensive to the senses and an interference with the comfortable enjoyment of life and property. To my knowledge, no such determination has been made relative to plant noise from Tennessee Eastman Division.

   As far as Eastman and noise complaints, the Chapter 5 section in the EIV on noise does a good job of describing the types of incidents that raise community concerns about noise. I reviewed the records on neighbors' noise concerns and follow-up calls for 1993 and year-to-date 1994. The sources of noise mentioned were associated with isolated incidents such as pressure relief of steam, noise associated with unloading trucks at the non-hazardous landfill, and one incident in which the source was not positively identified but was believed to be a start-up. The last noise concern occurred seven months ago, so it appears that each concern has been addressed.

EASTMAN IN KINGSPORT

1994 FACTS AND FIGURES
KINGSPORT, TENNESSEE 37662

Eastman Chemical Company is headquartered in Kingsport, Tennessee, and includes the following:

	Approximate Employment
Arkansas Eastman Division, Batesville, Arkansas	700
Carolina Eastman Division, Columbia, South Carolina	710
Distillation Products Industries, Rochester, New York	160
Eastman Chemical Ectona Limited, Workington/Hartlepool, England	370
Holston Defense Corporation, Kingsport, Tennessee	830
Tennessee Eastman Division, Kingsport, Tennessee	7,780
Texas Eastman Division, Longview, Texas	2,690
Eastman Chemical Company Staff, Administration (Kingsport), Research Laboratories, Technical Service and Development, Business Units, and Business Organizations	3,590
Worldwide Sales (Kingsport)	110
Worldwide Sales (Outside Kingsport)	150
Eastman Chemical Company (International)	480
Total Eastman Chemical Company Employment	17,570
Total Eastman Chemical Company Employment in Kingsport	12,310

Eastman Chemical Company Facts:

- Eastman Chemical Company manufactures and markets chemicals, fibers, and plastics. Sales in 1993 were $3.903 billion.
- Based on 1992 sales, ECC is the 10th largest chemical producer in the U.S. (Ranking is based on the May 31, 1993, issue of *Chemical and Engineering News.*)
- Employees holding degrees at Eastman companies in Kingsport
  - About 3,230 hold bachelor's degrees.
  - About 770 hold master's degrees.
  - About 360 hold doctor's degrees.
- Approximately 270 scientists and engineers are in the Eastman Chemical Company Research Laboratories.
- Eastman's Technical Information Center includes five libraries. Those libraries contain more than 45,000 books. 1,100 different periodical titles, 3.5 million U.S. and foreign patents, and about 250,000 technical reports and other proprietary documents.

Industry Week magazine selected Tennessee Eastman Division as one of America's top ten manufacturing plants in 1991.

Eastman won the 1993 Malcolm Baldrige National Quality Award in the manufacturing category and also won the Tennessee Governor's Quality Award.

We believe in listening to our neighbors. If you have concerns or suggestions about our operations call 229-CARE.

EASTMAN

Eastman Chemical Company
Kingsport, Tennessee

Tennessee Eastman Division Facts:

- Tennessee Eastman Division is one of the largest chemical manufacturing sites in North America.
- Tennessee Eastman Division manufactures over 300 industrial chemicals, 1 basic fiber, and 3 basic types of plastics.
- Tennessee Eastman Division has approximately 446 buildings and 7,167 acres of land. The 1,046-acre main plant site includes 40.1 acres of warehouse area under roof and more than 1.16 million square feet of office space. The tallest building at TED is Building 325 Powerhouse — 154 feet tall.
- Tennessee Eastman Division purchases over 1,000 separate raw materials.
- At full production, coal usage at Tennessee Eastman Division is 54 carloads (approximately 100-ton loads) or 5,400 tons per day.
- Tennessee Eastman Division operates 5 diesel locomotives over 37 miles of company track and makes approximately 5,000 railcar movements per week.
- Tennessee Eastman Division owns and operates more than 525 motor vehicles, 240 trailers and tankers, and 560 forklifts. There are more than 28 miles of paved roads within the plant area.
- Eastman's installed generating capacity is nearly 170,000 kilowatts — enough to serve approximately 80,000 average homes or about twice the number of homes served by Kingsport Power Company. The stacks on the Building 253 Powerhouse are 250 feet high. The single stack at the Building 325 Powerhouse is 375 feet high.
- At full production Eastman pumps more than 485,000,000 gallons of water each day. Approximately 26,000,000 gallons of filtered water are used daily.
- The Medical Department at Eastman Chemical Company, Kingsport, has a Clinical Services section and an Industrial Hygiene section, staffed by approximately 47 employees, including 5 full-time physicians. Two other physicians work with the company's Health, Safety and Environmental Services Department.

Historical Facts About Eastman in Kingsport

- Tennessee Eastman Division was established in 1920 to produce methanol for use in Kodak's photographic film base.
- Cellulose esters production began in 1930. Cellulose esters are used in the manufacture of safety film base, TENITE cellulosic plastics, ESTRON and CHROMSPUN acetate yarns, ESTRON filter tow for cigarettes, lacquer formulations, and plastic film and sheeting.
- Hydroquinone production began in 1931. Hydroquinone is an important photographic chemical and is used as an antioxidant.
- Production of TENITE cellulosic plastics began in 1932.
- Production of color photographic chemicals started in 1947. Tennessee Eastman now produces the majority of the color photographic chemicals to meet Eastman Kodak's needs.
- KODEL polyester fiber manufacturing began in 1958.
- TENITE polyester plastic was introduced in 1971.
- Chemicals from coal plant began producing chemicals in 1983. Expansion completed in 1991.
- New hydroquinone plant began production in 1986.
- New wastewater treatment plant opened in 1988.
- In 1991, Eastman formed a joint venture with Rhone-Poulenc to build a cellulose acetate facility in Kingsport.
- Effective January 1, 1994, Eastman was spun off by Eastman Kodak Company and became an independent company.

Some Recent Environmental Protection Facts:

- Tennessee Eastman Division spent $103 million in 1993 on environmental protection and improvements.
- Tennessee Eastman Division achieved a 25% reduction in total SARA, Title III (Superfund Amendment and Reauthorization Act) air emissions from 1988 to 1992.
- Tennessee Eastman Division reduced CFC (chlorofluorocarbon) refrigerant emission by 55% since 1989.
- Tennessee Eastman Division has reduced incinerated waste by 46% since 1987.
- During 1993, Tennessee Eastman Division collected over 4.9 million pounds of office paper, cardboard, cellulose and PET recyclables.
- In 1988 Tennessee Eastman Division built an $85 million wastewater treatment facility which has a 99.5% waste removal efficiency that exceeds all current environmental standards.
- In 1994 Tennessee Eastman Division completed installation of five state-of-the-art precipitators at a cost of $60

EASTMAN IN KINGSPORT

A Source of Economic Strength in the Region During 1993

EASTMAN'S ECONOMIC EFFECT IN TENNESSEE AND THE KINGSPORT AREA*

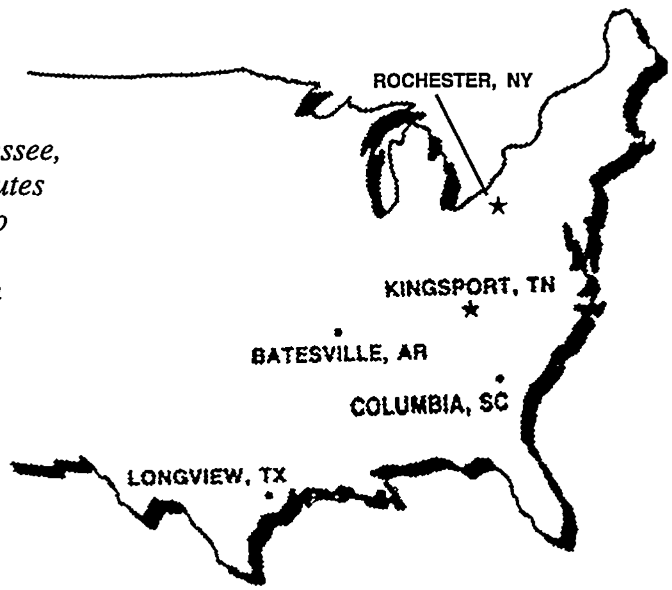
Paid to and for the Benefit of Eastman People Employed in Kingsport			$664,575,000
Freight and Express Paid in Tennessee and the Kingsport Area			78,658,000
Materials and Services Purchased from Firms in Tennessee (including coal from Virginia and Kentucky)			352,550,000
Taxes Paid in Tennessee (exclusive of Federal Taxes)			37,544,000
Income Tax		$ 4,826,000	
Sales, Use and Property Taxes..		32,385,000	
Includes:			
Kingsport	$ 8,083,000		
Sullivan County (Excl. Kingsport)	14,911,000		
Hawkins County	7,000		
Washington County	69,000		
State of Tennessee	9,315,000		
State Unemployment		234,000	
Other Miscellaneous		99,000	
Total Amount Spent in Tennessee and Kingsport Area			$1,133,327,000

**Includes Holston Defense Corporation*

EASTMAN CONTRIBUTIONS AND EDUCATIONAL AID — 1993

Headquartered in Kingsport, Tennessee, Eastman Chemical Company contributes approximately $2,000,000 annually to communities where it has facilities.

About half of that amount has been given to colleges and universities in those areas.



CONTRIBUTIONS MADE FROM EASTMAN IN KINGSPORT

16% →	Education	$ 96,235
56% →	Health & Human Services	326,580
8% →	Culture and the Arts	46,400
14% →	Civic & Community	80,575
6% →	Other	37,575
		$587,365

1993 LOCAL CONTRIBUTIONS (Partial Listing)

American Society of Civil Engineers — Holston Branch
American Legion Girls' State
American Legion Boys' State
Appalachian Girl Scouts
Arts Council of Greater Kingsport
Bristol Regional Rehabilitation Center
Bristol Regional Medical Center
Bristol Chamber of Commerce — Holston River Cleanup
Children's Advocacy Center
Contact Concern
Dawn of Hope Development Center
Downtown Kingsport Association
East Tennessee Engineering Association Council
First Night
Ford Quillen Scholarship
Greater Kingsport Family YMCA
Hands On! Museum
Holston Mental Health Center — Kingsport Sheltered Workshop
Holston Valley Health Care Foundation
J. Fred Johnson Memorial Library
Junior Achievement
Kingsport Tomorrow
Kingsport Area CHILDREN
Kingsport Chamber Foundation
Kingsport Community Concert Association
Kingsport Housing Authority
League of Women Voters/Watauga Region
Madison House
Mathcounts Foundation
Project D.A.R.E.
Rascals Teen Center
Rocky Mount Historical Society
Salvation Army Center of Hope
Scholars Bowl
Shepherd Center of Kingsport
Tennessee Special Olympics
Tennessee Society to Prevent Blindness
Tennessee Environmental Education Association
Times-News Newspapers in Education
United Way of Greater Kingsport
United Way of Hawkins County
Upper East Tennessee Science Fair
Upper East Tennessee Human Development Agency

CHROMSPUN, ESTRON, KODEL, and *TENITE* are trademarks.

Air Products and Chemicals, Inc.
7201 Hamilton Boulevard
Allentown, PA 18195-1501

Telephone (610) 481-4911
Telex: 847416

29 November 1994

AIR PRODUCTS

Mrs. Karen Khonsari
U.S. Department of Energy
P.O. Box 10940
Pittsburgh, PA 15236

Dear Karen:

Here are the answers to the EIV questions you asked yesterday morning.

1. Regarding the "new liquid stream" from the Eastman distillation. I believe you are referring to the stream identified in the EIV as "side drain to incinerator" (Fig. 6.1-2). This stream is mentioned in Paragraph 6.4.2 of the EIV and for the Methanol Case this steam increases by 324,000 lb./yr. above the base Lurgi Case. For the DME Case this stream increases by only 240,000 lb./yr. above the base Lurgi Case. This is described in Section 9.3.2 (DME write-up).

2. There are two mineral oil tanks; one for fresh oil (29D-30) and one for reclaimed oil (29D-31).

3. Yes, the average flow rate of the South Fork of the Houston River is 2290 ft.^{3}/sec. The EIV gives the total South Fork flow before it splits is 2610 ft.^{3}/sec. (Section 5.3.1.1). The EIV also gives the Big Sluce flow or 320 ft.^{3}/sec. (Section 5.3.2.1). The difference, 2290 ft.^{3}/sec., is the flow in the channel where Eastman's outfall is located.

4. The 68,000 #/yr. of catalyst/oil mixture going to the incinerator is in addition to the Lurgi catalyst which is disposed of by either landfill or is sent to a recycler for metals recovery. (See letter to K. Khonsari/M. Dean, dated 9 September 1994, page 6 of attachment.)

5. Using a nominal 6000 gallon tank truck load, 400,000 gallon represents 67 tank trucks. Methanol is 303 gal/short ton; 30 T/D is 9090 gallon and represents approximately 1.5 tank trucks/day.

Please call if you have any further questions or comments.

Very truly yours,

Frank S. Frenduto/ys

Frank S. Frenduto
Project Engineer

c:\let16
cc: W. Brown/A12B2
D. Drown/A12B2
L. Paulonis/EMN (fax)
R. Vannice/EMN (fax)

Air Products and Chemicals, Inc.
7201 Hamilton Boulevard
Allentown, PA 18195-1501

Telephone (215) 481-4911
Telex: 847416

AIR PRODUCTS

7 February 1995

Mrs. Karen M. Khonsari
U.S. Department of Energy/PETC
P.O. Box 10940
Pittsburgh, PA 15236

Dear Karen:

Here are the comments I've collected on the draft EA.

Page 5, Paragraph 1
Construction start has slipped from June 1995 to August 1995.

Page 7, Operational Related Impacts
You state that the magnitude of the emission rate is <10%. Should state <10% of the existing South Long Island rates.

Page 13, Visual Resources
The reactor is now 84 feet tall and the distillation columns are 82 and 97 feet tall respectively.

Appendix A, Figure A-1
A revised Figure A-1 is attached.

If you have any questions, please call.

Very truly yours,

Frank

Frank S. Frenduto
Project Engineer

fsf\let21

cc: W. Brown/A12B2
D. Drown/A12B2
L. Paulonis/EMN
R. Vannice/EMN

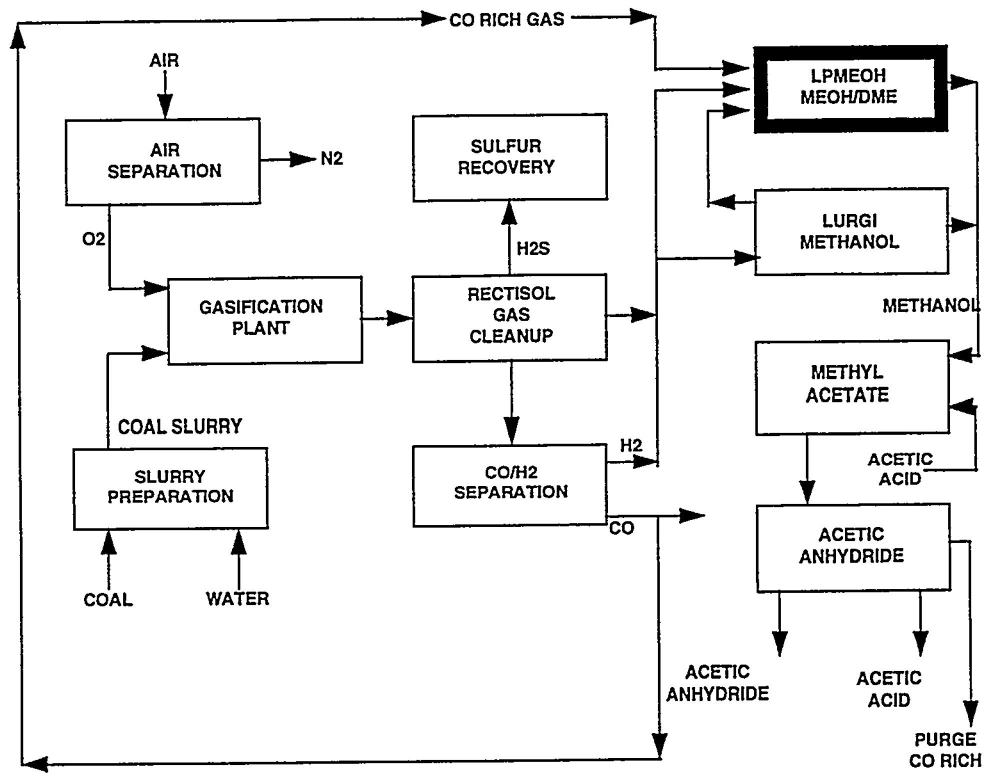


FIGURE A-1
INTEGRATION OF LPMEOH™ PLANT INTO EASTMAN KINGSPORT PLANT

Air Products and Chemicals, Inc.
7201 Hamilton Boulevard
Allentown, PA 18195-1501
Telephone (215) 481-4911
Telex: 847416

AIR PRODUCTS

6 March 1995

Mrs. Karen M. Khonsari
U.S. Department of Energy/PETC
P.O. Box 10940
Pittsburgh, Pennsylvania 15236

Dear Karen:

Attached are the updated answers to the questions regarding the Kingsport EA (your fax of 2/14/95).

In response to your question about when Eastman was going to make a public disclosure of this project, Bill Brown informs me that Air Products and Eastman have a joint news release that is set to go out as soon as the Continuation Agreement is formalized. Bob Kornosky has a copy of this news release.

Attached is the news release associated with the Air Permit Application. If you have any additional questions, please call.

Regards,

Frank

Frank S. Frenduto
Project Engineer

fsf\let23
Attachment

cc: W. Brown/A12B2
D. Drown/A12B2
W. Jones/EMN
R. Kornosky/PETC
L. Paulonis/EMN
R. Vannice/EMN

General Q4

Q.(1) It is unclear how 10-24%...input the NAAQS standard for ozone.

A. The 7.3 TPY (or 17.8 TPY in the DME Case) is about 10 to 24% of the South Long Island VOC emissions of 73.1 TPY. The VOC emissions for the Kingsport site were 14,600 TPY (1992). Therefore when compared to the Kingsport site, this project would represent an increase of only 0.1%.

Q.(2) The impact of the water...due to lack of information regarding the constraints of the wastewater.

A. The Kingsport "state-of-the-art" WWT Facility has a capacity of 25KK gal./D. This project increases the present load of about 23KK gal./D by 1.15K gal./D an increase of less than 0.01%. The facility will have no trouble meeting its operating NPDES Permit requirements. The chemicals which are measured are shown in the operating permit in Appendix III of the EIV.

Page 3 Q3

Q. During the initial scoping, was a meeting held with interested federal and state agencies to gain their input?

A. The following agencies were contacted for their input:

Tennessee State Historical Commission
U.S. Fish and Wildlife Service
Tennessee Department of Environmental and Conservation
Sullivan County Highway Department
Tennessee Division of Air Pollution Control

Page 5 Q5

Q. Under the changes...it's not clear why +68 TPD of MEOH would be purchased/bought daily with DME co-production.

A. Figure 9.2-2 in the EIV shows a comparison of the material balances for the methanol and the DME demonstration cases. The conditions were set by producing a raw methanol stream containing approximately 8 wt.% DME which was a target set in the joint objectives for the demonstration.

Page 7 Q4

Q. Will there be any mitigation measures taken during construction to reduce fugitive emissions?

A. See section 6.1.3 (pg. 6-4) of the EIV.

Page 8 Q6

Q. If it is decided to use DME as an alternative fuel on-site, what air quality impacts are anticipated and are the emissions included in Table 3-1?

A. The air quality impacts are addressed in section 9.3.1.1 of the EIV. Burning DME, which like methanol is a clean fuel, has the net effect of reducing the amount of coal that would have been burned in the boiler. Replacing coal with DME would have a benefit that has not been quantified.

Page 8-9 Q1

Q. Regarding landfill size...

A.
1. Hazardous waste landfill - 39.1 acre ft. (63,100 cubic yards); expected life approximately 17 years.
2. Non-hazardous waste landfill remaining life as of September 1994 - 1123 acre ft. (1,810,000 cubic yards); expected remaining life approximately 10 years.

Page 9 Q3

Q. Is the 2290 cubic feet per second the average or the low flow rate?

A. It is average; the low flow rate is 750 cubic feet per second.

Page 10 Q4

Q. Have the thermal impact to the water resources due to waste water discharge been considered?

A. The thermal impact to water is minimal. The heat rejected goes mainly to the air since we have cooling water from a cooling tower. In addition, some of the load is managed by direct air cooling (Fin/Fan Coolers).

Page 10 Q5&6

Q. Relating to the WWT Facility.

A. Suggest you include discussion of Eastman WWTF in the EA. Some good text can be found in the 1993 Health Safety and Environmental Performance Report in Appendix VI of the EIV (pg. 13).

Page 10 Q8

Q. There is not mention of ground water resources...

A. The landfills are or will be operated within their permits. The permits contain provisions for ground water monitoring.

Page 10 Q9

Q. Will there be any additional chemicals...

A. No.

Page 11 Q2

Q. It is clear that the liquid waste streams are to be incinerated on-site...

A. The LPMEOH addition can be operated within the current permits for the incinerator, boilers, landfill and within the NPDES requirements for all water discharges.

F001
2/17/95

Joe
This was in the
12/

Fax to

Wednesday 12/28/94
Kingsport Times News

PUBLIC NOTICE

The Tennessee Air Pollution Control Division (TAPCD) has received requests for construction of air-contaminant sources as noted below. The proposed construction is subject to part 1200-3-9-.01 (1)(h) of the Tennessee Air Pollution Control Regulations, which requires a public notification and 30-day public comment period. Interested parties may express their comments and concerns in writing to Mr. John W. Walton, Director, Air Pollution Control Division, 9th Floor, L&C Annex, 401 Church Street, Nashville, TN 37243-1531 within thirty (30) days of the date of this notice. Questions concerning a source may be addressed to the assigned Division personnel at the same address or by calling 615-532-0554.

Individuals with disabilities who wish to participate should contact the Tennessee Department of Environment and Conservation to discuss any auxiliary aids or services needed to facilitate such participation. Such contact may be in person, by writing, telephone, or other means, and should be made no less than ten days prior to the end of the thirty (30) day public comment period to allow time to provide such aid or service. Contact the Tennessee Department of Environment and Conservation ADA Coordinator, 21st Floor, 401 Church St, Nashville TN 37248, (615) 532-0103. Hearing impaired callers may use the Tennessee Relay Service (1-800-848-0298).

Applicant	Source Description and Location	Division Personnel
Exide Corp. / Speed Clip. Div.	Casting Machine, Electric Melting Furnace, Die Casting Operation, and Two (2) Gas Pots 8 Boswell Drive, Bristol 37620	O. Aisien
King Pharmaceuticals, Inc.	94-1 Granulation equipment 501 Fifth Street, Bristol 37620	O. Aisien
Eastman Chemical Company	B-486-1 Production of Methanol & Dimethyl Ether South Eastman Road, Kingsport 37662	G. Achanta

TOTAL P.02

JAN 04 '95 08:06

APPENDIX I

AIR PERMIT APPLICATIONS

State of Tennessee
Department of Environment and Conservation
Division of Air Pollution Control

Process Emission Source
Number B-486-1
Page 1 of 15
Date DEC 0 2 1994

APC-20
PERMIT APPLICATION

PLEASE TYPE OR PRINT AND SUBMIT IN DUPLICATE FOR EACH EMISSION SOURCE, ATTACH APPROPRIATE SOURCE DESCRIPTION FORMS.

1. Organization's Legal Name Eastman Chemical Company			/// For /// APC	APC Company-Point No.
2. Mailing Address (St/Rd/P.O. Box) P. O. Box 1993				APC Log/Permit No.
City Kingsport	State TN	Zip Code 37662		Phone With Area Code (615)229-2000
3. Principal Technical Contact J. H. Albrecht				Phone With Area Code (615)229-5877
4. Site Address (St/Rd/Hwy) South Eastman Road				County Name Sullivan
City of Distance to Nearest Town Kingsport		Zip Code 37662		Phone With Area Code (615)229-2000
5. Emission Source No. B-486-1		Permit Renewal Yes ( ) No (X)		SIC No. 2869

6. Brief Description of Emission Source

Production of Methanol and Dimethyl Ether

7. Type of Permit Request (Complete One Line Only)

Construction (X)	Starting Date 3/1/95	Completion Date 12/31/96		
Operating ( )	Date Construction Started	Date Completed	Last Permit No. New Source	Emission Source Reference Number New Source
Location Transfer ( )	Transfer Date		Last Permit No.	Emission Source Reference Number

Address of Last Location

8. Describe Changes That Have Been Made to This Equipment or Operation Since the Last Construction or Operating Permit Application.

New Source.

9. Signature (Application Must Be Signed Before It Will Be Processed)

Barry M. Mitchell

10. Signer's name (Type or Print): B. M. Mitchell

Title: Authorized Signatory

State of Tennessee
Department of Environment and Conservation
Division of Air Pollution Control
Page 1 of 3

Process Emission Source
Number B-486-1
Page 2 of 15
Date DEC 0 ? 199?

APC-21 & 24
PROCESS OR FUEL BURNING SOURCE DESCRIPTION

1. Organization Name Eastman Chemical Company	/// For	APC Company-Point No.
2. Emission Source No. B-486-1	/// APC	APC Log/Permit No.

3. Description of Process or Fuel Burning Unit
Production of Methanol and Dimethyl Ether

4. Normal Operation:	Hours/Day	Days/Week	Weeks/Year	Days/Year	Hours/Year
	24	7	52	365	8760

5. Type of Permit Application	(Check Below One Only)
Process Source: Apply for a separate permit for each source, (check at right, and complete lines 6, 7 and 8)	X
Process Source with in-process fuel: Products of combustion contact materials heated. Apply for a Separate permit for each source. (Check a right, and complete line 6, 7, 8, 10 to 14)	
Non-Process Fuel Burning Source: Products of combustion do not contact materials heated. Complete this form for each boiler or fuel burner and complete and emission point description form (APC-22) for each stack. (Check at right and complete lines 8 to 14)	

6. Type of Operation Continuous (X) Batch ( )	Normal Batch Time	Normal Batches/Day

7. Process Material Inputs and In-Process Solid Fuels	Diagram Reference*	Input Rates (Pounds/Hour) Design	Actual	(For APC Use Only) SCC Code
1. Synthesis Gas	1	35,500	35,500	
2. Sodium Hydroxide	6	1	1	
3. Carbon Monoxide	2	4,600	4,600	
4. Hydrogen Purge	3	5,500	5,500	
5. Oil	5	6,200	6,200	
6. Catalyst	4	1,600	1,600	
7.				
	Totals**		54,000	

* A Flow Diagram Must be Attached
**Total Rounded to 2 Significant Figures

8. Total Emissions for This PES (Tons/Year):

	Average	Maximum
Particulates	0.10	0.10
SO_2	0	0
NO_x	0	0
CO	2.60	2.60
VOC	4.56	4.56

Other (Specify)	Average	Maximum
CO_2	1.38	1.38
H_2	0.30	0.30

9. Boiler or Burner Data. (Complete Lines 9 to 14 using a separate form for each boiler.)

Boiler Number	Stack Number **	Type of Firing***	Rated Boiler Horsepower	Rated Input Capacity (10^6 Btu/Hr)	Fuel Type	
					Primary	Secondary
Not Applicable						

Boiler Serial No.	Date Constructed	Last Modification Date

** Boilers with same stack will have same stack number.
*** Cyclone spreader (with or without reinjection), pulverized (wet or dry bottom, with or without reinjection), other stoker (specify type), hand fired, automatic, or other type (describe below in comments.)

10. Fuel Data. (Complete for a process source with in-process fuel or a nonprocess fuel burning source.) Not Applicable

Fuels Used	Annual Usage	Hourly Usage		Percent Sulfur	Percent Ash	Btu Value of Fuel	(For APC Only) SCC Code
		Design	Average				
Natural Gas:	10^6 CUFT	CUFT	CUFT	///	///	1,000	
#2 Fuel Oil:	10^3 GAL	GAL	GAL		///		
#5 Fuel Oil:	10^3 GAL	GAL	GAL		///		
#6 Fuel Oil:	10^3 GAL	GAL	GAL		///		
Coal:	TONS	LBS	LBS				
Wood:	TONS	LBS	LBS	///	///		
Liquid Propane	10^3 GAL	GAL	GAL	///	///	85,000	
Other: (Specify Type & Units)							

11. If Wood is Used as a Fuel, Specify Types and Estimate Percent by Weight of Bark. Not Applicable

12. If Wood is Used With Other Fuels, Specify Percent by Weight of Wood Charged to the Burner. Not Applicable

13. Comments:

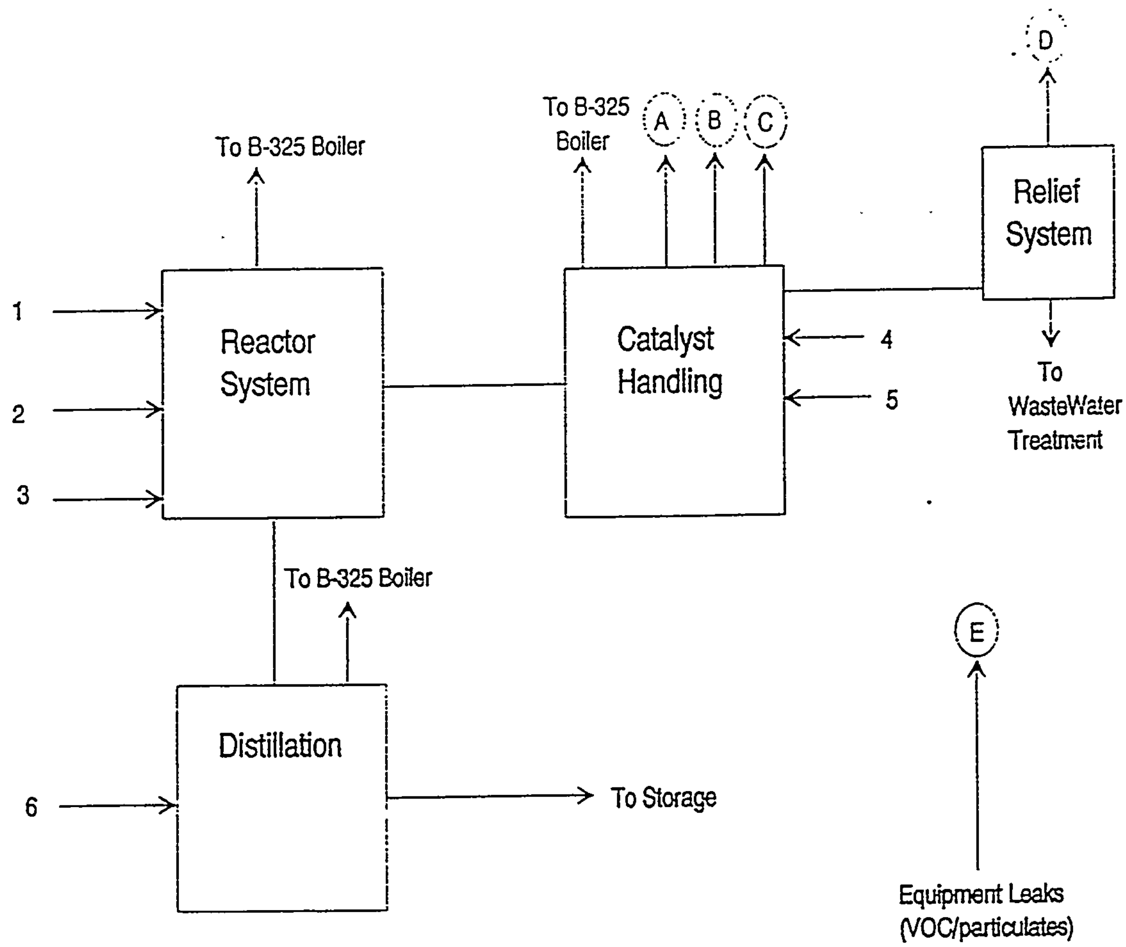
14. If a Standby or Interruptible Fuel is Used, Give Type of Fuel, Annual Quantity Used, and the Schedule or Program for Use Not Applicable

Sulfur Content of Standby Fuel %	If Coal, Show Ash Content %

Btu Value ______________

Flow Diagram

For Item 7 of APC-21 (& 24)



STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF AIR POLLUTION CONTROL

PROCESS EMISSION SOURCE
NUMBER B-486-1
PAGE 5 OF 15
DATE DEC 0 2 1994
TANK ID NUMBER 29D-30
VENT ID NUMBER A

APC - 27
STORAGE TANK DESCRIPTION

PROCESS TANK
STORAGE TANK X

1. ORGANIZATION NAME - EASTMAN CHEMICAL COMPANY		FOR	APC COMPANY-POINT NO.
2. PROCESS EMISSION SOURCE NO. B-486-1		APC	APC SEQUENCE NO.

3. TANK LATITUDE 36 DEG 31' 7" N	TANK LONGITUDE 82 DEG 32' 48" W	UTM VERTICAL 4042400 N	UTM HORIZONTAL 361500 E
4. TANK ID NUMBER 29D-30	VENT ID NUMBER A	CONSTRUCTION DATE 3/1/95	
5. DIAMETER (FT) 9.0	HEIGHT (FT) 22.1	CAPACITY (GAL) 10500.	
6. CYLINDER (VERT) X	CYLINDER (HORZ)	SPHERE	OTHER (DESCRIBE)

7. TANK COLOR	WHITE	ALUMINUM		GRAY			OTHER (DESCRIBE)
		SPECULAR	DIFFUSE	LIGHT	MEDIUM	DARK	
A. ROOF:	X						
B. SHELL:					X		

8. PAINT CONDITION	GOOD X	POOR	NO PAINT

9. TANK TYPE	FIXED ROOF X	FLOATING ROOF	OPEN TOP	UNDERGROUND	OTHER (DESCRIBE)

10. INSULATED NONE	TEMPERATURE 77. DEGREES F	PRESSURE 14. PSIA	

11. FOR FLOATING ROOF TANKS COMPLETE: NOT APPLICABLE

A. ROOF TYPE	DOUBLE DECK	PONTOON	PAN	OTHER (DESCRIBE)
B. SEAL TYPE	SINGLE	DOUBLE		OTHER (DESCRIBE)
C. SHELL CONSTRUCTION	RIVETED	WELDED		OTHER (DESCRIBE)

12. LIST ALL LIQUIDS, VAPORS, GASES, OR MIXTURES TO BE STORED IN THIS TANK. GIVE THE PERCENT BY WEIGHT OF EACH COMPONENT. SEE APC - 27 SHEET 3.

13. OUTAGE: AVERAGE DISTANCE FROM TOP OF TANK TO LIQUID SURFACE (FEET) 11.0	AVG. THROUGHPUT (GALLONS / DAY) 99.	MAXIMUM NO. OF TANK TURNOVERS PER YEAR 3.

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF AIR POLLUTION CONTROL

PROCESS EMISSION SOURCE
NUMBER B-486-1

DATE DEC 0 2 1994
TANK ID NUMBER 29D-30
VENT ID NUMBER A

APC - 27
STORAGE TANK DESCRIPTION

14. LOADING TYPE:	BOTTOM	SUBMERGED	VAPOR BALANCED	OTHER (DESCRIBE)
		X		

15. OPERATING HOURS/YEAR 8760. OPERATING DAYS/YEAR 365.

16. SPECIAL VAPOR CONTROL DEVICES:

CONSERVATION VENT

17. OPERATIONAL DATA:

CONTINUOUS FILLING AND DISCHARGING
AVERAGE DAILY LEVEL FLUCTUATION N/A
AVERAGE DAILY VOLUME FLUCTUATION N/A

BATCH FILLING
AVERAGE NUMBER OF GALLONS PER FILLING 6000.
AVERAGE NUMBER OF FILLS PER YEAR 6.

18. INERT GAS OR NITROGEN FLOW:
GAS FLOW 0.08300 SCFM
SATURATION OF GAS 100.0 %

19. TOTAL VOC EMISSIONS: Negligible TONS/YEAR

20. TOTAL PARTICULATE EMISSIONS: 0.00 TONS/YEAR

21. EMISSIONS ESTIMATION METHOD AP - 42

PROCESS EMISSION SOURCE
NUMBER B-486-1
PAGE 7 OF 15
DATE DEC 0 2 1994
TANK ID NUMBER 29D-30
VENT ID NUMBER A

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF AIR POLLUTION CONTROL

APC - 27
STORAGE TANK DESCRIPTION

12. (CONTINUED)

COMPONENT	WEIGHT PERCENT	MOL. WEIGHT	VAPOR PRESSURE (PSIA) AT 77. DEG F
White Mineral Oil	100.0	450.0	0.0000

PROCESS EMISSION SOURCE
NUMBER B-486-1
PAGE 8 OF 15
DATE DEC 0 2 1994
TANK ID NUMBER 29D-31
VENT ID NUMBER B
PROCESS TANK X
STORAGE TANK

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF AIR POLLUTION CONTROL

APC - 27
STORAGE TANK DESCRIPTION

1. ORGANIZATION NAME - EASTMAN CHEMICAL COMPANY		FOR APC	APC COMPANY-POINT NO.
2. PROCESS EMISSION SOURCE NO. B-486-1			APC SEQUENCE NO.
3. TANK LATITUDE 36 DEG 31' 7" N	TANK LONGITUDE 82 DEG 32' 48" W	UTM VERTICAL 4042400 N	UTM HORIZONTAL 361500 E
4. TANK ID NUMBER 29D-31	VENT ID NUMBER B	CONSTRUCTION DATE 3/1/95	
5. DIAMETER (FT) 4.0	HEIGHT (FT) 11.6	CAPACITY (GAL) 1000.	
6. CYLINDER (VERT) X	CYLINDER (HORZ)	SPHERE	OTHER (DESCRIBE)

7. TANK COLOR	WHITE	ALUMINUM SPECULAR	ALUMINUM DIFFUSE	GRAY LIGHT	GRAY MEDIUM	GRAY DARK	OTHER (DESCRIBE)
A. ROOF:	X						
B. SHELL:					X		

8. PAINT CONDITION	GOOD X	POOR	NO PAINT

9. TANK TYPE	FIXED ROOF	FLOATING ROOF	OPEN TOP	UNDERGROUND	OTHER (DESCRIBE)
	X				

10. INSULATED NONE	TEMPERATURE 122. DEGREES F	PRESSURE 15. PSIA	

11. FOR FLOATING ROOF TANKS COMPLETE: NOT APPLICABLE

A. ROOF TYPE	DOUBLE DECK	PONTOON	PAN	OTHER (DESCRIBE)
B. SEAL TYPE	SINGLE	DOUBLE		OTHER (DESCRIBE)
C. SHELL CONSTRUCTION	RIVETED	WELDED		OTHER (DESCRIBE)

12. LIST ALL LIQUIDS, VAPORS, GASES, OR MIXTURES TO BE STORED IN THIS TANK. GIVE THE PERCENT BY WEIGHT OF EACH COMPONENT. SEE APC - 27 SHEET 3.

13. OUTAGE: AVERAGE DISTANCE FROM TOP OF TANK TO LIQUID SURFACE (FEET) 5.8	AVG. THROUGHPUT (GALLONS / DAY) 51.	MAXIMUM NO. OF TANK TURNOVERS PER YEAR 19.

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF AIR POLLUTION CONTROL

PROCESS EMISSION SOURCE
NUMBER B-486-1

DATE DEC 0 2 1994
TANK ID NUMBER 29D-31
VENT ID NUMBER B

APC - 27
STORAGE TANK DESCRIPTION

	BOTTOM	SUBMERGED	VAPOR BALANCED	OTHER (DESCRIBE)
14. LOADING TYPE:	X			

15. OPERATING HOURS/YEAR 8760. OPERATING DAYS/YEAR 365.

16. SPECIAL VAPOR CONTROL DEVICES:

CONSERVATION VENT

17. OPERATIONAL DATA:

CONTINUOUS FILLING AND DISCHARGING
AVERAGE DAILY LEVEL FLUCTUATION N/A
AVERAGE DAILY VOLUME FLUCTUATION N/A

BATCH FILLING
AVERAGE NUMBER OF GALLONS PER FILLING 500.
AVERAGE NUMBER OF FILLS PER YEAR 37.

18. INERT GAS OR NITROGEN FLOW:
GAS FLOW 0.08300 SCFM
SATURATION OF GAS 100.0 %

19. TOTAL VOC EMISSIONS: Negligible TONS/YEAR

20. TOTAL PARTICULATE EMISSIONS: 0.00 TONS/YEAR

21. EMISSIONS ESTIMATION METHOD AP - 42

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF AIR POLLUTION CONTROL

PROCESS EMISSION SOURCE
NUMBER B-486-1

DATE DEC 0 2 1994
TANK ID NUMBER 29D-31
VENT ID NUMBER B

APC - 27
STORAGE TANK DESCRIPTION

12. (CONTINUED)

COMPONENT	WEIGHT PERCENT	MOL. WEIGHT	VAPOR PRESSURE (PSIA) AT 122. DEG F
White Mineral Oil	100.0	450.0	0.0000

PROCESS EMISSION SOURCE
NUMBER B-486-1
PAGE 11 OF 15
DATE DEC 0 2 1994
TANK ID NUMBER 29C-36
VENT ID NUMBER C

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF AIR POLLUTION CONTROL

PROCESS TANK X
STORAGE TANK

APC - 27
STORAGE TANK DESCRIPTION

1. ORGANIZATION NAME - EASTMAN CHEMICAL COMPANY			FOR	APC COMPANY-POINT NO.
2. PROCESS EMISSION SOURCE NO. B-486-1			APC	APC SEQUENCE NO.
3. TANK LATITUDE 36 DEG 31' 7" N	TANK LONGITUDE 82 DEG 32' 48" W	UTM VERTICAL 4042400 N		UTM HORIZONTAL 361500 E
4. TANK ID NUMBER 29C-36	VENT ID NUMBER C	CONSTRUCTION DATE 3/1/95		
5. DIAMETER (FT) 2.0	HEIGHT (FT) 4.7	CAPACITY (GAL) 110.		
6. CYLINDER (VERT) X	CYLINDER (HORZ)	SPHERE		OTHER (DESCRIBE)

7. TANK COLOR	WHITE	ALUMINUM SPECULAR	ALUMINUM DIFFUSE	GRAY LIGHT	GRAY MEDIUM	GRAY DARK	OTHER (DESCRIBE)
A. ROOF:	X						
B. SHELL:					X		

8. PAINT CONDITION	GOOD X	POOR	NO PAINT

9. TANK TYPE	FIXED ROOF	FLOATING ROOF	OPEN TOP	UNDERGROUND	OTHER (DESCRIBE)
	X				

10. INSULATED NONE	TEMPERATURE 122. DEGREES F	PRESSURE 15. PSIA

11. FOR FLOATING ROOF TANKS COMPLETE: NOT APPLICABLE

A. ROOF TYPE	DOUBLE DECK	PONTOON	PAN	OTHER (DESCRIBE)
B. SEAL TYPE	SINGLE	DOUBLE		OTHER (DESCRIBE)
C. SHELL CONSTRUCTION	RIVETED	WELDED		OTHER (DESCRIBE)

12. LIST ALL LIQUIDS, VAPORS, GASES, OR MIXTURES TO BE STORED IN THIS TANK. GIVE THE PERCENT BY WEIGHT OF EACH COMPONENT. SEE APC - 27 SHEET 3.

13. OUTAGE: AVERAGE DISTANCE FROM TOP OF TANK TO LIQUID SURFACE (FEET) 2.3	AVG. THROUGHPUT (GALLONS / DAY) 50.	MAXIMUM NO. OF TANK TURNOVERS PER YEAR 166.

PROCESS EMISSION SOURCE
NUMBER B-486-1
PAGE 12 OF 15
DATE DEC 0 2 1994
TANK ID NUMBER 29C-36
VENT ID NUMBER C

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF AIR POLLUTION CONTROL

APC - 27
STORAGE TANK DESCRIPTION

	BOTTOM	SUBMERGED	VAPOR BALANCED	OTHER (DESCRIBE)
14. LOADING TYPE:		X		

15. OPERATING HOURS/YEAR 8760. OPERATING DAYS/YEAR 365.

16. SPECIAL VAPOR CONTROL DEVICES:

CONSERVATION VENT

17. OPERATIONAL DATA:

CONTINUOUS FILLING AND DISCHARGING
AVERAGE DAILY LEVEL FLUCTUATION N/A
AVERAGE DAILY VOLUME FLUCTUATION N/A

BATCH FILLING
AVERAGE NUMBER OF GALLONS PER FILLING 88.
AVERAGE NUMBER OF FILLS PER YEAR 208.

18. INERT GAS OR NITROGEN FLOW:
GAS FLOW 0.08300 SCFM
SATURATION OF GAS 100.0 %

19. TOTAL VOC EMISSIONS: Negligible TONS/YEAR

20. TOTAL PARTICULATE EMISSIONS: 0.00 TONS/YEAR

21. EMISSIONS ESTIMATION METHOD AP - 42

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF AIR POLLUTION CONTROL

DATE DEC 0 2 1994
TANK ID NUMBER 29C-36
VENT ID NUMBER C

APC - 27
STORAGE TANK DESCRIPTION

12. (CONTINUED)

COMPONENT	WEIGHT PERCENT	MOL. WEIGHT	VAPOR PRESSURE (PSIA) AT 122. DEG F
White Mineral Oil	100.0	450.0	0.0000

State of Tennessee
Department of Environment and Conservation
Division of Air Pollution Control

Process Emission Source
Number B-486-1
Page 14 of 15
Date ~~DEC 0 2 199~~

APC-22
EMISSION POINT DESCRIPTION

1. Organization Name	Eastman Chemical Company		/// For /// APC	APC Company-Point No.
2. Emission Source No. B-486-1	Flow Diagram Point No. D			APC Sequence No.

3. Location:	Latitude 36° 31' 7" N	Longitude 82° 32' 48" W	UTM Vertical 4042400 N	UTM Horizontal 361500 E

4. Brief Emission Point Description
Vent from scrubber

	Hours/Days	Days/Week	Weeks/Year	Days/Year	Hours/Year
5. Normal Operation:	24	7	52	365	8760

6. Stack or Emission Point Data:	Height Above Grade (FT) 60	Diameter (FT) 0.3	Temperature (°F) 100	% of Time Over 125°F 0	Direction of Exit (Up, Down, Horizontal) Up
Data at Exit Conditions:	Flow (Actual Ft^3/Min.) 0.13	Velocity (Ft/Sec) 0.03	Moisture (Volume %) 2		
Data at Standard Conditions: (70°F and 29.92 In. Hg.	Flow (Dry Std. Ft^3/Min.) 0.10	Velocity (Ft/Sec) 0.02			

7. Air Contaminants

	Emissions (Lbs/Hr)		Concentration		Emissions (TPY)		Emissions*	Control*	Control
	Average	Maximum	Average	Max.	Average	Maximum	Est. Method	Device	Eff. %
Particulates	–		**	**					
Sulfur Dioxide	–		***	***					
Nitrogen Oxides	–		PPM	PPM					
Organic Compounds	–		PPM	PPM					
Carbon Monoxide	0.2	0.2	PPM 400,000	PPM 400,000	0.88	0.88	2	000	–
Fluorides	–								
Other (Specify)	–								

8. Check Types of Monitoring and Recording Instruments That are Attached:
Opacity Monitor ( ). SO_2 Monitor ( ). NO_x Monitor ( ). Other (Specify in Comments) ( )
None (X)

9. Comments: (Continue on Back if Needed)

* Refer to the back of the permit application form for estimation method and control device codes.

** Exit gas particulate concentration units: process – grains/dry standard ft^3 (70°F); wood fired boilers – grains/dry standard ft^3 (70°F); all other boilers – lbs/million Btu heat input.

*** Exit gas sulfur dioxide concentrations units: process – ppm by volume, dry bases; boilers lbs/million Btu heat input.

State of Tennessee
Department of Environment and Conservation
Division of Air Pollution Control

Process Emission Source
Number B-486-1
Page 15 of 15
Date DEC 0 2 1994

APC-22
EMISSION POINT DESCRIPTION

1. Organization Name	Eastman Chemical Company	/// For /// APC	APC Company-Point No.
2. Emission Source No. B-486-1	Flow Diagram Point No. E		APC Sequence No.

3. Location:	Latitude	Longitude	UTM Vertical	UTM Horizontal
	36^{o} 31' 7" N	82^{o} 32' 48" W	4042400 N	361500 E

4. Brief Emission Point Description

Equipment Leaks

5. Normal Operation:	Hours/Days	Days/Week	Weeks/Year	Days/Year	Hours/Year
	24	7	52	365	8760

6. Stack or Emission Point Data:	Height Above Grade (FT)	Diameter (FT)	Temperature (°F)	% of Time Over 125°F	Direction of Exit (Up, Down, Horizontal)
	–	–	–	–	
Data at Exit Conditions:	Flow (Actual Ft^3/Min.) –	Velocity (Ft/Sec) –	Moisture (Volume %) –		
Data at Standard Conditions: (70°F and 29.92 In. Hg.	Flow (Dry Std. Ft^3/Min.) –	Velocity (Ft/Sec) –			

7. Air Contaminants

	Emissions (Lbs/Hr)		Concentration		Emissions (TPY)		Emissions*	Control*	Control
	Average	Maximum	Average	Max.	Average	Maximum	Est. Method	Device	Eff. %
Particulates	–	–	** –	** –	–	0.10	3	000	–
Sulfur Dioxide	–		***	***					
Nitrogen Oxides	–		PPM	PPM					
Organic Compounds	–	–	PPM –	PPM –	–	4.56	5	000	–
Carbon Monoxide	–	–	PPM –	PPM –	–	1.72	5	000	–
Fluorides	–								
Other (Specify) Hydrogen	–	–	–	–	–	0.30	5	000	–

8. Check Types of Monitoring and Recording Instruments That are Attached:
Opacity Monitor ( ). SO_2 Monitor ( ). NO_x Monitor ( ). Other (Specify in Comments) (X)
None ( )

9. Comments: (Continue on Back if Needed)

Leak detection and repair as required by Title III.

* Refer to the back of the permit application form for estimation method and control device codes.

** Exit gas particulate concentration units: process - grains/dry standard ft^3 (70°F); wood fired boilers - grains/dry standard ft^3 (70°F); all other boilers - lbs/million Btu heat input.

*** Exit gas sulfur dioxide concentrations units: process - ppm by volume, dry bases; boilers lbs/million Btu heat input.

BACT/LAER Discussion

Flow Diagram Reference Point A, B, C

1. Description of Reference Point

   Conservation vents for Tanks 29D-30, 29D-31, and 29C-36.

2. Description of Emissions

   Inert gas with a potential for a small quantity of VOC as a result of tank filling operations, breathing losses, and inert gas purges on level devices.

3. Alternatives Considered

   Because low VOC emissions are produced due to the low vapor pressure of the stored chemical, no emission abatement was considered for these sources.

4. Relative Cost of Alternative Systems

   Not applicable.

5. Relative Efficiencies of Alternative Systems

   Not applicable.

6. Process Steps Which Inherently Reduce Emission Levels

   None.

7. Reasons for Selection of the System Chosen

   The low vapor pressure of the stored chemical results in low VOC emissions without the installation of emission control equipment. Emissions are negligible.

BACT/LAER Discussion

Flow Diagram Reference Point D

1. Description of Reference Point

   Vent from a water scrubber.

2. Description of Emissions

   Emissions consist of carbon monoxide.

3. Alternatives Considered

   Due to the low potential for emissions as a result of process constraints, no alternatives were considered.

4. Relative Cost of Alternative Systems

   Not applicable.

5. Relative Efficiencies of Alternative Systems

   Not applicable.

6. Process Steps Which Inherently Reduce Emission Levels

   None.

7. Reasons for Selection of the System Chosen

   Process constraints do not allow CO emissions to reach a significant level.

Process Emission Source
Number B-486-1
Date DEC 0 ? 1994
Page 15c of 15

BACT/LAER Discussion

Flow Diagram Reference Point E

1. Description of Reference Point

Fugitive emissions from valves, flanges, and open equipment. Leak detection and repair will be employed per Title III.

2. Description of Emissions

These emissions consist of VOCs (including Methanol), CO, particulates, and other (H_2 and CO_2).

3. Alternatives Considered

Because of the applicability of the HON, no other alternatives were considered.

4. Relative Cost of Alternative Systems

Not applicable.

5. Relative Efficiencies of Alternative Systems

Not applicable.

6. Process Steps Which Inherently Reduce Emission Levels

None.

7. Reasons for Selection of the System Chosen

Leak detection and repair, as required by Title III, represent the best management practices available.

Process Emission Source
Number B-486-1
Date DEC 0 2 1994
Page 15d of 15

Emission Changes for New/Modified Sources

Vent Code	Type of Emission	* Application Max. Lb/Hr	This Application Max. Lb/Hr	Net Change Max. Lb/Hr	Hrs./Yr.	Net Change Max. TYP
A	VOC	Not Applicable	Negligible	–	8760	Negligible
B	VOC	Not Applicable	Negligible	–	8760	Negligible
C	VOC	Not Applicable	Negligible	–	8760	Negligible
D	CO	Not Applicable	0.20	+0.20	8760	+0.88
Fugitives E	VOC	Not Applicable	4.56 TPY	–	8760	+4.56
	CO	Not Applicable	1.72 TPY	–	8760	+1.72
	TSP	Not Applicable	0.10 TPY	–	8760	+0.10
	Others	Not Applicable	1.68 TPY	–	8760	+1.68

Total Emission Change:	max. lbs./hr.	max. TPY
VOC	–	+4.56
TSP	–	+0.10
SO_2	–	–
NO_x	–	–
CO	–	+2.60
Other	–	+1.68

* Previous Application Submittal Date

(New Source)

This was in the 12/

Fax it

Wednesday 12/28/94 Kingsport Times News

PUBLIC NOTICE

The Tennessee Air Pollution Control Division (TAPCD) has received requests for construction of air contaminant sources as noted below. The proposed construction is subject to part 1200-3-9-.01 (1)(h) of the Tennessee Air Pollution Control Regulations, which requires a public notification and 30-day public comment period. Interested parties may express their comments and concerns in writing to Mr. John W. Walton, Director, Air Pollution Control Division, 9th Floor, L&C Annex, 401 Church Street, Nashville, TN 37243-1531 within thirty (30) days of the date of this notice. Questions concerning a source may be addressed to the assigned Division personnel at the same address or by calling 615-532-0554.

Individuals with disabilities who wish to participate should contact the Tennessee Department of Environment and Conservation to discuss any auxiliary aids or services needed to facilitate such participation. Such contact may be in person, by writing, telephone, or other means, and should be made no less than ten days prior to the end of the thirty (30) day public comment period to allow time to provide such aid or service. Contact the Tennessee Department of Environment and Conservation ADA Coordinator, 21st Floor, 401 Church St., Nashville TN 37248, (615) 532-0103. Hearing impaired callers may use the Tennessee Relay Service (1-800-848-0298).

Applicant	Source Description and Location	Division Personnel
Eddie Corp. / Speed Clip Div.	Casting Machine, Electric Melting Furnace, Die Casting Operation, and Two (2) Gas Pots 8 Boswell Drive, Bristol 37620	O. Aislen
King Pharmaceuticals, Inc.	94-1 Granulation equipment 501 Fifth Street, Bristol 37620	O. Aislen
Eastman Chemical Company	B-486-1 Production of Methanol & Dimethyl Ether South Eastman Road, Kingsport 37662	G. Acharta

TOTAL P.02

APPENDIX II

SOLID WASTE DISPOSAL FACILITIES PERMITS

HAZARDOUS WASTE LANDFILL PERMITS

State of Tennessee
Department of Environment
and Conservation
Division of Solid Waste Management

Hazardous Waste Management Program
4th Floor, Customs House
701 Broadway
Nashville, TN 37243-1535
(615) 741-3424

PERMIT

Permittee: Tennessee Eastman Division, Eastman Chemical Company
Installation Identification Number: TND 00 337 6928
Permit Number: TNHW-019
Units: Hazardous Waste Surface Impoundments and Landfill
Modification Number: 1

Pursuant to the Tennessee Hazardous Waste Management Act, as amended (Tennessee Code Annotated 68-46-101 et seq.) and regulations (Chapter 1200-1-11) promulgated thereunder by the Tennessee Solid Waste Disposal Control Board, a permit is issued to Tennessee Eastman Division, Eastman Chemical Company (hereinafter called the Permittee), to operate a hazardous waste storage, treatment, and disposal facility for the management of hazardous waste, located in Kingsport, Tennessee, Sullivan County at latitude 36° 31' 27" and longitude 82° 33' 44". The Permittee will be allowed to store, treat, and dispose of hazardous waste subject to the terms of this permit.

The Permittee must comply with all terms and conditions of this permit. This permit consists of the conditions contained herein (including those in any attachments) and the applicable regulations contained in Rule Chapter 1200-1-11, as specified in the permit. Applicable regulations are those which are in effect on the date of issuance of the permit, except for the requirements of the annual permit maintenance fees of Rule 1200-1-11-.08 in which case the applicable regulations are those in effect on the date the appropriate fee is due.

Continuation, Transfer, Modification, Revocation and Reissuance, and Termination of this permit must comply with and conform to Rule 1200-1-11-.07(9).

This permit is based on the assumption that the information submitted in the original permit application and subsequent modifications thereto (hereinafter referred to as the application) is accurate and that the facility will be constructed, operated, maintained, and closed as specified in the application. The Permittee's failure in the application to disclose fully all relevant facts or the Permittee's misrepresentation of any relevant facts at any time may be grounds for termination of this permit and potential enforcement action. The Commissioner may modify this permit if information is received which was not available at the time of permit issuance and which justifies the application of different permit conditions at the time of issuance. The Permittee must inform the Tennessee Department of Environment and Conservation, Division of Solid Waste Management, of any deviation from or changes in the information in the application which would affect the Permittee's ability to comply with the applicable regulations or permit conditions.

This permit is effective as of March 31, 1992, and shall remain in effect until September 30, 1998, unless revoked and reissued, or terminated, or continued.

Tom Tiesler, Director
Division of Solid Waste Management
Tennessee Department of Environment and Conservation

TT/HMB/F1151280

TENNESSEE AIR POLLUTION CONTROL BOARD
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
NASHVILLE, TENNESSEE 37247-3101

Permit to Construct or Modify an Air Contaminant Source Issued Pursuant to Tennessee Air Quality Act

Date Issued: SEP 29 1992

Date Expires: April 1, 1994

Permit Number:

935213P

Issued To:

Tennessee Eastman Company

Installation Address:

Kingsport

Installation Description:
HWDU-1
Ash (From Incineration of Hazardous Waste)
Disposal Unit with Wet Suppression

Emission Source Reference No:
82-1009-66

The holder of this permit shall comply with the conditions contained in this permit as well as all applicable provisions of the Tennessee Air Pollution Control Regulations.
This is not a permit to operate.

CONDITIONS:

1. This permit does not cover any air contaminant source that does not conform to the conditions of this permit and the information given in the approved application.

2. Visible emissions shall not exceed 10 percent or greater opacity as determined by EPA Method 9, as published in the Federal Register, Volume 39, No. 219 on November 12, 1974. (6 minute average)

3. This permit shall serve as a temporary operating permit from initial start-up to the receipt of a standard operating permit, (regardless of the expiration date), provided the operating permit is applied for within thirty (30) days of initial start-up and the conditions of this permit and any applicable emission standards are met.

John W. Walton

~~HAROLD E. HODGES, P.E.~~
TECHNICAL SECRETARY

F2052268

No Authority is Granted by this Permit to Operate, Construct, or Maintain any Installation in Violation of any Law, Statute, Code, Ordinance, Rule or Regulation of the State of Tennessee or any of its Political Subdivisions.

NON TRANSFERABLE

POST AT INSTALLATION ADDRESS

CN-0754

NON-HAZARDOUS WASTE LANDFILL PERMITS

State of Tennessee
Department of Health and Environment
Division of Solid Waste Management

Solid Waste Management Program
7th Floor, 150 9th Ave. North
Nashville, Tennessee 37203
(615) 741-3424

REGISTRATION AUTHORIZING SOLID WASTE DISPOSAL ACTIVITIES IN TENNESSEE

Registration Number: I 049

Date Issued: JUL 12 1984

Issued to Tennessee Eastman Company for a facility located south of the Holston River South Fork on Tennessee Eastman Company property in Sullivan County.

Activities Authorized: Disposal by landfilling of fly ash and bottom ash from the coal-fired boilers, bottom ash from the incinerators, ash from the coal gasification plant, construction rubble and relatively inert solid wastes (i.e. gravel, dirt, wooden pallets, metal shavings).

By my signature, this registration is issued in compliance with the provisions of the Tennessee Solid Waste Disposal Act (Tennessee Code Annotated, Section 68-31-101, et. seq.), and applicable regulations developed pursuant to this law and in effect; and in accordance with the conditions and other terms set forth in this registration document and the attached Registration Conditions.

Tom Tiesler, Director
Division of Solid Waste Management

EC/ch SW/18

TENNESSEE AIR POLLUTION CONTROL BOARD
NASHVILLE, TENNESSEE 37219

Operating Permit issued pursuant to Tennessee Air Quality Act

Date Issued: December 11, 1980 Permit Number: 011138

Expires:

Issued to: Installation Address:

Tennessee Eastman Company Kingsport

Installation Description:	Emission Source Reference No.:
Nontraditional fugitive dust sources (Not otherwise permitted)	82-00003

The holder of this permit shall comply with the conditions contained in this permit as well as all applicable provisions of the Tennessee Air Pollution Control Regulations.

CONDITIONS:

1. No person shall cause, suffer, allow, or permit any materials to be handled, transported, or stored; or a road to be used, constructed, altered, repaired, or demolished without taking reasonable precautions as specified by the Technical Secretary, to prevent particulate matter from being airborne. Such reasonable precautions shall include, but not be limited to, the following:

   (a) Use, where possible, of water or chemicals for control of dust in demolition of existing buildings or structures, construction operations, grading of roads or the clearing of land:

   (b) Application of asphalt, oil, water or suitable chemicals on dirt roads, materials stock piles, and other surfaces which can create airborne dusts:

2. The attached plan is accepted by the Technical Secretary and adherence with this plan is a condition of this permit. Any deviation to lessen the requirements of this plan is a violation of this permit.

3. Should the Technical Secretary determine in his estimation that the plan of action outlined in condition #2 is not adequate to meet the objectives of the attainment plan or condition #1 of this permit, he shall provide the owner or operator with written notice that the plan is no longer acceptable. The owner or operator shall have 30 days to submit a new acceptable plan addressing the deficiencies noted by the Technical Secretary.

Continued on next page.

Harold E. Hodges
HAROLD E. HODGES, P. E.
TECHNICAL SECRETARY jdp

No authority is granted by this permit to operate, construct, or maintain any installation in violation of any law, statute, code, ordinance, rule or regulation of the State of Tennessee or any of its political subdivisions.

NON TRANSFERABLE

POST OR FILE AT INSTALLATION ADDRESS

PH- 0423
APC Rev. 1/78

4. For industrial traffic and parking areas, the Technical Secretary will use the following criterion to determine conformance with condition #1 of the permit and the measures required under condition #2 of the permit to maintain the traffic and parking areas reasonably dust free:

- 10% opacity for any 2 minutes (2 minute average) conducted in the manner prescribed by the Technical Secretary.

5. No person shall cause, suffer, allow or permit discharge of a visible emission from any fugitive dust source with an opacity in excess of ten (10) percent for an aggregate of fifteen (15) minutes. Readings are to be taken across the narrower direction if the generation site is rectangular or oblong and are to be perpendicular to the wind direction ($\pm 30^{\circ}$). Readings will be taken approximately every 15 seconds for any consecutive fifteen minute period and an arithmetic average used to determine compliance. Any other items not covered here will be in accordance with the general specifications of reference method as specified in part 1200-3-16-.01-(5)-(g)-9.

INCINERATOR PERMIT

State of Tennessee
Department of Health and Environment
Division of Solid Waste Management

Hazardous Waste Management Program
4th Floor, Customs House
701 Broadway
Nashville, Tennessee 37219-5403
(615) 741-3424

PERMIT

Permittee: Tennessee Eastman Company, Division of Eastman Kodak Company
Installation Identification Number: TND 00 337 6928
Unit(s): Incinerators (3)
Permit Number: TNHW-025

Pursuant to the Tennessee Hazardous Waste Management Act, as amended (Tennessee Code Annotated 68-46-101 *et seq.*), and regulations (Chapter 1200-1-11) promulgated thereunder by the Tennessee Department of Health and Environment (TDHE) and the Tennessee Solid Waste Disposal Control Board, a permit is issued to Tennessee Eastman Company (hereinafter also called the Permittee or TEC), to operate a hazardous waste treatment facility for the management of hazardous wastes, located in Kingsport, Tennessee, 37662 at latitude 36° 31' 27" and longitude 82° 33' 44". The Permittee will be allowed to treat hazardous waste by incineration in two rotary kilns and a liquid destructor in accordance with the conditions of this Permit.

The Permittee must comply with all terms and conditions of this permit. This permit consists of the conditions contained herein (including those in any attachments) and the applicable regulations contained in Rule Chapter 1200-1-11, as specified in the permit. Applicable regulations are those which are in effect on the date of issuance of the permit, except for the applicable fee requirements of Rule 1200-1-11-.08, applicable land disposal restriction requirements of Rule 1200-1-11-.10, and the permit continuation, transfer, modification, revocation and reissuance, and termination provisions at Rule 1200-1-11-.07(9). Any lawfully promulgated modification made to these excepted regulations during the effective life of this permit shall be considered applicable regulations.

Continuation, Transfer, Modification, Revocation and Reissuance, and Termination of this permit must comply with and conform to Rule 1200-1-11-.07(9).

This permit is based on the assumption that the information submitted in the original permit application and subsequent modifications thereto (hereinafter referred to as the application) is accurate and that the facility will be constructed, operated, maintained, and closed as specified in the application. The Permittee's failure in the application to disclose fully all relevant facts, or the Permittee's misrepresentation of any relevant facts at any time may be grounds for termination of this permit and potential enforcement action. The Commissioner may modify this permit if information is received which was not available at the time of permit issuance and which justifies the application of different permit conditions at the time of issuance. The Permittee must inform the Tennessee Department of Health and Environment, Division of Solid Waste

BOILER PERMITS

Kodak

August 19, 1992 This is the correct date per green card

CERTIFIED

U.S. Environmental Protection Agency
Region IV
4WD-RCRA
Mr. G. Alan Farmer
Chief, RCRA Branch
Attention: BIF
345 Courtland Street, N. E.
Atlanta, Georgia 30365

Dear Sir:

Subject: Certification of Compliance for Tennessee Eastman Division's Boiler Nos. 18, 19, 20, 23, 24, and 30

On August 21, 1991, Tennessee Eastman Division, Eastman Chemical Company, submitted to the U. S. Environmental Protection Agency (EPA) certifications of precompliance for boiler nos. 18-24 in Building 83 Powerhouse and boiler no. 30 in the Building 325 Powerhouse pursuant to EPA's February 21, 1991 Boiler and Industrial Furnace rule.

In April - June of 1992, Tennessee Eastman Division conducted tests on boiler nos. 19, 23, and 30 according to the test plan submitted to EPA on March 6, 1992. Based on the results of the compliance tests, Tennessee Eastman Division is now submitting the enclosed certification of compliance for boiler nos. 18, 19, 20, 23, 24, and 30. The certification for boiler nos. 21 and 22 was previously submitted on September 13, 1991 and was revised on August 19, 1992.

If you have any questions concerning this submittal, please contact me at (615) 229-3991.

Very truly yours,

C.W. Bridges

C. W. Bridges
Environmental Affairs

cwb-2001.doc

Enclosure

cc: Tom Tiesler, Director
Tennessee Division of Solid Waste Management
701 Broadway
Nashville, Tennessee 37243-1535
4th Floor, Customs House

Eastman Chemical Company
Tennessee Eastman Division
Eastman Road; P.O. Box 511
Kingsport, Tennessee 37662
(615) 229-2000

EPA Facility ID No. TND003376928

Region IV, EPA

Certification of Compliance
for
Eastman Chemical Company, Tennessee Eastman Division
Boiler Nos. 18, 19, 20, 23, 24 & 30

August 21, 1992

Submitted to

The United States Environmental Protection Agency

jbr/BIF2-001

Eastman Chemical Company, Tennessee Eastman Division
Certification of Compliance for Tennessee Eastman Division
Boilers Nos. 18, 19, 20, 23, 24 & 30
August 21, 1992

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6.0 Certification Statement

I certify under penalty of law that this information was prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gathered and evaluated the information and supporting documentation. Copies of all emissions tests, dispersion modeling results and other information used to determine conformance with the requirements of 40 CFR 266.103(c) are available at the facility and can be obtained from the facility contact person listed above. Based on my inquiry of persons who manage the facility, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

I also acknowledge that the operating conditions established in the certification pursuant to 40 CFR 266.103(c)(4)(iv) are enforceable limits at which the facility can legally operate during interim status until a revised certification of compliance is submitted.

John F. Webb ____________________ 8/18/92 ____________

Mr. John F. Webb
Superintendent, Power & Services Division

Date

jbr/BIF2-012

APPENDIX III

WATER PERMIT

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF WATER POLLUTION CONTROL
401 CHURCH STREET
L & C ANNEX 6TH FLOOR
NASHVILLE TN 37243-1534

SEP 1993
RECEIVED

August 31, 1993

Dr. Robert L. Barnes, Mgr., Env. Affairs
Tennessee Eastman Division
Division of Eastman Kodak Company
P.O. Box 1993
Kingsport, Tennessee 37662-5393

Subject: **NPDES Permit No. TN0002640**
Tennessee Eastman Division
Kingsport, Sullivan County, Tennessee

In accordance with the provisions of the Tennessee Water Quality Control Act, Tennessee Code Annotated, Sections 69-3-101 through 69-3-120, the enclosed NPDES Permit is hereby issued by the Division of Water Pollution Control. The continuance and/or reissuance of this NPDES Permit is contingent upon your meeting the conditions and requirements as stated therein.

Please be advised that you have the right to appeal any of the provisions establised in this NPDES Permit, in accordance with Tennessee Code Annotated, Section 69-3-110, and the General Regulations of the Tennessee Water Quality Control Board. If you elect to appeal, you should file a petition within thirty (30) days of the receipt of this permit.

If you have questions concerning this correspondence or if we may be of assistance to you in any way, please contact Mr. Stephen B. Letendre at (615) 532-0673.

Sincerely,

Thomas E. Roehm, Manager
Division of Water Pollution Control
Industrial Facilities Section

TER/sbl

02640FPT.DOC

Enclosure

cc: Division of Water Pollution Control, Permits Section
Division of Water Pollution Control, Johnson City Field Office

STATE OF TENNESSEE
NPDES PERMIT

NO. TN0002640

Authorization to discharge under the
National Pollution Discharge Elimination System
Issued By

DIVISION OF WATER POLLUTION CONTROL
401 CHURCH STREET
L & C ANNEX 6TH FLOOR
NASHVILLE TN 37243-1534

Under authority of the Tennessee Water Quality Control Act of 1977 (T.C.A. 69-3-101, et seq.) and the delegation of authority from the United States Environmental Protection Agency under the Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977 (33 U.S.C. 1251, et seq.)

Discharger: **Tennessee Eastman Division, Division of Eastman Kodak Company**

is authorized to discharge: uncontaminated cooling water, miscellaneous low level contaminants and storm water runoff through Outfall 001, treated process wastewater and storm water runoff through Outfall 002, uncontaminated cooling water, cooling tower blowdown, ash settling basin effluent, intake water, cooling system agents and storm water runoff through Outfall 004, uncontaminated cooling water, intake water, cooling system agents and storm water runoff through Outfall 005, uncontaminated cooling water, ash settling basin effluent, intake water, cooling system agents and storm water runoff through Outfall 006, and intermittent discharges associated with various miscellaneous activities, sources, and storm water runoff through seventy-seven (77) storm water outfalls numbered Outfalls S01 through S84 (not all inclusive)

from a facility located: in Kingsport, Sullivan County, Tennessee

to receiving waters named: the South Fork of the Holston River, Big Sluice of South Fork of the Holston River, and Horse Creek

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall become effective on: September 1, 1993
This permit shall expire on: August 30, 1998
Issuance date: August 31, 1993

Paul E. Davis, Director
Division of Water Pollution Control

02640CVR.DOC

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SBL

02640CON.DOC

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

Tennessee Eastman Division (Eastman), Division of Eastman Kodak Company, is authorized to discharge uncontaminated cooling water, miscellaneous low level contaminants and storm water runoff through Outfall 001, treated process wastewater and storm water runoff through Outfall 002, uncontaminated cooling water, cooling tower blowdown, ash settling basin effluent, intake water, cooling system agents and storm water runoff through Outfall 004, uncontaminated cooling water, intake water, cooling system agents and storm water runoff through Outfall 005, uncontaminated cooling water, ash settling basin effluent, intake water, cooling system agents and storm water runoff through Outfall 006, and intermittent discharges associated with various miscellaneous activities, sources, and storm water runoff through seventy-seven (77) storm water outfalls numbered Outfalls S01 through S84 (not all inclusive) from a facility located in Kingsport, Sullivan County, Tennessee to the South Fork of the Holston River, Big Sluice of South Fork of the Holston River, and Horse Creek.

Storm water discharges from Outfalls 001, 002, 004, 005, and 006 are being permitted simultaneously with the process and/or nonprocess wastewater discharges from these outfalls. No separate storm water outfalls will be designated in these instances.

The seventy-seven (77) storm water outfalls are designated as follows:

Storm Water Outfalls
S01 - S33, S36 - S39, S41, S43 - S60, S63 - S70, S72 - 75, S77, S78, S81, S84

Only storm water Outfalls S12, S23, S36, S44, S57, S63, S64, S65, S73, and S84 need to be monitored for storm water discharges for the purpose of this permit. These ten (10) storm water outfalls are considered by the Division of Water Pollution Control (the "Division") to be "substantially identical" to, per 40 CFR 122.21(g)(7), and representative of the storm water discharges from all seventy-seven (77) storm water outfalls.

In particular, the non-storm water discharges authorized by this permit through these seventy-seven (77) outfalls include intermittent discharges from fire-fighting activities, fire hydrant flushings, potable water sources including waterline flushings, irrigation drainage, lawn watering, routine external building washdown (which does not use detergent or other similar compounds), pavement washwaters where spills or leaks of toxic or hazardous material have not occurred (unless all spilled material has been removed) and where detergents are not used, air conditioning condensate, springs, uncountaminated groundwater, existing foundation or footing drains where flows are not contamnated with process materials such as solvents, uncontaminated and/or filtered river water not previously used as noncontact or contact cooling waters or for process purposes.

In summary, a group of fifteen (15) total monitored discharges need to be sampled and tested by the permittee in accordance with the conditions set forth in this permit. These fifteen (15) monitored discharges are tabulated here:

Process or Non-process, & Storm Water

001
002
004
005
006

Non-process & Storm Water

S12	S63
S23	S64
S36	S65
S44	S73
S57	S84

These discharges shall be limited and monitored by the permittee as specified herein:

PERMIT LIMITS

OUTFALL 002

TREATED INDUSTRIAL PROCESS WASTEWATER AND STORM WATER RUNOFF

EFFLUENT CHARACTERISTIC	EFFLUENT LIMITATIONS: MONTHLY AVG. CONC. (mg/l)	EFFLUENT LIMITATIONS: MONTHLY AVG. AMNT. (lb/day)	EFFLUENT LIMITATIONS: DAILY MAX. CONC. (mg/l)	EFFLUENT LIMITATIONS: DAILY MAX. AMNT. (lb/day)	MONITORING REQUIREMENTS: MSRMNT. FRQNCY.	MONITORING REQUIREMENTS: SAMPLE TYPE
FLOW	REPORT (MGD)*		REPORT (MGD)*		Continuous	Recorder
CBOD5 (MAY 1 – SEPT. 30)	---	4000	---	8500	Daily	Composite
CBOD5 (OCT. 1 – APR. 30)	---	6000	---	13000	Daily	Composite
AMMONIA (as N)	30.5	6000	61	12000	Daily	Composite
TSS	---	11111	---	35954	Daily	Composite
pH	6.0–9.0		6.0–9.0		Continuous	---
96HR LC50 **	Survival in 16.29% Effluent				1/2 Months	Composite
NOEC **	Survival, Growth, Repro. in 4.89% Effluent				1/2 Months	Composite
CHROMIUM, TTL.	0.050	12.51	0.100	25.02	1/Week	Composite
COPPER, TTL.	0.050	12.51	0.100	25.02	1/Week	Composite
LEAD, TTL.	0.172	43.03	0.690	172.64	1/Week	Composite
NICKEL, TTL.	1.690	422.84	3.980	995.80	1/Week	Composite
ZINC, TTL.	0.635	158.88	1.270	317.75	1/Week	Composite
CYANIDE	0.058	14.51	0.419	104.83	1/Week	Composite
ACENAPHTHENE	0.022	5.50	0.059	14.76	1/Quarter	Grab
ACRYLONITRILE	0.096	24.02	0.242	60.55	1/Quarter	Grab
BENZENE	0.037	9.26	0.136	34.03	1/Quarter	Grab
CARBON TETRACHLORIDE	0.018	4.50	0.038	9.51	1/Quarter	Grab
CHLOROBENZENE	0.015	3.75	0.028	7.01	1/Quarter	Grab
1,2,4–TRICHLOROBENZENE	0.068	17.01	0.140	35.03	1/Quarter	Grab
HEXACHLOROBENZENE	0.000186	0.05	0.000372	0.09	1/Quarter	Grab
1,2–DICHLOROETHANE	0.068	17.01	0.211	52.79	1/Quarter	Grab
1,1,1–TRICHLOROETHANE	0.021	5.25	0.054	13.51	1/Quarter	Grab
HEXACHLOROETHANE	0.021	5.25	0.054	13.51	1/Quarter	Grab
1,,1–DICHLOROETHANE	0.022	5.50	0.059	14.76	1/Quarter	Grab
1,1,2–TRICHLOROETHANE	0.021	5.25	0.054	13.51	1/Quarter	Grab
CHLOROETHANE	0.104	26.02	0.268	67.05	1/Quarter	Grab
CHLOROFORM	0.021	5.25	0.046	11.51	1/Quarter	Grab
2–CHLOROPHENOL	0.031	7.76	0.098	24.52	1/Quarter	Grab
1,2–DICHLOROBENZENE	0.077	19.27	0.163	40.78	1/Quarter	Grab
1,3–DICHLOROBENZENE	0.031	7.76	0.044	11.01	1/Quarter	Grab

Permit Limits Continued on Next Page...

Permit Limits Continued from Previous Page...

OUTFALL 002

1,4-DICHLOROBENZENE	0.015	3.75	0.028	7.01	1/Quarter	Grab
1,1-DICHLOROETHYLENE	0.016	4.00	0.025	6.26	1/Quarter	Grab
1,2-TRANS-DICHLOROEHTYLENE	0.021	5.25	0.054	13.51	1/Quarter	Grab
2,4-DICHLOROPHENOL	0.039	9.76	0.112	28.02	1/Quarter	Grab
1,2-DICHLOROPROPANE	0.153	38.28	0.230	57.55	1/Quarter	Grab
1,3-DICHLOROPROPYLENE	0.029	7.26	0.044	11.01	1/Quarter	Grab
2,4-DIMETHYLPHENOL	0.018	4.50	0.036	9.01	1/Quarter	Grab
2,4-DINITROTOLUENE	0.113	28.27	0.285	71.31	1/Quarter	Grab
2,6-DINITROTOLUENE	0.255	63.80	0.641	160.38	1/Quarter	Grab
ETHYLBENZENE	0.032	8.01	0.108	27.02	1/Quarter	Grab
FLUORANTHENE	0.025	6.26	0.068	17.01	1/Quarter	Grab
METHYLENE CHLORIDE	0.040	10.01	0.089	22.27	1/Quarter	Grab
METHYL CHLORIDE	0.086	21.52	0.190	47.54	1/Quarter	Grab
HEXACHLOROBUTADIENE	0.020	5.00	0.049	12.26	1/Quarter	Grab
NAPHTHALENE	0.022	5.50	0.059	14.76	1/Quarter	Grab
NITROBENZENE	0.027	6.76	0.068	17.01	1/Quarter	Grab
2-NITROPHENOL	0.041	10.26	0.069	17.26	1/Quarter	Grab
4-NITROPHENOL	0.072	18.01	0.124	31.02	1/Quarter	Grab
2,4-DINITROPHENOL	0.071	17.76	0.123	30.77	1/Quarter	Grab
4,6-DINITRO-O-CRESOL	0.078	19.52	0.277	69.31	1/Quarter	Grab
PHENOL	0.015	3.75	0.026	6.51	1/Quarter	Grab
BIS(2-ETHYLHEXYL) PHTHALATE	0.103	25.77	0.279	69.81	1/Quarter	Grab
DI-N-BUTYL PHTHALATE	0.027	6.76	0.057	14.26	1/Quarter	Grab
DIETHYL PHTHALATE	0.081	20.27	0.203	50.79	1/Quarter	Grab
DIMETHYL PHTHALATE	0.019	4.75	0.047	11.75	1/Quarter	Grab
BENZO(A)ANTHRACENE	0.008	2.00	0.016	4.06	1/Quarter	Grab
BENZO(A)PYRENE	0.008	2.00	0.016	4.06	1/Quarter	Grab
3,4-BENZOFLUORANTHENE	0.008	2.00	0.016	4.06	1/Quarter	Grab
BENZO(K)FLUORANTHENE	0.008	2.00	0.016	4.06	1/Quarter	Grab
CHRYSENE	0.001	0.25	0.002	0.41	1/Quarter	Grab
ACENAPHTHYLENE	0.008	2.00	0.016	4.06	1/Quarter	Grab
ANTHRACENE	0.001	0.25	0.002	0.41	1/Quarter	Grab
FLUORENE	0.001	0.25	0.002	0.41	1/Quarter	Grab
PHENANTHRENE	0.001	0.25	0.002	0.41	1/Quarter	Grab
PYRENE	0.001	0.25	0.002	0.41	1/Quarter	Grab
TETRACHLOROETHYLENE	0.022	5.50	0.056	14.01	1/Quarter	Grab
TOLUENE	0.026	6.51	0.080	20.02	1/Quarter	Grab
TRICHLOROETHYLENE	0.021	5.25	0.054	13.51	1/Quarter	Grab
VINYL CHLORIDE	0.104	26.02	0.268	67.05	1/Quarter	Grab

* Flow shall be reported in Million Gallons Per Day (MGD).
** See Part III for monitoring requirements of toxicity tests.

NOTE: Effluent Limitations prescribed here apply to NET ADDITIONS to treated intake water except for TSS and pH which are Gross Limits. The Division is granting this request for net additions pursuant to 40 CFR, Part 122.45(g) and contingent upon the requirements set forth therein.

PERMIT LIMITS

OUTFALLS 001, 004, 005, & 006

UNCONTAMINATED COOLING WATER, COOLING TOWER BLOWDOWN, ASH SETTLING BASIN EFFLUENT, LOW LEVEL CONTAMINANTS, INTAKE WATER, COOLING SYSTEM AGENTS, AND STORM WATER RUNOFF

	EFFLUENT LIMITATIONS				MONITORING REQUIREMENTS	
	MONTHLY		DAILY			
EFFLUENT CHARACTERISTIC	AVG. CONC. (mg/l)	AVG. AMNT. (lb/day)	MAX. CONC. (mg/l)	MAX. AMNT. (lb/day)	MSRMNT. FRQNCY.	SAMPLE TYPE
FLOW	Report (MGD) *		Report (MGD) *		Continuous	Recorder
OIL & GREASE	15	--	30	--	1/Month	Grab
pH	Range 6.0 – 9.0 **		Range 6.0 – 9.0 **		Daily	Grab
TEMPERATURE	29.4 Deg. C		30.5 Deg. C ****		Continuous	Recorder
TSS *****	--	--	Report	--	1/Month	Composite
96HR LC50	See Note ***				Semi-annual	Composite
NOEC	See Note ***				Semi-annual	Composite

* Flow shall be reported in Million Gallons Per Day (MGD).
** pH analyses shall be performed within fifteen (15) minutes of sample collection.
*** See Part III for the toxicity limits and monitoring frequencies for toxicity tests.
**** Based on information provided by the permittee, it has been determined pursuant to Section 316(a) of the Federal Water Pollution Control Act, as amended, (the "Act"), that (1) the water quality standards relating to heat and the thermal discharge requirements of Section 301 of the Act as they apply to the permittee's discharge are more stringent than necessary to provide for the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the receiving water; and (2) alternative effluent limitations relating to heat and thermal discharge requirements, such that the flow and temperature shall be controlled so that the stream temperature does not exceed 30.5 Deg.C at the point of discharge (unless caused by natural conditions) do provide for such protection and propagation. Therefore, the water quality standards relating to heat and the thermal discharge requirements of Section 301 of the Act and similar standards as provided by the Tennessee Water Quality Control Act (TCA 69-3-101 et seq.) are hereby modified in accordance with Section 316(a) of the Act and an alternative effluent limitation is imposed such that the permittee shall control the flow and temperature of the effluent from these outfalls such that the effluent does not exceed 30.5 Deg.C at the points of discharge.
*****For the purpose of sampling these outfalls, the term "Composite" may be representative of samples collected continuously over a period of 24 hours at a rate proportional to time.

PERMIT LIMITS

OUTFALLS S12, S23, S36, S44, S57, S63, S64, S65, S73, S84

MISCELLANEOUS NONPROCESS WASTEWATER AND STORM WATER RUNOFF

EFFLUENT CHARACTERISTIC	EFFLUENT LIMITATIONS: MONTHLY AVG. CONC. (mg/l)	MONTHLY AVG. AMNT. (lb/day)	DAILY MAX. CONC. (mg/l)	DAILY MAX. AMNT. (lb/day)	MONITORING REQUIREMENTS: MSRMNT. FRQNCY.*****	SAMPLE TYPE
FLOW	Report (GPD) *		Report (GPD) *		Semi-annual	Estimate****
OIL & GREASE	Report	--	Report	--	Semi-annual	Grab
pH	Report **		Report **		Semi-annual	Grab
TSS	Report	--	Report	--	Semi-annual	Grab
48HR LC50	--		Report ***		Once ***	Grab

* Flow shall be reported in Gallons Per Day (GPD).

** pH analyses shall be performed within fifteen (15) minutes of sample collection.

*** See Part III for the monitoring frequencies for toxicity tests. Toxicity tests shall be conducted once during the first year of this permit for Outfalls S12, S23, S36, S44, and S57. Toxicity tests shall be conducted once during the second year of this permit for Outfalls S63, S64, S65, S73, S84.

**** An estimate of the flow shall be made using on-site measurements of the amount of rainfall, duration of the rainfall, and the drainage area of the outfall.

*****Storm water runoff samples shall be collected within 30 minutes of initiation of flow, as practicable, during a storm event that is greater than 0.1 inches and that occurs after a period of at least 72 hours after any previous storm event with rainfall of 0.1 inches or greater.

Additional monitoring requirements and conditions applicable to all outfalls include:

Discharges of storm water runoff from land disturbed by construction activities in drainage areas to outfalls covered under the conditions of this permit are hereby authorized. the permittee shall develop and implement erosion and sediment control plans fifteen (15) days prior to the start of each individual project whose area of land disturbance is equal to or greater than five (5) acres.

There shall be no distinctly visible floating scum, oil or other matter contained in the wastewater discharge. The wastewater discharge must not cause an objectionable color contrast in the receiving stream.

The wastewater discharge must result in no other materials in concentrations sufficient to be hazardous or otherwise detrimental to humans, livestock, wildlife, plant life, or fish and aquatic life in the receiving stream.

Sludge or any other material removed by any treatment works must be disposed of in a manner which prevents its entrance into or pollution of any surface or subsurface waters. Additionally, the disposal of such sludge or other material must be in compliance with the Tennessee Solid Waste Disposal Act, TCA 68-31-101 et seq. or the Tennessee Hazardous Waste Management Act, TCA 68-46-101 et seq.

B. MONITORING PROCEDURES

1. Representative Sampling

Samples and measurements taken in compliance with the monitoring requirements specified herein shall be representative of the volume and nature of the monitored discharge, and shall be taken after treatment, as applicable, and prior to mixing with uncontaminated stormwater runoff (where warranted) or the receiving stream.

2. Test Procedures

a. Test procedures for the analysis of pollutants shall conform to regulations published pursuant to Section 304 (h) of the Clean Water Act (the "Act"), as amended, under which such procedures may be required.

b. Unless otherwise noted in the permit, all pollutant parameters shall be determined according to methods prescribed in Title 40, CFR, Part 136, as amended, promulgated pursuant to Section 304 (h) of the Act.

3. Recording of Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. The exact place, date and time of sampling;

b. The exact person(s) collecting samples;

c. The dates and times the analyses were performed;

d. The person(s) or laboratory who performed the analyses;

e. The analytical techniques or methods used, and;

f. The results of all required analyses.

4. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation shall be retained for a minimum of three (3) years, or longer, if requested by the Division of Water Pollution Control.

C. DEFINITIONS

The ***Monthly Average Concentration***, a limitation on the discharge concentration, in milligrams per liter (mg/l), is the arithmetic mean of all daily concentrations determined in a one-month period. For parameters measured less than twice per month, representing a minimum of two (2) separate daily concentrations, only the daily maximum value shall be reported.

The ***Monthly Average Amount***, a discharge limitation measured in pounds per day (lb/day), is the total amount of any pollutant in the discharge by weight during a calendar month divided by the number of days in the month that the production or commercial facility was operating. Where less than daily sampling is required by a permit, the monthly average amount shall be determined by the summation of all the measured daily discharges by weight divided by the number of days during the calendar month when the measurements were made. For parameters measured less than twice per month, representing a minimum of two (2) separate daily amounts, only the daily maximum value shall be repoded. Notwithstanding the above, the Division of Water Pollution Control may monitor or may require that the permittee monitor the discharge in order to determine compliance with the monthly average amount.

The ***Daily Maximum Concentration*** is a limitation on the average concentration, in milligrams per liter (mg/l), of the discharge during any calendar day. When a proportional-to-flow composite sampling device is used, the daily concentration is the concentration of that 24-hour composite; when other sampling means are used, the daily concentration is the arithmetic mean of the concentrations of equal volume samples collected during any calendar day or sampling period.

The ***Daily Maximum Amount***, is a limitation measured in pounds per day (lb/day), on the total amount of any pollutant in the discharge by weight during any calendar day.

The ***Instantaneous Concentration*** is a limitation on the concentration, in milligrams per liter (mg/l), of any pollutant contained in the discharge determined from a grab sample taken at any point in time.

A *Composite Sample*, for the purposes of this permit, is a sample collected continuously over a period of 24 hours at a rate proportional to the flow unless otherwise stipulated in this permit.

For the purpose of this permit, a ***Calendar Day*** is defined as any 24-hour period.

For the purpose of this permit, a ***Quarter*** is defined as any one of the following three month periods: January 1 through March 31, April 1 through June 30, July 1 through September 30, or October 1 through December 31.

For the purpose of this permit, ***Annually*** is defined as a period of twelve (12) consecutive months beginning with the date of issuance of this permit.

For the purpose of this permit, ***Semi-annually*** means the same as "once every six months." Measurements of the effluent characteristics concentrations may be made anytime during a six-month period beginning from the issuance date of this permit so long as the second set of measurements for a given 12 month period are made approximately six-months subsequent to that time.

D. REPORTING

1. Monitoring Results

Monitoring results shall be recorded monthly and submitted monthly for Outfalls 001, 002, 004, 005, and 006 using Discharge Monitoring Report (DMR) forms supplied by the Division of Water Pollution Control or an alternative form approved by the Division. Monitoring results shall be recorded semi-annually and submitted annually for the ten (10) representative storm water outfalls numbered Outfalls S12, S23, S36, S44, S57, S63, S64, S65, S73, and S84. Submittals shall be postmarked no later than 15 days after the completion of the reporting period. The top two copies of each report are to be submitted. A copy should be retained for the permittee's files. DMR's and any communication regarding compliance with the conditions of this permit must be sent to:

**TENNESSEE DEPT OF ENVIRONMENT & CONSERVATION
DIVISION OF WATER POLLUTION CONTROL
COMPLIANCE REVIEW SECTION
401 CHURCH STREET
L & C ANNEX 6TH FLOOR
NASHVILLE TN 37243-1534**

The first DMR is due October 15, 1993

DMR's must be signed and certified by a responsible corporate officer as defined in 40 CFR 122.22, a general partner or proprietor, or a principal municipal executive officer or ranking elected official, or his duly authorized representative. Such authorization must be submitted in writing and must explain the duties and responsibilities of the authorized representative.

For the purpose of evaluating compliance with the permit limits established herein, the results of analyses which are below the EPA published detection levels for those effluent characteristics shall be reported as Below Detection Level (BDL), unless in specific cases other detection limits are demonstrated to be the best achievable because of the particular nature of the wastewater being analysed.

2. Additional Monitoring by Permittee

If the permittee monitors any pollutant specifically limited by this permit more frequently than required at the location(s) designated, using approved analytical methods as specified herein, the results of such monitoring shall be included in the calculation and reporting of the values required in the DMR form. Such increased frequency shall also be indicated on the form.

3. Falsifying Reports

Knowingly making any false statement on any report required by this permit may result in the imposition of criminal penalties as provided for in Section 309 of the Federal Water Pollution Control Act, as amended, and in Section 69-3-115 of the Tennessee Water Quality Control Act.

E. SCHEDULE OF COMPLIANCE

Full compliance and operational levels shall be attained from the effective date of this permit.

PART II

A. GENERAL PROVISIONS

1. Duty to Reapply

Permittee is not authorized to discharge after the expiration date of this permit. In order to receive authorization to discharge beyond the expiration date, the permittee shall submit such information and forms as are required to the Director of Water Pollution Control (the "Director") no later than 180 days prior to the expiration date.

2. Right of Entry

The permittee shall allow the Director, the Regional Administrator of the U.S. Environmental Protection Agency, or their authorized representatives, upon the presentation of credentials:

a. To enter upon the permittee's premises where an effluent source is located or where records are required to be kept under the terms and conditions of this permit, and at reasonable times to copy these records;

b. To inspect at reasonable times any monitoring equipment or method or any collection, treatment, pollution management, or discharge facilities required under this permit; and

c. To sample at reasonable times any discharge of pollutants.

3. Availability of Reports

Except for data determined to be confidential under Section 308 of the Federal Water Pollution Control Act, as amended, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Division of Water Pollution Control. As required by the Federal Act, effluent data shall not be considered confidential.

4. Proper Operation and Maintenance

a. The permittee shall at all times properly operate and maintain all facilities and systems (and related appurtenances) for collection and treatment which are installed or used by the permittee to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance also includes adequate laboratory and process controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit. Backup continuous pH and flow monitoring equipment are not required.

b. Dilution water shall not be added to comply with effluent requirements to achieve BCT, BPT, BAT and or other technology based effluent limitations such as those in State of Tennessee Rule 1200-4-5-.03.

5. Treatment Facility Failure

The permittee, in order to maintain compliance with this permit, shall control production, all discharges or both, upon reduction, loss, or failure of the treatment facility, until the facility is restored or an alternative method of treatment is provided. This requirement applies in such situations as the reduction, loss, or failure of the primary source of power.

6. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State, or local laws or regulations.

7. Severability

The provisions of this permit are severable. If any provision of this permit due to any circumstance, is held invalid, then the application of such provision to other circumstances and to the remainder of this permit shall not be affected thereby.

8. Other Information

If the permittee becomes aware that he failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, then he shall promptly submit such facts or information.

B. CHANGES AFFECTING THE PERMIT

1. Planned Changes

The permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

a. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR 122.29(b); or

b. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under 40 CFR 122.42(a)(1).

2. **Permit Modification, Revocation, or Termination**

a. This permit may be modified, revoked and reissued, or terminated for cause as described in 40 CFR 122.62 and 122.64, Federal Register, Volume 49, No. 188 (Wednesday, September 26, 1984), as amended.

b. The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

c. If any applicable effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established for any toxic pollutant under Section 307(a) of the Federal Water Pollution Control Act, as amended, the Director shall modify or revoke and reissue the permit to conform to the prohibition or to the effluent standard, providing that the effluent standard is more stringent than the limitation in the permit on the toxic pollutant. The permittee shall comply with these effluent standards or prohibitions within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified or revoked and reissued to incorporate the requirement.

3. **Change of Ownership**

This permit may be transferred to another person by the permittee if:

a. The permittee notifies the Director of the proposed transfer at least 30 days in advance of the proposed transfer date;

b. The notice includes a written agreement between the existing and new permittees containing a specified date for transfer of permit responsibility, coverage, and liability between them; and

c. The Director, within 30 days, does not notify the current permittee and the new permittee of his intent to modify, revoke or reissue, or terminate the permit and to require that a new application be filed rather than agreeing to the transfer of the permit.

4. Change of Mailing Address

The permittee shall promptly provide to the Director written notice of any change of mailing address. In the absence of such notice the original address of the permittee will be assumed to be correct.

C. NONCOMPLIANCE

1. Effect of Noncompliance

All discharges shall be consistent with the terms and conditions of this permit. Any permit noncompliance constitutes a violation of applicable State and Federal laws and is grounds for enforcement action, permit termination, permit modification, or denial of permit reissuance.

2. Reporting of Noncompliance

a. 24-Hour Reporting

In the case of any noncompliance which could cause a threat to public drinking supplies, or any other discharge which could constitute a threat to human health or the environment, the required notice of non-compliance shall be provided to the appropriate Division field office within 24 hours from the time the permittee becomes aware of the circumstances. (The field office should be contacted for names and phone numbers of emergency response personnel.)

A written submission must be provided within five days of the time the permittee becomes aware of the circumstances unless this requirement is waived by the Director on a case-by-case basis. The permittee shall provide the Director with the following information:

i. A description of the discharge and cause of noncompliance;

ii. The period of noncompliance, including exact dates and times or, if not corrected, the anticipated time the noncompliance is expected to continue; and

iii. The steps being taken to reduce, eliminate, and prevent recurrence of the noncomplying discharge.

b. Scheduled Reporting

For instances of noncompliance which are not reported under subparagraph 2.a. above, the permittee shall report the noncompliance on the Discharge Monitoring Report. The report shall contain all information concerning the steps taken, or planned, to reduce, eliminate, and prevent recurrence of the violation and the anticipated time the violation is expected to continue.

3. Bypassing

a. "*Bypass*" means the discharge of wastewaters from any portion of the collection or treatment system to surface waters other than through permitted outfalls. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Bypass is prohibited unless the following three (3) conditions are met:

i. Bypass is unavoidable to prevent loss of life, personal injury, or severe property damage;

ii. There are not feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment down-time. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment down-time or preventative maintenance;

iii. The permittee submits notice of an unanticipated bypass to the appropriate field office of the Division of Water Pollution Control within 24 hours of becoming aware of the bypass (if this information is provided orally, a written submission must be provided within five days). When the need for the bypass is foreseeable, prior notification shall be submitted to the Director, if possible, at least ten (10) days before the date of the bypass.

c. The permittee shall operate the collection system so as to avoid bypassing. No new or additional flows shall be allowed that will contribute to bypass discharges or would otherwise overload any portion of the system.

4. <u>Upset</u>

a. "***Upset***" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

b. An upset shall constitute an affirmative defense to an action brought for noncompliance with such technology - based permit effluent limitations if the permittee demonstrates, through properly signed, contemporaneous operating logs, or other relevant evidence that:

i. An upset occurred and that the permittee can identify the cause(s) of the upset;

ii. The permitted facility was at the time being operated in a prudent and workman-like manner and in compliance with proper operation and maintenance procedures;

iii. The permittee submitted information required under "Reporting of Noncompliance" within 24 hours of becoming aware of the upset (if this information is provided orally, a written submission must be provided within five days); and

iv. The permittee complied with any remedial measures required under "Adverse Impact."

5. Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact to the waters of Tennessee resulting from noncompliance with this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge. It shall not be a defense for the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

6. Diversion

a. "*Diversion*" is the intentional rerouting of wastewater within a treatment facility away from a biological portion of the treatment facility.

D. LIABILITIES

1. Civil and Criminal Liability

Except as provided in permit conditions or "***Bypassing***", "***Upset***", "***Diversion***", and "***Treatment Facility Failures***", nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance. Notwithstanding this permit, the permittee shall remain liable for any damages sustained by the State of Tennessee, including but not limited to fish kills and losses of aquatic life and/or wildlife, as a result of the discharge of wastewater to any surface or subsurface waters. Additionally, notwithstanding this Permit, it shall be the responsibility of the permittee to conduct its wastewater treatment and/or discharge activities in a manner such that public or private nuisances or health hazards will not be created.

2. Liability Under State Law

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or the Federal Water Pollution Control Act, as amended.

PART III

OTHER REQUIREMENTS

A. TOXIC POLLUTANTS

The permittee shall notify the Division of Water Pollution Control as soon as it knows or has reason to believe:

1. That any activity has occurred or will occur which would result in the discharge on a routine or frequent basis, of any toxic substance(s) (listed at 40 CFR 122, Appendix D, Table II and III) which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

   a. One hundred micrograms per liter (100 ug/l);

   b. Two hundred micrograms per liter (200 ug/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/l) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;

   c. Five (5) times the maximum concentration value reported for that pollutant(s) in the permit application in accordance with 122.21(g)(7); or

   d. The level established by the Director in accordance with 122.44(f).

2. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

   a. Five hundred micrograms per liter (500 ug/l);

   b. One milligram per liter (1 mg/l) for antimony;

   c. Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 122.21(g)(7); or

   d. The level established by the Director in accordance with 122.44(f).

B. BIOMONITORING REQUIREMENTS, ACUTE

The permittee shall conduct 48-hour static toxicity tests on two appropriate test species on samples of final effluent from Outfalls S12, S23, S36, S44, S57, S63, S64, S65, S73, and S84. The test organisms shall include a Daphnidae species and the fathead minnow (Pimephales promelas). A grab sample of final effluent shall be collected during the first period of continuous discharge within the first 30 minutes of flow initiation, where practicable. Results of all tests conducted with any species shall be reported according to EPA/600/4-90/027, Report Preparation and Data Utilization, and two copies shall be submitted to the Division of Water Pollution Control with the annual discharge monitoring reports.

The permittee shall determine the LC_{50} using serial dilutions and a control one time only during the *first* year of this permit for Outfalls S12, S23, S36, S44, and S57. Likewise, the permittee shall determine the LC_{50} using serial dilutions and a control one time only during the *second* year of this permit for Outfalls S63, S64, S65, S73, and S84.

All test organisms, procedures, and quality assurance criteria used shall be in accordance with Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms, EPA-600/4-90-027. The Division of Water Pollution Control will allow the acute test to be conducted at 25^{o}C as per the chronic test procedures. The permittee's selection of an appropriate control water for the toxicity tests shall be submitted to the Division of Water Pollution Control for review and approval prior to use. The permittee shall submit the name of the laboratory performing the toxicity test(s) to the Division of Water Pollution Control, along with a discussion evaluating the relative toxicity of this discharge.

C. BIOMONITORING REQUIREMENTS, CHRONIC

The permittee shall conduct a 7-Day Ceriodaphnia Survival and Reproduction Test and a 7-Day Fathead Minnow (Pimephales promelas) Larval Survival and Growth Test on samples of final effluent from Outfalls 001, 002, 004, 005, and 006. Toxicity will be demonstrated if more than 50% lethality of the test organisms occurs in 96 hours in 100% effluent for Outfall 001, 16.3% effluent for 002, 6.79% effluent for 004, 6.19% effluent for 005, or 6.19% effluent for 006 or the 7-day no observalbe effect concentration (NOEC) is less than 52.15% effluent for Outfall 001, 4.90% effluent for 002, 2.04% effluent for 004, 1.86% effluent for 005, or 1.86% effluent for 006. The following table illustrates the acute (96HR LC_{50}) and chronic (NOEC) toxicity limits for each of these outfalls.

TOXICITY LIMITS CALCULATIONS

PROCESS, NONPROCESS, & STORM WATER OUTFALLS

OUTFALL	96HR LC50 (%)	NOEC (%)	48HR LC50 (%) *
001	100	52.15	--
002	16.29	4.89	--
004	6.79	2.04	--
005	6.19	1.86	--
006	6.19	1.86	--

NONPROCESS AND STORM WATER OUTFALLS

S12	--	--	REPORT
S23	--	--	REPORT
S36	--	--	REPORT
S44	--	--	REPORT
S57	--	--	REPORT
S63	--	--	REPORT
S64	--	--	REPORT
S65	--	--	REPORT
S73	--	--	REPORT
S84	--	--	REPORT

* All 48HR LC50 tests shall be conducted using serial dilutions.

All tests will be conducted on 24-hour composite samples of final effluent. All test solutions shall be renewed daily. If, in any control, more than 10% of the test organisms die in 96 hours or more than 20% of the test organisms dies in 7 days, that test (control and effluent) shall be repeated at the option of the permittee. Such testing will determine whether the effluent affects the survival, reproduction, and/or growth of the test organisms.

The toxicity tests specified above shall be conducted once every two (2) months (1/2 Months) for Outfall 002 and semi-annually for Outfalls 001, 004, 005, and 006. If, after a period of one year of testing, the permittee has demonstrated compliance with the toxicity limits set forth herein for Outfall 002, the monitoring frequency for this outfall shall be reduced to once every six (6) months. The first test shall be conducted no later than ninety (90) days from the effective date of this permit for Outfall 002 and within the first one hundred eighty (180) days for Outfalls 001, 004, 005, and 006. Results shall be reported according to EPA/600/4-89/001, or the current edition, and two copies shall be submitted to the Division with the monthly discharge monitoring reports, as applicable. If any one test shows lethality to more than 50% of the test organisms in 96 hours in the effluent concentration prescribed as the limit for that outfall and/or the NOEC is less than the prescribed limit for that outfall then the next paragraph applies.

If toxicity (greater than 50% lethality of test organisms in 96 hours or an NOEC less than the prescribed limits) is found in any of the tests specified above, this will constitute a violation of this permit. The permittee will then be subject to the enforcement provisions of the Clean Water Act.

The determination of effluent lethality values will be made in accordance with Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms, EPA/600/4-90/027. The Division of Water Pollution Control will allow the acute toxicity value to be generated within the chronic toxicity test.

All test organisms, procedures and quality assurance criteria used shall be in accordance with Short-term Methods For Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, EPA/600/4-89/001, or the current edition. The permittee's selection of an appropriate control water for the toxicity tests shall be submitted to the Division of Water Pollution Control for review and approval prior to use. The permittee shall submit the name of the laboratory performing the toxicity test(s) to the Division of Water Pollution Control.

D. REOPENER CLAUSE FOR PERMITS ISSUED TO SOURCES IN PRIMARY INDUSTRIES

If an applicable standard or limitation is promulgated under Sections 301(b)(2)(C) and (D), 304(B)(2), and 307(a)(2) and that effluent standard or limitation is more stringent than any effluent limitation in the permit or controls a pollutant not limited in the permit, the permit shall be promptly modified or revoked and reissued to conform to that effluent standard or limitation.

E. PLACEMENT OF SIGNS

Within sixty (60) days of the effective date of this permit, the permittee shall place and maintain a sign(s) at Outfalls 001, 002, 004, 005, and 006. Likewise, the permittee, within the same time period, shall place and maintain signs at an upstream and downstream point, on both sides of the river bank, of the Eastman property boundaries, describing the source of the discharges from the seventy-seven (77) nonprocess wastewater and storm water outfalls permitted herein. The sign(s) should be clearly visible to the public from the bank and the receiving stream. The minimum sign size should be two feet by two feet (2' x 2') with one inch (1") letters. The sign should be made of durable material and have a white background with black letters.

The sign(s) are to provide notice to the public as to the nature of the discharge and, in the case of the permitted outfalls, that the discharge is regulated by the Tennessee Department of Environment and Conservation, Division of Water Pollution Control. The following is given as an example of the minimal amount of information that must be included on the sign(s):

NPDES permitted industrial outfalls:

TREATED PROCESS WASTEWATER AND STORM WATER RUNOFF
(PERMITTEE'S NAME)
(PERMITTEE'S PHONE NUMBER)
NPDES PERMIT NO. ______
TENNESSEE DIVISION OF WATER POLLUTION CONTROL
(615) 928-6487 JOHNSON CITY FIELD OFFICE

or

NONPROCESS WASTEWATER AND STORM WATER RUNOFF
(PERMITTEE'S NAME)
(PERMITTEE'S PHONE NUMBER)
NPDES PERMIT NO. ______
TENNESSEE DIVISION OF WATER POLLUTION CONTROL
(615) 928-6487 JOHNSON CITY FIELD OFFICE

PART IV

BEST MANAGEMENT PRACTICES CONDITIONS

A. GENERAL CONDITIONS

1. BMP Plan

For purposes of this part, the terms "pollutant" or "pollutants" refer to any substance listed as toxic under Section 307(a)(1) of the Clean Water Act, oil, as defined in Section 311(a)(1) of the Act, and any substance listed as hazardous under Section 311 of the Act. The permittee shall develop and implement a Best Management Practices (BMP) plan which prevents, or minimizes the potential for, the release of pollutants (including oil and grease, alumina ore dust, carbon dust from electrodes, and debris from crushed aluminum cans) from ancillary activities, including material storage areas; plant site runoff; in-plant transfer, process and material handling areas; loading and unloading operations, and sludge and waste disposal areas, to the waters of the State of Tennessee through plant site runoff; spillage or leaks; sludge or waste disposal; or drainage from raw material storage.

2. <u>Implementation</u>

The plan shall be developed within eighteen (18) months after the effective date of this permit. The permittee shall begin implementation of the BMP Plan as soon as practicable following it's development.

B. GENERAL REQUIREMENTS

The BMP plan shall:

1. Be documented in narrative form, and shall include any necessary plot plans, drawings or maps.

2. Establish specific objectives for the control of pollutants.

    a. Each facility component or system shall be examined for its potential for causing a release of significant amounts of pollutants to waters of the State of Tennessee due to equipment failure, improper operation, natural phenomena such as rain or snowfall, etc.

    b. Where experience indicates a reasonable potential for equipment failure (e.g., a tank overflow or leakage), natural condition (e.g., precipitation), or other circumstances to result in significant amounts of pollutants reaching surface waters, the plan should include a prediction of the direction, rate of flow, and total quantity of pollutants which could be discharged from the facility as a result of each condition or circumstance.

3. Establish specific best management practices to meet the objectives identified under paragraph b of this section, addressing each component or system capable of causing a release of significant amounts of pollutants to the waters of the State of Tennessee, and identifying specific preventative or remedial measures to be implemented.

4. Be reviewed by plant engineering staff and the plant manager.

C. DOCUMENTATION

The permittee shall maintain the BMP plan at the facility and shall make the plan available to the permit issuing authority upon request.

D. BMP PLAN MODIFICATION

The permittee shall amend the BMP plan whenever there is a significant change in the facility or a significant change in the operation of the facility which materially increases the potential for the ancillary activities to result in a discharge of significant amounts of pollutants.

E. MODIFICATION FOR INEFFECTIVENESS

If the BMP plan proves to be ineffective in achieving the general objective of preventing the release of significant amounts of pollutants to surface waters and the specific objectives and requirements under paragraphs b and c of General Requirements Section, the permit shall be subject to modification pursuant to 40 CFR 122.62 or 122.63 to incorporate revised BMP requirements. Any such permit modification shall be subject to review in accordance with the procedures for permit appeals set forth in accordance with 69-3-110, Tennessee Code Annotated.

F. SARA TITLE III, SECTION 313 PRIORITY CHEMICALS

The BMP Plan shall include the following for those facilities subject to reporting requirements under SARA Title III, Section 313 for chemicals which are classified as Section 313 water priority chemicals:

1. In areas where Section 313 water priority chemicals are stored, processed or otherwise handled, appropriate containment, drainage control and/or diversionary structures shall be provided. At a minimum, one of the following preventive systems or its equivalent shall be used:

   a. curbing, culverting, gutters, sewers or other forms of drainage control to prevent or minimize the potential for storm water run-on to contact significant sources of pollutants.

   b. Roofs, covers or other forms or protection to prevent storage piles from exposure to stormwater and wind.

2. The plan shall include a discussion of measures taken to conform with the following applicable guidelines:

   a. Liquid storage areas where stormwater comes into contact with any equipment, tank container, or other vessel used for Section 313 water priority chemicals.

      i. Tank or container must be compatible with Section 313 water priority chemical which it stores.

      ii. Liquid storage areas shall be operated to minimize discharges of Section 313 chemicals.

   b. Material storage areas for Section 313 water priority chemicals other than liquids shall incorporate features which will minimize the discharge of Section 313 chemicals by reducing stormwater contact.

   c. Truck and rail car loading and unloading areas for Section 313 water priority chemicals shall be operated to minimize discharges of chemicals. Appropriate measures may include placement and maintenance of drip pans for use when making and breaking hose connections; a spill contingency plan; and/or other equivalent measures.

   d. In plant areas where Section 313 chemicals are transferred, processed or handled, piping, processing equipment, and materials handling equipment shall be operated so as to minimize discharges of chemicals. Piping and equipment must be compatible with chemicals handled. Additional protection including covers and guards to prevent exposure to wind and pressure relief vents, and overhangs or door skirts to enclose trailer ends at truck loading docks shall be implemented as appropriate. Visual inspections or leak tests shall be conducted on overhead piping that conveys Section 313 water priority chemicals.

e. Discharges from areas covered by parts 2a, 2b, 2c, or 2d:

i. Drainage from these areas should be restrained by valves or other positive means to prevent the discharge of a spill or excessive leakage. Containment units shall be drained manually.

ii. Flapper-type drain valves shall not be used for drainage of containment units.

iii. If facility is not engineered as specified above, the final discharge of in-facility storm sewers should be equipped with a diversion system that could, in the event of an uncontrolled spill of a Section 313 chemical, return the spilled material to the facility or direct the materials to wastewater treatment facilities.

iv. Records shall be kept of the frequency and estimated volume (in gallons) of discharges from containment area.

f. Facility site runoff other than from areas covered by parts 2a, 2b, 2c, and 2d from which runoff could contain Section 313 water priority chemicals shall incorporate the necessary drainage or other control features to prevent discharge of spilled or improperly disposed material and ensure the mitigation of pollutants in runoff or leachate.

g. All areas of the facility shall be inspected at specific intervals for leaks or conditions that could lead to discharges of Section 313 water priority chemicals or direct contact of stormwater with raw materials, intermediate materials, waste materials or products. Inspection intervals shall be specified in the plan and shall be based on design and operational experience. Corrective action shall be taken promptly when a leak or condition which could cause significant releases of chemicals is discovered. If corrective action can not be taken immediately, the unit or process shall be shut down until the situation is corrected. When a leak or spill has occurred, the contaminated material(s) must be promptly removed and disposed in accordance with Federal, State, and local requirements and/or as described in the plan.

h. Facilities shall have the necessary security systems to prevent accidental or intentional entry which could cause a discharge.

i. Facility employees and contract personnel that work in areas where SARA Title III, Section 313 water priority chemicals are used or stored shall be trained in and informed of preventive measures at the facility, as appropriate. As necessary or warranted, employee training shall be conducted at least once per year in matters of pollution control laws and regulations, and in the BMP Plan. The plan shall designate a person(s) who is accountable for spill prevention at the facility and who will set up the necessary spill emergency procedures and reporting requirements.

3. "Section 313 water priority chemicals" means the following chemicals or chemical categories:

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
401 Church Street
Nashville, Tennessee 37243

FEB 1994
RECEIVED

To: Richard Strang

From: William M. Christie, WMC
Ecological Services Division

Subject: Environmental Review for Threatened and Endangered Species.

Date: 2/25/94

Project: Industrial Project Site

Be advised that a review of our data base indicate no recorded threatened and endangered species for this specific project area.

The results of this review does not mean that a comprehensive biological survey has been completed for this and other sites.

/wmc

Ecological Services Division: 8th Floor, L & C Tower, 401 Church St., Nashville, TN 37243-0447 • Phone (615)532-0437 • FAX(615)532-0046

a. listed at 40 CFR 372.65 pursuant to Section 313 of Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986, also titled the Emergency Planning and Community Right-to-Know Act of 1986;

b. present at or above threshold levels at a facility subject to SARA Title III, Section 313 reporting requirements; and,

c. that meet at least one of the following criteria:

i. are listed in Appendix D of 40 CFR 122 on either Table II (organic priority pollutants), Table III (certain metals, cyanides, and phenols) or Table V (certain toxic pollutants and hazardous substances);

ii. are listed as a hazardous substance pursuant to section 311(b)(2)(A) of the CWA at 40 CFR 116.4; or,

iii. are pollutants for which EPA has published acute or chronic toxicity criteria.

SBL

02640PMT.DOC

APPENDIX IV

EXISTING AIR PERMITS

TENNESSEE AIR POLLUTION CONTROL BOARD
NASHVILLE, TENNESSEE 37219

Operating Permit issued pursuant to Tennessee Air Quality Act

Date Issued: December 11, 1980

Permit Number: 0101131

Expires:

Issued to:

Tennessee Eastman Company

Installation Address:

Kingsport

Installation Description:

B-248-1
Rotary Kiln Incinerators #1 & 2
with Wet Scrubbers

Emission Source Reference No.:

82-01003-40 & 41

EMS #040 & 41

The holder of this permit shall comply with the conditions contained in this permit as well as all applicable provisions of the Tennessee Air Pollution Control Regulations.

CONDITIONS:

HAROLD E. HODGES, P. E.
TECHNICAL SECRETARY oh

No authority is granted by this permit to operate, construct, or maintain any installation in violation of any law, statute, code, ordinance, rule or regulation of the State of Tennessee or any of its political subdivisions.

NON TRANSFERABLE

POST OR FILE AT INSTALLATION ADDRESS

PH- 0423
APC Rev. 1/78

Process Emission Source
Number B-248-1
Edition [illegible] 2 6 [illegible]

TENNESSEE EASTMAN COMPANY
AIR OPERATING PERMIT APPLICATION APPROVAL SHEET

Check One: ____ Original
_X_ Renewal Application With Change
____ Renewal Application Without Change

Division Power & Services
Department Water & Waste Treatment
Building 248
Date Application Must Be Submitted to TDAPC ____________

DESCRIPTION OF PROCESS EMISSION SOURCE

Steam Generating Unit - Waste Incinerator Rotary Kiln HRT Boiler

---

The originals of the application forms are attached for approval. After approval, the Clean Environment Program will send the transmittal letter and copies of the APC forms to the Tennessee Division of Air Pollution Control. The original APC forms will be returned to the Division Environmental Coordinator for filing.

APPROVALS:

1) Kenneth Fults — 1-30-84
Division Environmental Coordinator (Responsible for Completeness of Application) — Date

2) Jackson E. Hicks — 1-30-84
Department Superintendent (Responsible for Accuracy of Technical Information) — Date

3) R. J. Woodward — 2/3/84
Division Superintendent (Approval to Release Information to Agency) — Date

4) Return to the Clean Environment Program, B-54D

(See Reverse Side for Additional Requested Information)

RECEIVED FEB 1984

wlc/TA1622g/F 5/1/83 (Green)

STATE OF TENNESSEE
DEPARTMENT OF PUBLIC HEALTH
DIVISION OF AIR POLLUTION CONTROL

Process Emission Source
Number B-248-1
Page 1 of
Date April 25 1984

APC-20
PERMIT APPLICATION

1. ORGANIZATION'S LEGAL NAME Tennessee Eastman Company A Division of Eastman Kodak Company	FOR APC: APC COMPANY-POINT NO.
2. MAILING ADDRESS (ST/RD/P.O. BOX) P. O. Box 511	APC LOG/PERMIT NO.

CITY	STATE	ZIP CODE	PHONE WITH AREA CODE
Kingsport	Tennessee	37662	(615) 229-2444

3. PRINCIPAL TECHNICAL CONTACT J. C. Edwards — PHONE WITH AREA CODE (615) 229-2444

4. SITE ADDRESS (ST/RD/HWY) South Eastman Road — COUNTY NAME Sullivan

CITY OR DISTANCE TO NEAREST TOWN	ZIP CODE	PHONE WITH AREA CODE
Kingsport	37662	(615) 229-2444

5. EMISSION SOURCE NO. (NUMBER WHICH UNIQUELY IDENTIFIES THIS SOURCE) B-248-1 — PERMIT RENEWAL YES ( ), NO ( ).

6. BRIEF DESCRIPTION OF EMISSION SOURCE

Steam Generating Unit - Waste Incinerator

Rotary Kiln HRT Boiler

7. TYPE OF PERMIT REQUESTED (COMPLETE ONE LINE ONLY)

CONSTRUCTION ( )	STARTING DATE	COMPLETION DATE	DATE WAIVER APPROVED (IF APPLICABLE)	
OPERATING (X)	DATE CONSTRUCTION STARTED	DATE COMPLETED June 1, 1979	LAST PERMIT NO. 0101131	EMISSION SOURCE REFERENCE NUMBER 82-01003-40 & 41
LOCATION TRANSFER ( )	TRANSFER DATE		LAST PERMIT NO.	EMISSION SOURCE REFERENCE NUMBER

ADDRESS OF LAST LOCATION

8. DESCRIBE CHANGES THAT HAVE BEEN MADE TO THIS EQUIPMENT OR OPERATION SINCE THE LAST CONSTRUCTION OR OPERATING PERMIT APPLICATION

None

9. SIGNATURE (APPLICATION MUST BE SIGNED BEFORE IT WILL BE PROCESSED) J C Edwards		DATE
10. SIGNER'S NAME (TYPE OR PRINT) J. C. Edwards	TITLE Manager, Clean Environment Program	PHONE WITH AREA CODE (615) 229-2444

11/7/83

STATE OF TENNESSEE
DEPARTMENT OF PUBLIC HEALTH
DIVISION OF AIR POLLUTION CONTROL

25. CAPITOL HILL BUILDING
NASHVILLE, TENNESSEE 37219
TELEPHONE (615) 741-3931

INCINERATOR SOURCE DESCRIPTION

PLEASE TYPE OR PRINT, SUBMIT IN DUPLICATE AND ATTACH TO THE PERMIT APPLICATION.

1. ORGANIZATION NAME: Tennessee Eastman Company, A Division of Eastman Kodak Company — ////FOR APC COMPANY POINT NO.:

2. EMISSION SOURCE NO. (AS ON PERMIT APPLICATION): B-248-1 — SIC CODE: 2869 — ////APC APC PERMIT/LOG NO.:

3. SOURCE LOCATION:

LATITUDE	LONGITUTDE	UTM VERTICAL	UTM HORIZONTAL
36° 30' 44" N	82° 32' 1" W	4,041,656 N	362,671 E

4. TYPE OF WASTE BURNED: 0, 1, 6 (USE CODE FROM TABLE ON BACK)

CHARGING RATE (POUNDS/HOUR) AVERAGE	DESIGN	TONS BURNED PER YEAR
	10,000	47,000

5. IS THE INCINERATOR FURNACE VOLUME 2.5 CUBIC FEET OR LESS? NO: X YES: — IS THE UNIT USED SOLELY FOR DISPOSAL OF INFECTIVE DRESSINGS? NO: X YES:

6. INCINERATOR MANUFACTURER: #1 Ruggles Coles, #2 Bartlett-Snow — MODEL NUMBER: — DATE INSTALLED: 1963

7. INCINERATOR TYPE:

SINGLE CHAMBER	MULTI-CHAMBER	REFRACTORY LINED	AUXILARY BURNERS
X		X	

8. INCINERATOR OPER. SCHEDULE:

HOURS/DAY	DAYS/WEEK	WEEKS/YEAR	DAYS/YEAR
24	7	52	

9. PERCENT ANNUAL THROUGHPUT:

DEC.-FEB.	MARCH-MAY	JUNE-AUG.	SEPT.-NOV.
25	25	25	25

10. BURNER DATA:

BURNER CAPACITY (BTU/HOUR) PRIMARY	SECONDARY/AFTERBURN	AIR FLOW (CFM) OVERFIRE	UNDERFIRE

DOES UNIT HAVE CONTROLLED OR STARVED AIR? NO: YES:

11. AUXILARY FUEL DATA: PRIMARY FUEL TYPE (SPECIFY): #2 Fuel Oil — STANDBY FUEL TYPE (SPECIFY):

FUEL	ANNUAL USAGE	HOURLY USAGE DESIGN	HOURLY USAGE AVERAGE	% SULFUR	% ASH	BTU VALUE OF FUEL	(FOR APC ONLY) SCC CODE
NATURAL GAS	10^6 CUFT	CU FT	CU FT	///	///	1,000	
#2 FUEL OIL	10^3 GAL 173	GAL 600	GAL	0.35 Wt %	///	130,000	
LIQUID PROPANE	10^3 GAL	GAL	GAL	///	///	85,000	
OTHER (SPECIFY TYPE & UNITS)							

12. STACK OR EMISSION POINT DATA:

STACK OR EMISSION POINT DATA	HEIGHT ABOVE GRADE (FT): 200	DIAMETER (FT): 10	TEMPERATURE (°F): 161	DISTANCE TO NEAREST PROPERTY LINE (FT): 295
DATA AT EXIT CONDITIONS	FLOW (ACTUAL FT3/MIN): 85,667	VELOCITY (FT/SEC): 18.1	MOISTURE (GRAINS/FT3): 47.9	MOISTURE (PERCENT): 18
DATA AT STANDARD CONDITIONS	FLOW (DRY STD. FT3/MIN): 57,400	VELOCITY (FT/SEC): 12.1	MOISTURE GRAINS/FT3): 71.7	MOISTURE (PERCENT):

13. AIR CONTAMINANTS	EMISSIONS(LBS/HR) AVERAGE	MAXIMUM	CONCEN-TRATION	AVG. EMISS. (TONS/YR)	EMISSIONS* EST. METHOD	CONTROL* DEVICES	CONTROL EFFICIENCY %
PARTICULATES**	7.3	8.9	***0.015	31.97	1	053*	95
SULFUR DIOXIDE	102.7	201.1	**** 169	449.83	1		
NITROGEN OXIDES			PPM				
ORGANIC COMPOUNDS	<1.0		PPM	<4.7	2		
CARBON MONOXIDE			PPM				
FLUORIDES							
OTHER(SPECIFY)							

14. SCRUBBER DATA:	MANUFACTURER & MODEL NUMBER	WATER FLOW (GALLONS/MINUTE)	SCRUBBER PRESSURE DROP(INCHES WATER)
	Peabody-Venturi Scrubber	350	50

OTHER CONTROL (DESCRIBE)
A quench chamber is located upstream of the venturi scrubber.

15. CHECK TYPES OF MONITORING AND RECORDING INSTRUMENTS THAT ARE ATTACHED:
OPACITY MONITOR ( ), SO2 MONITOR ( ), NOX MONITOR ( ), OTHER-SPECIFY IN COMMENTS ( )

16. COMMENTS *053 control device for particulates.
Low boilers from production processes; bottoms, sludges & tars from production process waste solvents or solvent contaminated wastes; distillation residues & sidestreams; off quality or surplus product or raw materials; discarded samples; laboratory or pilot plant wastes.

17. SIGNATURE | DATE
See signature on APC 20

* REFER TO THE BACK OF THE PERMIT APPLICATION FORM FOR ESTIMATION METHOD AND CONTROL DEVICE CODES.
** A VALID STACK TEST OF PARTICULATE EMISSIONS FROM MANUFACTURER SHALL BE INCLUDED WITH APPLICATION
*** EXIT GAS PARTICULATE CONCENTRATION UNITS: GRAINS/DRY STANDARD FT (70°F).
**** EXIT GAS SULFUR DIOXIDE CONCENTRATION UNITS: PPM BY VOLUME DRY BASIS.

TYPE OF WASTE BURNED CODE TABLE

PRINCIPAL COMPONENTS, USUAL SOURCE AND TYPICAL MOISTURE CONTENT	CODE
HIGHLY COMBUSTABLE WASTE, PAPER, WOOD, CARDBOARD CARTONS,(INCLUDING UP TO 10% TREATED PAPERS, PLASTIC OR RUBBER SCRAPS); FROM COMMERCIAL AND INDUSTRIAL SOURCES; 10% MOISTURE	0
COMBUSTIBLE WASTE, PAPER, CARTONS, RAGS, WOOD SCRAPS, COMBUSTIBLE FLOOR SWEEPINGS, FROM: DOMESTIC, COMMERCIAL, AND INDUSTRIAL SOURCES; 25% MOISTURE	1
RUBBISH AND GARBAGE, FROM: RESIDENTIAL SOURCES; 50% MOISTURE.	2
PREDOMINANTLY ANUMAL AND VEGTABLE WASTE FROM: RESTAURANTS, HOTELS, MARKETS, INSTITUTIONAL, COMMERCIAL AND CLUB SOURCES; 70% MOISTURE.	3
CARCASSES, ORGANS, SOLID ORGANIC WASTES, FROM: HOSPITALS, LABORATORIES, SLAUGHTERHOUSES, ANIMAL POUNDS, AND SIMILAR SOURCES; 85% MOISTURE.	4
GASEOUS AND SEMI-LIQUID INDUSTRIAL PROCESS WASTE; VARIABLE MOISTURE. DESCRIBE IN DETAIL UNDER COMMENTS.	5
SOLID AND SEMI-SOLID INDUSTRIAL PROCESS WASTE; VARIABLE MOISTURE. DESCRIBE IN COMMENTS IN DETAIL.	6

ƐENNESSEE AIR POLL ION CON ROL BOARD
NASHVILLE, TENNESSEE 37219

Operating Permit issued pursuant to Tennessee Air Quality Act

Date Issued: December 11, 1980 Permit Number: 0101141

Expires:

Issued to: Tennessee Eastman Company

Installation Address: Kingsport

nstallation Description:
3-248-2
Waste Chemical Incinerator
Bigelow-Liptak with Quench Chamber,
Packed Bed & Venturi Scrubbers
5,000 lbs/hr design charge rate

Emission Source Reference No.:
82-01003-50
EMS #050

The holder of this permit shall comply with the conditions contained in this permit as well as all applicable provisions of the Tennessee Air Pollution Control Regulations.

CONDITIONS:

Harold E. Hodges

HAROLD E. HODGES, P. E.
TECHNICAL SECRETARY ah

authority is granted by this permit to operate, construct, or maintain any installation in violation any law, statute, code, ordinance, rule or regulation of the State of Tennessee or any of its political divisions.

NON TRANSFERABLE

POST OR FILE AT INSTALLATION ADDRESS

PH- 0423
APC Rev. 1/78

STATE OF TENNESSEE
DEPARTMENT OF PUBLIC HEALTH
DIVISION OF AIR POLLUTION CONTROL

Process Emission Source
Number B-248-2
Page 1 of
Date April 25, 1984

APC-20
PERMIT APPLICATION

1. ORGANIZATION'S LEGAL NAME Tennessee Eastman Company A Division of Eastman Kodak Company			FOR APC	APC COMPANY-POINT NO.
2. MAILING ADDRESS (ST/RD/P.O. BOX) P. O. Box 511				APC LOG/PERMIT NO.
CITY Kingsport	STATE Tennessee	ZIP CODE 37662		PHONE WITH AREA CODE (615) 229-2444
3. PRINCIPAL TECHNICAL CONTACT J. C. Edwards				PHONE WITH AREA CODE (615) 229-2444
4. SITE ADDRESS (ST/RD/HWY) South Eastman Road				COUNTY NAME Sullivan
CITY OR DISTANCE TO NEAREST TOWN Kingsport		ZIP CODE 37662		PHONE WITH AREA CODE (615) 229-2444
5. EMISSION SOURCE NO. (NUMBER WHICH UNIQUELY IDENTIFIES THIS SOURCE) B-248-2		PERMIT RENEWAL YES ( ), NO (X).		

6. BRIEF DESCRIPTION OF EMISSION SOURCE

A waste chemical incinerator with heat recovery and scrubbers.

7. TYPE OF PERMIT REQUESTED (COMPLETE ONE LINE ONLY)

CONSTRUCTION ( )	STARTING DATE	COMPLETION DATE	DATE WAIVER APPROVED (IF APPLICABLE)	
OPERATING (X)	DATE CONSTRUCTION STARTED	DATE COMPLETED 1-24-79	LAST PERMIT NO. 0101141	EMISSION SOURCE REFERENCE NUMBER 82-01003-50
LOCATION TRANSFER ( )	TRANSFER DATE		LAST PERMIT NO.	EMISSION SOURCE REFERENCE NUMBER

ADDRESS OF LAST LOCATION

8. DESCRIBE CHANGES THAT HAVE BEEN MADE TO THIS EQUIPMENT OR OPERATION SINCE THE LAST CONSTRUCTION OR OPERATING PERMIT APPLICATION

None

9. SIGNATURE (APPLICATION MUST BE SIGNED BEFORE IT WILL BE PROCESSED) J C Edwards Jr		DATE
10. SIGNER'S NAME (TYPE OR PRINT) J. C. Edwards	TITLE Manager, Clean Environment Program	PHONE WITH AREA CODE (615) 229-2444

11/7/83

STATE OF TENNESSEE
DEPARTMENT OF PUBLIC HEALTH
DIVISION OF AIR POLLUTION CONTROL

25(PITOL HILL BUILDING
NASHVILLE, TENNESSEE 37219
TELEPHONE (615) 741-3931

INCINERATOR SOURCE DESCRIPTION

PLEASE TYPE OR PRINT, SUBMIT IN DUPLICATE AND ATTACH TO THE PERMIT APPLICATION.

1. ORGANIZATION NAME Tennessee Eastman Company
A Division of Eastman Kodak Company | //// FOR | APC COMPANY POINT NO.

2. EMISSION SOURCE NO. (AS ON PERMIT APPLICATION) B-248-2 | SIC CODE 2869 | //// APC | APC PERMIT/LOG NO.

3. SOURCE LOCATION: → | LATITUDE 36° 30' 48" N | LONGITUTDE 82° 31' 58" W | UTM VERTICAL 4,041,778 N | UTM HORIZONTAL 362,747 E

4. TYPE OF WASTE BURNED: 5 (USE CODE FROM TABLE ON BACK) | CHARGING RATE (POUNDS/HOUR): AVERAGE | DESIGN 6,000 | TONS BURNED PER YEAR 25,000

5. IS THE INCINERATOR FURNACE VOLUME 2.5 CUBIC FEET OR LESS? → | NO X | YES | IS THE UNIT USED SOLELY FOR DISPOSAL OF INFECTIVE DRESSINGS? | NO X | YES

6. INCINERATOR MANUFACTURER Bigelow-Liptak | MODEL NUMBER | DATE INSTALLED 1979

7. INCINERATOR TYPE: → | SINGLE CHAMBER X | MULTI-CHAMBER | REFRACTORY LINED X | AUXILARY BURNERS

8. INCINERATOR OPER. SCHEDULE: → | HOURS/DAY 24 | DAYS/WEEK 7 | WEEKS/YEAR 50 | DAYS/YEAR

9. PERCENT ANNUAL THROUGHPUT: → | DEC.-FEB. 25 | MARCH-MAY 25 | JUNE-AUG. 25 | SEPT.-NOV. 25

10. BURNER DATA: → | BURNER CAPACITY (BTU/HOUR): PRIMARY | SECONDARY/AFTERBURN | AIR FLOW (CFM): OVERFIRE | UNDERFIRE

→ | DOES UNIT HAVE CONTROLLED OR STARVED AIR? | NO | YES

11. AUXILARY FUEL DATA: #2 Fuel Oil | PRIMARY FUEL TYPE (SPECIFY) | STANDBY FUEL TYPE (SPECIFY)

FUEL	ANNUAL USAGE	HOURLY USAGE DESIGN	HOURLY USAGE AVERAGE	% SULFUR	% ASH	BTU VALUE OF FUEL	(FOR APC ONLY) SCC CODE
NATURAL GAS	10^6 CUFT	CU FT	CU FT	///	///	1,000	
#2 FUEL OIL	10^3 GAL 100	GAL 180	GAL	0.35 Wt %	///	130,000	
LIQUID PROPANE	10^3 GAL	GAL	GAL	///	///	85,000	
OTHER (SPECIFY TYPE & UNITS)							

12. STACK OR EMISSION POINT DATA:

→	HEIGHT ABOVE GRADE (FT) 50	DIAMETER (FT) 3.5	TEMPERATURE (°F) 198.1	DISTANCE TO NEAREST PROPERTY LINE (FT) 1500
DATA AT EXIT CONDITIONS →	FLOW (ACTUAL FT3/MIN) 30,800	VELOCITY (FT/SEC) 53.7	MOISTURE (GRAINS/FT3) 59.67	MOISTURE (PERCENT) 23.7
DATA AT STANDARD CONDITIONS →	FLOW (DRY STD. FT3/MIN) 18,200	VELOCITY (FT/SEC) 31.5	MOISTURE GRAINS/FT3) 101.37	MOISTURE (PERCENT)

13. AIR CONTAMINANTS	EMISSIONS(LBS/HR) AVERAGE	MAXIMUM	CONCEN-TRATION	AVG. EMISS. (TONS/YR)	EMISSIONS* EST.METHOD	CONTROL* DEVICES	CONTROL EFFICIENCY %
PARTICULATES**	1.83		*** 0.006	8.02	1	053*/001	99
SULFUR DIOXIDE	0.18		**** 0.91	0.79	1		
NITROGEN OXIDES			PPM				
ORGANIC COMPOUNDS	<0.6		PPM	<2.5	2	001	
CARBON MONOXIDE			PPM				
FLUORIDES							
OTHER(SPECIFY)							

14. SCRUBBER DATA: | MANUFACTURER & MODEL NUMBER Ceilcote Packed Bed Scrubber and Peabody High Energy Venturi Scrubber | WATER FLOW (GALLONS/MINUTE) 180-250 | SCRUBBER PRESSURE DROP(INCHES WATER) 60

OTHER CONTROL (DESCRIBE)
A quench chamber is located upstream of the packed bed scrubber.

15. CHECK TYPES OF MONITORING AND RECORDING INSTRUMENTS THAT ARE ATTACHED:
OPACITY MONITOR ( ), SO2 MONITOR ( ), NOX MONITOR ( ), OTHER-SPECIFY IN COMMENTS ( )

16. COMMENTS *053 control device for particulates.
Low boilers from production processes; bottoms, sludges and tars from production processes; waste solvents or solvent contaminated wastes; distillation residues and sidestreams; off quality or surplus product or raw materials; laboratory or pilot plant wastes.

17. SIGNATURE | DATE

See signature an APC 20

* REFER TO THE BACK OF THE PERMIT APPLICATION FORM FOR ESTIMATION METHOD AND CONTROL DEVICE CODES.
** A VALID STACK TEST OF PARTICULATE EMISSIONS FROM MANUFACTURER SHALL BE INCLUDED WITH APPLICATION
*** EXIT GAS PARTICULATE CONCENTRATION UNITS: GRAINS/DRY STANDARD FT (70°F).
**** EXIT GAS SULFUR DIOXIDE CONCENTRATION UNITS: PPM BY VOLUME DRY BASIS.

TYPE OF WASTE BURNED CODE TABLE

PRINCIPAL COMPONENTS, USUAL SOURCE AND TYPICAL MOISTURE CONTENT	CODE
HIGHLY COMBUSTABLE WASTE, PAPER, WOOD, CARDBOARD CARTONS,(INCLUDING UP TO 10% TREATED PAPERS, PLASTIC OR RUBBER SCRAPS); FROM COMMERCIAL AND INDUSTRIAL SOURCES; 10% MOISTURE	0
COMBUSTIBLE WASTE, PAPER, CARTONS, RAGS, WOOD SCRAPS, COMBUSTIBLE FLOOR SWEEPINGS, FROM: DOMESTIC, COMMERCIAL, AND INDUSTRIAL SOURCES; 25% MOISTURE	1
RUBBISH AND GARBAGE, FROM: RESIDENTIAL SOURCES; 50% MOISTURE.	2
PREDOMINANTLY ANUMAL AND VEGTABLE WASTE FROM: RESTAURANTS, HOTELS, MARKETS, INSTITUTIONAL, COMMERCIAL AND CLUB SOURCES; 70% MOISTURE.	3
CARCASSES, ORGANS, SOLID ORGANIC WASTES, FROM: HOSPITALS, LABORATORIES, SLAUGHTERHOUSES, ANIMAL POUNDS, AND SIMILAR SOURCES; 85% MOISTURE.	4
GASEOUS AND SEMI-LIQUID INDUSTRIAL PROCESS WASTE; VARIABLE MOISTURE. DESCRIBE IN DETAIL UNDER COMMENTS.	5
SOLID AND SEMI-SOLID INDUSTRIAL PROCESS WASTE; VARIABLE MOISTURE. DESCRIBE IN COMMENTS IN DETAIL.	6

TENNESSEE AIR POLLUTION CONTROL BOARD
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
NASHVILLE, TENNESSEE 37247-3101

Permit to Construct or Modify an Air Contaminant Source Issued Pursuant to Tennessee Air Quality Act

Date Issued: APR 29 1992

Permit Number:

Date Expires:
September 1, 1994

932325P

Issued To:

Tennessee Eastman Company

Installation Address:

South Eastman Road
Kingsport

Installation Description:

B-325-1: Boiler #31
Pulverized Coal-Fired Boiler

Emission Source Reference No:

82-1010-15
PSD-BACT-NSPS

The holder of this permit shall comply with the conditions contained in this permit as well as all applicable provisions of the Tennessee Air Pollution Control Regulations.
This is not a permit to operate.

CONDITIONS:

1. This permit does not cover any air contaminant source that does not conform to the conditions of this permit and the information given in the approved application dated June 14, 1991. This includes compliance with the following operating parameters:

   Heat input to this source shall not exceed 880 million Btu/hour.

2. Particulate matter emitted from the new boiler #31 shall not exceed 15.8 lbs/hour.

3. Sulfur dioxide emitted from the new boiler #31 shall not exceed 293 lbs/hour and have a minimum removal efficiency of 90%. Sulfur dioxide emissions from the existing boiler #30 shall not exceed 317 lbs/hour and it shall be retrofitted with a spray dryer absorber to reduce sulfur dioxide emissions, and this reduction in emissions shall be accomplished by the time the new boiler #31 becomes operational.

4. Volatile Organic Compounds emitted from the new boiler #31 shall not exceed 8.8 lbs/hour.

5. Carbon monoxide emitted from the new boiler #31 shall not exceed 176 lbs/hour.

(continued on the next page)

Harold E. Hodges
HAROLD E. HODGES, P.E.
TECHNICAL SECRETARY

F5501261

No Authority is Granted by this Permit to Operate, Construct, or Maintain any Installation in Violation of any Law, Statute, Code, Ordinance, Rule or Regulation of the State of Tennessee or any of its Political Subdivisions.

NON TRANSFERABLE POST AT INSTALLATION ADDRESS

CN-0754

APR 2 9 1992

932325P

6. Fluorides emitted from the new boiler #31 shall not exceed 2.75 lbs/hour. Fluorides emitted from the existing boiler #30 shall not exceed 2.25 lbs/hour.

7. Fluorides emitted from the existing boiler #30 shall not exceed 2.25 lbs/hour. To determine the decrease in fluoride emissions as a result of the proposed spray dryer absorber, tests shall be conducted at the inlet and the outlet of the proposed spray dryer absorber.

8. Hydrogen chloride emitted from the new boiler #31 shall not exceed 28.2 lbs/hour. Hydrogen chloride emitted from the existing boiler #30 shall not exceed 25.0 lbs/hour.

9. Particulate matter emitted from the coal bunker for boiler #31 shall not exceed 1.06 lbs/hour.

10. Particulate matter emitted from the lime storage silo shall not exceed 1.06 lbs/hour.

11. Beryllium emitted from the new boiler #31 shall not exceed 0.004 lbs/hour.

12. Nitrogen oxides emitted from this source shall not exceed 0.40 lb/million Btu heat input.

13. Visible emissions from the new boiler #31 shall not exceed 20 percent opacity (6 minute average), except for one 6 minute period per hour of not more than 27 percent opacity as determined by EPA Method 9, as published in the Federal Register, Volume 39, No. 219 on November 12, 1974.

14. Within 60 days after achieving the maximum production rate at which the facility will be operated, but no later than 180 days after initial start-up, the owner or operator shall furnish the Technical Secretary a written report of the results of an emissions performance test for the pollutants listed below. The performance test shall be conducted and data reduced in accordance with methods and procedures specified in 40 CFR 60.46b.

Particulates from the new boiler #31.

15. Within 60 days after achieving the maximum production rate at which the facility will be operated, but no later than 180 days after initial start-up, the owner or operator shall furnish the Technical Secretary a written report of the results of an emissions performance test for the pollutants listed below. The performance test shall be conducted and data reduced in accordance with methods and procedures specified in Chapter 1200-3-16-.01(5)(g)13 of the Tennessee Air Pollution Control Regulations.

Fluorides from the new boiler #31 and the existing boiler #30

(continued on the next page)

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16. At least thirty (30) days prior to conducting the source tests, the Technical Secretary shall be given notice of the test in order to afford him the opportunity to have an observer present.

17. The Technical Secretary shall be notified in writing at least ten (10) days prior to start-up of the source.

18. This permit does not cover construction which commences after 18 months of the date of issuance of this permit.

19. This permit shall serve as a temporary operating permit from initial start-up to the receipt of a standard operating permit, provided the operating permit is applied for within the time period specified in this permit for submitting test reports, and provided the conditions of this permit and any applicable emission standards are met.

20. The source owner or operator shall install, maintain, operate, and submit reports of excess emissions from continuous in-stack monitoring systems for sulfur dioxide and nitrogen oxides and either oxygen or carbon dioxide. The sensors of these monitoring systems shall be located in representative areas of the effluent gas stream of the boiler. Electronic signal combining systems shall be installed to convert the output of the pollutant monitors into units of the applicable emission standards. The in-stack sulfur dioxide and nitrogen oxides monitoring system shall meet all the requirements of Performance Specification 2 as outline in the Federal Register, Volume 48, Number 102, Wednesday, May 25, 1983, and performance specification test data shall be submitted as proof of this. Prior to the installation of these monitoring systems, a monitoring plan shall be submitted to the Technical Secretary for approval. At least ten (10) days prior to the performance testing of this monitoring system, the Technical Secretary shall be notified of such performance testing so that an official observer may be present. This monitoring system shall be in effective operation, the performance specifications completed, and the report of this performance testing submitted to the Technical Secretary within one hundred eighty (180) days of the start-up of the source.

(continued on the next page)

APR 2 8 1992

21. Operational Condition for Sulfur Dioxide and Nitrogen Oxides Monitoring Systems

The use of continuous in-stack monitoring for sulfur dioxide and nitrogen oxides and the monitoring of the sulfur dioxide input to the control device (measured as per 40 CFR 60.47b) is the method by which this boiler proves continual compliance with the applicable sulfur dioxide and nitrogen oxides emissions limitation and sulfur dioxide emission reduction requirement. Therefore, for this boiler to demonstrate continual compliance with the applicable sulfur dioxide and nitrogen oxides emissions limitations, the in-stack nitrogen oxides and sulfur dioxide monitoring systems shall each be fully operational for at least eighty (80) percent of the operational time of the monitored source during each month of the calendar quarter. An operational availability of less than this amount may be considered the basis for declaring the source to be in non-compliance with the applicable monitoring requirements, unless the reasons for the failure to maintain this level of operational availability are accepted by this Division as being legitimate malfunctions of the instruments.

22 Quality Assurance Condition for the Sulfur Dioxide and Nitrogen Oxides Monitoring Systems. The continuous in-stack sulfur dioxide and nitrogen oxides monitoring systems shall meet all of the requirements of Appendix F as published in the Federal Register, Volume 52, Number 107, June 4, 1987, beginning on page 21007.

23. The owner or operator shall submit excess emission reports and CEMS downtime reports to this Division for each calendar quarter in accordance with Rule 1200-3-10-.02(2). If there are no excess emissions or CEMS downtime during this quarter, the owner or operator shall submit a report to that effect. A format for this report will be supplied by the Division after the acceptance of the performance specifications test.

24. To determine compliance with the emission limits for nitrogen oxides required under condition 12 of this permit, the owner or operator of an affected facility shall conduct the performance test as required under 1200-3-16-.01(5) using the continuous system for monitoring nitrogen oxides. For the initial compliance test, nitrogen oxides from the steam generating unit are monitored for 30 successive steam generating unit operating days and the 30-day average emission rate is used to determine compliance with the nitrogen oxides emission standards under condition 12 of this permit. The 30-day average emission rate is calculated as the average of all hourly emissions data recorded by the monitoring system during the 30-day test period.

(continued on the next page)

APR 2 9 1992

932325P

25. The source owner or operator shall install, calibrate, operate, and submit reports of excess emissions from an in-stack continuous opacity monitoring system. The new boiler #31 shall utilize the Division approved continuous in-stack opacity monitor because the new boiler #31, as proposed, will exhaust thru the stack for the existing boiler #30. Therefore for this fuel burning installation to demonstrate continual compliance with the applicable opacity limitation, the in-stack opacity monitor shall be fully operational for at least ninety-five (95) percent of the operational time of the monitored unit during any calendar quarter. An operational availability of less than this amount may be considered the basis for declaring the fuel burning installation to be in noncompliance with the applicable monitoring requirements, unless the reasons for the failure to maintain this level of operational availability are accepted by the Division as being legitimate malfunctions of the instrument. In the event of a disparity between the instrument's reading versus that of a qualified visible emission evaluator, the Technical Secretary may require the source to conduct any necessary testing or investigations needed to resolve the disparity.

Quality assurance checks shall be performed on the opacity monitor on a biennial calendar basis and in a manner prescribed by the Technical Secretary. Written reports of the quality assurance checks shall be submitted in a format prescribed by the Technical Secretary.

As an alternative to this, an on-stack quality assurance audit may be conducted on a semiannual basis. If elected, this on-stack quality assurance audit shall be conducted in a manner prescribed by the Technical Secretary, and written reports of these audits shall be submitted to the Technical Secretary. Prior to the commencing of the use of the semiannual audit, the Technical Secretary shall be informed in writing of the election of this option.

Furthermore within ninety (90) days of each major modification or major repair of the opacity monitor, a repeat of the performance test shall be conducted and a written report of it submitted to the Technical Secretary as proof of the continuous operation of the opacity monitor within acceptable accuracy limits.

26. No hazardous waste shall be burned in boiler #31.

27. For the pollutants with emission limitations placed on this permit, the emissions measuring test methods and procedures are the following:

(continued on the next page)

APR 29 1992

932325P

Pollutant	Testing Methodology
Particulates	EPA Method 5 as published in 42 FR 41776 and subsequent amendments.
Fluorides	EPA Method 13 as published in 45 FR 41852 and subsequent amendments.
Sulfur dioxide	See Permit Condition #28.
Nitrogen oxides	See Permit Condition #24.
Hydrogen chloride	EPA Method 26 as published in 56 FR 5770
Beryllium	EPA Method 104 as published in 40 CFR 61, Appendix B.
Carbon monoxide	EPA Method 10 as published in 39 FR 9319.
Volatile Organic Compounds	EPA Method 25 as published in 45 FR 65959.

28. To determine compliance with the emission limit and emissions reduction for sulfur dioxide required under condition 3 of this permit, the owner or operator of an affected facility shall conduct the performance test as required under 1200-3-16-.01(5) using the continuous system for monitoring sulfur dioxide. To demonstrate compliance with the 90% sulfur dioxide reduction requirement, the procedures outlined in 40 CFR 60.47b shall be utilized. For the initial compliance test, sulfur dioxide emission and percent sulfur dioxide reduction from the steam generating unit are monitored for 30 successive steam generating unit operating days and the 30-day average emission and average reduction rates are used to determine compliance with the sulfur dioxide emission standard and emission reduction rate under condition 3 of this permit. The 30-day average emission rate is calculated as the average of all hourly emissions data recorded by the monitoring system during the 30-day test period.

F3501261

TENNESSEE AIR POLLUTION CONTROL BOARD
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
NASHVILLE, TENNESSEE 37243-1531

OPERATING PERMIT Issued Pursuant to Tennessee Air Quality Act

Date Issued: JUL 08 1993

Date Expires: July 1, 1997

Permit Number: 036681F

Issued To:

Tennessee Eastman Division
Eastman Kodak Company

Installation Address:

South Eastman Road
Kingsport

Installation Description:

B-325-1
Steam and Electric Generating Unit
Coal Fired Boiler No. 30
Coal Bunker and Ash Handling

Emission Source Reference No: 82-1007-37

The holder of this permit shall comply with the conditions contained in this permit as well as all applicable provisions of the Tennessee Air Pollution Control Regulations.

CONDITIONS:

1. This operating permit was prepared utilizing an application dated July 8, 1992 and signed by Mr. John F. Webb, P & S Division Superintendent along with a letter dated April 28, 1993 signed by Ms. Nancy F. Whitten, Environmental Representative of the permitted facility. This permit does not cover any air contaminant source that does not conform to the conditions of this permit and the information given in the approved application. This includes compliance with the following operating parameters:

   The input capacity for this source shall not exceed 780 million Btu per hour.

(continued on the next page)

John W. Walton

TECHNICAL SECRETARY

No Authority is Granted by this Permit to Operate, Construct, or Maintain any Installation in Violation of any Law, Statute, Code, Ordinance, Rule or Regulation of the State of Tennessee or any of its Political Subdivisions.

NON TRANSFERABLE

POST OR FILE AT INSTALLATION ADDRESS

JUL 0 8 1993

2. The maximum allowable emissions from Vent A of this source shall not exceed the following:

Pollutant	Pounds per MM Btu	Pounds per Hour
TSP	0.018	14
SO_2	1.2	936
NO_x	0.60	468
CO	0.065	51
VOC	0.013	10

After Boiler 31 (ESRN 82-1010-15, Permit No. 932325F) is in full, steady state operation, the maximum allowable emissions from Vent A of this source shall not exceed the following:

Pollutant	Pounds per MM Btu	Pounds per Hour
TSP	0.018	14
SO_2	0.41	317
NO_x	0.60	468
CO	0.065	51
VOC	0.013	10

3. The existing #30 boiler shall be retrofitted with a spray dryer absorber to reduce sulfur dioxide emissions, and this reduction in emissions shall be accomplished by the time the new boiler #31 becomes operational.

4. Fluorides emitted from the existing boiler #30 shall not exceed 2.25 pounds per hour. To determine the decrease in fluoride emissions as a result of the proposed spray dryer absorber, tests shall be conducted at the inlet and the outlet of the proposed spray dryer absorber.

5. Hydrogen chloride emitted from the existing boiler #30 shall not exceed 25.0 pounds per hour.

6. Particulate matter emitted from Vent C shall not exceed 1.06 pounds per hour.

7. Operating time shall not exceed 8,568 hours per year for Vent A and 1,500 hours per year for Vent C.

8. A log of the operating hours for Vents A and C must be maintained at the source location and kept available for inspection by the Technical Secretary or his representative. This log must be retained for a period of not less than two years.

(continued on the next page)

9. Periods of excess emissions with the sulfur dioxide emission limitation shall be any three-hour period during which the average emissions of sulfur dioxide exceeds the applicable standard.

10. This source shall not exhibit greater than 20 percent opacity except that a maximum of 40 percent opacity standard shall be permissible for not more than 2 minutes in any hour as stated in subparagraph 1200-3-16-.02(3)(a)2 of the Tennessee Air Pollution Control Regulations.

11. Quality assurance checks shall be performed on the opacity monitor(s) on a biennial calendar basis and in a manner prescribed by the Technical Secretary. Written reports of these quality assurance checks shall be submitted in a format prescribed by the Technical Secretary.

    Furthermore, within ninety (90) days of each major modification or major repair of the opacity monitor, a repeat of the performance test shall be conducted, and a written report of it submitted to the Technical Secretary as proof of the continuous operation of the opacity monitor within acceptable accuracy limits.

12. Quality assurance checks shall be performed on both the sulfur dioxide and diluent monitoring system on a calendar basis and in a manner prescribed by the Technical Secretary. Written reports of these quality assurance checks shall be submitted in a format prescribed by the Technical Secretary.

    Furthermore, within ninety (90) days of each major modification or major repair of either the sulfur dioxide monitor or diluent monitor, a repeat of the monitor performance test shall be conducted, and a written report of it submitted to the Technical Secretary as proof of the continuous operation of the sulfur dioxide monitor within acceptable accuracy limits.

13. The use of continuous in-stack monitoring for sulfur dioxide is the method by which this fuel burning installation demonstrates continual compliance with the applicable sulfur dioxide emission limitation. Therefore, for this fuel burning installation to demonstrate continual compliance with the applicable sulfur dioxide emissions limitation, the in-stack sulfur dioxide monitor and companion diluent monitor shall be simultaneously fully operational for at least eighty-five (85) percent of the operational time of the monitored unit during any calendar quarter. An operational availability of less than this amount may be considered the basis for declaring the fuel burning installation to be in non-compliance with the applicable monitoring requirements unless the reasons for the failure to maintain this level of operational availability are accepted by this Division as being legitimate malfunctions of the instruments.

(continued on the next page)

JUL 0 8 1993

14. The use of a Division approved continuous in-stack opacity monitor is one of the methods of demonstrating continual compliance with the applicable opacity limitation for this fuel burning installation. Therefore, for this fuel burning installation to demonstrate continual compliance with the applicable opacity limitation, the in-stack opacity monitor shall be fully operational for at least ninety-five (95) percent of the operational time of the monitored unit during any calendar quarter. An operational availability of less than this amount may be considered the basis for declaring the fuel burning installation to be in non-compliance with the applicable monitoring requirements, unless the reasons for the failure to maintain this level of operational availability are accepted by this Division as being legitimate malfunctions of the instrument. In the event of a disparity of the instrument's reading versus that of a qualified visible emission evaluator, the Technical Secretary may require the source to conduct any necessary testing or investigations needed to resolve the disparity.

15. This permit supersedes any previous operating permit(s) for this source.

16. The permittee shall apply for renewal of this permit not less than sixty (60) days prior to the permit's expiration date pursuant to Division Rule 1200-3-9-.02(3).

(End of Conditions)

TENNESSEE AIR POLLUTION CONTROL BOARD
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
NASHVILLE, TENNESSEE 37243-1531

Permit to Operate and
Permit to Construct or Modify an Air Contaminant Source Issued Pursuant to Tennessee Air Quality Act

Date Issued: JAN 17 1998

Permit Number: 743568P

Date Expires: November 1, 1998

Issued To:

Eastman Chemical Company

Installation Address:

South Eastman Road
Kingsport

Installation Description:

B-335-1
Alcohol Production

Emission Source Reference No.

82-1007-66

The holder of this permit shall comply with the conditions contained in this permit as well as all applicable provisions of the Tennessee Air Pollution Control Regulations.

CONDITIONS:

1. The application that was utilized in the preparation of this permit is dated October 6, 1995 and signed by B.M. Mitchell of the permitted facility. If this person terminates his/her employment or is reassigned different duties such that he/she is no longer the responsible person to represent and bind the facility in environmental permitting affairs, the owner or operator of this air contaminant source shall notify the Technical Secretary of the change. Said notification shall be in writing and submitted within thirty (30) days of the change. The notification shall include the name and title of the new person assigned by the source owner or operator to represent and bind the facility in environmental permitting affairs. All representations, agreement to terms and conditions and covenants made by the former responsible person that were used in the establishment of limiting permit conditions on this permit will continue to be binding on the facility until such time that a revision to this permit is obtained that would change said representations, agreements and covenants.

(Continued on next page)

John W. Walton

TECHNICAL SECRETARY

No Authority is Granted by this Permit to Operate, Construct, or Maintain any Installation in Violation of any Law, Statute, Code, Ordinance, Rule, or Regulation of the State of Tennessee or any of its Political Subdivisions.

NON-TRANSFERABLE

POST AT INSTALLATION ADDRESS

RDA-1298

CN-0754 (Rev. 9-92)

2. The production rate (total alcohol production) shall not exceed 1,900,000 pounds per day (lb/day) on a rolling thirty (30) day average until such time as the Technical Secretary issues a major Stationary Source Operating Permit for this source pursuant to paragraph 1200-3-9-.02(11) that includes some other compliance demonstration methods to meet the monitoring and related recordkeeping and reporting requirements of subpart 1200-3-9-.02(11)(e)1.(iii).

3. For as long as condition 2 exists, a production record of the process material input or output rate, in a form that readily shows compliance with condition 2, must be maintained at the source location and kept available for inspection by the Technical Secretary or his representative. This record must be retained for a period of not less than two years.

4. Volatile Organic Compounds (VOCs) emitted from storage tanks scrubber vent (Vents A and B) shall not exceed 3.26 tons per year (ton/yr).

5. Unless allowed otherwise in 1200-3, the control device for Vents A and B shall be operated with a control efficiency of 98 and 99% respectively, at the control device design rating.

6. Carbon monoxide (CO) emitted from depressurization vent for Purification Bed (Vent C) shall not exceed 126 pounds per hour and 0.063 ton/yr.

7. VOCs emitted from pumps, valves, etc. shall not exceed 10.68 ton/yr.

8. Visible emissions from this source shall not exceed 20 percent or greater opacity as determined by EPA Method 9, as published in the Federal Register, Volume 39, Number 219 on November 12, 1974. (6 minute average).

9. The issuance of this combined construction/operating permit supersedes any previously issued construction and/or operating permit for this air contaminant source.

10. The permittee shall apply for renewal of this permit not less than sixty (60) days prior to the expiration of this permit, pursuant to Division Rule 1200-3-9-.02(3).

(End of conditions)

TENNESSEE AIR POLLUTION CONTROL BOARD
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
NASHVILLE, TENNESSEE 37243-1531

Permit to Operate and
Permit to Construct or Modify an Air Contaminant Source Issued Pursuant to Tennessee Air Quality Act

Date Issued: JUN 2 3 1995

Date Expires: November 1, 1997

Permit Number:
741878P

Issued To:

Eastman Chemical Company

Installation Address:

South Eastman Road
Kingsport

Installation Description:
B-354-1
Production of Methyl Acetate

Emission Source Reference No.
82-1003-25
[Federal NSPS as indicated]
[State NSPS as indicated]

The holder of this permit shall comply with the conditions contained in this permit as well as all applicable provisions of the Tennessee Air Pollution Control Regulations.

CONDITIONS:

1. The application that was utilized in the preparation of this permit is dated April 6, 1995 and signed by B.M. Mitchell of the permitted facility. If this person terminates his/her employment or is reassigned different duties such that he/she is no longer the responsible person to represent and bind the facility in environmental permitting affairs, the owner or operator of this air contaminant source shall notify the Technical Secretary of the change. Said notification shall be in writing and submitted within thirty (30) days of the change. The notification shall include the name and title of the new person assigned by the source owner or operator to represent and bind the facility in environmental permitting affairs. All representations, agreement to terms and conditions and covenants made by the former responsible person that were used in the establishment of limiting permit conditions on this permit will continue to be binding on the facility until such time that a revision to this permit is obtained that would change said representations, agreements and covenants.

(Continued on next page)

John W. Walton

TECHNICAL SECRETARY

No Authority is Granted by this Permit to Operate, Construct, or Maintain any Installation in Violation of any Law, Statute, Code, Ordinance, Rule, or Regulation of the State of Tennessee or any of its Political Subdivisions.

NON-TRANSFERABLE **POST AT INSTALLATION ADDRESS**

2. The production rate shall not exceed 1,910,000 pounds per day (lb/day) until such time as the Technical Secretary issues a major stationary source operating permit for this source pursuant to paragraph 1200-3-9-.02(11) that includes some other compliance demonstration method to meet the monitoring and related recordkeeping and reporting requirements of subpart 1200-3-9-.02(11)(e)1.(iii).

3. This permit is valid for the storage tanks listed below:

Tank I.D.	Capacity (Gallons)	Status
31C-2	2,540	
31C-61	184	
31D-2	81,218	NSPS (Federal)
29D-20/21	37,600	NSPS (State)

4. For storage tank 31D-2, the source owner or operator shall comply with the requirements specified in the Federal Register, Volume 52, Number 67, April 8, 1987, Subpart Kb.

5. Storage tank 29D-20/21 is subject to Rules 1200-3-16-.01(7) and 1200-3-16-.61 of the Tennessee Air Pollution Control Regulations.

6. This source is subject to Rule 1200-3-16-.43 of the Tennessee Air Pollution Control Regulations.

7. The permittee shall certify the start-up date of the modified air contaminant source (storage tank 29D-20/21) regulated by this permit by submitting A COPY OF ALL PAGES OF THIS PERMIT, with the information required in A) and B) of this condition completed, to the Technical Secretary's representatives listed below:

A) DATE OF START-UP: ______ / ____ / _____
month day year

B) Anticipated operating rate: ____ percent of maximum rated capacity

For the purpose of complying with this condition, "start-up" of the modified air contaminant source shall be the date of the setting in operation of the modified source (storage tank 29D-20/21) for the production of product for sale or use as raw materials or steam or heat production.

The undersigned represents that he/she has the full authority to represent and bind the permittee in environmental permitting affairs. The undersigned further represents that the above provided information is true to the best of his/her knowledge and belief.

Signature		Date
Signer's name (type or print)	Title	Phone (with area code)

The completed certification shall be delivered to Compliance Validation Program and the Field Office at the addresses listed below no later than 30 days after the modified air contaminant source (storage tank 29D-20/21) is started-up.

Compliance Validation Program
Division of Air Pollution Control
9th Floor, L & C Annex
401 Church Street
Nashville, TN 37243-1531

Johnson City Field Office
Division of Air Pollution Control
2305 Silverdale Road
Johnson City, TN 37601-2162

(Continued on next page)

8. Volatile Organic Compounds (VOCs) emitted from this source shall not exceed 0.12 lb/hr.

9. Fugitive Volatile Organic Compounds emitted from pumps, valves, etc. (Process units 1 and 2) shall not exceed 5.8 tons per year (ton/yr).

10. Visible emissions from this source shall not exceed 20 percent or greater opacity as determined by EPA Method 9, as published in the Federal Register, Volume 39, Number 219 on November 12, 1974. (6 minute average)

11. This permit shall supersede permit 032303P.

12. Sixty (60) days prior to the expiration of this permit, permittee shall apply for permit renewal.

(End of conditions)

APPENDIX V

AGENCY CORRESPONDENCE

EASTMAN

Eastman Chemical Company
P.O. Box 431
Kingsport, Tennessee 37662

February 25, 1994

Joe Garrison
State Historical Commission
B-30 Customs House
701 Broadway
Nashville, TN 37243-0442

Mr. Garrison:

Air Products and Chemicals Inc. (APCI), Tennessee Eastman Division (TED) of Eastman Chemical Company, and the U.S. Department of Energy (DOE) are proposing to build a small commercial-scale methanol production facility in the existing TED manufacturing facility in Kingsport, Tennessee. The .34 acre proposed project site is located just outside the Kingsport, TN city limits in unincorporated Sullivan County. The proposed site is located between the South Fork of the Holston River and the Big Sluice in an area called Long Island. The parcel of land on which the proposed site is located was purchased by the then-Tennessee Eastman Corporation (which is now Tennessee Eastman Division of Eastman Chemical) from Tom C. Childress on November 26, 1941.

Currently, Eastman Chemical operates a methanol production plant on Long Island. The proposed plant will use existing synthesis gas capacity from the coal gasification facility to produce methanol, but a different catalyst system will be utilized. The proposed production facility is one of the projects in the U.S. Department of Energy's Clean Coal Technology Program and will aid the Department of Energy in finding technologies to produce cleaner burning fuels and to reduce dependence on foreign oil imports.

Since DOE will be funding part of this project, a review, as defined in 36 CFR 800, is needed to satisfy requirements of Section 106 of the National Historic Preservation Act and the National Environmental Policy Act (NEPA). We understand that your office will coordinate this review, send back comments, and that the criteria to determine effects used are found in 36 CFR 800.9.

The first criteria to determine effects, defined in 36 CFR 800.9(a), is "when the undertaking may alter characteristics of the property that may qualify the property for inclusion in the National Register (of Historic Places)." Since all of Long Island is already listed in the National Register, this project is not believed to have an effect based on this criteria.

The second criteria (36 CFR 800.9(b)) states that "An undertaking is considered to have an adverse effect when the effect on a historic property may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association." The National Register of Historic Places Inventory Nomination Form for Long Island, Item 10, states, "Modern residential and industrial development on the eastern half of Long Island does not contribute to the national significance of the site;..." The proposed project site is located on the eastern half, and, therefore, based on the previous statement, is not believed to have an adverse effect based on this criteria.

The referenced statement in the nomination form concludes, "...however, that area is included in the landmark designation because of its potential for productive archeological investigation." During the early 1980s, members of the Kingsport Chapter of the Tennessee Archeological Society investigated various plots on Long Island owned by Tennessee Eastman. According to the project leader from the local chapter, no significant artifacts were found.

In a conversation with S.D. Dean, a prominent local amateur archeologist, Mr. Dean commented that he believed the potential of significant archeological finds on this part of Long Island has been overstated. Mr. Dean surface-hunted this part of Long Island during the 1960s. Although he did find artifacts during this time, there were no indications of a major site.

The extensive development on the project site may also lessen the probability of finding significant archeological artifacts. Before TED's development of the site, it was used for grazing and farming. During expansions of TED in the 1980s, the site was prepared for construction by filling with 6 feet of fill dirt and surface levelling with gravel.

The ground below the fill material will not be disturbed significantly during construction. Disturbances will be limited to caissons placed through the fill material until bedrock is reached (which is 20 to 30 feet below the level of the fill material). Foundations and any required underground utilities will be located within the fill material. Other than the caissons, the ground below the fill will not be disturbed.

To aid your review, part of a USGS Quadrangle, an aerial photograph, and pictures of the proposed site have been included to identify the location of the proposed plant site, existing structures in the area, and development of the proposed site.

Mr. Garrison, I hope this letter and the other items included meet your needs. I look forward to your response. Please let me know if you need further information.

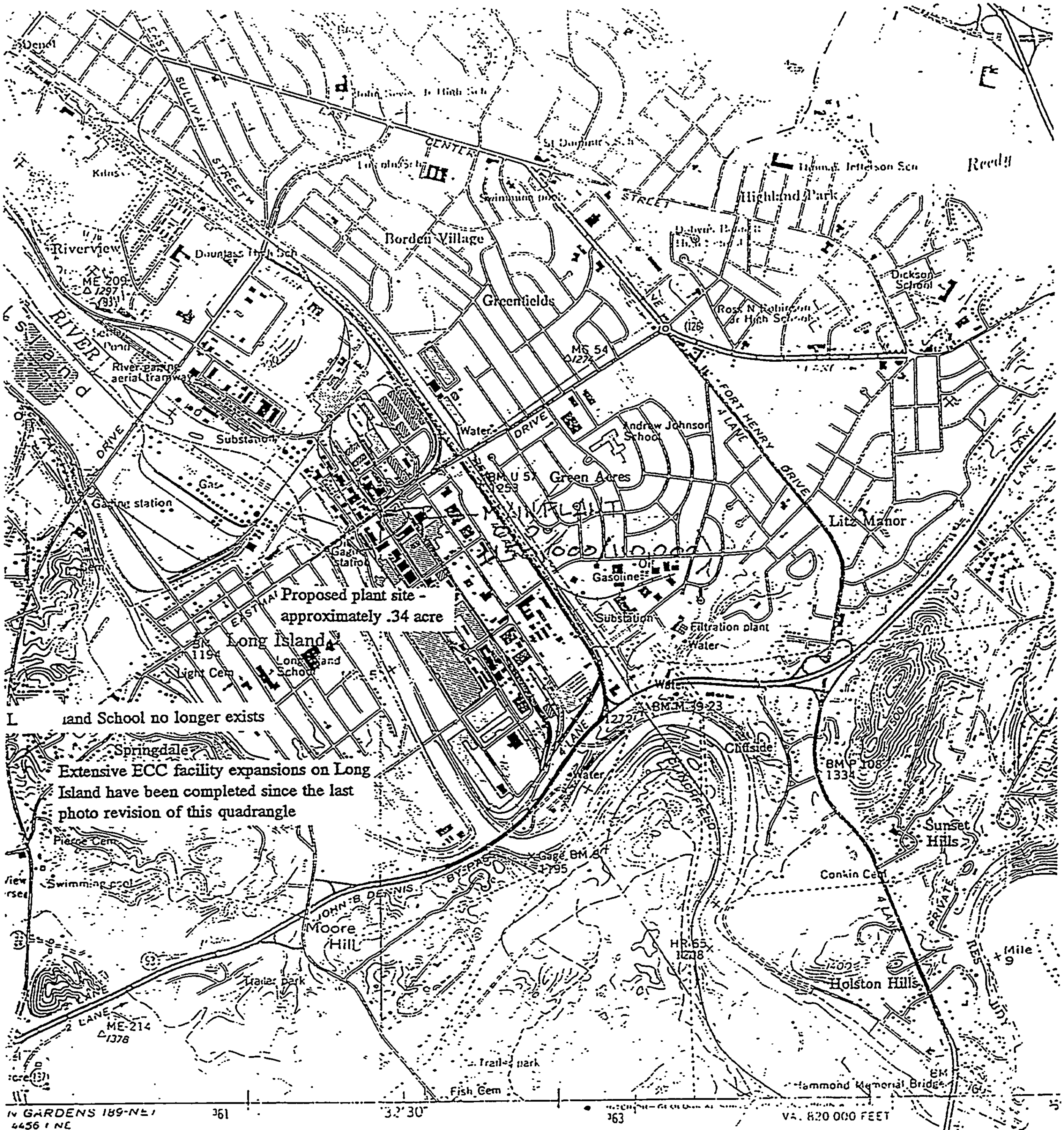
Sincerely,

Ryan Vannice

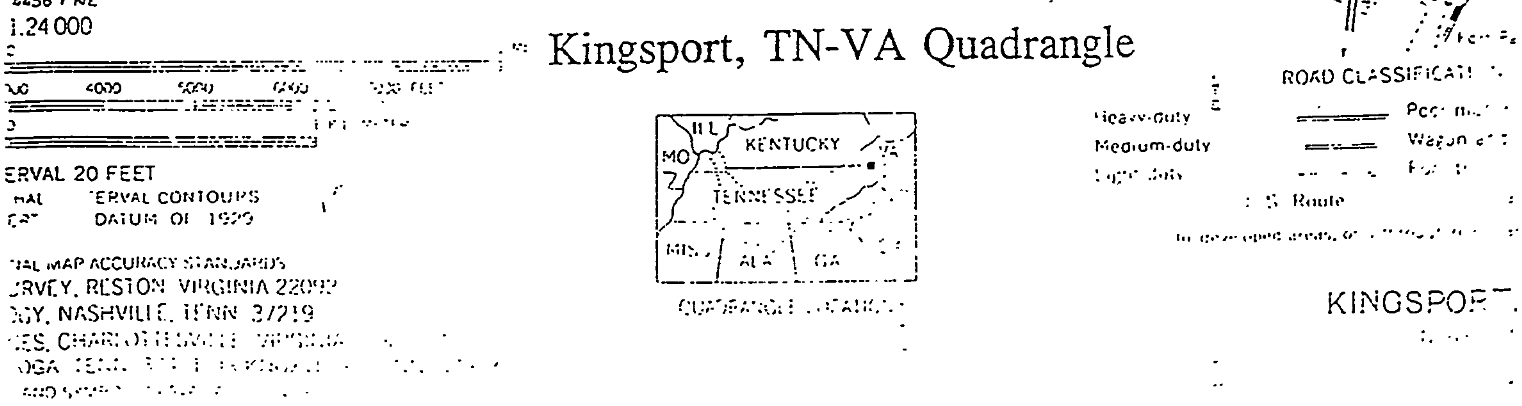
Ryan Vannice
Eastman Chemical Company
P.O. Box 511
Kingsport, TN 37662-5054
(615)229-2885

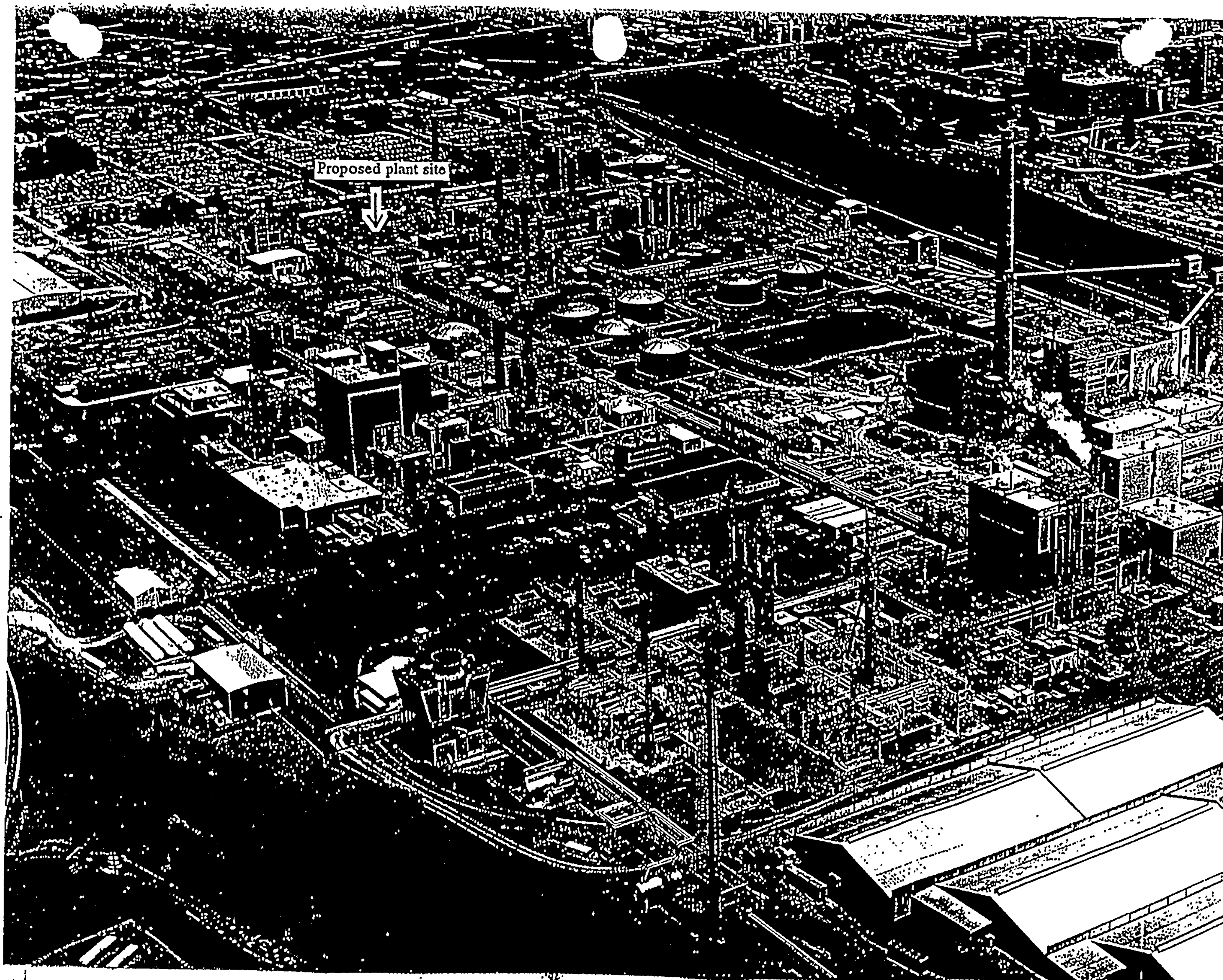
.cc Jerry Bewley
Larry Daniels
Sharon Nolen
Tennessee Eastman Division

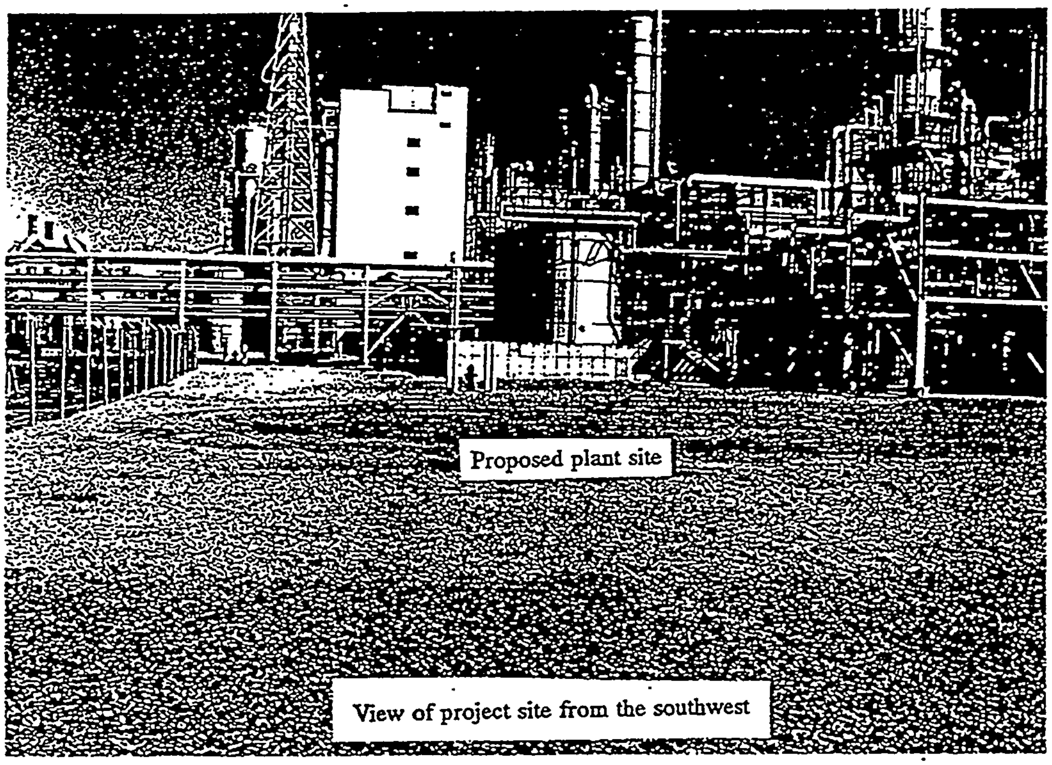
enclosures

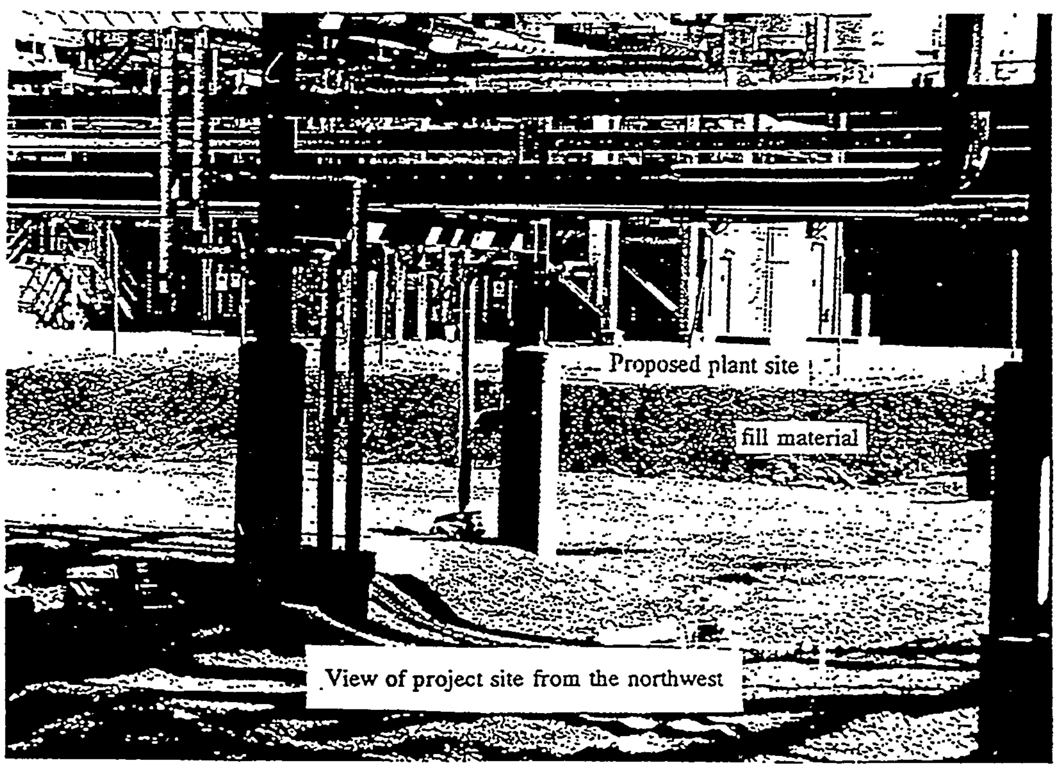


Kingsport, TN-VA Quadrangle




Proposed plant site


Proposed plant site
View of project site from the southwest


Proposed plant site
fill material
View of project site from the northwest

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
401 Church Street
Nashville, Tennessee 37243

FEB 1994
RECEIVED

To: Richard Strang

From: William M. Christie, WMC
Ecological Services Division

Subject: Environmental Review for Threatened and Endangered Species.

Date: 2/25/94

Project: Industrial Project Site

Be advised that a review of our data base indicate no recorded threatened and endangered species for this specific project area.

The results of this review does not mean that a comprehensive biological survey has been completed for this and other sites.

/wmc

Ecological Services Division: 8th Floor, L & C Tower, 401 Church St., Nashville, TN 37243-0447 • Phone (615)532-0437 • FAX(615)532-0046

a. listed at 40 CFR 372.65 pursuant to Section 313 of Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986, also titled the Emergency Planning and Community Right-to-Know Act of 1986;

b. present at or above threshold levels at a facility subject to SARA Title III, Section 313 reporting requirements; and,

c. that meet at least one of the following criteria:

i. are listed in Appendix D of 40 CFR 122 on either Table II (organic priority pollutants), Table III (certain metals, cyanides, and phenols) or Table V (certain toxic pollutants and hazardous substances);

ii. are listed as a hazardous substance pursuant to section 311(b)(2)(A) of the CWA at 40 CFR 116.4; or,

iii. are pollutants for which EPA has published acute or chronic toxicity criteria.

SBL

02640PMT.DOC

TENNESSEE HISTORICAL COMMISSION
701 BROADWAY
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
NASHVILLE, TENNESSEE 37243-0442

March 13, 1994

Mr. Ryan Vannice
Eastman Chemical Company
Post Office Box 511
Kingsport, Tennessee 37662-5054

Re: DOE; PROPOSED METHANOL PRODUCTION FACILITY; LONG ISLAND OF THE HOLSTON; SULLIVAN COUNTY

Dear Mr. Vannice:

The above-referenced undertaking has been reviewed pursuant to Section 106 of the National Historic Preservation Act for compliance by the participating federal agency or applicant for federal assistance. Procedures for implementing Section 106 of the act are codified at 36 CFR 800 (51 FR 31115, September 2, 1986).

Based on the documentation submitted, we concur with your determination that the above-referenced project will have no effect on the characteristics of the Long Island of the Holston which qualified the property for inclusion in the National Register of Historic Places.

If you are applying for federal funds, license or permit, you should submit this letter as evidence of compliance with Section 106 to the appropriate federal agency, which, in turn, should contact this office as required by 36 CFR 800. If you represent a federal agency, you should submit a formal determination to this office for comment. Questions or comments should be directed to Joe Garrison at (615) 532-1559. Your cooperation is appreciated.

Sincerely,

Herbert L. Harper

Herbert L. Harper, Executive Director
Deputy State Historic Preservation Officer

HLH:kes

United States Department of the Interior

FISH AND WILDLIFE SERVICE
446 Neal Street
Cookeville, TN 38501

April 21, 1994

Mr. Richard M. Strang
Principal Environmental Representative
Eastman Chemical Company
P.O. Box 511
Kingsport, Tennessee 37662

Dear Mr. Strang:

Thank you for your letter and enclosures of April 5, 1994, regarding the proposed construction of a methanol production demonstration project in Kingsport, Sullivan County, Tennessee. The Fish and Wildlife Service (Service) has reviewed the information submitted and offers the following comments.

Review of the Kingsport quadrangle of the Service's National Wetlands Inventory maps reveals that there are no forested, emergent, or scrub-shrub wetlands in the vicinity of the project. Therefore, the Service anticipates that there will be no project-related adverse impacts to valuable wetland resources.

We have also reviewed the proposed methanol production demonstration project with regard to endangered species. According to our records, there are no federally listed or proposed endangered or threatened plant or animal species in the project impact area. In view of this, we believe that the requirements of Section 7 of the Endangered Species Act have been fulfilled and no further consultation is needed at this time. However, consultation should be reinitiated if: (1) new information reveals that the proposed project may affect listed species in a manner not previously considered, (2) the proposed project is subsequently modified to include activities which were not considered during this review, or (3) new species are listed or critical habitat designated that might be affected.

Thank you for the opportunity to comment on this action. If you have any questions, please contact Sharon Martin of my staff at 615/528-6481.

Sincerely,

Lee A. Barclay

Lee A. Barclay, Ph.D.
Field Supervisor

EASTMAN

Eastman Chemical Company
P.O. Box 511
Kingsport, Tennessee 37662

April 5, 1994

Mr. Jim Widlak
U. S. Fish and Wildlife Services
446 Neal Street
Cookeville, TN 38501

Dear Mr. Widlak:

Air Products and Chemicals Inc., Tennessee Eastman Division (TED) and the U.S. Department of Energy (DOE) are proposing to build a small commercial-scale methanol production demonstration project in Kingsport, Tennessee at the existing TED manufacturing facility. The project is part of DOE's Clean Coal Technology Program and is designed to demonstrate a production process which can produce cleaner burning fuels for trucks, automobiles and electric power generating plants.

The proposed site for the project is a 0.34 acre plot located adjacent to existing manufacturing buildings at TED. The area has been backfilled with approximately six feet of compacted shale and a six inch gravel cover. A copy of a topographical map is enclosed showing the location of the site. Extensive expansions of the TED manufacturing complex have occurred since this map was revised. The Long Island School and many of the other residential structures indicated on the map have been removed and replaced by manufacturing buildings. A recent photograph of the 0.34 acres which shows the current level of development is also enclosed.

I am in the process of preparing an Environmental Information Volume for DOE. A discussion of the rare or endangered plant and wildlife species which might be impacted by this project is required as part of this effort. Please provide me with any information you have concerning rare plants or wildlife known to exist in the vicinity of the proposed site.

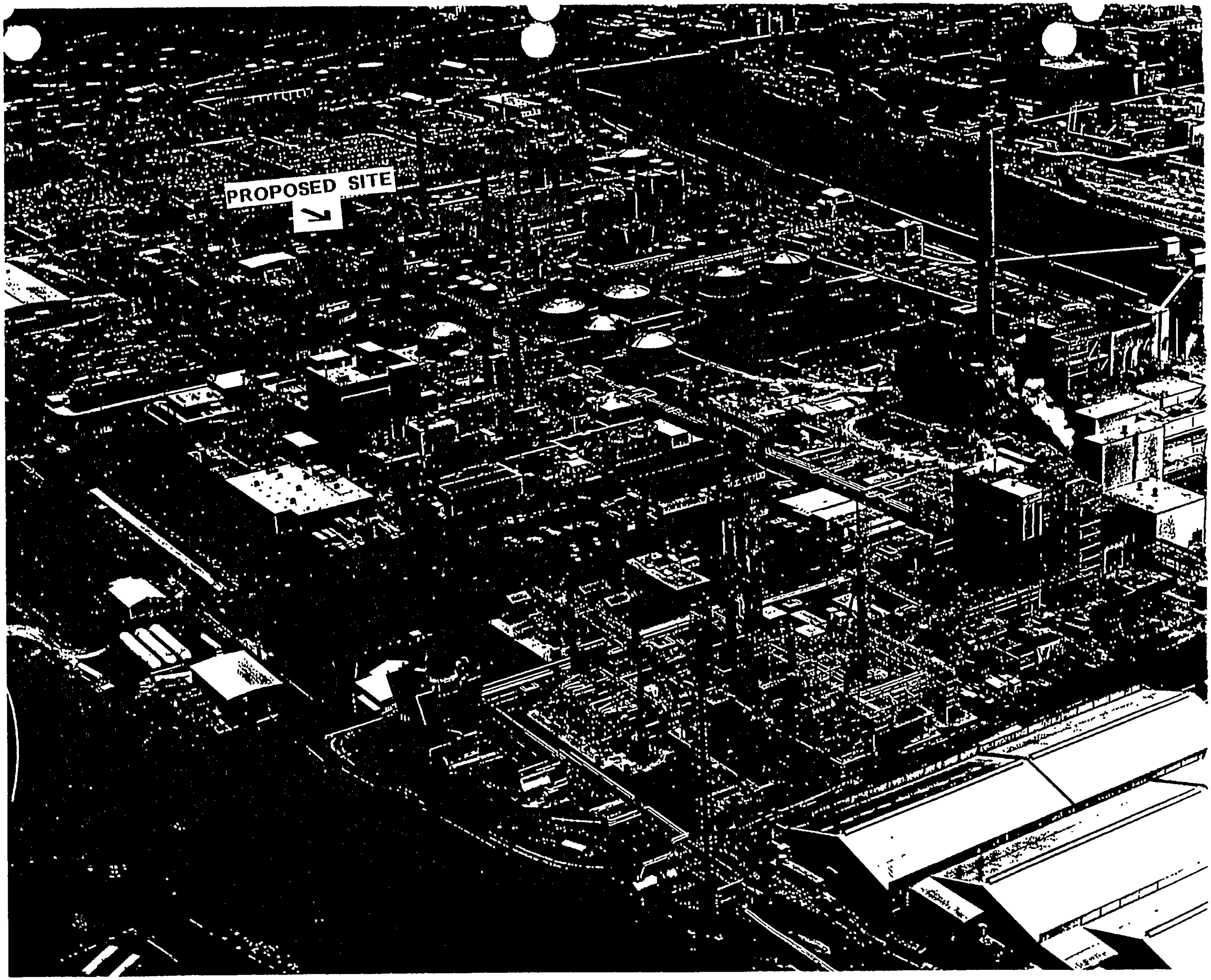
Thank you for you assistance in this matter. If you have any questions, you may call me at (615) 229-6677.

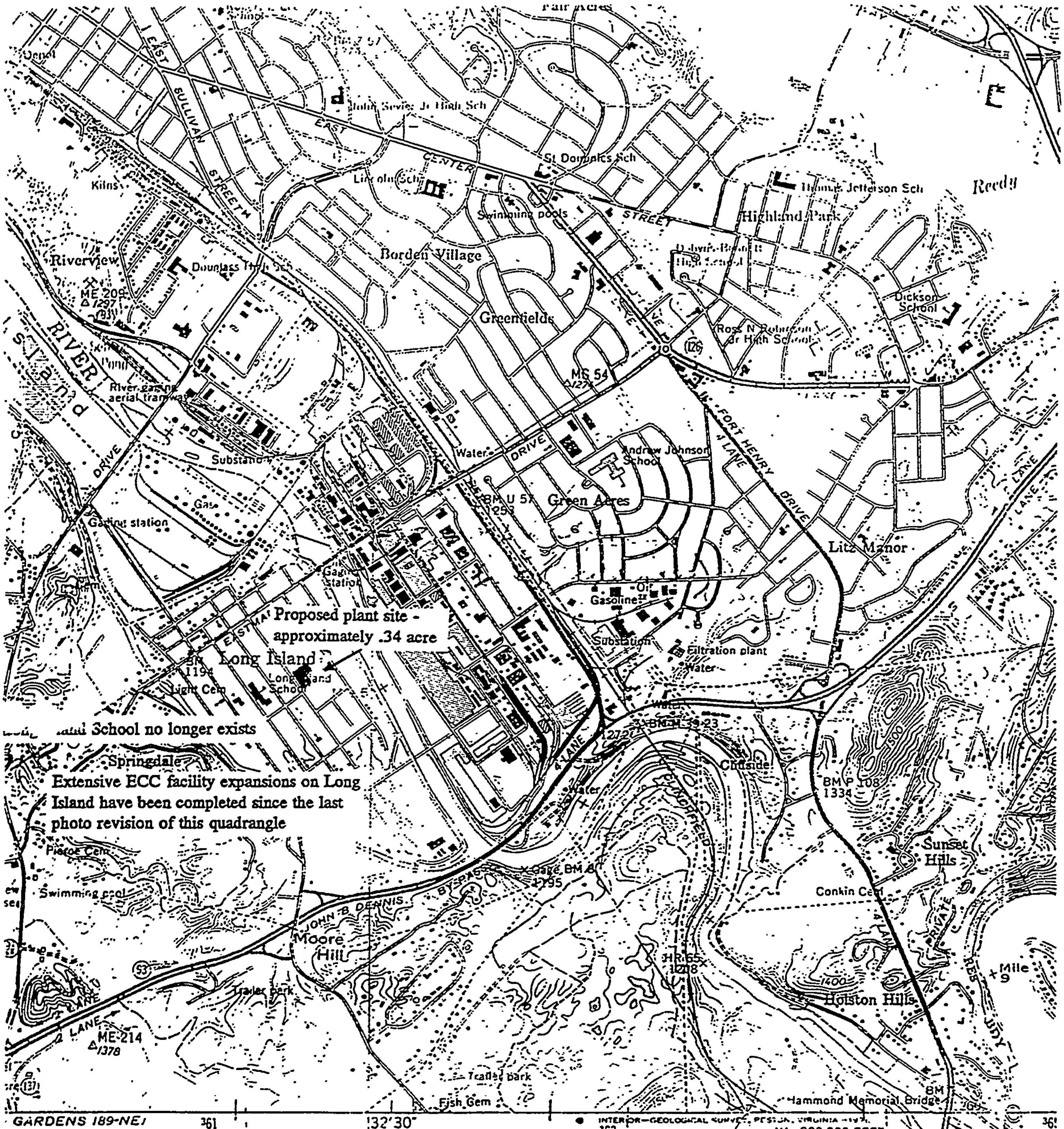
Very truly yours,

Richard M. Strang

Richard M. Strang
Principal Environmental Representative

National Quality Award
1993 Winner
Eastman Chemical Company


PROPOSED SITE



Kingsport, TN-VA Quadrangle

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1 KILOMETER

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Light-duty ...... Foot tra

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QUADRANGLE LOCATION

ILL. KENTUCKY VA. MO. TENNESSEE MISS. ALA. GA. S.C.

KINGSPORT,

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19!

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RVAL CONTOURS
DATUM OF 1929

AL MAP ACCURACY STANDARDS
RVEY, RESTON, VIRGINIA 22092,
GY, NASHVILLE, TENN. 37219,
ES, CHARLOTTESVILLE, VIRGINIA 22903
OGA, TENN. 37401 OR KNOXVILLE, TENN. 37902
AND SYMBOLS IS AVAILABLE ON REQUEST

EASTMAN

Eastman Chemical Company
P.O. Box 511
Kingsport, Tennessee 37662

March 15, 1994

TO: Community Advisory Panel Members

The meeting last night included a presentation on acid rain, health, safety and environmental programs in some of the manufacturing areas and a recommendation that the Panel serve to assess Eastman's effectiveness in implementing the Community Awareness and Emergency Response Code (CAER) for Responsible Care®.

The following members were absent:

Dick Gendron
Betty Ottenfeld
Brenda Walters
Keith Westmoreland

The next meeting is scheduled for Monday, May 9. The meeting will be dedicated to assessment of the CAER Code by the Panel.

Please mark the date on your calendars.

Very truly yours,

Bill

Bill D. Edwards
Manager
Community Relations

ptw/caer

Betty:

Hope you are feeling better. We missed you. Enclosed is copy of an article on CAPs with reference to ours on page 20. Will send you the magazine when we receive a supply.

National Quality Award 1993 Winner
Eastman Chemical Company

A G E N D A

March 14, 1994

Introduction . . . . Edwards

Acid Rain Report . . . . Dr. Elaine Zoeller

Grass Roots Safety and Environmental
Representatives Employee Environmental
Survey . . . . TED Environmental Representatives

Information Update . . . . Garwood

Powerhouse Precipitators
Tank Farm Relocation
Education Involvement
HDC Report

CAER Code . . . . Ron Bumpers

Nascar . . . . Edwards

ptw/Marchcap

APPENDIX VI

EASTMAN AND AIR PRODUCTS LITERATURE

FOR CURRENT COPIES OF THIS LITERATURE PLEASE CALL FRANK FRENDUTO (AIR PRODUCTS AT 610-481-7857)

RESPONSIBLE CARE®

OUR PLEDGE
TO IMPROVED HEALTH, SAFETY AND ENVIRONMENTAL PERFORMANCE

Eastman Chemical Company is committed to protecting health, safety, and the environment and to continually improving the performance of all company operations in these areas through the endorsement and implementation of **RESPONSIBLE CARE®**.

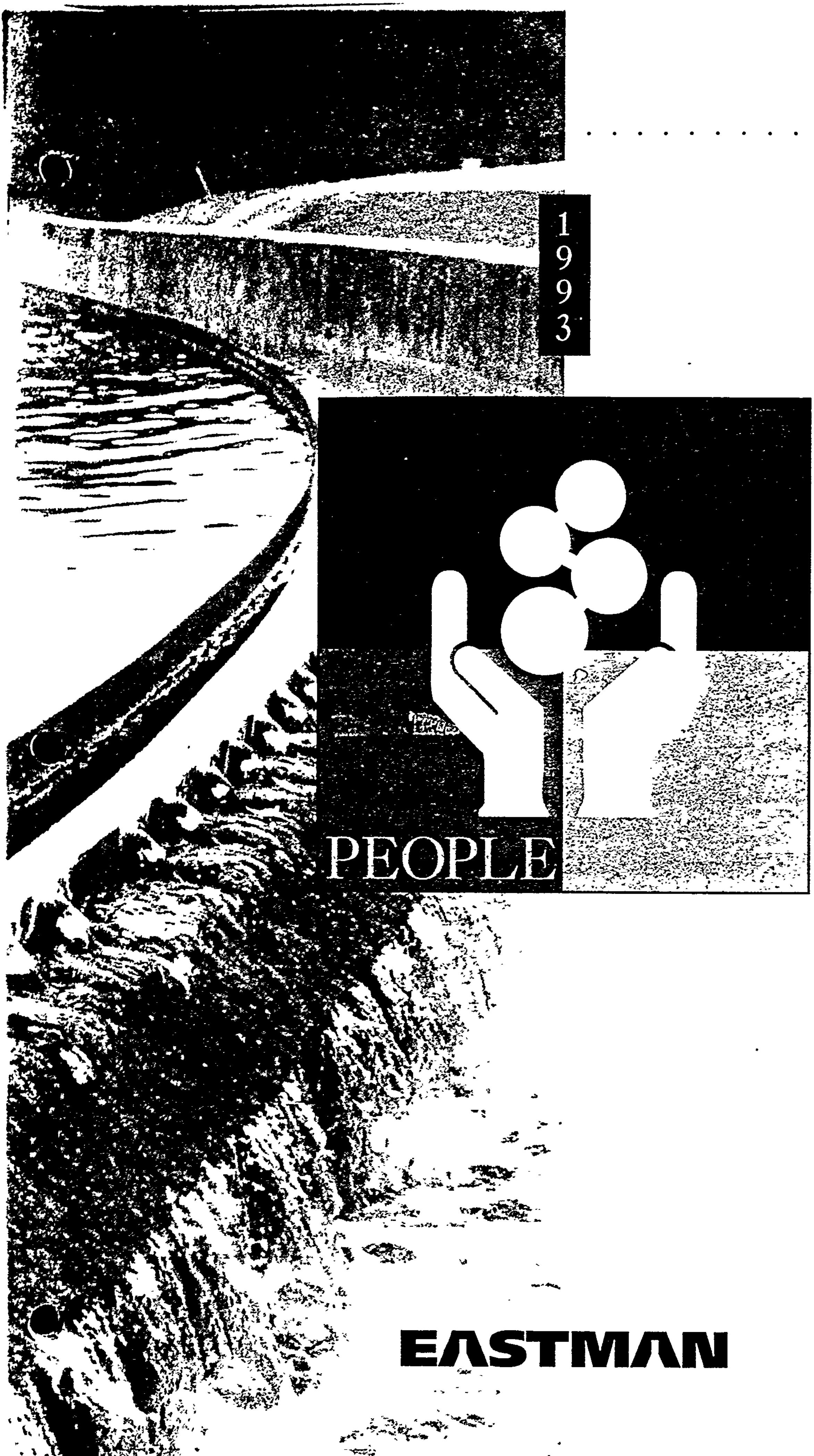
We will conduct business according to these **RESPONSIBLE CARE** principles:

- **To recognize** and respond to community concerns about chemicals and our operations.
- **To develop** and produce chemicals that can be manufactured, transported, used and disposed of safely.
- **To make** health, safety and environmental considerations a priority in our planning for all existing and new products and processes.
- **To report** promptly to officials, employees, customers and the public, information on chemical-related health or environmental hazards and to recommend protective measures.
- **To counsel** customers on the use, transportation and disposal of chemical products.
- **To operate** our plants and facilities in a manner that protects the environment and the health and safety of our employees and the public.
- **To extend** knowledge by conducting or supporting research on the health, safety and environmental effects of our products, processes and waste materials.
- **To work** with others to resolve problems created by past handling and disposal of hazardous substances.
- **To participate** with government and others in creating responsible laws, regulations and standards to safeguard the community, workplace and environment.
- **To promote** the principles and practices of **RESPONSIBLE CARE** by sharing experiences and offering assistance to others who produce, handle, use, transport or dispose of chemicals.

Earnie Deavenport

E.W. Deavenport, Jr.
President

EASTMAN



EASTMAN CHEMICAL COMPANY

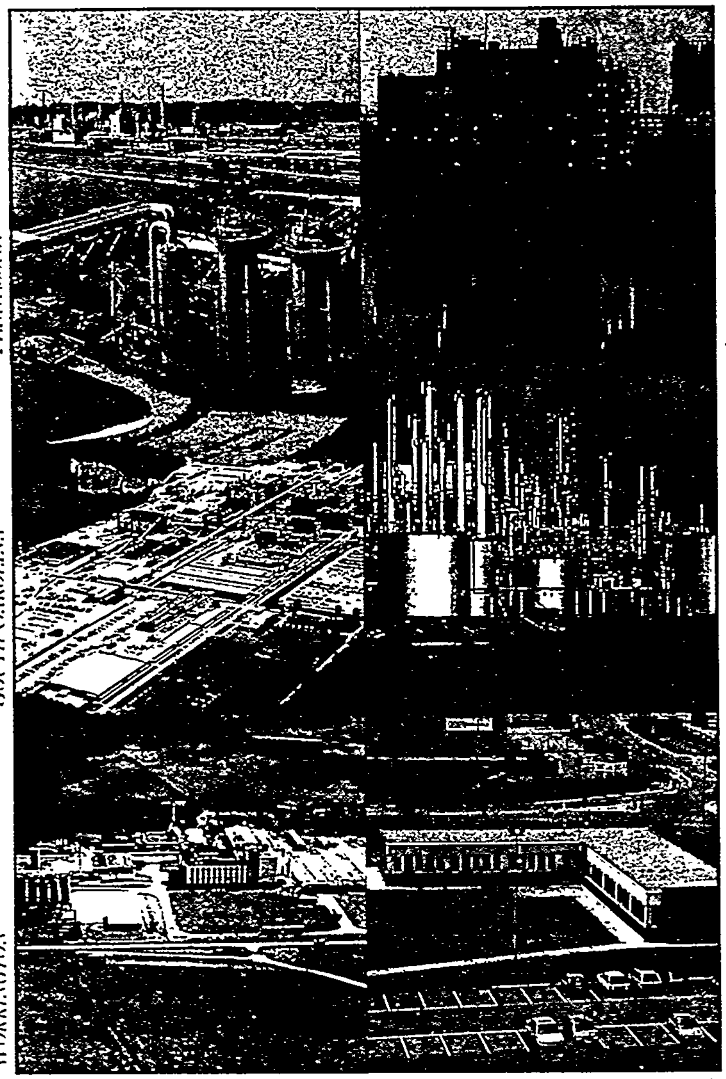
RESPONSIBLE CARE PROGRESS REPORT

HEALTH, SAFETY & THE ENVIRONMENT

EASTMAN

Eastman Chemical Company manufactures chemicals, fibers and plastics, which it markets to more than 7,000 customers around the world. Eastman's headquarters are in Kingsport, Tennessee as are its largest manufacturing site, sales headquarters, research and development, and corporate administrative offices.

Other major manufacturing operations are located in Longview, Texas; Batesville, Arkansas; Columbia, South Carolina; and England. Eastman employs about 18,000 people worldwide with annual sales of $3.9 billion in 1993.



TENNESSEE — ARKANSAS — SOUTH CAROLINA — TEXAS — WORKINGTON — HARTLEPOOL

EASTMAN

Publication No P-205 A
Printed in U S A.

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