

Interoffice
Communication

FROM: P. C. Gowan
DATE: September 14, 1989
SUBJECT: ENVIRONMENTAL STUDY

VISTA

This document is being distributed for your information. It was compiled with a number of different objectives and internal audiences in mind. The "Prologue" summarizes these.

Please keep in mind that it does not define a total plan or policy upon which to base actions, though several recommendations may be accepted. At this point, I believe that it may be useful as an educational tool, a reference document and a starting point for development of informed consensus. Actions to be taken will be directed through the line organization as appropriate.

Please contact me with questions or suggestions and keep in mind that I would be happy to address interested groups within the Company on this subject at your request.



Paul C. Gowan

S&T.012/mlf

PROLOGUE

This report is intended to address the following questions regarding Vista's environmental situation:

- Where have we been?
- Where are we today?
- What is the outlook for the future?
- How can past performance be improved?

It should be viewed as a beginning rather than an end product. The objectives in compiling the information are several:

- To inform and educate those who may not have closely followed recent developments in the environmental area.
- To serve as a reference document where appropriate.
- To identify areas which need further work.
- To serve as a starting point for development of an informed consensus in the organization.

PCG:dps

8-30-89

Executive Summary

EXECUTIVE SUMMARY

Environmental capital commitments are expected to total \$50-\$100MM over the next five years. This large resource requirement is due to increasingly stringent regulations governing allowable chemical emissions to air, land, and water.

It is anticipated that the regulatory trend will continue on toward an eventual "zero discharge" standard. This is due to increasing public pressure to eliminate health risks from preventable chemical exposure. Coupled with it is an increasing trend toward local public control of the discharge permitting process. Therefore, a strong incentive exists to ensure that the systems built to address the short-term situation are also compatible with anticipated long-term requirements. Otherwise, some portion of the upcoming investment may ultimately be re-spent.

To the degree that Vista successfully anticipates and integrates future requirements into current solutions, a competitive advantage may be obtained over companies which pursue piece-meal approaches.

The project to upgrade the Lake Charles Wastewater System is the most expensive (\$40+MM) environmental issue in the current plan. It is also an excellent example of the preferred way to approach environmental challenges. It appears to be a flexible, modular system which can be adapted to meet more stringent requirements as they occur. It was developed as a series of alternatives from which informed choices could be made. The selected approach required the smallest initial investment. The detailed design and implementation phase has a full-time project manager. Nevertheless, as far as implementation timing, Vista appears to be in the lower middle of the competitor group surveyed. This indicates that some organizations may have a head start in analyzing and planning for

future requirements.

Investments of \$35MM and \$10MM may be required at Aberdeen and Oklahoma City respectively to reduce residual VCM in PVC resin. About \$2MM of environmental items are included in the Ethylene Expansion Project. A \$70MM PACOL front-end at Baltimore would address numerous issues, some of which are environmental. These projects are further discussed in the body of the report.

The remainder of Vista's current environmental plan is a compilation of several location-specific plans, some further developed than others. None is in final form for the next five plus year period. Many projects have been identified and manpower anticipated to be required has been estimated for most. Few are yet developed to the point of being cost-estimated. This area will require significant work to bring it into full focus. At some locations, external resources are expected to be required for design and implementation.

With the recent release of Vista's Environmental Policy Statement, the organization is better equipped to proceed with the discussion and debate necessary to refine the current plan into one which better reflects an organizational consensus.

A number of recommendations address issues identified during this three month study. The following is a summary.

1. Environmental decisions should receive broader input and be fully integrated into Business Area strategies. This is a key requirement if the cost burden is to be developed into either a neutral or a competitive advantage.

2. In support of the above, greater and earlier R&D involvement in addressing these issues is warranted. Also technical personnel should be actively encouraged to look at the total system, to develop alternative solutions and to identify returns on incremental/decremental expenditures relating to those options.
3. An active effort should be initiated to gather and compile information on the developing environmental activities and philosophies of both domestic and foreign competitors. This will provide an additional yardstick against which to assess our own.
4. The above recommendations are all directed toward obtaining additional or better quality facts and viewpoints on which to base decisions. It is proposed that environmental decisions continue to be based upon sound business judgement, taking into account both long- and short-term factors, both internal and external. This differs with past tendency to set environmental matters apart from normal business activities because they are externally imposed and viewed to be non-productive costs. The magnitude of predicted future expenditures should preclude that approach.
5. Resolve the environmental performance standards to which smaller businesses such as Blane, Premiere, and Vycom will be subject. The same need may exist for offshore joint ventures and trading activities. Competitive issues must be balanced against Vista's liability in the event of a problem.
6. Marketing of streams which would otherwise be considered "waste" poses both opportunities and challenges.

Successfully placing streams not currently sold, such as Ethylene Unit spent caustic and VCM incinerator HCl, could result in a capital avoidance in the \$5MM range and operating/disposal cost avoidance in the \$2-5MM per year range. These appear at present to be "either-or" situations and should receive high priority. Several other streams have significant potential for margin improvement/cost reduction, but can be viewed opportunistically. A third category is those currently being sold, but which would quickly become problems if the current customers were lost. Development of contingency plans for these streams may be warranted.

7. Evaluate Vista's off site chemical emergency response readiness via a joint Manufacturing/S&T Team.
8. Consider utilizing additional resources, which may include consultants and contractors, as necessary to catch up on environmental activities. As previously mentioned, this need may exist particularly at Lake Charles. Duration maybe over the next one to two years.
9. Consider whether an intensified R&D effort in PVC compound/dryblend formulation may allow Vista to gain a competitive advantage as regulations tighten on heavy metals, flame, and smoke generation.
10. Consider use of a consultant to assess DOT pipeline compliance. This may be an immediate need.
11. Continue to support development of waste minimization goals by location and for the corporation. Manufacturing locations are underway with identified coordinators and targets to be included in objectives.

BACKGROUND

A

ENVIRONMENTAL WHITE PAPER

BACKGROUND

Summary

Environmental issues are again assuming a prominent place on the national agenda. This can be seen in legislative initiatives, increasingly visible action by regulatory agencies and a shift in public opinion. This last may be partially attributable to "media events" following newsworthy spills and the public release of industry emissions data. The more astute politicians sense an environmental mandate and are publicly declaring their new-found activism.

During the 1970's and early 80's, regulations and procedures were put in place to correct "gross pollution". The emphasis now turns to reduction of the remainder by on the order of 90% in order to protect public health. In the current debates as to what constitutes an "acceptable risk", cost/benefit considerations are notably absent. Objective research data is unavailable regarding human health effects of long term exposure to low chemical concentrations; therefore, decisions will be based on an emotional objective of "zero risk" with reality moving ever closer toward that "zero discharge" standard.

While Vista has historically concentrated on remaining in compliance with environmental regulations as they developed, this may not be a cost effective approach in the long term. At Lake Charles, we face a multi-million dollar replacement of existing wastewater treatment facilities in order to comply with ever-tightening standards. A more proactive approach over the years could very well have cost no more than was spent and have avoided the upcoming expenditures altogether or at least to some extent. By approaching the environmental area strategically rather than reactively, Vista can achieve a competitive advantage over those who continue piecemeal programs based on minimizing short term costs.

A more compelling reason may be that proactive companies are more likely to obtain public endorsement of their right to operate than are laggards and those who chronically fall short of regulatory standards. This issue is expected to grow in importance with time as discharge permit issues become increasingly subject to control at the local public level.

The following is a partial list of environmental issues which affect or will affect Vista:

- A. Air emissions of organics from wastewater treatment systems. (Anticipated 1990)

- B. Sara Title III reporting - public outcry over industry emissions with probable increased regulations. (In force 1988)
- C. Definition of "safe" levels of various chemicals in air and water. (Definition debate in progress)
- D. States establishing individual regulations more stringent than federal. (Increasing trend)
- E. Much tighter limits for various chemicals in wastewater - whether discharged directly or to city treatment system. Examples are: LCCP wastewater BOD reduction of 80-90%; Baltimore benzene from essentially unregulated to parts per billion level; VCM Plant EDC 99.6% reduction. (Implementation of new regulations underway)
- F. Improving analytical ability allows regulation to parts per billion and lower vs. parts per million a few years ago.
- G. EPA mandated by legislature to "eliminate discharge of pollutants into waters of the United States". (Strategy statement in Clean Water Act of 1972 and 1987 indicating long term direction)
- H. "Hazardous" waste being redefined to encompass more chemicals in much lower concentrations. (1989 and continuing) Potentially includes almost everything but waste paper. For example, some off-spec PVC compounds are currently classified as hazardous due to metals content. The proposed regulations would include PVC resin with VCM residuals exceeding about 5 ppm. It has been claimed that shredded paper money from the U.S. Mint is hazardous waste in California due to heavy metals content of the printing ink.
- I. Federal regulations require tank and pond modifications to minimize potential for release of hazardous materials to groundwater. (Now in force)
- J. State of Louisiana already expressly prohibits discharge of "pollutants" to groundwater. (Recently in force)
- K. New regulations will eliminate burning of many "hazardous" materials as boiler fuel. (Anticipated 1989)
- L. State and Federal regulations being phased in to eliminate any landfill type disposal of many "hazardous" wastes. (Implementation 1989-90)
- M. "Acceptable Risk" will be decided in local public forum instead of by scientific study! This may become the most

B

Past Practice/Philosophy

When we were Conoco Chemicals, the environmental philosophy was to stay in legal compliance with regulations as they were developed. This was done primarily with closely controlled capital expenditures for equipment at the "end of the pipe". The equipment was designed to collect a wide variety of waste streams and either dilute or destroy chemicals which would otherwise be emitted directly. In light of current understanding, relatively little was done to the manufacturing processes or operating practices to eliminate, segregate or recycle these wastes other than for yield improvement.

As Vista, the basic philosophy of compliance remained initially the same and we achieved the added benefit of Conoco/DuPont retaining liability for conditions or practices preceding the purchase. This retained liability has resulted in significant cost savings for Vista, but it is far from a panacea and relates very little to many of the issues we face in the near future. For instance, the split of costs to cleanout sludge from equipment in use both before and after the formation of Vista is a topic for negotiation. Costs to reduce emissions from Level A to a lower Level B due to a recent regulatory change belong solely to Vista.

Therefore, with the exception of pre-existing groundwater contamination and closure of idled waste treatment ponds, Vista faces future environmental challenges on the same regulatory basis as our competitors.

The opportunity exists, however, to manage these expenditures in such a way as to achieve a competitive advantage. At first glance, turning a forced expenditure into an advantage would seem a bit optimistic. But just as the Federal Trade Commission imposes rules to supplement free market forces, so too do the environmental regulators. By so doing, a more or less "level playing field" is created. Just as some organizations achieve a competitive edge within the commercial arena, so too can other constraints be met more efficiently by one group than by another. The difference in performance per dollar expended comes from ceasing to treat environmental costs as a burden and instead, beginning to manage them in the same way as any other aspect of doing business; i.e., Do they make sense to the benefit of the business and how can this benefit be maximized?

As an example, consider the Lake Charles Complex wastewater treatment system. Between 1960 and 1986, Conoco/Vista spent approximately \$10MM capital on facilities which must now be abandoned and replaced because they cannot meet new standards. In 1989 dollars, that cost is about \$35MM. Those facilities will consume another \$10MM in cleanout and closure cost before they can be abandoned. So, in today's dollars, we expended and committed \$45MM to those facilities.

C

Regulations

As things currently stand, a plethora of regulations, both state and federal, deal with environmental issues. These regulations, carrying the force of law, appear to be a maze of overlapping, interlocking and sometimes conflicting set of directives. Fragmented administration, scope, timing and technical particulars abound. Numerous critical (to Vista) interpretations are vague and/or left to the discretion of functionaries in one agency or another. Definitions of what constitutes a hazardous chemical and what concentration is harmful vary from group to group, list to list. New regulations, along with updates, expansions and re-authorizations of existing regulations continue to be issued for review, public comment or in final form on a daily basis.

In order to make some sense of it all, consider that there are five major areas being addressed:

- 1) Air emissions
- 2) Wastewater quality
- 3) Groundwater contamination
- 4) Hazardous solid waste
- 5) Non-hazardous solid waste (garbage)

During the late 60's and 70's, most of the emphasis (as far as the chemical industry) was being placed on wastewater quality. The intent was to eliminate gross pollution of lakes and streams which caused oil slicks, fish kills and destroyed recreational value. The automobile industry felt the effect of efforts to reduce air emissions from vehicles.

In the late 70's, air quality in terms of smoke and sulfuric acid precursors became an issue for the chemical industry. The question of how to dispose of hazardous solid and liquid wastes began to be a constraint. Also, studies were beginning to identify health effects from exposure to various common chemicals. Major cities began to run out of space for conventional garbage dumps.

Through the early to mid 80's, concern mounted regarding possible chemical contamination of underground water supplies and allowable limits were "fine-tuned" downward on all the above. The general public saw no new major initiatives and concluded that the Reagan Administration had abandoned the environment. However, the regulators continued to tighten existing standards.

It has been estimated that 80-90% of pre-1970 emissions were addressed by regulations to date. A mandate seems to exist to reduce the remainder by another 80-90% within the next several years. (Remember that cost increases geometrically.) Individual states have begun proposing and enforcing regulations which are

much more strict than federal standards. The State of Louisiana is a prime example.

The driving force for this new round of cleanup has moved from the visible effects on the environment to an emphasis on protecting human health. An example is the pending wastewater biotoxicity standards which require survival of microscopic and extremely delicate water fleas as an indicator of non-toxicity.

The following is a sampling of actual and proposed regulations. They are more fully described in the Appendix.

I. Air

- A. EPA - Clean Air Act - Remove 95% of volatile organic organic compounds from wastewater streams before going to treatment. (Proposed)
- B. EPA - RCRA - Reduce organics from hazardous waste storage, treatment and disposal by 95%. (New in force)
- C. EPA - NESHAPS - EPA required to set emissions standards which provide ample margin of safety to protect human health. (1987)
- D. State of La. - New installation may contribute no more than 1/42 of allowable exposure limit at plant fenceline. (Much lower for carcinogens based on health risk factors of 10^{-4} to 10^{-6} . (New)
- E. EPA - SARA Title III - Industry required to publically release annual inventory of hazardous emissions to air, ground, water. (1987)

II. Wastewater

- A. EPA - OCPSF - Control pollutants by best available technology (80-90% reduction for Lake Charles Complex). (1987)
- B. EPA - Cleanwater Act - Eliminate discharge of pollutants into waters of U.S. (1972 & 1987)
- C. EPA - TC - Redefines what materials are hazardous and therefore subject to the extremely strict set of handling/treatment/disposal requirements of RCRA. (Anticipated 1989)

D

Public/Legislative Sentiment

It might be said that information and "education" are raising public awareness of and sentiments against human health effects of chemicals in the environment.

For many years a vocal percentage of the general public has maintained that industrial decision makers are allowing irreparable harm to be done. After 20-30 years of attempts to dispel that perception, it remains. Unfortunately, as more concrete knowledge became available and past abuses were uncovered, we had to concede that to some extent, unwitting harm was done. Regardless that past practices were based on good faith ignorance, for industry to achieve credibility with the general public is extremely difficult at this point.

Within the past few months, the first annual reports of hazardous emissions were made available to the public under SARA Title III "Right to Know" legislation. Nearly everyone can read about tons of chemicals, which the government says are hazardous, being emitted within their general area. This is a frightening prospect, particularly to the uninitiated.

This data, coupled with other "media events" such as spills, releases, and cancer corridors has spread concerns across a much larger portion of the populace than the previous vocal few. Topics such as global climate changes and acid rain are now debated at the international level.

From that perspective, let's revisit the question of "acceptable risk". Simply stated, this means "What chance of getting cancer from preventable chemical exposure am I willing to accept?" The current debates deal with ranges of 1 in 10,000 to 1 in 1 million. Even these infer emissions of cancer-related materials in the parts per billion to parts per trillion range.

There is no reason to believe, however, that the public will accept any given exposure level as being low enough if the opportunity exists to drive it lower still. This is particularly true if the public remains convinced of industrial insensitivity.

That is why an eventual zero discharge standard is likely, with the only real questions being "How soon and with how many stops along the way?"

The legislators and other elected officials have begun to realize the degree of support available to environmental activists. Numerous legislative initiatives are making their way through the system as "read my lips" gives way to "clear the air".

One little-noticed regulatory procedural change is that public comment periods are now a major determinant of outcome. In

E

Other

By now, anyone who has not closely followed this area over the past several years may be feeling a bit punchy.

The news is not all bad. As with previous regulatory initiatives, real world considerations of jobs and the need to avoid wholesale loss of segments of American industry are apt to temper implementation timing. The sky won't fall, but we will find a way to achieve the required levels of performance.

That is not to say that any individual company will not be hurt. It is reasonable to expect that those best able to adapt to changing situations will gain at the expense of those which are unwilling to change.

Vista has no apparent fatal flaws such as Love Canal or Bophal. We do have some groundwater contamination by EDC at Lake Charles and benzene at Baltimore, but believe the remediation actions underway have it surrounded. We may be at a disadvantage in PVC reactor stripping. A group is working to define that. We know that a large expenditure is necessary to replace the Lake Charles wastewater treatment system, but believe that to be a prudent, well thought out solution. It is possible that further investigation will uncover other regulatory-driven requirements. However, our competition also must face the same regulations and many have substantial pre-existing liabilities as well.

In short, there is no ticking bomb.

It should be noted that this conclusion is not necessarily shared by all of Vista's environmental and enviro-legal experts. It has been suggested by some involved in day-to-day environmental activities that a ticking bomb does in fact exist. That bomb is a result of a general complacency and failure to appreciate the seriousness of the challenges facing the Company. This concern stems from a perception that increases in resources applied to the environmental area are being made belatedly and fear that financial restructuring will cause management attention to be directed elsewhere, precluding effective solutions. The management challenges in the environmental area include dispelling that fear.

In truth, Vista's regulatory compliance record is not pristine. While most excursions do not result in formal enforcement actions, the trend toward formal proceedings against violators is increasing. Vista Legal has recently assembled the following data on enforcement actions (not all of which are strictly environmental):

PLAN DEVEL.

DEVELOPMENT OF A PLAN

Summary

To say that Vista currently has a solid, fully integrated and engineered long-range environmental plan would be misleading. That ultimate plan will evolve as the implications of the Corporate Environmental Policy are tested, understood, and interpreted by employees and managers.

There exist good location - specific plans, some more fully developed than others. Corporate Policy Statement communication has recently begun.

There also exists a good example of the development of a long-range plan directed toward one waste category at one location. This is the LCCC Wastewater Project. The methods and approach used in the development of that project may be applicable to other selected issues. Additional recent examples of longer range thinking include the Baltimore Sewer Project and the environmental aspects of the Ethylene Expansion Project.

5. Fully integrated with business area strategy and

Objectives

In order to achieve a favorable result, any plan must meet certain criteria. There must first be recognition that having some plan is necessary. The plan itself must be consistent with overall organizational objectives. Most importantly, thought leaders and decision makers must be able to "buy in" on the strategy and tactics implied in the plan.

The objective in developing an environmental plan for Vista is to satisfy those criteria.

The recognition element is addressed in the "background" section of this document. Consistency derives from the plan objectives as guided by policy; in this case, the Corporate Environmental Policy which is by definition consistent with overall corporate objectives. "Buy in" is anticipated to come from communication, debate, and refinement of the initial proposals contained in this document.

An ideal environmental plan might include the following among its objectives:

1. A long-term view vs. short term.
2. An integrated system vs. a sub-optimized "band aid" approach.
3. Implementation managed in the same fashion as other aspects of the business.
4. Compatible with eventual "near-zero discharge" standard.

2. Identify waste minimization options for water, air, and solids associated with wastewater treatment.
3. Identify optimum waste management implementation Plan.

While expensive and time consuming, the result was a comprehensive, objective treatment of an extremely complicated area. Perhaps more importantly, the Radian Study allowed for a clear and logical decision making process with multiple alternatives from which to select. This provided the ability to deal with the issues in a businesslike manner. The broader representation on the study team, both internal and external, contributed an overall perspective lacking in a one or two person effort.

Studies

In the past, the study portion of environmental planning has consisted primarily of internal personnel identifying to management the requirements of newly enacted or proposed regulations. Due to the typically short response time allowed by these regulations, communications, and development of action plans tended to be conducted in a crisis type atmosphere. While this approach was successful in focusing attention on the problem, it fostered resentments and misunderstandings which diluted the impact of more forward-looking proposals.

Given that internal studies took time away from today's problems, there was concern that they may have been hastily done or might be lacking in long-range objectivity.

In the Lake Charles Wastewater Project, Radian Corporation, was retained as a consultant to first develop a comprehensive review of wastewater regulations and regulatory trends. This regulatory assessment took one month and cost about \$15,000, excluding the value of time spent by internal people. This portion was completed in November 1988.

Radian then continued to develop project alternatives from which Vista would select one strategy and Radian would then proceed to outline a preliminary process design with implementation plan. As part of this effort, Engineering Science, Inc. was retained by Radian as a subcontractor and Vista retained Lyle Tichler and Diana Kocurek of Austin as an additional resource. A Vista Project Team was formed with representatives from PED and three Lake Charles Plants, plus part time involvement by Headquarters Environmental and Legal personnel. This phase involved six months and about \$235,000 out of pocket cost.

focus. It is not necessary to think of outside consultants in terms of multi-hundred thousand dollars provided that their work is restricted in scope to specific questions. This is borne out by the comparison of regulatory assessment and project development cost for Radian.

A positive aspect of QMP and PD&I influences has been the broadening of representation on internal efforts. Early involvement of R&D, Business Area, and Marketing personnel will continue to be a key factor in converting regulatory burdens into competitive advantages.

Management Reviews

A common complaint from managers has been the tendency for environmental projects to contain no realistic alternatives. The Lake Charles Wastewater Study instead provided four possible approaches encompassing differing costs, technologies, and philosophies.

This allowed selection of a combination of source control and "end of pipe" treatment which can be later adapted to meet more stringent requirements. The selected option was also that of least initial cost. (A summary is included in the Appendix.)

The project implementation is also proceeding in a businesslike manner with appointment of a full-time project manager to direct detailed engineering and construction. Obviously, not all environmental projects require this type of focus, but providing it for this large project is evidence of Vista's commitment to excellence.

As efforts continue to move out of the reactive mode, originators of environmental projects will need to spend additional preparation time identifying positive benefits and developing creative alternatives. Otherwise, the audience will lack a basis for informed business decisions. This issue is further addressed in the Appendix.

Types of Wastes

A comprehensive environmental plan will recognize and address five major types of wastes/emissions:

- Air

- Point Sources

- Fugitive (Leaks)

- Wastewater

- Process Water

- Cooling Tower/Boiler Blowdown Streams

- Stormwater Run-off

- Groundwater

- Existing Cleanup

- Future Contamination Prevention

- Solid Waste - Hazardous

- Continuous Generation

- From Spills or Excavation

- From Old Site Cleanup

- Scrap Product

- Solid Waste - Non-Hazardous

- Trash

- Scrap Product

- Innert Materials

These wastes have a variety of sources, among which are:

Raw Materials	Office Supplies
Intermediates	Transp./Pkg. Supplies
Products	Fuels
Byproducts	Heels, BS&W, Ash, Coke
Wastes/Losses	Contaminated or Surplus Materials
Processing Supplies	Byproducts of Waste Trtmt. Processes
Maintenance Supplies	Spills, Accidents, Upsets
Lab Chemicals	

Vista Chemical Company Environmental Policy

This policy forms the basis of and mandate for future environmental planning. Included in this section are summaries of some possible implications of the policy along with a few examples of this thinking in action.

Vista Chemical Company

ENVIRONMENTAL POLICY

Vista Chemical Company produces and transports chemical products that can potentially impact the environment in the communities in which we conduct business. Vista believes that compliance with all laws and regulations related to environmental quality and public health protection is a *minimum* standard of acceptable practice. Vista Chemical Company is committed to improving Vista's environmental protection efforts to achieve performance levels exceeding those required by law.

Vista recognizes the responsibility we have to our employees, the surrounding communities, customers, carriers, contractors and government agencies to conduct our business activities according to the following environmental principles:

- Vista will inform and educate employees, surrounding communities, customers, carriers, contractors and government agencies of the health and environmental hazards of the chemicals we make, use and sell. These activities will involve recognizing and responding to community concerns regarding environmental issues.
- Vista will continually reduce the risk to employees and neighboring communities posed by chemical substances used, produced and transported within our communities.
- Vista will continue to reduce the potential for emergencies involving chemical releases that would impact the environment and surrounding communities.
- Vista will foster and maintain an awareness of and sensitivity to environmental responsibility among our employees through an ongoing internal communication program.
- Vista will maintain an environmental quality assurance program to ensure that operations are in full compliance with Company policies and procedures, governmental permit limitations and regulatory requirements.

- Vista will determine how each new or existing product can be made, used, handled and disposed of while protecting employee safety, public health and the environment.
- Vista will make safety, health, environmental control and waste minimization essential and integral parts of process and facility design, construction and operation.
- Vista will reduce waste generation in the air, water and soil through employee involvement and the pursuit of source-control technology to reduce emissions from both the manufacturing process and equipment.
- Vista will work with the government and other parties in developing responsible laws, regulations and standards to protect employees, surrounding communities and the environment.

July 20, 1989

Environmental Policy Summary

<u>Item</u>	<u>Impact</u>
Performance Better Than Required	\$
Inform & Educate Employees Community	People
Reduce Risk Used/Produced Transported	\$/People
Reduce Potential for Emergencies (Chemical Releases)	\$/People
Environmental Quality Assurance Program	People
Waste Reduction/Minimization Integral Design Construction Operation Source Control	\$
Government/Regulatory Involvement	People

Corporate Policy Statement

1. A pro-active approach to environmental responsibility.
2. Key differences from previous practice:
 - a. Performance better than required by law as a desired goal.
 - b. Commitment to waste minimization by source control rather than cleanup as it leaves the Plant. Also "designed in" control vs. "added on".
 - c. Emphasis on education and awareness among employees and surrounding communities. Also emphasis on legislative involvement.
3. Why do it?
 - a. Long-term correct approach - minimize resources, rework.
 - b. Regulations directionally headed toward zero discharge. Timing and methods are seemingly the only issues. Unfavorable publicity likely for incidents of non-compliance.
 - c. "Right to know" puts vast amounts of previously confidential information on chemical emissions in hands of public.
 - d. Environmental issues to be increasingly debated in public forms vs. on a technical level. We will need our neighbors on our side.

e. CMA membership requirement.

4. Implications of Corporate Policy Statement

a. Short Term

1. Higher capital theoretically (probably little if any higher from practical standpoint).
2. More manpower devoted to environmental matters in order to catch up.
3. Higher profile in local communities and in government.
4. More emphasis on planning vs. reacting.
5. Multi-discipline responsibility for environmental excellence. (engineering, R&D, operators, business areas, support groups, in addition to manufacturing management, environmental specialists, legal specialists).

b. Long-Term

1. Less Capital - (See Appendix - Look Back Study)
2. Less manpower specifically devoted to environmental problems as responsibility is spread more broadly.
3. Flexible, modular plans which anticipate and allow for changing regulations.

CURRENT PLAN

CURRENT PLAN

A. Summary

This location - specific plan contains some elements of a comprehensive corporate plan along with an identification of open issues and recommendations as to how the organization might proceed from this point. As such, it should be viewed as one interration in the process of discussion, testing and debate from which a consensus will emerge.

The question posed to the organization was to identify upcoming environmental projects exclusive of those already in the 1990 or earlier Capital Budgets. The intent was to develop location - specific plans looking forward into the next several years. From these, it was anticipated that an overall plan could be developed.

The project lists which resulted were based on brainstorming sessions at the various locations during the summer budgeting period. They consisted of items which were known or anticipated to be necessary, but had not yet been developed to a point where they were ready for budget - quality consideration. Very few were engineered or ready to be cost - estimated. Therefore, due to time and available resources, it was decided to identify the manpower which would be necessary to develop each project and the desired completion time frame for each. At Lake Charles this estimated manpower is a large fraction of the total available technical force, indicating a possible need for outside engineering assistance.

An issues list has been developed, outling items which need resolution before an overall plan is completed.

A limited competitive assessment was also performed which indicated Vista to be somewhat behind in implementation of the Wastewater Project.

B. Project List - Lake Charles Chemical Complex

Based on discussions with plant personnel, there is a belief that substantial work remains to achieve compliance with current Environmental Regulations. The magnitude of this effort mitigates against a strong focus on future requirements and proactive projects.

However, as previously discussed, the approach taken on the Lake Charles Wastewater Project is a good example of designing to meet current requirements while creating a system which is adaptable to the more stringent demands of the future.

A concern expressed by the Plant is to what extent time and available resources will allow similar approaches to the other outstanding issues at LCCC. This concern is reflected in the anticipated environmental project workload summary for process engineers which indicates that a high percentage of available manpower will be required over the next 1 - 3 years. Outside or headquarters engineering assistance may be necessary on a selective basis if the desired project timetables are to be met.

In an effort to bracket the impact of this project list, the following worst case scenario was developed: Assuming no ability to provide internal resources to these projects, what would be required in the next year? The LCCC technical group would then recommend as follows:

1. Regulatory Analysis by outside consultant (priority order).
Approximate cost \$90M.
 - a. Air
 - b. SARA
 - c. TOSCA
 - d. Hazardous Waste
 - e. Solid Waste
2. Outside (contract) engineering to design and begin implementing solutions. Approximate cost \$1MM.

The critical restraint (excluding cost) would be Vista's ability to oversee and give direction to contract personnel.

The actual situation is probably somewhere between business as usual and that worst case. It is recommended that this issue receive further attention to achieve a better definition of staffing requirements along with completion of project cost estimates.

LCCG ENVIRONMENTAL PROJECT AGENDA

<u>PROJECT</u>	<u>AREA</u>	<u>COST, M\$</u>	<u>TIMING</u>	<u>REMARKS</u>
<u>Budgeted Projects</u>				
DAF Unit modification	LCCP	30	1Q90	
Stormwater Projects (3)	LCCP	1250	1Q90	For Waste- water Project
Cooling water leak detection	LCVCM	80	1Q90	Maybe
Stormwater tank	LCLAB	100	1Q90	For waste- water Project
T-405 Secondary Containment	LCVCM	75	2Q90	
SPCC Plan MODS.	LCVCM	63	2Q90	
Environmental Lab Equip.	LCVCM	50	2Q90	Maybe
Alcohol VOC closed loop sampling	LCCP	50	2Q90	
Ethylene VOC Anal. Bldg, vents	LCCP	90	2Q90	
S.400 RX Emission Red.	LCCP	4000	2Q90	
Spent caustic loading system	LCCP	250	2Q90	
Stormwater & Hydr. min Proj. (2)	LCCP	2700	2Q90	For Waste- water Project

LCCC ENVIRONMENTAL PROJECT AGENDA

<u>PROJECT</u>	<u>AREA</u>	<u>COST, M\$</u>	<u>TIMING</u>	<u>REMARKS</u>
Stormwater & W.W. Proj. (3)	LCLAB	1800	2Q90	For Waste- water Project
VCM Wastewater Engr.	LCVCM	150	3Q90	For Waste- water Project
EO Emission	LCCP	100	3Q90	
S.600 Baro. Sump Emis. Red.	LCCP	2000	3Q90	
Stormwater HNDLG.	LCCP	2000	3Q90	For Waste- Water Project
Wastewater HNDLG.	LCLAB	1000	3Q90	For Waste- Water Project
KOH Benzene Stripper	LCLAB	1500	3Q90	Maybe
EDC Wastewater Compliance	LCVCM	1000	4Q90	For Waste- water Project
Wastewater Slop Tank	LCVCM	400	4Q90	
Copper Pit Replacement	LCVCM	150	4Q90	
Waste/Hydr. Red.	LCCP	2000	4Q90	For Waste- water Project
W. W. Treatment MODS.	LCLAB	800	4Q90	For Waste- water Project

LCCC ANTICIPATED ENVIRO. PROJECT WORKLOAD (2)

PROCESS ENGRS

	<u>GEN.</u>	<u>LCCP</u>	<u>LCVCM</u>	<u>LCLAB</u>	<u>TOTAL</u>	ENVIRO. WORK (1) % OF AVAILABLE ENGRS
Process Engrs. - Total		17	7	3	27	
Equiv. Manmonths		204	84	36	324	
<u>Enviro. Project Requirements (Manmonths)</u>						
Immediate	59	48		37.5	145	45
1990	12	15	21	2	50	15
1991		74	23	4	101	31
1992		34	15	5	54	17
1993	4	13	7	4	28	9
1994		11		12	23	7
1995		29			29	9
Later	6	24			30	9
Wastewater Proj. (?)		55	43		98	

Note: (1) If projects assumed to be part of the Wastewater Project must be handled individually, the percentages increase with the largest effect being in early years.

Note: (2) This workload is understood to be in addition to projects previously identified by 1990 and earlier capital budgets and projects known to be part of the LCCC Wastewater (Black Box) Project.

LCCC GENERAL ENVIRONMENTAL ISSUES

<u>PROJECT</u>	<u>AREA</u>	<u>COST</u>	<u>TIMING</u>	<u>EST. ENGR. MANMONTHS</u>		<u>REMARKS</u>
				<u>PROCESS</u>	<u>PROJECT</u>	
<u>Hazardous Waste Disposal</u>	Gen		Immed.	6+	4+	Many are economic issues today Coke immediate problem; complete Abestos elimination at LCCP is estimated \$5MM over time; remainder are waste minimization issues at present.
Coke						
Asbestos						
Waste Paint						
Sandblasting Sand						
Filter Cartridges						
Tank Btms. Solid/Liq.						
Waste Oil						
Samples						
Laboratory Chemicals						
Contaminated Trash						
<u>Air Emissions</u>	Gen					
Asbestos Removal			Continuing	3 + 4	3 + 3	
Emerg. Release Elim. Program						
Heater Emissions Red. - NO _x , CO ₂			2000	6	5	
<u>Water Issues</u>	Gen					
Bayou Verdine Toxic/Biototoxicity				6	4	
LCCC Wastewater Project						
<u>Product Stewardship</u>	Gen			4	2	
Reduce Residual R.M. in products			1993 & 94			Non-Capital
Risk Communications						"
Use Communications						"
End User Exposure						"
<u>Transportation</u>	Gen			8	8	
Railcar Heels/Cleanouts			Immed.	4	2	
Truck Heels/Cleanouts			Immed.			
Railcar Repairs						
Pipeline Maintenance/DOT Compliance			Immed.	3	1	
Elimination of Drums/Admin. Changes				3	1	

LCCC GENERAL ENVIRONMENTAL ISSUES

<u>PROJECT</u>	<u>AREA</u>	<u>COST</u>	<u>TIMING</u>	<u>EST. ENGR. MANMONTHS</u>		<u>REMARKS</u>
				<u>PROCESS</u>	<u>PROJECT</u>	
<u>Wastes</u>	Gen					
Groundwater Cleanup				6	5	
Old Site Cleanup						
Catalyst, Sieves Filter						
Cartridge Disposal						
<u>Spill Containment</u>	Gen					
Tank High Level Alarms				3 + 2 + 4	1+1+2	Phased completion with desired early start
Tank Dike Cleanup						
<u>Waste Minimization</u>	Gen					
Program Development			1990	12	8	
<u>Contingency Plans</u>	Gen					
Event of CoProduct Market Loss				?	?	
Reduce Volume of Hazardous						
Materials stored onsite						
(E.O., ALKYLS, H.F., Benzene,						
V.C., Chlorine)						

LCCP ENVIRONMENTAL PROJECT AGENDA

<u>PROJECT</u>	<u>AREA</u>	<u>COST</u>	<u>TIMING</u>	<u>EST. ENGR. MANMONTHS</u>		<u>REMARKS</u>
				<u>PROCESS</u>	<u>PROJECT</u>	
Elim. EPA-023 Discharge Violations	NPU		Immed.	3	1	
Elim. RV Discharges to Grade	ETO		Immed.	2	1	
Elim. Spills to Grade or Contain.	ETO		Immed.	2	1	
Off-Spec/Mixed Product	ETO		Continuing	4	2	
Novel Catalyst Disposal	ETO		Before AFE	3	1	
Novel Catalyst Contaminated Material Disposal	ETO		Before AFE	3	1	Marketing Solution Ideally should be resolved as R&D issues prior to process commercialization.
Closed Loop Sampling (Grab & Continuous)	Alcohol/Ethylene		Immed.	4+3	2+1	
Fugitive Emissions Sec, 300 Values	Alcohol		Immed.	2	1	
Alumina Dust Emissions	Alcohol		In Process	2	1	
Elim. Rainwater Flooding	Alcohol		Immed.	10	12	
Fugitive Emissions	Ethylene		Immed.	4+3+3	2+1+1	
Subtotal Immediate				48	28	
Better define fugitive emissions	NPU		1990	3	1	
Cooling Tower Emissions/Exchanger Leaks	Alcohol		1990	4+2+4	3+1+4	
Tank 428 - BZ, VOC Definition	Alcohol		1990	2	2	
Subtotal 1990				15	11	
Spent Caustic Elim. or Sale	Ethylene		1991	10	8	
Fugitive E.O. Emissions Control	ETO		1991	3	1	
E.O. Viking Emissions Control	ETO		1991	3	1	
Oxidation RX and Barometric Emissions	Alcohol	\$2750M	1991	50	40	Marketing Solution (\$5MM capital avoidance)
Acid Holding Pit Emissions	Alcohol		1991	4	2	
Elim. RV Discharge to Grade	Alcohol		1991	4	3	
Subtotal 1991				74	55	
Elim. Once-Through Cooling Water	NPU		1991-92			See Wastewater Project Issues
E.O. Blowdown Pond - Elim. or Synthetic Liners	ETO		1991-92	4	2	
Quench Solids Subject to Land Ban	Alcohol		1991-92	8	8	Possible economic issue - Marketing solution with \$500M/yr. current incentive increasing to \$1MM/yr by 1991
Railcar/Truck Loading Emissions Containment	NPU		1992	3	1	
Internal Floating Roofs Tanks below 10,000 gal.	Alcohol		1992	2	1	Proposed LA. State Regulation
Closed Loop tank Sampling	Alcohol		1992	6	4	
Ethanol alternate to burning	Alcohol		1992	3	2	
Flare Emissions Sampling	Ethylene		1992	4	2	Marketing Solution

LCCP ENVIRONMENTAL PROJECT AGENDA

<u>PROJECT</u>	<u>AREA</u>	<u>COST</u>	<u>TIMING</u>	<u>EST. ENGR. MANMONTHS</u>		<u>REMARKS</u>
				<u>PROCESS</u>	<u>PROJECT</u>	
Tempered Water Toxicity?	Alcohol		1992	4	4	
Subtotal 1992				34	24	
Eliminate Ammonia Emissions	Alcohol		1992-93	3	2	
Benzene Emissions/Neshap	Ethylene		1992-93	4	2	
Residual EO in Product	ETO		1993-94	6	4	If leak std. revised to 1000 ppm vs current 10,000
Subtotal 1993				13	8	
Tank Cleanout Method/Disposal	Alcohol		1994	4	4	
Cleanout Tank Dikes	Alcohol		1994	4	8	
Merox Odor Reduction	Ethylene		1994	3	1	
Subtotal 1994				11	13	
Elim. Dixoane Emission	ETO		1994-95	3	1	
Light Hydrocarbon Odor Elim.	Alcohol		1995	4	2	
ALKYL Containment	Alcohol		1995	6	3	
Catalyst, Sieve, Filter Cartridge	NPU/Alcohol/Ethy		1995	4+6+6	1+3+4	
Disposal						
Subtotal 1995				29	14	
<u>Addressed by Wastewater Project (?)</u>						
Reduce Hydraulic Loading Stormwater	NPU		1991-92	3	1	
Elim. once - through cooling water?	NPU		1991-92	3	1	
Revise surface ditches	Alcohol			6	6	
Underground Lines	Alcohol			12	12	
Sewer System Redesign	Alcohol			12	12	
EPA 018 Outfall Violations	Alcohol			3	3	
Oil Spills, Leaks, Drips	Ethylene			4	3	
EPA 004 Outfall Violations	Ethylene			12	10	
Subtotal W.W. Proj. (?)				55	48	
<u>Miscellaneous Additional Issues</u>						
Turnaround Waste Red/Disposal	NPU		Prior to next TAR	3	1	Define administrative changes
Elim. Odors	ETO			3	1	
Replacements for Freon	Alcohol			3	2	
Sec. 225 BTMS - Min., Recycle, Sell	Alcohol			6	5	Marketing Solution
Quench Solids						

LCCP ENVIRONMENTAL PROJECT AGENDA

<u>PROJECT</u>	<u>AREA</u>	<u>COST</u>	<u>TIMING</u>	<u>EST. ENGR. MANMONTHS</u>		<u>REMARKS</u>
				<u>PROCESS</u>	<u>PROJECT</u>	
Disposal of hot oil contaminated Alkoxide	Alcohol			4	3	Incinerate?
Coke Handling/Disposal	Ethylene			<u>5</u>	<u>3</u>	Economic Issue
Subtotal Misc.				24	15	

LCVCM ENVIRONMENTAL PROJECT AGENDA

<u>PROJECT</u>	<u>AREA</u>	<u>COST</u>	<u>TIMING</u>	<u>EST. ENGR. MANMONTHS (Process/Project)</u>					<u>Remarks</u>
				<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>Total</u>	
Invest. RC Vent Handling			Immed.	2/0	0/1	-	-	2/1	
Scope Bauxite Bed Problem			Immed.	1/0	-	-	-	1/0	
Reduce Fugitive Emissions			Immed.	4/1	2/2	-	-	6/3	
Elim. Tar Still R. Disk Events			Immed.	2/0	2/2	-	-	4/2	
Eval. Alt. Direct Chlorination Tech.			Immed.	1/0	6/2	2/4	-	9/6	
Red. Potential for Reportable Releases			Immed.	4/0	6/2	-	-	10/2	
Red. Light & Hvy. Ends Production			1993-94	-	-	4/1	2/2	6/3	
Alt. Disposal for Lt. & Hvy Ends			1993-94	-	-	2/0	3/1	5/1	
Close Surface Impoundments			1992	-	1/0	3/2	0/2	4/4	
Provox In Incin. Area			1992	6/2	2/2	-	-	8/4	
Min. Vents to Incin.			1991	1/0	4/1	1/3	-	6/4	
Rev. Coke Handling			1993-94	-	-	3/0	2/1	5/1	Economic Issue
Environmental Lab for LCCC		?	?						
Subtotal				21/3	23/12	15/10	7/6	66/31	
<u>Addressed by Wastewater Project (?)</u>									
Rev. Sewers/Fix CPS			Immed.	4/0	2/4	0/2	-	6/6	
Eval. C. T. Alternatives			Immed.	3/0	3/3	-	-	6/3	
Upgrade Stream Stripping			Immed.	8/2	6/4	3/4	-	17/10	
Elim. Limestone Neutralization			1991	2/0	4/2	2/2	-	8/4	
Biotoxcity Identification			1992	2/0	4/1	-	-	6/1	
Subtotal				19/2	19/14	5/8	-	43/24	
				=====	=====	=====	=====	=====	
Total Enviro.				34/5	42/26	20/18	7/6	109/55	

C. PROJECT LIST - BALTIMORE PLANT

The Baltimore Plant's Environmental Vision is as follows:

Short Term - Compliance with all applicable regulations.

Long Term - Work toward zero discharge.

A. Apply state-of-the-art environmental technology to all
new installations.

B. Stop emissions at the source rather than by adding
"end-of-pipe" equipment.

There is a strong belief at the plant that replacement of the front end with a PACOL unit would significantly improve both safety and environmental cost/performance. As compared with current operation, the project would achieve the following benefits:

1. Eliminate production of HCl with its attendant problems of
marketing, disposal/destruction cost, hazardous sludge
production, wastewater contamination, environmental/safety
capital requirements.
2. Eliminate the majority of plant corrosion-related equipment
repair & maintenance costs.
3. Eliminate storage, transportation, handling, emissions of
chlorine.
4. Eliminate tetralins from LAB product - (Quality).
5. Upgrade byproduct values.
6. Potential for improved community relations.
7. Improved operating efficiencies.

The PACOL Project is in the early stages of definition with probable timetable of 3 years and \$70MM to complete.

A major sewer replacement project is underway at Baltimore. Due to leaks and associated groundwater contamination potential, some action was necessary. The approach chosen (suspension of sewer lines inside a concrete-lined, grating-covered trench) is a good example of the sort of forward thinking we want to encourage across the company. While allowing easy detection/repair of leaks (as would be the case if run in overhead piperacks), the system continues to operate by gravity flow, avoiding problems of power outages. This type installation should be evaluated as a potential standard for new and replacement sewer systems.

The Plant also has a very good regulatory agenda document which is included for reference. It describes in-force and pending regulations along with the impact and response necessary to comply. Other locations might consider whether a similar approach would be helpful for communication and planning purposes.

Since this location was undergoing a strike in addition to budgeting activity, efforts were concentrated on assembling the project listing and further definition of cost, timing and manpower requirements was postponed.

BALTIMORE ENVIRONMENTAL PROJECT AGENDA

<u>PROJECT</u>	<u>AREA</u>	<u>COST M\$</u>	<u>TIMING</u>
<u>BUDGETED PROJECTS</u>			
W.W. VENT COLLECTION SYSTEM		700	2Q90
PROCESS SEWER REPLACEMENT		650	2Q90
VENT COLLECTION IMPROVEMENT		950	3Q90
STXS VOC EMISSION CONTROL		100	4Q90
PROCESS SEWER REPLACEMENT		500	4Q90

BALTIMORE ENVIRONMENTAL PROJECT AGENDA

<u>PROJECT</u>	<u>AREA</u>	<u>COST M\$</u>	<u>TIMING</u>
<u>ANTICIPATED PROJECTS</u>			
WATER RECYCLE			
REPLACE RIVETED TANKS IN BENZENE SVC.			
ELIM. BZ RELIEF VALVES TO GRADE			
BZ CONTROL TOWER - REPL.AND/OR SPARE			
ELIM. IN-GROUND PROCESS TANKS			
ACID PIT REPL./UPGRADE		1000	
ACID PIT SLUDGE HANDLING		1000-1500	
FUGITIVE EMISSIONS REDUCTION			
TANK FARM REVISIONS - LONG TERM			
GROUNDWATER REMEDIATION		100	
PUMP SEAL REPL. - BZ SVC.			
REMOVE TRACE MATERIAL FROM PRODUCT			
ALTERNATE DISPOSAL FOR SPENT SULFURIC			
RAILCAR/TRUCK UPGRADE - HAZMAT			
LAB ANALYTICAL EQUIPMENT			
ASBESTOS REMOVAL		200/YR	
EQUIP. CLEARING REV. - BZ SVC.			
ELIM. GROUNDWATER INTO STORM DRAINS			
CONTAMINATED DIRT DISPOSAL			
PACOL FRONT END		70,000	

To: L. R. Bauer

From: J. P. Warner
Date: June 27, 1989

Subject: BALTIMORE PACOL UNIT - RECOMMENDATION FOR A DETAILED STUDY

A number of preliminary evaluations for a Baltimore PACOL Unit have been made since the LCLAB plant began operations. Each of these previous studies concluded that there was not sufficient justification to pursue a PACOL Unit. A new evaluation has just been completed by PED and Baltimore which concluded that there is justification and recommends that a detailed evaluation be conducted. The changes in the conclusions are based upon:

- (1) There is increasing pressure to reduce or eliminate tetralins in LAB.
- (2) There is a potential that a Baltimore PACOL Unit with AlCl_3 alkylation will produce high quality dialkylbenzenes that can be moved into the synthetics lubricants market at high margins.
- (3) There is a continual deterioration in the HCl market while disposal costs are escalating rapidly.
- (4) There is a higher efficiency associated with a PACOL Unit since Define and Paid Energy Recovery projects have come on line.
- (5) There is a realization that the community safety issues associated with the transportation of chlorine and hydrochloric acid will make permits for the project easier to obtain.

The new evaluation shows a 13% IRR based upon a capital cost of 70 million dollars. Average revenues for the project were derived from the following sources:

L. R. Bauer
June 27, 1989
page 2

	<u>M\$</u>
. Variable Costs Improvements (not including HCL)	8,800
. Maintenance Savings	2,400
. Increased 7050 Margins - Improved Quality	2,200
. HCL Marketing and Disposal Cost Avoidance	3,000
. Miscellaneous	1,900
. Lost Sales due to Tetralins	Not Included
. Ability to use Tetralins Against Competition	Not Included
. Sale of HCL Business	Not Included
. Chlorine and HCL Transportation Safety Issues	Not Included
. Opportunities in Specialty Alkylate Markets (excluding 7050)	Not Included
. Capital Avoidance for HCL Environmental Projects	1,100
. Capacity Improvements	Not Included

The Capital requirement of 70 million dollars is larger than that included in any of the previous studies. The increase is due to a better definition of the facilities outside of the project's battery limits. The project costs are broken down as follows:

PACOL Unit	30 MM \$
Revisions to Distillation and Alkylation	10 MM \$
Outside Battery Limits	<u>30 MM \$</u>

Total: 70 MM \$

A presentation on this issue was made to Ron Bryan and Tom O'Brien at the last Plant/Business Area meeting. Ron agreed with our recommendation but wanted to check with upper management before committing manpower to the detailed study. It is our recommendation that the study be pursued based upon our preliminary economics and on the need to be prepared if the Tetralins becomes a major issue in the American LAB market.

J. Paul Warner
Chief Process Engineer

/imw

cc: JAD, TFO, RB, GEH - Houston
A.A. Salah - LOCP
JOG, JOGi, JRP, JJR, DLM, ACP, MAF

To: J. P. Warner

From: R. B. Merriam

Date: June 2, 1989

Subject: Capital Expenditures Due To HCl
- 1985 through 1991 -

Per your request, attached is the graph of capital expenditures for projects related to HCl from 1985 through 1991. We do not have and projects projected for 1992 so this data is not included in the graph.

Also attached is the list of projects and the associated capital that make up the graph.

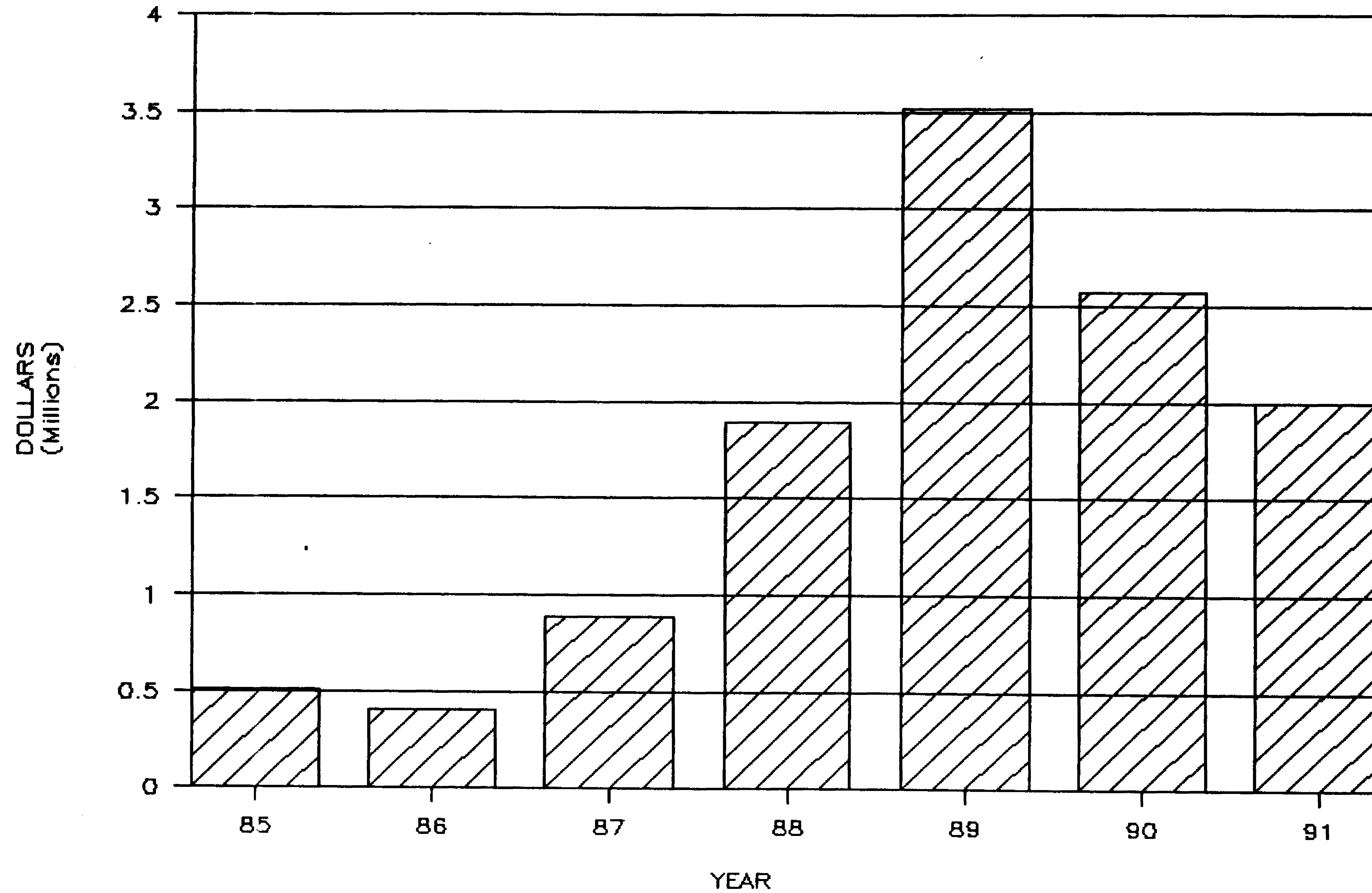


Russ Merriam

BALTIMORE PLANT CAPITAL EXPENDITURES

RELATED TO HCL AND MURIATIC ACID

ENVIRONMENTAL



Capital Expenditure Due To HCl
1985 - 1991

FY 1985

D-344 Replacement	\$93,186
Acid Piping Upgrade, Phase I	85,263
Primary Deoiler Replacement	195,168
F-36/50 Weak Acid Circulation System	44,778
T-247 Roof Replacement	<u>89,397</u>
Total	\$508,000

FY 1986

Secondary Deoiler Replacement	\$219,000
Acid Piping Upgrade, Phase II	<u>183,608</u>
Total	\$403,000

FY 1987

Acid Sewer Recovery, Phase I	\$245,000
Acid Piping Upgrade, Phase III	95,000
Acid Pit Overflow Protection	90,000
Spare HCl Absorber	83,070
T-10 Floor Replacement	165,000
Crude Tank Bottom Replacement	<u>210,000</u>
Total	\$888,000

FY 1988

4th Acid Tank	\$600,000
Absorber Vent Line Replacement	120,000
Acid Pit Foam and Fume Protection	65,000
HCl Fume Scrubbing Improvements	140,000
Acid Filter Replacement	120,000
Acid Dilution	285,000
Spare Critical Equipment(Absorber Only)	60,000
Water Wash Drum Replacement	210,000
Crude Neutralization Improvements	130,000
Caustic Settling Drum Replacement	<u>170,000</u>
Total	\$1,900,000

FY 1989

Acid Pit Scubber	\$120,000
D-24 Replacement	50,000
Acid Sewer Benzene Control	1,750,000
Secondary Benzene Tower	<u>1,600,000</u>
(Paraffin Stripper Capital Only)	
Total	\$3,520,000

FY 1990

Crude Neutralization Improvements	\$800,000
Acid Filter Replacement	125,000
Deoiler Temperature Control	200,000
Second Acid Pit Cover	400,000
D-201 Replacement	400,000
Acid Loading Spill Prevention	250,000
Underground Acid Sewer Elimination	<u>400,000</u>
Total	\$2,575,000

FY 1991

Waste Solids Reduction	\$2,000,000
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Interoffice
Communication

To: Paul Gowan

From: D. L. Mahler

Date: July 7, 1989

Subject: BALTIMORE PLANT REGULATORY AGENDA

VISTA

Jim Gibson indicated that you would like to review the attached document prior to visiting Baltimore this month. Please give me a call if you have any questions.

Dave Mahler

Dave Mahler
Director of Environmental Control

/mw

att

cc: JOGi, JPW

JUL 10 89

VAB.0001125140

REGULATORY AGENDA
BALTIMORE CHEMICAL PLANT

1. EFFLUENT GUIDELINES FOR OCPSF FACILITIES
2. ORGANIC TOXICITY CHARACTERISTIC
3. MARYLAND TOXIC AIR POLLUTION REGULATIONS
4. NESHAP - BENZENE RECONSIDERATION
5. LAND DISPOSAL BAN
6. VOC REGULATION REVISIONS
7. RCRA DEFINITION OF "TANK"
8. REPORTABLE QUANTITY ADJUSTMENTS
9. BURNING OF HAZARDOUS WASTE IN BOILERS FOR ENERGY RECOVERY
10. ASBESTOS NESHAP REVISIONS
11. OIL POLLUTION PREVENTION REGULATION
12. DISTILLATION NSPS
13. SOCMR REACTOR NSPS
14. SMALL BOILER NSPS
15. REFINERY WASTEWATER SYSTEMS NSPS
16. AIR TOXICITY CHARACTERISTIC FOR HAZARDOUS WASTE

1. EFFLUENT GUIDELINES FOR OCPSF FACILITIES

ABSTRACT: EPA has issued regulations which limit the discharge of toxic pollutants from organic chemicals, plastics and synthetic fibers manufacturing facilities to United States waters and publicly owned treatment works.

TIMETABLE:

Action	Date
Proposal	3/83
Final	11/87
Effective	11/90

IMPACT: Wastewater discharged to the Baltimore City sewer will need to comply with strict concentration limits for 47 listed chemicals by 11/90. Pertinent limits include:

- . Benzene - 57 ppb monthly average, 134 ppb daily maximum.
- . Toluene - 28 ppb monthly average, 74 ppb daily maximum.
- . Phenol - 19 ppb monthly average, 47 ppb daily maximum.
- . Chlorobenzene - 142 ppb monthly average, 380 ppb daily maximum.
- . Methylene chloride - 36 ppb monthly average, 170 ppb daily maximum.

PENDING ACTION STEPS:

- . Complete design, construction and successful startup of all projects identified in the plant's compliance plan by 11/90.
- . Purchase the GC/MS and provide lab space, manpower and analytical methods to operate it by 11/90.
- . Submit quarterly progress reports to the City.
- . Institute process monitoring and control procedures.

2. ORGANIC TOXICITY CHARACTERISTIC

page 1 of 2

ABSTRACT: EPA has proposed to expand the criteria for identifying hazardous wastes. Wastes which contain threshold amounts of listed organic chemicals will be classified as hazardous wastes.

TIME TABLE:

<u>Action</u>	<u>Date</u>
Proposal	6/86
Final	Earliest date - 8/89 Probable date - ?/90
Effective	6 months after final

IMPACT: This regulation will have a major impact on nearly every waste management operation and practice at the Baltimore plant. Many wastes which are currently non-hazardous could become classified as hazardous wastes. Any treatment, storage and disposal of hazardous waste must be conducted in a RCRA Permitted facility which complies with RCRA facility standards. Noted exceptions to this requirement include wastewater treatment units and elementary pH neutralization units.

The following wastes at the Baltimore plant will become subject to this new hazard identification criteria.

- . Waste hydrocarbons burned for energy recovery.
- . Wastewater solids, including acid pit spoils.
- . Slip solids.
- . Excavation dirt.
- . Trash.
- . Tank bottoms stored in excess of 90 days.
- . Any material which is spilled or leaked onto or into the ground.

Pertinent thresholds are expected to be 0.5 ppm benzene and 1,000 ppm toluene. Liquids will be analyzed directly for hazardous constituents, whereas solids and sludge will be extracted and analyzed using the Toxicity Characteristic Leaching Procedure (TCLP).

PENDING ACTION STEPS:

- . Complete construction and startup of Phase I of the SOB fractionation improvements. Design, construct and startup Phase II of the SOB fractionation improvements if necessary.
- . Purchase the GC/MS, headspace analyzer and zero headspace extractor, and provide lab space, manpower and analytical procedures to operate this equipment by the effective date.
- . Stabilize wastewater solids and acid pit spoils off-site and close the jersey barriers operation if the OTC effective date precedes start-up of the pretreatment standard projects.

PENDING ACTION STEPS (cont.)

- . Close out the slip and remove the dam.
- . Develop procedures to test excavation soil and manage as a hazardous waste where necessary.
- . Develop procedures to separate hydrocarbon contaminated trash from other trash and manage as a hazardous waste.
- . Develop procedures to clean out tanks within 90 days of removal from service.
- . Provide equipment and procedures to manage routine vessel clean out solids as hazardous waste. This will likely involve a permanent DPA slurry operation.

3. MARYLAND TOXIC AIR POLLUTION REGULATIONS

page 1 of 2

ABSTRACT: Facilities which discharge listed toxic air pollutants (TAPs) must quantify TAP emissions and demonstrate that ambient TAP concentrations outside of the facility do not exceed health-based guidelines.

TIMETABLE:

<u>Action</u>		<u>Date</u>
Proposal		5/88
Final		8/88
Effective	Carcinogens and highly toxic TAPs -	7/90
	All other TAPs -	7/92

IMPACT: Preliminary modelling indicates that benzene emissions are impacted by this regulation. All other TAP emissions should screen-out without any additional controls. The plant will need to install Best Available Control Technology (BACT) on all benzene emission sources as follows.

- . Collect, store and treat benzene contaminated wastewater in closed processes. BACT will probably be the Refinery Wastewater Systems New Source Performance Standard.
- . Eliminate venting from benzene containing storage tanks. BACT will be the Volatile Organic Liquid Storage New Source Performance Standard.
- . Tie-in all remaining benzene containing tanks, vessels and vents (excluding D-201) to the VCS or other appropriate control device.
- . Maintain compliance with the benzene fugitive emissions NESHAP.

A compliance plan can be submitted by 7/1/90 if compliance cannot be obtained by that date. Modelling studies for benzene, chlorine and hydrochloric acid must be submitted by 7/1/90. Modelling studies for toluene and xylenes must be submitted by 7/1/92.

PENDING ACTION STEPS:

- . Complete construction and startup of the VCS tank monitoring project and follow-up with necessary improvements.
- . Provide benzene emissions controls for T-185 tank, the new wastewater stripper, the new process sewer, the new wastewater transfer tanks, T-150 tank and the weak AlCl_3 liquor tanks.

PENDING ACTION STEPS (cont.)

- . Remodel anticipated and current (as of 7/90) benzene, chlorine, and hydrochloric acid emissions by 7/90.
- . Submit a benzene emissions reduction compliance plan by 7/90 and a special permit application if modeling does not screen-out anticipated benzene emissions.
- . Remodel toluene, ethylbenzene and xylenes emissions by 7/92.
- . Evaluate the need for a back-up benzene emissions control device.

4. NESHAP - BENZENE RECONSIDERATION

ABSTRACT: EPA must reconsider NESHAPs for all benzene sources as a result of the recent NRDC vs. EPA vinyl chloride decision. Target benzene sources include LAB plants, benzene storage tanks, benzene fugitive sources and benzene containing wastewater treatment units.

TIMETABLE:

<u>Action</u>	<u>Date</u>
Proposal	9/89
Final	?/90

IMPACT: Any additional Federal benzene emissions requirements are not expected to exceed requirements posed by Maryland's Toxic Air Pollutant regulations. However, additional recordkeeping, monitoring and enforcement are expected based on historical NESHAP trends.

PENDING ACTION STEPS: Proceed with Maryland toxic air pollution compliance steps. Monitor the progress of EPA NESHAP activities.

5. LAND DISPOSAL BAN

ABSTRACT: Hazardous wastes are to be banned from land disposal in accordance with a schedule specified by RCRA. Hazardous wastes which exhibit the organic toxicity characteristic will be banned from land disposal 6 months after promulgation of the organic toxicity characteristic.

TIMETABLE:

<u>Action</u>	<u>Date</u>
Proposal	Same as OTC final action
Final	Same as OTC effective
Effective	Immediate when final

IMPACT: Unless a variance is granted by EPA, wastes which are hazardous because of benzene contamination will be banned from land disposal on the effective date of the organic toxicity characteristic (6 months after promulgation). Wastes which are currently disposed of on land include:

- . Wastewater solids.
- . Excavation dirt.
- . Benzene dryer molecular sieves.
- . Spent carbon.
- . Tank bottoms with low BTU value.
- . Trash.

Treatment alternatives will need to be identified for any such hazardous wastes banned from land disposal.

PENDING ACTION STEPS: Locate incineration or other treatment capacity for wastes subject to the land disposal ban. Wastes which will most likely be subject to the land disposal ban include benzene dryer molecular sieves, spent AlCl_3 liquor carbon, spent HCl carbon and benzene contaminated tank bottoms.

6. VOC REGULATION REVISIONS

ABSTRACT: EPA has instructed Maryland to revise its VOC regulations in order to further reduce hydrocarbon emissions in the Baltimore area. Maryland will adopt piecemeal changes throughout the next year.

TIMETABLE:

<u>Action</u>	<u>Date</u>
Proposal	12/89
Final	3/90
Effective	Immediate when final

IMPACT: Several changes are expected which will impact the Baltimore plant.

- . Benzene will become classified as a VOC.
- . The VOC storage tank NSPS will be adopted as the standard for all VOC storage tanks in the Baltimore area.
- . The 200 lbs/day VOC emission control cutoff will be lowered to 100 lbs/day. The STXS plant VOC emissions inventory is currently 135 lb/day.
- . Some type of fugitive emissions monitoring program will be mandated for SOCM processes.

Once any of these changes are adopted, a compliance plan can be submitted if additional time is needed to attain compliance.

PENDING ACTION STEPS:

- . Monitor development of these regulations at the draft stage and negotiate new requirements with the AMA.
- . Implement STXS plant controls as required.
- . Submit compliance plans as required.

7. RCRA DEFINITION OF "TANK"

ABSTRACT: This issue involves a troublesome EPA interpretation of an existing regulation which is resulting in the development of a new regulation. In two separate proceedings (EPA vs. Brown Wood, EPA vs. Koppers) EPA has alleged that structures which require earthen backfill for structural support are surface impoundments and not tanks. Opposite decisions were obtained on these cases, leaving a final decision to the Administrator of the EPA. The EPA has subsequently announced that it intends to promulgate a new RCRA definition of "tank" through the rulemaking process.

TIMETABLE:

<u>Action</u>	<u>Date</u>
Proposal	10/89
Appeal	Uncertain

IMPACT: Several inground concrete units on-site may become classified as surface impoundments if earthen backfill is shown to provide structural support. Surface impoundments which contain hazardous waste must obtain RCRA permits and be provided with secondary containment, leak detection, leachate collection and groundwater monitoring. In addition, the land disposal ban for wastes with a pH less than 2 is already in effect.

PENDING ACTION STEPS:

- . Determine which wastewater treatment units require earthen structural support and identify possible structural revisions which can be made to any such units.
- . Provide structural revisions or secondary containment if required.

8. REPORTABLE QUANTITY ADJUSTMENTS

ABSTRACT: EPA has proposed to adjust reportable quantities for certain carcinogens, including benzene. The reportable quantity for benzene will potentially be lowered from 1,000 lbs to 10 lbs. With limited exceptions, releases in excess of a reportable quantity must be reported to the National Response Center, the State and the Fire Department.

TIMETABLE:

<u>Action</u>	<u>Date</u>
Proposal	3/87
Final	?/89
Effective	Immediate when final

IMPACT: A continuous release report for benzene emissions will have to be made annually. Non-continuous release reporting will have to be made for sudden releases in excess of the reportable quantity.

PENDING ACTION STEPS:

- . Annually report to the National Response Center continuous benzene releases from storage tanks and wastewater treatment units in excess of 10 lbs/day.
- . Develop and implement procedures to immediately report non-routine benzene emissions in excess of 10 lbs.

9. BURNING OF HAZARDOUS WASTE IN BOILERS FOR ENERGY RECOVERY

ABSTRACT: EPA has proposed stringent standards for boilers which burn hazardous waste for energy recovery. In addition, RCRA permitting will be required.

TIMETABLE:

<u>Action</u>	<u>Date</u>
Proposal	5/87
Final	?/90

Effective	6 months after final
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IMPACT: This regulation will have no impact on the Baltimore plant if waste hydrocarbons transferred to the fuel oil tank remain non-hazardous.

PENDING ACTION STEPS: Proceed with SOB fractionation improvement plans.

10. ASBESTOS NESHAP REVISIONS

ABSTRACT: EPA is considering revisions to the asbestos NESHAP. Pertinent changes are likely to include requirements for waste disposal operations and reclassification of currently non-friable objects to friable.

TIMETABLE:

<u>Action</u>	<u>Date</u>
Proposal	?/90
Final	?

IMPACT: Changes to the asbestos waste handling and storage operation by T-1 tank could be required. Asbestos objects such as asbestos board and gaskets could become classified as friable asbestos.

PENDING ACTION STEPS:

- . Monitor development of this regulation.
- . Continue to aggressively remove asbestos from the Baltimore plant.

11. OIL POLLUTION PREVENTION REGULATION

ABSTRACT: In response to the Ashland Oil spill incident, EPA is reviewing the adequacy of existing oil pollution prevention regulations. A task force has developed recommendations which are to be adopted in two phases.

TIMETABLE:

<u>Action</u>	<u>Date</u>
Proposal	?/89
Final	?/90

IMPACT: Unknown

PENDING ACTION STEPS: Monitor the development of this regulation.

12. DISTILLATION NSPS

ABSTRACT: EPA has proposed a New Source Performance Standard for new and modified distillation units.

TIMETABLE:

<u>Action</u>	<u>Date</u>
Proposal	12/83
Final	?
Effective	Immediate when final for sources constructed after 12/83

IMPACT: This regulation will control hydrocarbon emissions from W-1 and W-6 tower, and any other new distillation units which vent to the atmosphere.

PENDING ACTION STEPS: Monitor the development of this regulation.

13. SOCM REACTOR NSPS

ABSTRACT: EPA is developing a New Source Performance Standard for new and modified SOCM reactor processes.

TIMETABLE:

<u>Action</u>	<u>Date</u>
Proposal	?
Final	?
Effective	?

IMPACT: Once proposed, any new reactor will become an affected facility. Emissions from affected reactors will be regulated by the NSPS.

PENDING ACTION STEPS: Monitor the development of this regulation.

14. SMALL BOILER NSPS

ABSTRACT: EPA is developing a New Source Performance Standard for new and modified small boilers (less than 100 MM BTU/hr).

TIMETABLE:

<u>Action</u>	<u>Date</u>
Proposal	6/89
Final	9/90
Effective	Immediate when final for sources constructed after proposed date

IMPACT: After proposal, any new or modified small industrial boiler will be regulated by this NSPS.

PENDING ACTION STEPS: Avoid the need for a third boiler, if at all possible.

15. REFINERY WASTEWATER SYSTEMS NSPS

ABSTRACT: EPA has issued a New Source Performance Standard for new and modified petroleum refinery wastewater systems. The NSPS regulates emissions from sewers systems and oil-water separators.

TIMETABLE:

<u>Action</u>	<u>Date</u>
Proposal	5/87
Final	11/88

IMPACT: This NSPS does not directly impact the Baltimore plant, however it is likely that EPA will follow-up with a SOCMII wastewater systems NSPS. Maryland will probably consider this NSPS to be Best Available Control Technology for wastewater treatment units relative to Maryland's toxic air pollution regulation.

PENDING ACTION STEPS: Proceed to install a closed sewer and wastewater collection system as currently planned.

16. AIR TOXICITY CHARACTERISTIC FOR HAZARDOUS WASTE

ABSTRACT: EPA intends to develop test procedures and threshold concentrations for wastes which contain volatile hazardous constituents. Wastes which contain threshold amounts of listed organic chemicals will be classified as hazardous wastes. This new characteristic will supplement the organic toxicity characteristic.

TIMETABLE:

<u>Action</u>	<u>Date</u>
Proposal	?
Final	?

IMPACT: This new hazardous characteristic will have no impact unless thresholds are set at lower levels than the TCLP thresholds.

PENDING ACTION STEPS: Monitor the development of this regulation.

D. Project List - Aberdeen Plant

With completion of projects currently underway and planned for 1990, the plant personnel feel they will be in relatively good shape with the exception of one major potential expenditure.

The possible need for External Steam Stripping (as opposed to current In-Reactor Stripping) of product to remove Residual VCM is a potential \$20-30MM item. Current regulations do not force the change, but it is anticipated that regulations will tighten sufficiently within the next five years to require it. It is believed that major resin competitors (possibly excepting Air Products) already use this technology. Georgia Gulf recently voluntarily agreed to a lower residual level than our current practice will achieve. Therefore "Best Available" treatment has a now (and unfavorable to Vista) definition. A Vista team is currently assessing this situation to develop a recommendation with expected proposal early calendar 1990.

With the exception of a major project such as External Stripping, plant personnel believe that staffing is adequate to address anticipated project work. A question exists concerning administrative requirements such as communication, training and legislative involvement implied in the corporate policy statement.

For purposes of completeness, cost estimates should be performed for the anticipated project list.

ABERDEEN ENVIRONMENTAL PROJECT AGENDA

<u>Project</u>	<u>Area</u>	<u>Cost, M\$</u>	<u>Timing</u>	<u>Remarks</u>
<u>Budgeted Projects</u>				
New Module Piping Upgrade		59	1Q90	Maybe
TC Wastewater Compliance		1,350	2Q90	
Phthalic Anhyd. Waste Elim.		125	2Q90	Maybe
Plasticizer Process Improvements		175	2Q90	
Plant Sewer Revisions		300	3Q90	Maybe
<u>Anticipated Projects</u>				
External Steam Stripping	20-30,000		1-5 yrs.	
Reduction of Unknown Product Residuals			Long Term	
Old Site Cleanup			Long Term	
Alt. Disposal of Paper Bags With Hazardous Resid.			5-6 yrs.	
Collection/Recycle of Non-Haz. Bags & Cardboard			5+ yrs.	
Recycle Water From Waste Treatment			10 yrs.	
Alt. Handling RX culls & Vac Vent Dust			Contingency	
Complete Decontamination Of Junked Equipment			Long Term	
PVC Customer Scrap Recycle			Unknown	
Asbestos Removal			Ongoing	
Transite Siding Removal			Contingency	
Repair/Repl. Leaking Sewers			5 yrs.	

E. Project List - OKC

The Oklahoma City Plant has a situation very similar to Aberdeen in that they seem to be in relatively good shape except for the Potential External Steam Stripping requirement (\$10-15MM). Internal resources are believed to be adequate to address the anticipated project load.

Though claiming a short-term focus, management seems to have for several years been looking to future requirements and generating creative solutions. That sort of sustained effort is key in achieving cost effective performance.

G. Issues

A number of issues or areas requiring further work are listed below. In many cases, agreement on philosophy is required, after which technical and implementation efforts will follow naturally. In a minority of cases the issue to be resolved is technical only.

1. Degree to which smaller businesses, such as Blane, Premiere and Vycom, will be accountable against corporate policies and programs. This is a thorny issue involving staffing, capital, margin and competitive considerations weighed against liability, publicity and consistency questions. The solution would seem to include combinations of further distancing these operation from the rest of the organization from a liability standpoint, providing additional support from headquarters and working together to clearly define expectations.
2. Resolution of the perception that environmental jobs by their nature will result in a "dead end" career path. This long-standing concern could be addressed from several standpoints. The broadening of environmental responsibility throughout the organization will help. This is addressed both directly and indirectly throughout this report, including the Corporate Environmental Policy. It is suggested that management and supervision watch for opportunities to interact with environmental professionals and to recognize positive contributions. A challenge also exists for environmental professionals to move away from the "siege mentality" and to deal with managers on a non-emotional basis. Part of the problem is that it is assumed (whether or not correctly) that one would operate in other jobs similarly to the one currently held. Many other jobs lack the "hammer" of regulatory development to influence action in the organization. If a manager has seen little evidence of an individual's capability to influence without a hammer, he may question whether the capability exists.
3. The general issue of product liability is purposely not addressed in this report.
4. Involvement of Vista's International businesses in corporate environmental planning. NNC, NAA and the Indonesian Alcohol Operation contain elements of the smaller business question, but are probably of less liability concern due to being non-domestic joint ventures none of which are majority owned by Vista. However, fairly extensive trading and direct export sales activities also exist. Since differing laws and standards exist in each location in which business is done, the question of prudent training and audit of Vista's International activities may require additional work. This could be an appropriate area for use of one or more consultants to assess the situation.

5. A related matter is the concern that foreign companies operating under less stringent regulations may obtain a competitive advantage over domestic producers such as Vista. This might be an issue appropriately addressed through the several trade organizations to which Vista belongs. Among these are Chemical Manufactures Association (CMA), National Petroleum Refiners Association (NPRA), Society of Plastics Industry (SPI), Vinyl Institute, Soap and Detergent Association (SDA). Within each of these and other industry groups, various environmental, safety and trade issues are included among the agenda items.
6. PVC recycling is potentially of interest to Vista and certainly to the industry. Plastics recycling in general is a media issue due to the developing crisis of lack of space in municipal landfills. While numerous studies indicate that plastics are a small part of landfilled trash, this portion is essentially there forever once buried. (Other studies have shown that newspapers and food don't biodegrade either in some landfills, but that is a technical irrelevancy to Environmentalists.) Vista is currently working with several companies through the Vinyl Institute to develop a workable system for collection of PVC containers from consumers and recycle of that plastic into another product such as pipe. This could be a joint demonstration plant with a 25MM lb./yr. capacity. The Polymers Business Area is leading this continuing effort.
7. Heavy metals, such as barium, cadmium and lead in PVC compounds/dryblends. This issue stems from redefining what materials will be classified as "hazardous" in the future. Though an industry issue, it may offer an opportunity for Vista to achieve a competitive advantage if reformulation work in progress can produce a product line free of these "bad actors" without noticeable loss of performance in customer applications. In the extreme case, together with flame, smoke and other PVC "safety" issues someone with breakthrough formulation technology could setup a marketing coup similar to the DuPont Freon situation. By publically dropping and, by inference, denouncing freon after having developed the only viable (though lower performance) substitute, DuPont may have the market essentially to itself for some period of time. In any event, a significant R&D activity will probably be required at some point and smaller compounders may be at a disadvantage. The decision to be made is whether to attempt to lead or follow.
8. Integration of environmental decisions into mainstream business activities. This is a recurring theme throughout the report and requires conscious acceptance by responsible managers. It is suggested that applicable environmental plan review and revision be included as a topic on Business Steering Team agendas. This can provide a means for deeper involvement of R&D and support groups along with better integrated overall direction and priority-setting.

9. Environmental activities, programs and philosophies of domestic competitors is partially addressed elsewhere in this report. However, it is an appropriate item for ongoing follow-up and documentation. Limited information may be gathered from published documents such as 10K's, permit filings, enforcement actions, SARA Title III filings, news releases, articles, etc. However, these sources are incomplete and may be misleading or fail to address the specific areas of interest to us. A more reliable and timely sources is informal conversations with our counterparts in those organizations via trade group meetings or other circumstances which present on opportunity. Quite a bit of information is likely gathered and then not fully utilized now due to lack of documentation and assembly. It is recommended that gathering and compiling this type information be institutionalized as follows:
 - a. Managers and employees be encouraged to gather and write down information which may be obtained from normal contacts.
 - b. This information be routed to one group which has the responsibility to periodically compile and publish an assessment. This could be the Environmental group or any one of several others.
10. Other items previously mentioned in the section dealing with "Studies" include:
 - a. Assessment of DOT pipeline regulations. Consultant assistance is recommended. Based on the findings, an implementation plan may need to be developed. Individual plants now have the pipeline responsibility, so implementation may proceed naturally once requirements are defined.
 - b. Resolution of whether External Stripping is required for reducing residual VCM in PVC. As previously mentioned, a Vista team is currently evaluating this \$40-50MM question. Most other PVC producers appear to have previously made the switch for large reactors. The expenditure is included in recapitalization forecast capital for 1991.
 - c. Assessment and plan development for Lake Charles air emission with assistance from consultant recommended. This would be a smaller and perhaps less expensive version of the Wastewater Project effort.
 - d. Resolution of Baltimore Process Revisions (PACOL front end). As previously mentioned, a team is doing a preliminary assessment of this \$70MM project. The outcome of a decision whether or not to proceed could have significant impact on environmental capital and expense requirements at Baltimore.

11. A mostly technical issue is that of assuring the integrity of underground sewer systems. This is a decision similar to that made in the Wastewater Project to convert ponds and lagoons to above-ground tanks. That decision was prompted by regulations designed to protect soil and groundwater from contamination due to seepage or leaks. Similar regulations for sewers do not now exist, but might be anticipated eventually. It might be wise for new construction or as opportunities occur to consider either putting sewers above ground or in lined trenches a la Baltimore. This is unfortunately a multimillion dollar proposition, but so is remediation if the integrity of these systems cannot otherwise be assured. At the least, system integrity should be assessed by each location on a periodic basis.
12. Portions of the Plan propose marketing solutions as a means of dealing with specific waste streams. These solutions may or may not be entirely realistic, but the potential exists for substantial savings of capital and/or expense if the efforts are successful. A summary is provided below for information and input into priority-setting. The streams are grouped into three categories.
 - a. "Must Do Something" - The current situation is or will soon become unacceptable and marketing the stream is a desirable option vs. alternatives.
 - b. "Improvement Opportunity" - While no external forces are currently acting to change how the stream is handled, the opportunity for cost savings or margin improvement exists.
 - c. "Contingency" - Current handling is acceptable, but loss of that market would create a significant problem.

INCENTIVE TO MARKET

<u>PLANT</u>	<u>STREAM</u>	<u>ANNUAL VOLUME (MMLB)</u>	<u>CAPITAL AVOIDED</u>	<u>DISPOSAL COST AVOIDED</u>	<u>OPERATING COST AVOIDED</u>	<u>EST. SALES REVENUE</u>	<u>REMARKS</u>
<u>Must Do Something</u>							
LCCP	Ethylene Spent Caustic	17.0	\$4-6MM	\$1MM/Yr.	?	?	Problem in Wastewater System as-is.
LCVCM	Incinerator HCL	11.0	\$500M	\$4MM/Yr.	\$1.8MM/Yr.	?	Currently neutralized with limestone causing fume problem and solids disposal. Caustic neutralization option is capital and operating cost. Offsite disposal is \$4MM option.
<u>Improvement Opportunity</u>							
ABD	Stormwater Pit #1 Solids	0.1	-	\$3M/Yr.	-	?	Annual accumulation of compound. Hazardous due to metals content.
ABD	Stormwater Pit #2 Resin	0.1	-	\$3M/Yr.	-	?	Annual accumulation of resin. Non-hazardous currently.
LCCP	Pressed Biological Solids	16.6	?	\$500M/Yr.	-	?	Non-hazardous landfilled now. Substantial cost increase if it becomes hazardous.
LCCP	Molex Sieves - Current Inventory	0.7	-	\$185M	\$28M/Yr. STG.	?	Based on non-hazardous landfill.
LCCP	Molex Sieves - Every 3-5 years	0.4 Total	-	\$120M	-	?	One sieve replacement.
LCCP	Ethanol Solution	3.8	*0.1M-\$3MM	0 If Remains Burnable	?	\$270M	Currently burned.
LCCP	Quench Unit Solids	8.4	?	\$500M/Yr.	?	?	Based on non-hazardous landfill.

<u>PLANT</u>	<u>STREAM</u>	<u>ANNUAL VOLUME (MMLB)</u>	<u>CAPITAL AVOIDED</u>	<u>DISPOSAL COST AVOIDED</u>	<u>OPERATING COST AVOIDED</u>	<u>EST. SALES REVENUE</u>	<u>REMARKS</u>
LCLAB	Alkylate Bottoms	4.0 Excess	-	\$1-2.5MM/Yr.	(\$204M)	\$840M	Currently sold to refinery. Could be burned as fuel at same value until regulations change. Then would require capital or incineration.
LCLAB	Acid Soluble Oil (ASO)	1.1	?	\$275-700M/Yr.	(\$42M)	?	Currently burned as fuel. If regulations change as expected, would require incineration or capital to modify heaters.
<u>Contingency</u>							
LCCP	MeCl Spent Hcl	13.8	\$1-2MM	?	-	?	Non-issue based on MeCl shutdown date. Disposal problem otherwise due to high organic content.
LCCP	Recovered Oil From Wastewater	17.9	?	?	?	-	Currently sold to Conoco Refinery as part of HAD stream at \$920M/Yr. revenue. If contract volume limit is enforced, this stream or the actual HAD stream from ethylene will need another home.
LCCP/LCLAB	Nickel and Palladium Catalyst	Variable	N/A	N/A	N/A	Varies	Currently sold for precious metal recovery based on assay. Should not become an issue.
LCVCM	Light and Heavy Ends	1.1 LT } 9.9 Hvy}	\$0.3-7.25MM	\$5.5MM/Yr.	\$4.5-1.1MM/Yr.	?	Currently sold. Light ends to Vulcan for \$55M/Yr. revenue. Heavy ends go to PPG at net negative revenue. One Alt. is \$7.25MM capital and \$1.1MM/Yr. OP. cost for UOP technology to convert streams to Anhydrous HCl for recycle in process. On-site incineration is another option at \$0.3MM

<u>PLANT</u>	<u>STREAM</u>	<u>ANNUAL VOLUME (MMLB)</u>	<u>CAPITAL AVOIDED</u>	<u>DISPOSAL COST AVOIDED</u>	<u>OPERATING COST AVOIDED</u>	<u>EST. SALES REVENUE</u>	<u>REMARKS</u>	
							capital and \$4.5MM/Yr. OP. cost. This also requires additional \$0.5MM capital for caustic neutralization. Offsite incineration is \$5.5MM/Yr.	
ABD	Vacuum Vent Dust	0.5)	\$0.4MM	\$35M/Yr.)	\$2M/Yr.	\$17M	Current	If current markets were lost, capital and operating cost reflect a scrap compound line. Disposal is option in interim.
	Millscrap	1.3)		\$37M/Yr.)		\$200M	Current	
	VRP	1.6)		\$48M/Yr.		\$640M	Current	
ABD	Pond Resin	1.7	\$0.1MM	\$46M/Yr.	\$2M/Yr.	\$435M	Current	Currently sold. Alternate capital to prevent material reaching pond to improve marketability and margin.
ABD	Reactor Culls	0.5)	\$0.3MM	\$32M/Yr.)	\$5M/Yr.	\$10M	Current	Currently sold. Alternate capital for Grinder & Dryer to market beyond single current customer.
	Sifter Overflow	0.08)		\$2M/Yr.)		\$12M	Current	
ABD	De-Box Resin	10.6	-	\$280M/Yr.	-	\$3.2MM	Current	Currently sold. Probable non-issue.
LCCP								
Ethylene	HAD	18.1	-	\$0.5-7.0MM	Burnable	\$0.9MM	Current	
	LAC	26.6	-	\$0.5-5.0MM	N/A	\$2.9MM	Current	
	Butadiene	33.6	-	\$2.0-5.0MM	N/A	\$3.0MM	Current	
	P&P	21.3	-	\$2.0-5.0MM	N/A	\$2.8MM	Current	
	MOG	60.2	-	\$0.5-2.0MM	Burnable	\$3.0MM	Current	
	HOG	133.3	-	\$1.0-3.0MM	Burnable	\$10.2MM	Current	
Methyl Chloride	Spent HCL	13.8	-	\$1.0-2.0MM	Undetermined	N/A		
	Spent Sulfuric Acid	1.1	-	Undetermined	Undetermined	Subtracted from Raw Cost		
Normal Paraffin	MR Solvent (Raffinate)	957.0	-	\$0.25-1.0MM	N/A	73.2MM	Current	
	Unstabilized Gasoline	151.1	-	\$0.5-1.0MM	N/A	11.6MM	Current	
	N.P. Off-gas	10.8	-	Undetermined	Burnable	N/A		
	LPA Solvent	148.2	-	Undetermined	N/A	11.3MM	Current	

<u>PLANT</u>	<u>STREAM</u>	<u>ANNUAL VOLUME (MMLB)</u>	<u>CAPITAL AVOIDED</u>	<u>DISPOSAL COST AVOIDED</u>	<u>OPERATING COST AVOIDED</u>	<u>EST. SALES REVENUE</u>	<u>REMARKS</u>
Ethoxylation	Off-spec Mixed Ethoxylate	1-2	Undetermined	N/A	-	\$0.3-0.7MM Current	
Alcohol	SSO						
	Thermal Olefins	40.0	\$1.0-7.0MM	N/A	-	\$6MM Potential	
	Solvent & Stripper Overhead	92.2	\$4.0MM	N/A	-	4.9MM Current	
	Growth Reaction Hotwash Solvent	3.0	Undetermined	Undetermine	-	0.2MM Current	
	Butanol	11.8	\$0.2-0.5MM	Burnable	-	3.1MM Current	
	Fuel Gas	12.7	Undetermined	Flared	-	0.1MM Current	

13. Development of contingency plans. A number of non-primary-product streams are currently being sold to Conoco or others for blending or extraction of valuable components. In most cases, the loss of these markets would result in significant containment or treatment/disposal problems if alternate markets were not quickly available. Assuming success in marketing additional streams as indicated above, the potential problems increase. Developing and documenting a set of contingency plans may be a worthwhile team project given that production of Vista's primary products could be impacted on short notice.
14. Included "for the record" are the following items for which appropriate actions are already underway:
 - a. Groundwater Cleanup
 - b. Definition of waste minimization goals including fugitive air emissions.
15. An essentially technical issue is that much work remains, particularly at Lake Charles, on resolution of wastewater biotoxicity. The proper action seems to be underway, but it should be noted that the Wastewater Project cannot presently be guaranteed to solve the problem. To date, no Lake Charles plant wastewater has passed this "water flea survival" test and the causes are not yet isolated. Therefore the requirements are undefined at this time.
16. Chemical emergency response readiness. Other than being referred to in the Environmental Policy, this is not specifically an environmental issue. The Exxon Valdez situation highlights the difficulty of dealing with transportation-related incidents in remote locations. Plant incidents, while the potential may be greater, seem to raise fewer concerns due to the proximity of equipment, people and supplies to deal with the situation. A joint manufacturing/S&T team may be appropriate for addressing offsite response ability and needs.
17. Environmental manpower has previously been evaluated by a Team and recommendations were issued in late 1988. A summary and current status is included below.

It should be noted that some overlap may exist between these recommendations and the Lake Charles engineering requirement identified by the project list. However, my sense is that the needs identified are essentially separate and may be additive. Further resolution is required.

EXECUTIVE SUMMARY

ENVIRONMENTAL MANPOWER TEAM (Nov. 1988)

I. BACKGROUND:

As a result of discussions at the Vista Annual Environmental Meeting, a team was formed to evaluate and recommend changes to address Environmental Manpower staffing needs. Pursuant to this goal extensive data were collected and analyzed. Based upon the results of the data analysis, the team recommends a total of five permanent positions be approved to assure our immediate compliance goals are achieved.

A second tier of four dedicated positions are recommended for purposes of maintaining environmental program continuity and addressing longer term needs. Attrition in the environmental area is a significant area of vulnerability for Vista.

Beyond immediate needs, the team identifies two other significant areas deserving attention. Environmental awareness at many levels is lacking, particularly among non-environmental/non-operational personnel. Environmental training is a fundamental need at all levels surveyed. Unless environmental awareness is elevated, both these interrelated areas will be a long term detriment to the environmental, engineering, and operational efforts of the company. A third tier of recommendations involving temporary engineering assignments is made to address these areas. Further work is needed to expand awareness and training into the business and marketing areas, and the recommendations within this report address this problem.

The recommendations are made to respond to immediate compliance demands, as well as to modify the existing organization. The intent is to ultimately reduce the need to further increase professional environmental manpower, through addressing environmental needs at the source, rather than awaiting development of a crisis situation.

II. Recommendations:

The Team is making recommendations in three areas of priority. The three groupings reflect a phased approach to satisfy immediate and longer term needs. The Priority I recommendations are based on immediate manpower needs to satisfy existing short term compliance demands. We view these as recommendations necessary to assure a minimal level of achievement of our compliance goals. Priority II needs reflect both longer term demands as well as insuring program continuity as personnel changes occur. Priority III recommendations reflect the company's need to create environmental issues awareness Process Superintendents, Plant Managers, Business Area and Marketing personnel, or serve in other supervisory capacities.

Where an immediate manpower need is recommended in the near term. No further assessment was performed to determine whether additional manpower, beyond the scope of the recommendation, is needed at any specific location. Further assessment by each individual location is needed for identification of manpower needs beyond the scope recommended by this report.

Staffing Additions:

<u>Priority I To Assure Compliance</u>	<u>Status 9-89</u>
(1 to 6 month implementation)	
LCCC: LCCP/LAB - Add 1 Senior Environmental Coordinator	Offer Outstanding
LCVCM - Add 1 Environmental Coordinator	Done
Houston Environmental - Add 1 Program Manger	Done
OKC - Add 1 Environmental Coordinator	Done
S&T - Add 1 Environment Coordinator*	No Progress
 <u>Priority II To Assure Program Continuity</u>	 <u>Status 9-89</u>
(6 to 12 month implementation)	
Baltimore - Add 1 Environmental Coordinator	
Blane - Add (or <u>dedicate</u>) 1 Environmental Coordinator	Done
Houston - Add 1 Environmental Coordinator	
R&D - Add (or <u>dedicate</u>) 1 Environmental Coordinator	

To: Paul Gowan
From: J. C. Ledvina
Date: August 11, 1989
Subject: Environmental Planning at Other Companies

Paul,

At your request, I have phoned several contacts at other companies to discuss the degree to which they are proactively spending money in anticipation of future environmental regulations. A number of people within Vista have expressed an interest in knowing whether other companies are contemplating or doing projects similar to the LOCC "Black Box". This survey is an attempt to provide some perspective on that issue.

From the information that I was able to obtain it appears that Vista lags behind BF Goodrich, Mobay, Borden, Rohm & Haas, Union Carbide and Dow on replace of surface impoundments. We are at about the same stage as Air Products, Georgia-Gulf and DuPont. We are ahead of Conoco and Oxy.

In the survey, I asked my contacts what their companies were doing about surface impoundments in anticipation of the Toxicity Characteristic (TC) being promulgated. Since the TC regulation is a significant part of the reasoning for Vista's work on the "Black Box", asking what other companies are doing on this seems to be a reasonable basis for evaluating our degree of proactivity relative to other companies. Following are comments by company to the question "What is your company doing about surface impoundments in anticipation of TC?"

Georgia-Gulf - Will probably have a problem with TC at one site. They are in the process of testing wastewater at that site to determine if constituents are present above the anticipated regulatory level. At another plant, source control work was done to reduce constituent levels in wastewater below regulatory levels. Georgia-Gulf does not have an active project to replace surface impoundments with tanks yet. However, surface impoundments that were considered environmental problems have been replaced with tanks. Impoundments, such as those in the wastewater treatment unit that are causing no known environmental problem are not being replaced. Ga-Gulf will wait to see how the TC regulations develop.

Oxy - The Oxy corporate office is not pushing the plants on pond replacement. The Pasadena plant has proposed money in the 1990 budget to do something on TC/surface impoundments. They don't know what that "something" is yet. My contact at the Oxy/Cain Chocolate Bayou Plant says that Oxy seems to be disorganized on this issue.

Conoco - Conoco is at the evaluation stage. They are doing analytical work to determine which surface impoundments will be impacted by the TC. No proactive surface impoundments have been done.

Air Products - Have two surface impoundments that may be impacted. My contact was not sure what they were going to do, but he isn't the person most knowledgeable on this subject.

* DuPont - My contact was unaware of surface impoundment replacements within DuPont that were done in anticipation of regulations. A few years ago, the Chambers Works installed a tank-based wastewater treatment plant but that was before TC was an issue. However, tanks were chosen because of a perception that they were more environmentally acceptable than surface impoundments. DuPont has done analytical work to characterize wastewater. They are installing a steam stripper on the Ethylene Unit at Sabine to remove benzene from wastewater. That project is currently under construction. The Cape Fear, NC plant is looking at getting out of surface impoundments but for reasons other than TC; apparently, to avoid groundwater contamination.

Vulcan - They have replaced some surface impoundments at Geismar. No other details.

Rohm & Haas - They closed out their Deer Park Plant surface impoundments except for two impoundments in the wastewater treatment plant. The wastewater treatment plant will need to be revised to meet the OCPSF effluent guidelines. When that occurs they plan to go to a tank-based system. They are doing feasibility studies and engineering now. The Deer Park Plant is planning to make each operating unit do primary treatment of their wastewater before pumping it in above ground sewers to the secondary.

Mobay - This past May, Mobay took five surface impoundments out of service at their Baytown Plant and replaced them with above ground tanks. Plants in WV, Kansas City, and Bushy Park (PA?) replaced surface impoundments with tanks for reasons other than TC.

Dow - Dow is moving away from surface impoundments on storage of concentrated materials. They continue to operate impoundment-based wastewater treatment plants in their US facilities. They have replaced impoundments in a German plant and the Ft. Saskatchewan plant. Dow is looking toward the year 2000 and trying to predict what the regulatory situation will be. Decisions on surface impoundments will be based on that prediction.

Borden - They are putting together projects to get out of PVC settling ponds but will not implement until the regulations become firmer. The biological treatment system at their Louisiana plant has been converted to an above ground tank system. The tanks are equipped with double bottoms for leak detection purposes.

BF Goodrich - All surface impoundments at all plants, with one exception, have been taken out of service and replaced with tanks. The one exception is a pond that follows biological treatment and is used only occasionally for flood control. That pond will be eliminated later this year.

Union Carbide - My contact is at the Texas City Plant which has several

INDUSTRY ENVIRONMENTAL COST DATA

<u>Company</u>	<u>Data Source</u>	<u>Environmental Capital Expenditure (\$MM)</u>						<u>Comments</u>
		<u>1990</u>	<u>1989</u>	<u>1988</u>	<u>1987</u>	<u>1986</u>	<u>1985</u>	
Ethyl	10K			6	4	5		
BFG	10K			1.7				
Borden	10K		2.0	1.7				
Formosa	1986 Ann. Rpt.					17.2 (Taiwan)	23.4 (Taiwan)	
Monsanto	10K		65-75	36				1988 Enviro. O&O \$207MM
Shell Oil	10K		245	170				1988 Enviro. O&O \$415MM
GA Gulf	10K							
Dow	10K	150	150	105				Est. Enviro. at 10% of Cap. Exp. (Financed by Revenue Bonds)
PPG	10K		30	27	26	19		
Carbide	Article	50-60+						\$50-60MM is for wastewater at Texas City only.
Hercules	Article	30						3/4 of Enviro. total is for waste- water.
DuPont	Article	100-200						

INDUSTRY ENVIRONMENTAL COST DATA

<u>Company</u>	<u>Data Source</u>	<u>Fines Paid (M\$)</u>	<u>Old Site Cleanup Cost</u>	<u>Consent Decrees</u>
Ethyl	10K			
BFG	10K	398 in 1989, 395 in 1987	\$11MM 1988 (+\$38MM Accrual)	6 1986-89
Borden	10K	1000 in 1988, 90 in 1985	35 sites Cost?	2 1985-88
Formosa	10K	80 plus 4-wk shutdown in 1985		1 1987
Monsanto	10K		\$19MM in 1988, \$23MM in 1987	2 1987
Shell Oil	10K		103 sites (Fcst \$120MM after tax at one site)	
GA Gulf	10K			
Dow	10K	204 in 1987		2 1987
PPG	10K	225 in 1987, 36 in 1986	46 Sites \$25-30MM/yr. Fcst.	2 1986-87

EVOLV. PLAN

Priority List

The following proposal for the relative order in which environmental opportunities might be explored is intended primarily as a thought jogger. The actual order is likely to be different in many cases as a result of local issues or industry initiatives.

ENVIRONMENTAL WASTE MINIMIZATION PRIORITIES

1. Meet Regulatory Limits
2. Groundwater Remediation
3. Reduce Hazardous Waste - Normal Production (Process, Supplies, Lab, Maintenance, Turnaround Contractors)
4. Reduce Potential for Hazardous Material (Product, Waste, Raw Material, Intermediate, etc.) - Spill/Release
5. Old Site Remediation
6. Reduce Hazardous Constituents/Characteristics of Products
7. Reduce Non-Hazardous (Nuisance) Emissions - Dust, Smoke
8. Reduce Non-Hazardous (Visible) Emissions - Steam, Cooling Tower Vapor, Colored/Dirty Looking Water
9. Reduce Volume of Non-Hazardous Waste Leaving Plant Site
10. Reduce/Eliminate Storage of Non-Hazardous Waste On Site

What is Waste?

As the organization begins coming to grips with development of a waste minimization program, the definition of a waste is becoming an issue. Having heard many of the arguments and concluding that no definition is perfect or without exception, the following is proposed as a working model pending better insight:

A waste is any material which enters a process and (A) remains or (B) leaves without a positive price tag on it. Recycled containers such as trucks and railcars are excluded.

Under this definition, products and materials sold as byproducts are not wastes. Anything which goes into the air, ground, or water is a waste. Any byproduct which we pay someone to take is a waste. As an extreme, vented steam could be termed a waste, though obviously not a hazardous one. Catalyst sold for recovery of metal would not be a waste, even though it is likely that waste would be generated in the recovery process by others. If on the other hand, Vista paid someone to recover metal from catalyst to which we retained title, the waste from that process would be a Vista waste. As with any definition, loopholes can be found in this one.

Purists would say that byproducts sold below raw material value should be termed a waste and that such things as dewatering of sludge to reduce volume are not true waste minimization efforts. No doubt some regulator will be address the issue one day. Until then, Vista should pick almost any reasonable basis and begin moving forward. In the end, the only impact of differing definitions will be the percentage magnitude of reportable improvements. Regulations and good business judgement will determine the degree to which resources are allocated toward the effort.

Definition of "Pro-active"

Since words are subject to different interpretation, it might be useful to describe the intended meaning of "pro-active" as used in this report.

PRO-ACTIVE - Taking action before being forced to do so by regulations. The intent, however, is to take such action only when indicated by sound business judgement to be more cost effective in the longer term than other alternatives. This might also include considerations such as enhancement of community or regulatory officials' perceptions of corporate responsiveness on a selective basis.

Most "pro-active" opportunities are apt to come from a more complete review of possible alternatives when addressing a given regulatory issue. An example might be the cleanup and disposal of accumulated sludge in a tank. Option one might be to handle the situation now at a cost of \$100 per ton. Option two might be to wait until next year when the sludge level interferes with normal operation. Option two is probably preferable given that limited information. However, if it is known that this particular sludge is scheduled to be re-defined as hazardous waste a few months hence and that hazardous waste disposal will cost \$600 per ton, the option one "pro-active" approach makes more sense, all else being equal.

The same principal applies to proposed capital expenditures. Often, by making provision for future equipment additions or by attacking a waste at the source instead of later in the process, large benefits may derive from small incremental expenditures. By encouraging an assessment of the return on incremental dollars, more opportunities to improve cost performance may become visible.

The day may arrive when "pro-active" comes to mean other than good business practice, but in view of the magnitude of work required to simply stay current, that day may not be near for Vista. In preparation for discussions regarding taking that next step to "extremely pro-active", the following thought joggers may be helpful.

AN EXTREMELY PROACTIVE ENVIRONMENTAL APPROACH

PRO

- Potentially Good P.R.
- Satisfies Sense of Morality
- If Correct, May Save \$ Long Term
- Re-defines "Best Available" which Becomes New Min. for Competitors
- Enhance Long-Term Competitive Position Via Efficiency Improvements
- Consistent with QMP Principles
- Directionally Minimizes Liability
- A Trading Chip In Regulatory Negotiations

CON

- Will Not Get Enough Credit from Public
- Penalizes Current Earnings
- Some Competitors Will Not Follow Unless Forced by Regulation
- Some Foreign Competitors may not be subject to even the basic U. S. requirements
- Possible Low to No Immediate Return on These Discretionary Investments
- Debt Load Takes Priority
- Requires Leap of Faith from Relatively Successful Past Practice
- Hard to Sell on Businesslike Basis

APPENDIX

APPENDIX C

REGULATIONS

<u>AGENCY</u>	<u>REGULATION</u>	<u>AREA</u>	<u>PURPOSE</u>	<u>IMPLEMENTATION TIMING</u>	<u>CONTROL STRATEGY</u>	<u>EFFECT ON VISTA</u>
EPA	CLEAN AIR ACT (CAA) UPDATE	AIR	VOLATILE ORGANICS (VOC) FROM WASTE WATER TREATMENT SYSTEMS.	2 - 5 YEARS (BY STATES) EPA PRELIMINARY DRAFT APRIL '88 EPA FINAL DRAFT OCT. '90	1) REDUCE VOC 95% PRIOR TO AIR CONTACT AND RECYCLE /RECOVER. 2) CONTROL VOC IN COLLECTION /TREATMENT SYSTEM.	STATE BY STATE - MAY BE INITIALLY IN OZONE NON ATTAINMENT AREAS. PROBABLY AFFECT REFINERIES FIRST.
EPA	RESOURCE CONSERVATION RECOVERY ACT (RCRA)	AIR	ORGANICS FROM HAZARDOUS WASTE STORAGE TANKS AND AND IMPOUNDMENTS	STG/TREATMENT JUNE '89 DISPOSAL SPRING '90 COMPLIANCE 2 YRS - VENTS 90 DAYS-LEAKS	1) IF WASTE STREAM HANDLED IS 10% OR MORE TOTAL ORGANICS (A) REDUCE EMISSIONS FROM ALL VENTS BELOW 3 LB/HR OR 3.1 TON/YR. OR (B) REDUCE ORGANIC EMISSIONS BY 95%.	ALL STATES - NEW EXISTING SOURCES (RCRA CURRENTLY EXEMPTS WASTEWATER TREATMENT SYSTEMS PERMITTING) [TANK EXEMPT, IMPOUNDMENTS OR BOTH?] CURRENT RCRA - VCM HVY ENDS TANK.

APPENDIX C

REGULATIONS

CONT'D

<u>AGENCY</u>	<u>REGULATION</u>	<u>AREA</u>	<u>PURPOSE</u>	<u>IMPLEMENTATION TIMING</u>	<u>CONTROL STRATEGY</u>	<u>EFFECT ON VISTA</u>
					(C) LEAK DETECTION /REPAIR PROGRAM FOR ALL PUMPS & VALVES	
					2) IMPOUND- MENTS & TANKS CONTAINING WASTE'S GREATER THAN 500 PPM TOTAL ORGANICS	
					(A) COVERED/VENTED TO REDUCE EMISSIONS 95%	
					OR (B) WASTES PRETREATED TO REMOVE ORGANICS	
	SUPERFUND AMENDMENT AND REAUTHORIZATION ACT (SARA) TITLE III - COMMUNITY RIGHT TO KNOW	AIR	ANNUAL REPORTING OF INFO TO PUBLIC ON EMISSIONS TO AIR, LAND AND WATER	IN FORCE	N/A	COMPLYING
	NATIONAL EMISSIONS STDS. FOR HAZARDOUS AIR POLLUTANTS (NESHAPS)	AIR	CAA REQUIRES EPA TO ESTABLISH STDS WHICH PROVIDE AMPLE MARGIN OF SAFETY TO PROTECT HUMAN HEALTH	DEVELOPMENT IN PROGRESS		BZ, VCM ONLY ONES TODAY FUTURE - BUTADINE, EO BZ STG TKS @ BALT. SLURRY DUMP FROM PVC REACTORS 400 PPM VCM

APPENDIX C

REGULATIONS

<u>AGENCY</u>	<u>REGULATION</u>	<u>AREA</u>	<u>PURPOSE</u>	<u>IMPLEMENTATION TIMING</u>	<u>CONTROL STRATEGY</u>	<u>EFFECT ON VISTA</u>
STATE OF MARYLAND	AIR TOXICS	AIR	CONTROL EMISSIONS OF AIR TOXICS SUCH AS BZ	FY91	DETERMINE BY AIR EMISSIONS DISPERSIONS MODELING	MOST REDUCE BE REDUCE BZ AIR EMISSIONS FROM BALTIMORE PLANT PER MODELING ALREADY COMPLETED
STATE OF LA.	AIR TOXICS	AIR	CONTROL EMISSIONS FROM NEW INSTALLATIONS	POLICY IN FORCE	NEW PROJECT MUST NOT CONTRIB. MORE THAN 1/42 OF TLV TO AMB. AIR AT FENCELINE AND NOT MORE THAN SPECIFIED RISK LEVEL FOR CARCINOGENS. DEMONSTRATE BY AIR DISPERSION MODELING.	CURRENTLY EXCEED SOME LEVELS AT LCVCM AND LCCP. EXAM PROJECT DIRECTLY AFFECTED.
EPA	ORGANIC CHEMICALS, PLASTICS & SYNTHETIC FIBERS (OCPSF)	WASTE WATER	CONTROL LIST OF CONVENTIONAL AND PRIORITY POLLUTANTS	FINAL DEC '87 IMPL. DEC '90 OKC, BALT. IMPL. W/NEW PERMIT ABD, LCCC.	MASS LOADING LIMITS (BASED BEST AVAILABLE TECHNOLOGY)	WILL APPLY ON RENEWAL OF NPDES PERMIT (SEPT 91) WILL REQUIRE 80 - 90% REDUCTION FOR LCCC. ALSO REQUIRES PRETREATMENT IF DISCHARGE INTO CITY SEWER SYSTEM.

APPENDIX C

REGULATIONS

<u>AGENCY</u>	<u>REGULATION</u>	<u>AREA</u>	<u>PURPOSE</u>	<u>IMPLEMENTATION TIMING</u>	<u>CONTROL STRATEGY</u>	<u>EFFECT ON VISTA</u>
STATE OF LA.	REVISION TO SURFACE WATER QUALITY STANDARDS	WASTE WATER	PROTECT DESIGNATED USES OF STATE WATERWAYS	?		EXPECT TOUGHER THAN FEDERAL
STATE OF LA.	COMPILING STATUS & CONTROL STRATEGY FOR WATER TOXICS IN CERTAIN STATE WATERWAYS FOR SUBMISSION TO EPA					
LEGIS/ EPA	CLEAN WATER ACT	WASTE WATER	ELIMINATE DISCHARGE OF POLLUTANTS INTO WATERS OF THE US.	IN FORCE	<u>EPA TO:</u> 1) ISSUE EFFLUENT LIMITATION GUIDELINES STDS FOR NEW/EXISTING INDUSTRIAL DISCHARGES 2) ENSURE MAINTENANCE OF EXISTING WATER USES THROUGH WATER QUALITY STANDARD PROGRAM (TECHNOLOGY BASED)	
				SUBMIT TO EPA 2/89	<u>STATES TO:</u> 1) DEVELOP LIST OF IMPAIRED WATERS (BIOTOXCITY)	CALCASIEU RIVER AND BAYOU VERDINE

APPENDIX C

REGULATIONS

<u>AGENCY</u>	<u>REGULATION</u>	<u>AREA</u>	<u>PURPOSE</u>	<u>IMPLEMENTATION TIMING</u>	<u>CONTROL STRATEGY</u>	<u>EFFECT ON VISTA</u>
			PERMITS IMPLEMENTED 6/92	2) IDENTIFY POINT SOURCES CAUSING IMPAIRMENT		
				3) DEVELOP INDIVIDUAL CONTROL STRATEGIES FOR EACH POINT SOURCE (PERMITS)		
			FINAL 12/89	4) REVISE WATER QUALITY STANDARDS EVERY 3 YEARS		
EPA	TOXIC CHEMICAL LEACHING PROCEDURE (TCLP) (PART OF RCRA) OTC TC	WASTE WATER	REDEFINES HAZARDOUS WASTE	SEPT 89?		BENZENE, TOLUENE, EDC, VCM AFFECTED. IF NOT REDUCED TO TO PPB LEVELS, WOULD RENDER WASTE WATER TREATMENT SYSTEMS "HAZARDOUS WASTE IMPOUNDMENTS" SUBJECT TO RULES REQUIRING HIGH COST LINERS, WASTE TREATMENT, REPORTING, ETC.
STATE OF LA.	NARRATIVE STANDARD	GROUND WATER	PROHIBIT DISCHARGE OF POLLUTANTS INTO GROUND WATER	ADOPTED		

APPENDIX C

REGULATIONS

<u>AGENCY</u>	<u>REGULATION</u>	<u>AREA</u>	<u>PURPOSE</u>	<u>IMPLEMENTATION TIMING</u>	<u>CONTROL STRATEGY</u>	<u>EFFECT ON VISTA</u>
EPA	RCRA	GROUND WATER	MINIMIZE POTENTIAL FOR RELEASE OF HAZARDOUS MAT. FROM WASTE TANKS & IMPOUNDMENTS TO GROUND WATER	IN PLACE DESIGN REQUIREMENTS	CORROSION PROTECTION, SECONDARY CONTAINMENT, LINERS, LEACHATE COLLECTIONS, MONITORING	NONE-IMMEDIATE (CURRENT RCRA PERMITTING EXEMPTION FOR WASTE WATER TREATMENT UNITS) OTHERWISE REQUIRES FOR IMPOUNDMENTS DOUBLE LINER, SINGLE LEACHATE COLLECTION SYSTEM, GROUND WATER MONITORING COVERS HVY ENDS TKS VCM, THREE DRUM STG AREAS AT LCCC, NO RCRA FACIL. @ OTHER LOCATIONS
STATE OF LA.	UPGRADE OF NON- HAZARDOUS SOLID WASTE RULES	GROUND WATER	AS ABOVE - NON-HAZARDOUS	PROPOSED DRAFT SPRING 89 FINAL 12/89? SOME COMPLIANCE PERIOD BUT UNKNOWN		ALL LCCC IMPOUNDMENTS AND OLD DISPOSAL SITES REQUIRE SYNTHETIC LINER, LEAK DETECTION/REMOVAL SYSTEM TIMING??
EPA	BURNING & BLENDING	AIR? HAZ. WASTE	REGULATE WHAT MATERIALS MAY BE BURNED AS FUEL	FINAL SPRING 89 ANTIC. EFF SEPT 89		MUST REMOVE BZ FROM BALT. SPRUNG OIL BTMS TO ALLOW CONTINUED USE AS BOILER FUEL W/O RETROFIT OF MON. EQUIPMENT, RCRA (HAZ WASTE) PERMIT, ADMIN. PROGRAMS, ETC.
EPA	RCRA	HAZ. WASTE	TANKS TO HAVE SECONDARY CONTAINMENT	EXISTING	SECONDARY CONTAINMENT FOR HAZ. WASTE TANKS	LCVCM 452 TANK MUST HAVE SEC. CONT. BEFORE CAN GO INTO HEAVY ENDS SERVICE

APPENDIX D

LAKE CHARLES WASTEWATER A LOOKBACK STORY

This story is not to justify Rich Gerlach's having saved plant presentations from the Blauvelt/Gerhart era, though without the data from them, the story probably could not have been assembled.

During the 1960-86 period, on the order of \$10MM capital was spent on installations which will be abandoned after completion of the wastewater project. Based on Nelson cost indices, this translates to about \$35MM at today's cost. In addition, approximately \$10MM will be spent to clean out, close up and mop up behind those abandoned installations.

Portions of the wastewater project which more or less directly replace those installations total \$21MM in 1989 dollars. (An additional \$11MM will also be spent on "enabling" equipment, not including \$0-2.5MM in MeCl.)

Interesting, but so what? The "so what" is that with perfect foresight about the same money could have been spent "way back when" and we would need spend nothing or very little today or until 1995-98.

The technology being proposed already existed when the previous investments were made. Were we just dumb? No, each technical and investment decision made sense at the time, taken individually. The problem was that the sum of the individual decisions was a patchwork instead of a coordinated whole. (Lest anyone think this story to be an attack, the author had input to some of those decisions also.)

While no guarantee exists that a similar story won't appear 15 or 20 years from now, the LCCC Wastewater Project has been approached with best efforts at developing a long term, modular and flexible system to carry the complex into the future.

NOTE: Though it is true that operating cost differences between the new and old systems were disregarded, so also were the cost and resource diversion involved in redesign, following up violations, writing lookback stories, etc.

LCCP WASTEWATER PROJECTS TO BE ABANDONED
(Probably Significant on Low Side)

<u>Project</u>	<u>Date</u>	<u>SMM</u>	
		<u>Orig. Cost</u>	<u>Current Cost</u>
Holding Pond	1960	0.25?	1.3
API Separator	1971	0.57	1.9
Sand Filters	1968	0.20?	0.8
Aerated Lagoons	1971	1.28	4.2
Polishing Pond	1972?	0.05?	0.2
Other Water Projects	1968-74	0.38	1.3
Flow Meas./Pol. Pond Imp.	1974	0.02	0.05
Misc. Proj.	1974-77	0.50?	1.1
Stormwater Ponds	1976	0.24	0.5
Segr. B.D. Streams	1976	0.17	0.4
DAF Unit	1977	0.75?	1.4
Stormwater Diver. Rev.	1978	0.30?	0.5
Sludge Dewatering	1981	0.60?	0.9
Oil/Water Separator Covers	1983	0.91	1.1
Wastewater Compliance	1983	1.08	1.3
NPDES Runoff Compliance	1986	<u>0.23</u>	<u>0.3</u>
LCCP SubTotal		7.53?	30.0
VCM Lagoons	1970	0.40	2.1
VCM Copper Pond	1980	?	?
VCM Acid Pits	1985	1.91	2.1
VCM CPS Repl.	1986	<u>0.15</u>	<u>0.2</u>
VCM SubTotal		2.46	4.4
Total LCCC		10.00	35.0

LCCC WASTEWATER PROJECT

ITEMS DIRECTLY REPLACING ABANDONED
EQUIPMENT OR TECHNOLOGY

<u>Item</u>	<u>1989 \$ Cost</u>	<u>Date</u>	<u>Cost As Of Inst. Date</u>
ASU Pond Upgrade	1.6	1991	1.76
Alc. Baro. C.T.	.55	1990	.55
Hydr. Load Red.	2.0	1989/90	2.0
WAO-Spent Caustic	4.2	1990	4.2
Stormwater Tanks	4.6	1992	5.5
Tank Based ASU	<u>7.8</u>	1992	<u>9.4</u>
Replacements	20.8		23.4
Pond Closures	8.0	1992-97	9.9
Groundwater Treatmt.	<u>1.5</u>	1989PV	<u>1.5+</u>
Cleanup	9.5		11.4
MeCl Unit Shutdown	-	1991	-
	<u> </u>		<u> </u>
	30.3		35.0

NOTE: "Enabling" equipment not listed here.

NELSON COST INDEX
CONSTRUCTION INDEX
INDEX (1946 = 100)

JUN 15 89

YEAR	PUMPS & COMPR	ELECT MACH	INT- COMB ENGINE	CONT INSTR	HEAT EXCH	MISC EQUIP AVG	MATL COMP	LABOR COMP	NELSON INDEX
1946	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1947	117.2	113.0	109.0	113.0	115.0	114.2	122.4	113.5	117.0
1948	127.0	127.6	116.9	120.0	130.0	122.1	139.3	128.0	132.5
1949	135.9	130.9	124.8	122.0	133.0	121.6	143.6	137.1	139.7
1950	138.2	134.9	126.0	127.8	140.0	126.2	149.5	144.0	146.2
1951	155.9	154.3	146.1	142.3	152.0	145.1	164.0	152.5	157.2
1952	155.6	152.4	146.5	146.2	165.8	153.3	164.3	163.1	163.6
1953	162.5	156.4	148.1	151.8	174.9	158.8	172.4	174.2	173.5
1954	166.5	160.0	150.5	154.6	171.1	160.7	174.6	183.3	179.8
1955	172.2	162.5	153.2	162.9	156.8	161.5	176.1	189.6	184.2
1956	192.0	175.0	164.0	182.1	190.7	180.5	190.4	198.2	195.3
1957	206.7	188.9	173.9	187.4	203.6	192.1	201.9	208.6	205.9
1958	214.7	192.7	178.3	194.9	181.2	192.4	204.2	220.4	213.9
1959	226.9	195.8	178.5	201.0	178.9	196.1	207.8	231.6	222.1
1960	228.3	195.2	180.7	202.5	194.0	200.0	207.6	241.9	228.2
1961	228.8	192.1	181.2	207.5	188.1	199.5	207.7	249.4	232.7
1962	222.5	189.5	183.4	214.8	183.6	198.8	205.9	258.8	237.6
1963	224.3	187.7	181.5	224.5	189.1	201.4	206.3	268.4	243.6
1964	231.5	186.4	184.9	225.3	206.1	206.8	209.6	280.5	252.1
1965	245.6	186.2	186.4	221.5	218.4	211.6	212.0	294.4	261.4
1966	260.5	190.5	188.7	299.7	235.2	220.9	216.2	310.9	273.0
1967	272.2	196.1	192.0	232.3	237.9	226.1	219.7	331.3	286.7
1968	284.4	198.2	198.9	239.1	223.4	228.8	224.1	357.4	304.1
1969	298.6	201.7	207.4	252.8	235.8	239.3	234.9	391.8	329.0
1970	313.1	208.6	217.0	278.8	253.8	254.3	250.5	441.1	364.9
1971	330.6	241.5	226.1	304.2	268.0	268.7	265.2	499.9	406.0
1972	337.5	216.3	233.3	328.4	274.3	278.0	277.8	545.6	438.5
1973	346.9	220.2	238.3	338.0	313.7	291.4	292.3	585.0	468.0
1974	416.3	244.9	270.2	376.5	501.3	361.8	371.3	623.6	522.7
1975	509.8	275.6	319.8	420.5	553.9	415.9	421.0	678.5	575.5
1976	538.6	287.2	348.3	466.4	478.5	423.8	445.2	729.4	615.7
1977	574.9	299.2	376.9	484.1	454.0	438.4	471.3	774.3	653.0
1978	619.5	323.1	412.7	518.7	496.0	474.1	516.7	824.2	701.1
1979						515.4	573.1	879.0	756.6
1980						578.1	629.2	951.9	822.8
1981	880.6	431.4	576.9	623.4	727.3	647.9	693.2	1,044.2	903.8
1982	944.1	453.8	627.7	652.5	635.9	662.8	707.6	1,156.5	976.9
1983	944.5	469.0	653.7	675.2	541.7	656.8	712.4	1,234.8	1,025.8
1984	950.5	486.5	663.1	696.8	530.9	665.6	735.3	1,278.1	1,061.0
1985	969.9	497.0	666.7	713.7	520.0	673.4	739.6	1,297.6	1,074.4
1986	982.6	504.6	676.9	733.3	524.7	684.4	730.0	1,330.0	1,089.9
1987	995.3	511.5	690.3	744.4	577.7	703.9	750.0	1,397.6	1,123.0
1988	1,027.8	519.7	702.3	748.8	664.1	732.5	802.8	1,405.6	1,164.5
1989									1208 EST.
1990									
1991									
1992									
1993									
1994									
1995									
1996									
1997									

1960 → 89 = 5.3X
1965 → 89 = 4.6X
1970 → 89 = 3.3X
1975 → 89 = 2.1X
1980 → 89 = 1.5X
1985 → 89 = 1.1X

ANNUAL AVG
COMPOUND INC. 6.02%
001125194

APPENDIX E

ENVIRONMENTAL CAPITAL COMMITMENTS FORECAST

(RECAP BASIS)

	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>SUB TOTAL</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>TOTAL</u>
Must Do	7.2	8.2	3.0	5.0	5.0	28.4	5.2					
LCCC Black Box	2.0	11.7	0	8.0	0	21.7	0	1.0	9.2	6.0		37.9
Proactive	1.4	0.9	1.8	2.0	2.0	8.1	1.0					
	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____		_____
Subtotal	10.6	20.8	4.8	15.0	7.0	58.2	6.2					
External Stm. Strpg.	0	0	45	0	0		0					
TOTAL	10.6	20.8	49.8	15.0	7.0	103.2	6.2					

Figure 1-1. Short- and Long-term Regulatory Trends Applicable to the Vista Lake Charles Wastewater Treatment System

Consultant (Radian) Directional Recommendations - Wastewater LCCC

1. Prevent, eliminate, minimize waste generation
2. Implement practices which concentrate, remove, destroy, recycle organics in wastewater
3. Segregate waste streams for differing management (stormwater, others)
4. Improve housekeeping
5. Long Term - Alter/replace feedstocks, alter/replace production technology, redesign end products if necessary

PHASE I LCCC WASTEWATER PROJECT - RADIAN ESTIMATES (MARCH 1989)

<u>PROJECT</u>	<u>Total Cost</u>		<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>Total</u>
	<u>Jan. Est.</u>	<u>Mar. Est.</u>											
<u>A. Stormwater Segregation</u>	3.1	3.1											
* 1. MECL Stormwater* 0*													
2. LAB Water Collection 458			.46										
3. Ethylene Stormwater 1,080			1.08										
4. Alcohol Stormwater 1,530				1.53									
5. VCM Stormwater 36				.04									
3,104													
<u>B. Wastewater Treatment</u>	5.0	11.1											
1. ASU Pond Upgrade 1,600					1.76								
2. ASU Treatability Study 250			.25										
3. Biotoxicity Study 43			.04										
4. LCCC Stm. Stripper 1,978				1.98									
5. LAB Water Treatment 1,985				1.99									
6. VCM Stm. Stripper Upgrade 1,426				1.43									
7. VCM C-500 FD.TK/ T-110 290				0.29									
8. VCM SPCC Study 75				.08									
9. Alcohol DAF Unit 825				.82									
10. Repl. Alc. Baro C.T. 550				.55									
11. ALC. Acid Holding Pit 90					.10								
12. Hydraulic Load Reduction 2,000													
a. ALC 600			.60										
b. VCM 400			.40										
c. Ethy 750				.75									
d. NPU/ETO 250				.25									
11,112													
<u>C. Wet Air Oxid. - Spent Caustic</u>	5.6	4.2		4.28									
<u>D. MeCl Stripper</u>	0												
	13.7	18.4	2.83	13.89	1.86							18.6	

PHASE II LCCC WASTEWATER PROJECT - RADIAN ESTIMATES (MARCH 1989)

<u>PROJECT</u>	<u>Total Cost</u>		<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>Total</u>
	<u>Jan. Est.</u>	<u>Mar. Est.</u>											
<u>E. Stormwater Treatment (Tanks)</u>	3.8	4.6				5.53							
<u>F. Tank Based ASU</u>	4.2	7.8				9.38							
<u>G. NPU Coalescer</u>	-	0.3				.35							
	<u>8.0</u>	<u>12.7</u>				<u>15.3</u>							

PHASE III LCCC WASTEWATER PROJECT - RADIAN ESTIMATES (MARCH 1989)

<u>PROJECT</u>	<u>Total Cost</u> <u>1989 \$</u>		<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>Total</u>
	<u>Jan. Est.</u>	<u>Mar. Est.</u>											
<u>H. PACT/WAO</u>													
PACT/WAO - Engr. 465	10.2	4.7							.64				
PACT/WAO - Const. 4,188										5.87			
 <u>I. Incinerator</u>													
Incinerator - Engr. 600	6.0	6.0				.72							
Incinerator - Const. 5,400												7.56	
	<u>16.2</u>	<u>10.7</u>				<u>.72</u>			<u>.64</u>	<u>5.87</u>		<u>7.56</u>	<u>14.8</u>

NOT INCLUDED IN CAPITAL (EXPENSE ?)

<u>ITEM</u>	<u>COST</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>TOTAL</u>
<u>Pond Closures</u>	<u>Partial</u>											
Holding Pond-ENGR.	65		.06									
Holding Pond Closure Cleanout N, S	586				.07							
Lagoons & 1/2 Stormwater Pond	2066				2.48							
Close 1/2 Stormwater Pond & Sand Filters	368				.44							
Close REM. Impound- ments-ENGR.	339								.47			
Close REM. Impound- ments-CONST.	3050									4.27		
Digester Closure 1000-2000		1.5										
<u>Groundwater Treatment</u>	<u>Partial</u>											
VCM	700	.70										
<u>Radian Prelim. Design</u>	250	.25										
	<u>8924</u>	<u>2.45</u>	<u>.06</u>	<u>0</u>	<u>2.99</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>.47</u>	<u>4.27</u>	<u>0</u>	<u>10.2</u>

FIGURE 1

SUMMARY

LCCC Wastewater Implementation Plan

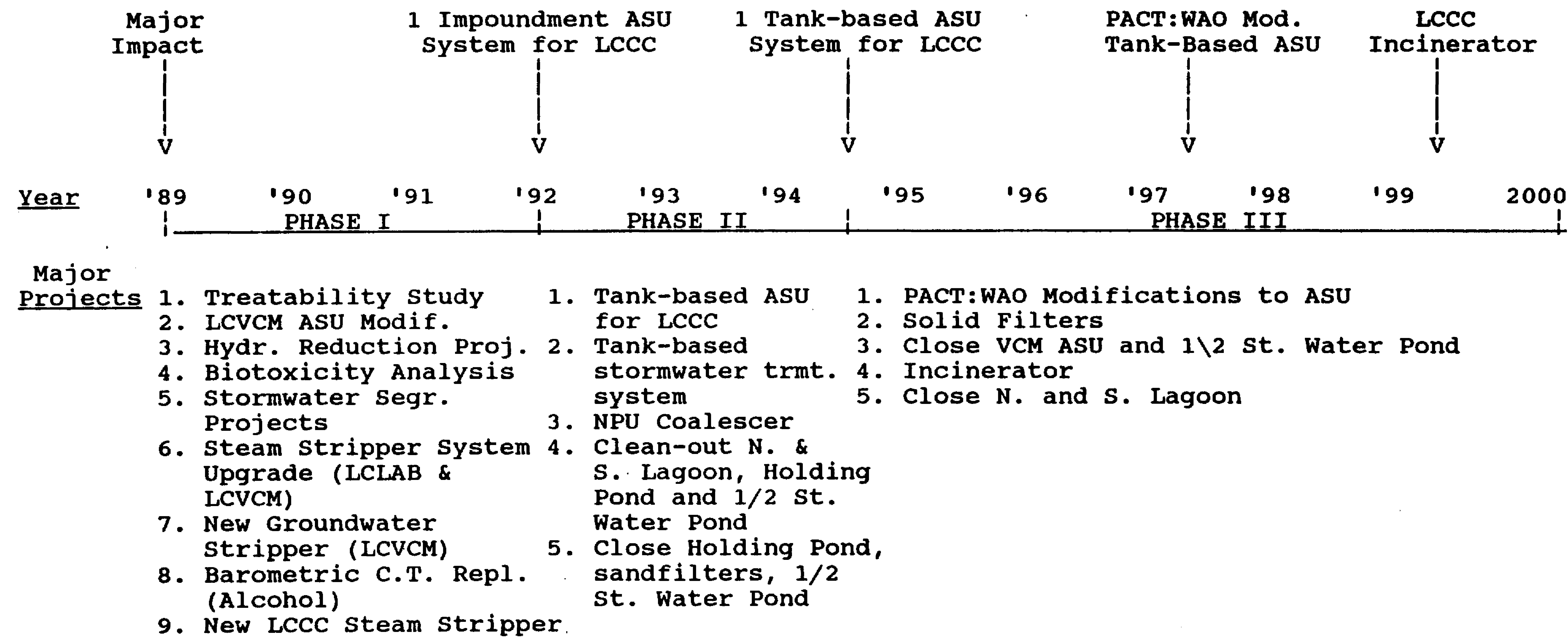


FIGURE 2

**LCCC WASTEWATER PROJECT
PHASE I — BLOCK FLOW DIAGRAM**

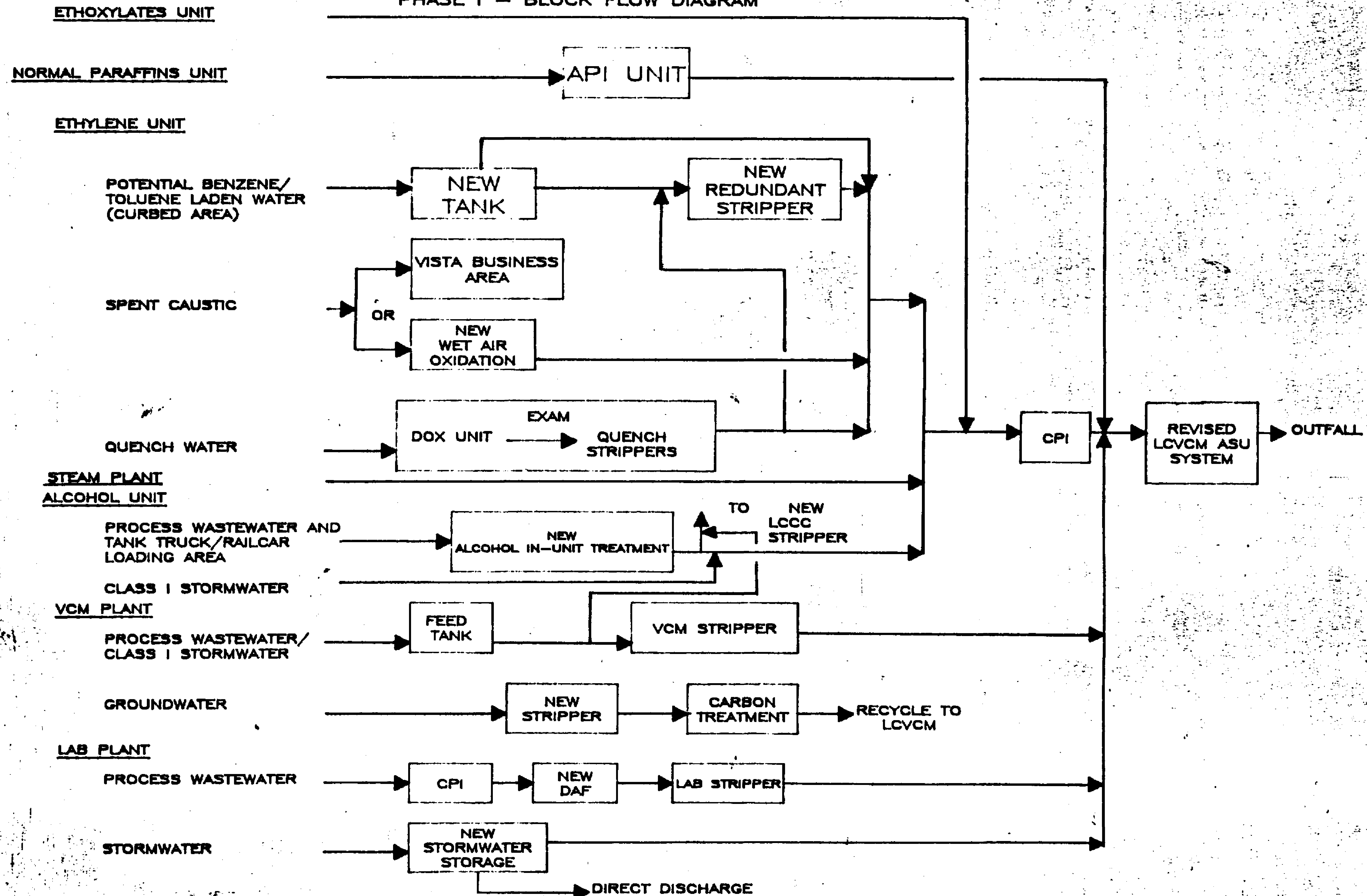
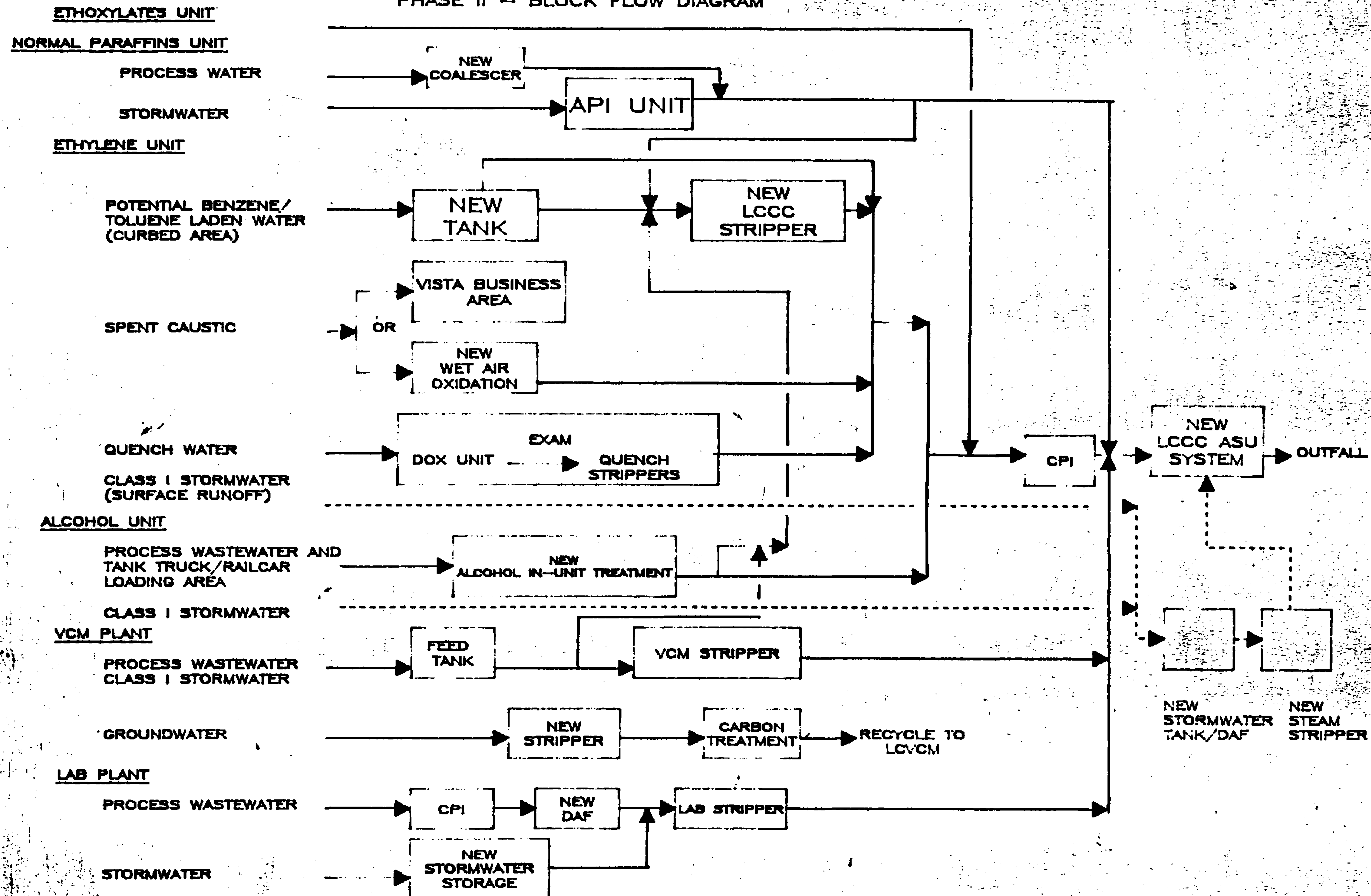


FIGURE 3

LCCC WASTEWATER PROJECT
PHASE II - BLOCK FLOW DIAGRAM



TWH
1-26-89

LCCC WASTEWATER STUDY

1. STUDY OBJECTIVES
2. REGULATORY REVIEW
3. REVIEW OF OPTIONS
4. COST
5. FUTURE ACTIONS

This
mtg

1-26-89

RDG

RTF

JADe

TTH

JF

MGT

JCS

TWH

WASTEWATER TEAM

LCCP	-	DUANE EVERY
	-	MIKE HAYES
	-	JIM SHAMBURGER
LCVCM	-	SANDRA CORKRAN
LCLAB	-	PAUL HIPPMAN
PED	-	TOM HELLER
	-	MIKE WISELEY
LEGAL	-	BILL McCLAIN
ENVIRONMENTAL	-	JOE LEDVINA

LCCC WASTEWATER STUDY

**INITIATED BY LOUISIANA DEQ PERMIT
REQUEST**

- LCCC SOURCE SURVEY**
- \$250M CONTRACTOR-BASED STUDY
INITIATED OCTOBER 1, 1988
(TO BE COMPLETED MARCH, 1989)**

STUDY OBJECTIVES

- 1. EVALUATE REGULATORY IMPACT
(NEXT 30 YEARS)**
- 2. IDENTIFY WASTE MINIMIZATION OPTIONS**
 - AIR**
 - SOLIDS**
 - WATER**
- 3. IDENTIFY OPTIMUM WASTE MANAGEMENT
IMPLEMENTATION PLAN**

LCCC WASTEWATER STUDY

TASK 1.0 REGULATORY REQUIREMENTS

TASK 2.0 WASTE CHARACTERIZATION

TASK 3.0 PROCESS SELECTION AND DESIGN

- **TECHNOLOGY ASSESSMENT**
- **ALTERNATIVE DEVELOPMENT**
- **CONCEPTUAL DESIGN**

TASK 4.0 PRELIMINARY DESIGN

**TASK 5.0 FINAL REPORT - IMPLEMENTA-
TION PLAN**

AIR REGULATIONS

EXISTING

SARA 313

REQUIREMENT

**REPORT EMISSIONS OF TOXICS
ANNUALLY**

EXPECTED

AIR TOXICS

REQUIREMENT

**CONTROL OF SARA 313
CHEMICALS TO 10^{-6} HEALTH
RISK**

**ORGANIC EMISSION
CONTROL**

**REQUIRE 95% REDUCTION FROM
1987 LEVELS OF HYDROCARBON
EMISSION FROM SEWERS,
DITCHES, SUMPS, TANKS,
IMPOUNDMENTS, OR OTHER
TREATMENT UNITS IN WASTE-
WATER SERVICE (INCLUDING
WATERS AND RESIDUALS)**

WATER REGULATIONS

EXISTING

REQUIREMENT

**ORGANIC CHEMICALS,
PLASTICS, SYNTHETIC
FIBERS EFFLUENT
GUIDELINES**

**SIGNIFICANT REDUCTIONS FROM
EXISTING PERMIT FOR CONVEN-
TIONAL POLLUTANTS (APPROX.
80% FOR BOD).**

**WASTE LOAD ALLOCA-
TION FOR BAYOU
VERDINE**

**APPROXIMATELY 50% REDUCTION
FOR BOD AND TSS.**

EXPECTED

REQUIREMENT

**BIOTOXICITY LIMITA-
TIONS ON EFFLUENT
DISCHARGE**

**80% SURVIVAL OF TEST SPECIES
IN EFFLUENT WATER. ORGANICS,
METALS, CALCIUM SALTS, AND
CHLORIDES ARE SUSPECTED
MAJOR CAUSES.**

**BIOTOXICITY LIMITA-
TIONS BASED ON
RECEIVING WATER
QUALITY**

**80-100% SURVIVAL OF TEST
SPECIES IN EFFLUENT DIS-
CHARGE WATERS.**

SOLID WASTE REGULATIONS

EXISTING

**DEFINITION OF A
SOLID WASTE
DISPOSAL UNIT**

REQUIREMENT

**INCLUDES SURFACE IMPOUND-
MENTS CONTAINING OR
COLLECTING WASTEWATER,
'DIRTY' STORMWATER,
'CLEAN' STORMWATER FROM
PROCESS AND PROCESS
OFFSITE AREAS, AND NON-
HAZARDOUS RESIDUES.**

EXPECTED

LINER REQUIREMENTS

REQUIREMENT

**DOUBLE OR SINGLE SYNTHE-
TIC LINERS AND LEACHATE
COLLECTION SYSTEMS WILL
BE REQUIRED FOR ALL NON-
HAZARDOUS SOLID WASTE
SURFACE IMPOUNDMENTS.**

EXPECTED

**TOXICS WASTE LOAD
ALLOCATION FOR
BAYOU VERDINE
BASED ON WATER
QUALITY STANDARDS
FOR TOXICS**

REQUIREMENT

**DETECTION LIMITS FOR TOXICS
IN EFFLUENT WATERS.**

HAZARDOUS WASTE REGULATIONS

EXISTING

**LINERS FOR LAND
DISPOSAL FACILI-
TIES**

**SECONDARY CON-
TAINMENT FOR
HAZARDOUS WASTE
TANKS**

**AIR EMISSION
CONTROLS FROM
HAZARDOUS WASTE
EQUIPMENT**

REQUIREMENT

**ALL HAZARDOUS WASTE
IMPOUNDMENTS MUST HAVE
DOUBLE SYNTHETIC LINERS
AND LEACHATE COLLECTION.**

**TANKS MUST BE CONSTRUCTED
SO THAT LEAKS FROM TOP,
SIDES, OR BOTTOM CAN BE
DETECTED IMMEDIATELY.
DIKE AREAS MUST BE SEALED
AND HAVE CAPACITY TO STORE
THE TANK CONTENTS PLUS A
25 YEAR FLOOD.**

**TANK, VALVE, PUMP SEAL,
COMPRESSOR SEAL EMISSION
STANDARDS FOR HYDROCARBONS
FROM HAZARDOUS WASTE TANKS
AND EQUIPMENT.**

HAZARDOUS WASTE REGULATIONS

EXPECTED

**ORGANIC TESTING
CHARACTERISTIC
(OTC (WAS TCLP))**

REQUIREMENT

**RECLASSIFIES WASTES WHICH
CONTAIN LOW LEVELS OF
ORGANIC POLLUTANTS FROM
SOLID WASTE TO HAZARDOUS
WASTE. FACILITIES CON-
TAINING THESE WASTES MUST
MEET HAZARDOUS WASTE
STANDARDS.**

**DESIGN REQUIRE-
MENTS FOR
CONVEYANCE
DEVICES**

**A NO DISCHARGE OR MIGRA-
TION TO GROUNDWATER
STANDARD FOR PIPES, DITCHES,
ETC., TRANSPORTING HAZARD-
OUS WASTES.**

**AIR EMISSION
CONTROL REQUIRE-
MENTS**

**A CONTROL REQUIREMENT FOR
HYDROCARBON EMISSIONS FROM
ALL RCRA UNITS, INCLUDING
CONVEYANCE DEVICES.**

LANDFILL BANS

**HAZARDOUS WASTE LAND DIS-
POSAL WILL CONTINUE TO BE
LIMITED WITH ADDITIONAL
CLASSES OF HAZARDOUS
WASTES PROHIBITED
FROM LAND DISPOSAL.**

WASTE MINIMIZATION

**NUMERICAL REQUIREMENTS
FOR WASTE ELIMINATION**

STORMWATER SEGREGATION

**OBJECTIVE: IDENTIFY REVISIONS WHICH WOULD SEGREGATE
'CLEAN' STORMWATER FROM 'PROCESS AREA'
STORMWATER.**

**TO ADDRESS: a. STORMWATER COMPLIANCE
b. ALCOHOL FLOODING
c. REDUCE HYDRAULIC LOADING (MeCl,
WASTE MIN.)**

ALT. 1 - BASE CASE

**46% RED. - ELIMINATE OPEN DITCHES/REVISE PIPING
 - GRADING/CURBING FOR SEGREGATION
 - TANK FARM PIPING REVISIONS FOR
 SEGREGATION**

ALT. 2 - DOUBLE COST

**53% RED. - ALT. 1 ITEMS
 - ADDITIONAL IN-UNIT CURBING
 - CATCH RAINFALL ON EXIST ROOFS**

ALT. 3 - TRIPLE COST

**60% RED. - ALT. 1 ITEMS
 - ALT. 2 ITEMS
 - ROOFING OVER H.C. SOURCES**

WASTE MINIMIZATION CLEAN STREAM SEGREGATION

**OBJECTIVE: IDENTIFY REVISIONS WHICH WOULD SEGREGATE
PROCESS WATER NOT REQUIRING TREATMENT**

**TO ADDRESS: a. STORMWATER COMPLIANCE
b. ALCOHOL FLOODING
c. REDUCE HYDRAULIC LOADING
(MECL, WASTE MIN.)**

- **COOLING TOWER BLOWDOWN FROM ALCOHOL TO DIRECT DISCHARGE**
- **COOLING TOWER AND BOILER BLOWDOWN STREAMS FROM ETHYLENE TO DIRECT DISCHARGE**
- **BOILER BLOWDOWN AND ZEOLITE REGENERANT STREAMS FROM STEAM PLANT TO DIRECT DISCHARGE**
- **LIME PIT WATER RECYCLE (STEAM PLANT)**
- **INSTALLATION OF RECIRCULATING COOLING WATER SYSTEMS IN ETHOXYLATE AND NORMAL PARAFFIN**
- **COOLING TOWER BLOWDOWN FROM LCVCM TO DIRECT DISCHARGE**
- **MISCELLANEOUS STEAM CONDENSATE RECOVERY SYSTEMS, FREEZE PROTECTION, AND MODIFIED SAMPLE LOOP PROJECTS**

TECHNOLOGY ASSESSMENT

**CHEMICAL OXIDATION
PHOTOLYSIS OXIDATION
CHEMICAL PRECIPITATION
VOLATILIZATION (GAS STRIPPING)
HYDROLYSIS
SOLVENT EXTRACTION
WET AIR OXIDATION
MEMBRANE PROCESSES
MOLECULAR SIEVES
ION EXCHANGE
ACTIVATED CARBON ADSORPTION PROCESSES
FILTRATION
COALESCE
DEWATERING (CENTRIFUGATION AND PRESSURE
FILTRATION)
DISTILLATION
RESIN ADSORPTION
EQUALIZATION/NEUTRALIZATION
OIL SEPARATION (GRAVITY AND FLOTATION)
COAGULATION AND FLOCCULATION
BIOOXIDATION PROCESSES (AEROBIC AND
ANAEROBIC)
PHYSICAL-BIOLOGICAL PROCESSES
CLARIFICATION/THICKENING
CRYSTALLIZATION PROCESSES
EVAPORATION PROCESSES
THERMAL DESTRUCTION PROCESSES**

**EXISTING AND/OR PROPOSED
BASE CASE SOURCE TREATMENTS/
WASTE MINIMIZATION PROJECTS**

- EXAM (ETHYLENE UNIT)
- EXISTING STEAM STRIPPING IN LCLAB AND LCVCM
- EXISTING OIL-WATER SEPARATION IN NORMAL PARAFFIN UNIT AND LCLAB
- TANKS AND VESSELS VENT TO CONTROL DEVICES
- SECONDARY CONTAINMENT ON HAZARDOUS WASTE TANKS AND PIPING
- SECONDARY CONTAINMENT ON PROCESS WASTEWATER SEWERS

CASE

DESCRIPTION

- | | |
|---|---|
| 1 | ONE END-OF-PIPE LCCC TREATMENT SYSTEM |
| 2 | SOURCE CONTROL WITH ONE END-OF-PIPE LCCC TREATMENT SYSTEM |
| 3 | SOURCE CONTROL WITH SEPARATE END-OF-PIPE TREATMENT SYSTEMS LCCP/LCLAB AND LCVCM |
| 4 | ZERO WATER DISCHARGE |

CASE 1

END-OF-PIPE TREATMENT

- **STORMWATER MANAGEMENT ALTERNATIVE #1 WITH RETENTION-STORAGE AND SECONDARY OIL-WATER SEPARATION (TANKAGE, DAF, STEAM STRIPPER)**
- **CLEAN STREAM SEGREGATION AND DIRECT DISCHARGE**
- **PRIMARY OIL-WATER SEPARATION (UPGRADE) OF COMBINED PROCESS WASTEWATERS AT THE END-OF-PIPE (CPI)**
- **SECONDARY OIL-WATER SEPARATION OF COMBINED PROCESS WASTEWATERS AT THE END-OF-PIPE (DAF UNIT)**
- **VOLATILIZATION (STEAM OR NATURAL GAS STRIPPING)**
- **EQUALIZATION/NEUTRALIZATION (TANKAGE/ VESSELS)**
- **POWDERED CARBON ACTIVATED SLUDGE TREATMENT (ASU WITH POWDERED CARBON)**
- **TERTIARY FILTRATION**
- **RESIDUALS MANAGEMENT (SOLIDS, SOLVENTS, VOC'S) BY INCINERATION AND WET OXIDATION OF POWDERED CARBON**
- **WET AIR OXIDATION AND NEUTRALIZATION/ PRECIPITATION APPLIED TO ETHYLENE SPENT CAUSTIC WASTEWATER**

CASE 2

SOURCE CONTROL WITH END-OF-PIPE TREATMENT

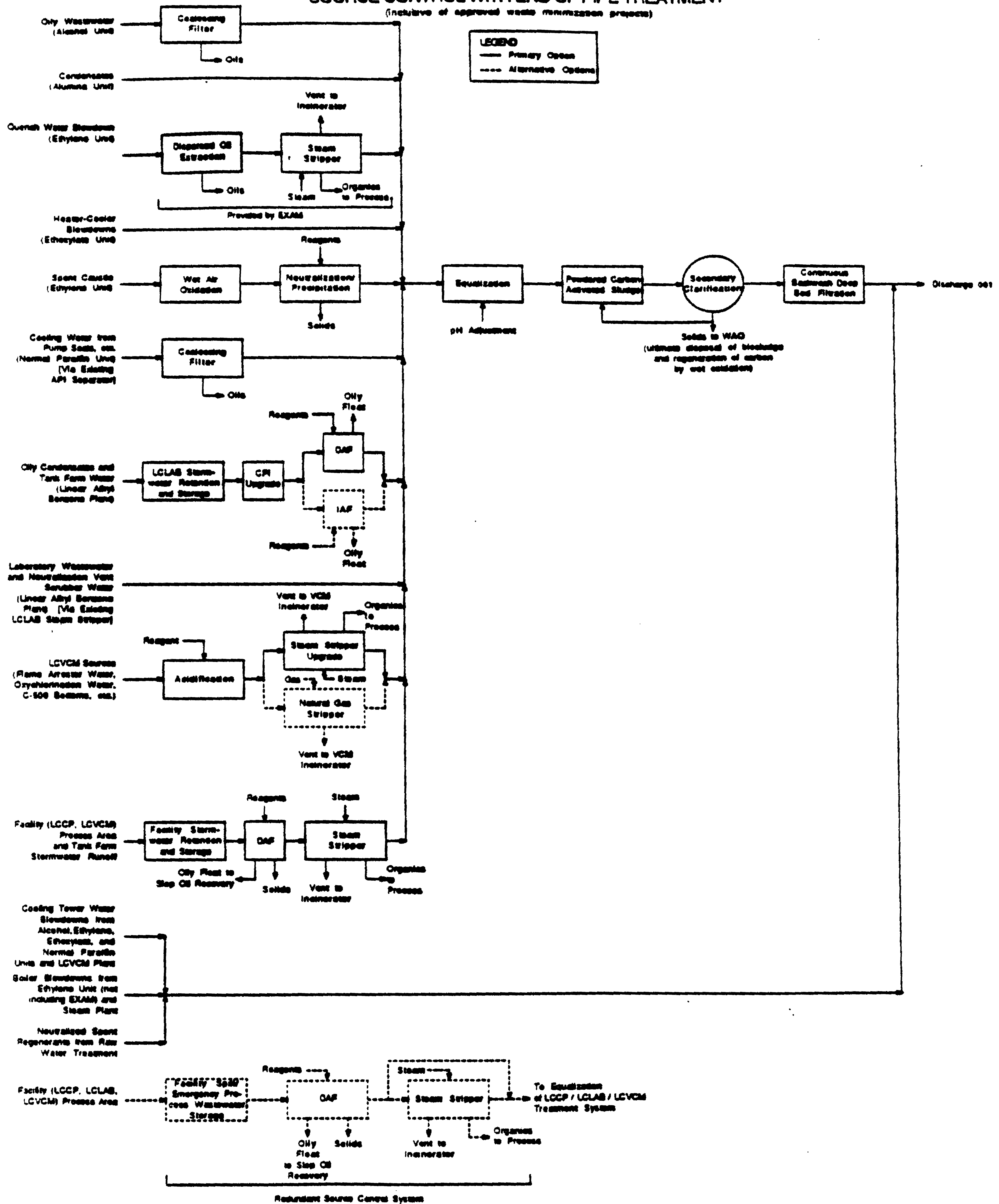
- **STORMWATER MANAGEMENT ALTERNATIVE #1 WITH RETENTION-STORAGE, SECONDARY OIL-WATER SEPARATION, AND STEAM STRIPPING (TANKAGE, DAF, STEAM STRIPPER)**
- **CLEAN STREAM SEGREGATION AND DIRECT DISCHARGE**
- **SOURCE CONTROLS**
 - **COALESCING FILTERS APPLIED TO ALCOHOL AND NORMAL PARAFFIN WASTEWATERS**
 - **WET AIR OXIDATION AND NEUTRALIZATION/PRECIPITATION APPLIED TO ETHYLENE SPENT CAUSTIC WASTEWATER**
 - **PRIMARY OIL-WATER SEPARATION UPGRADE AND SECONDARY OIL-WATER SEPARATION APPLIED TO LCLAB WASTEWATERS (CPI UPGRADE, DAF)**
 - **VOLATILIZATION UPGRADE APPLIED TO LCVCM WASTEWATERS (EXISTING STRIPPER UPGRADE)**
 - **DISPERSED OIL EXTRACTION AND STEAM STRIPPING (PROVIDED BY EXAM) APPLIED TO ETHYLENE WASTEWATERS**
 - **REDUNDANT SOURCE CONTROL SYSTEM (TANKAGE, DAF, STEAM STRIPPER)**

CASE 2 (CONTINUED)

- **END-OF-PIPE TREATMENT**
 - **EQUALIZATION/NEUTRALIZATION**
 - **POWDERED CARBON ACTIVATED SLUDGE TREATMENT**
 - **TERTIARY FILTRATION**
- **RESIDUAL MANAGEMENT (SOLIDS, SOLVENTS, VOC'S) BY INCINERATION AND WET AIR OXIDATION OF POWDERED CARBON**

CASE 2 SOURCE CONTROL WITH END OF PIPE TREATMENT

(Inclusive of approved waste minimization projects)



**CASE 3
SOURCE CONTROL WITH SEPARATE
END-OF-PIPE TREATMENT**

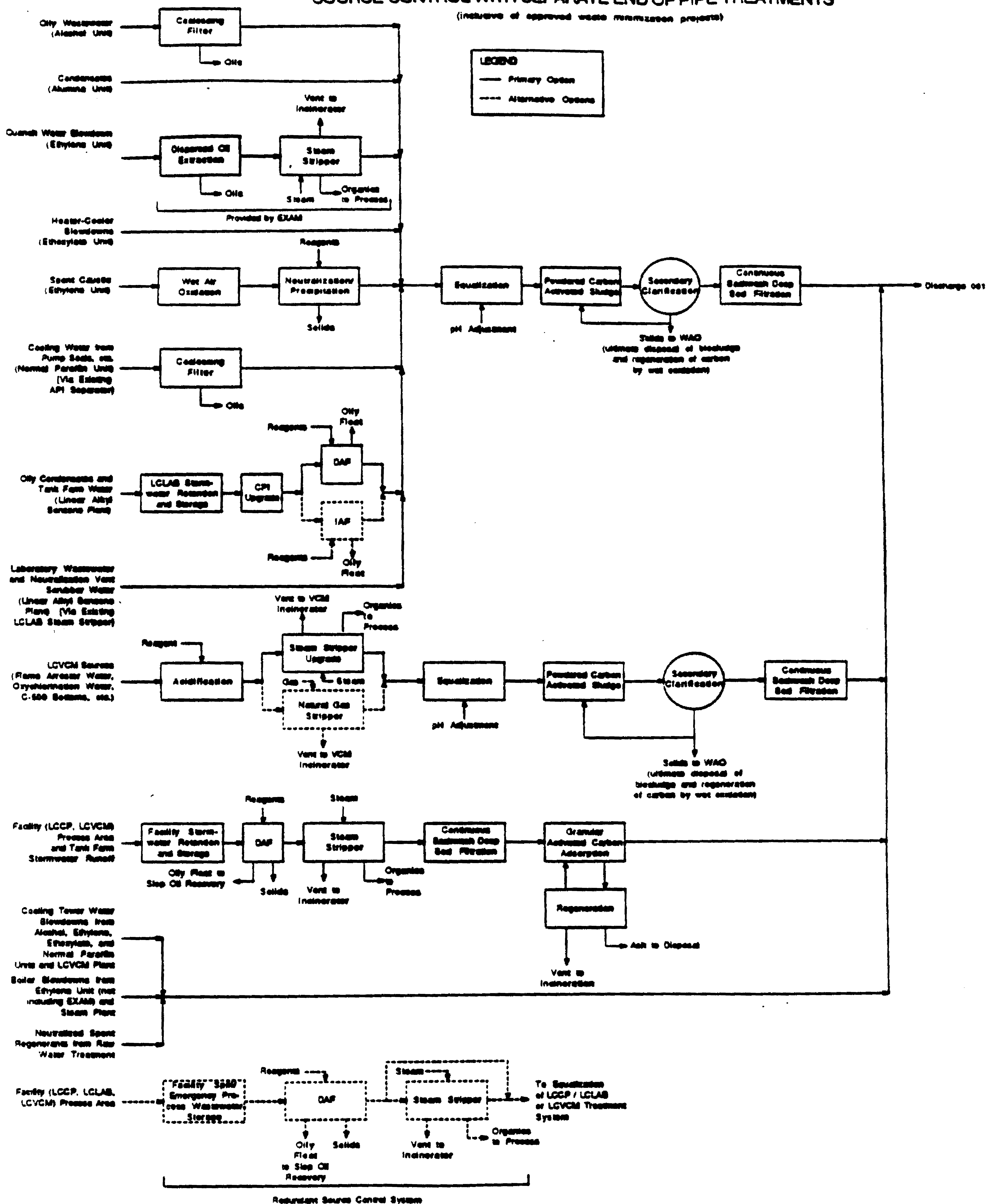
- **STORMWATER MANAGEMENT ALTERNATIVE #1
WITH RETENTION-STORAGE, SECONDARY OIL-
WATER SEPARATION, STEAM STRIPPING,
FILTRATION, AND GRANULAR ACTIVATED
CARBON ADSORPTION (TANKAGE, DAF,
STRIPPER, CARBON)**
- **CLEAN STREAM SEGREGATION AND DIRECT
DISCHARGE**
- **SOURCE CONTROLS**
 - **COALESCING FILTERS APPLIED TO ALCOHOL
AND NORMAL PARAFFIN WASTEWATERS**
 - **WET AIR OXIDATION AND NEUTRALIZATION/
PRECIPITATION APPLIED TO ETHYLENE SPENT
CAUSTIC WASTEWATER**
 - **PRIMARY OIL-WATER SEPARATION UPGRADE AND
SECONDARY OIL-WATER SEPARATION APPLIED
TO LCLAB WASTEWATERS (CPI UPGRADE, DAF)**
 - **VOLATILIZATION UPGRADE APPLIED TO LCVCM
WASTEWATERS (EXISTING STRIPPER UPGRADE)**
 - **DISPERSED OIL EXTRACTION AND STEAM
STRIPPING (PROVIDED BY EXAM) APPLIED
TO ETHYLENE WASTEWATERS**
 - **REDUNDANT SOURCE CONTROL SYSTEM
(TANKAGE, DAF, STEAM STRIPPER)**

**CASE 3
(CONTINUED)**

- **LCCP/LCLAB WASTEWATER END-OF-PIPE TREATMENTS**
 - **EQUALIZATION/NEUTRALIZATION**
 - **POWDERED CARBON ACTIVATED SLUDGE TREATMENT**
 - **TERTIARY FILTRATION**
- **LCVCM WASTEWATER END-OF-PIPE TREATMENTS**
 - **EQUALIZATION/NEUTRALIZATION**
 - **POWDERED CARBON ACTIVATED SLUDGE TREATMENT**
 - **TERTIARY FILTRATION**
- **RESIDUAL MANAGEMENT (SOLIDS, SOLVENTS, VOC'S)
BY INCINERATION, WET AIR OXIDATION OF POWDERED
CARBON AND THERMAL REGENERATION OF GRANULAR
CARBON**

CASE 3 **SOURCE CONTROL WITH SEPARATE END OF PIPE TREATMENTS**

(inclusive of approved waste minimization projects)



CASE 4

ZERO WASTEWATER DISCHARGE

- **STORMWATER MANAGEMENT ALTERNATIVE #1 WITH RETENTION-STORAGE, SECONDARY OIL-WATER SEPARATION, STEAM STRIPPING**
- **CLEAN STREAM SEGREGATION AND DIRECT DISCHARGE**
- **SOURCE CONTROLS**
 - **COALESCING FILTERS APPLIED TO ALCOHOL AND NORMAL PARAFFIN WASTEWATERS**
 - **WET AIR OXIDATION AND NEUTRALIZATION/ PRECIPITATION APPLIED TO ETHYLENE SPENT CAUSTIC WASTEWATER**
 - **PRIMARY OIL-WATER SEPARATION UPGRADE AND SECONDARY OIL-WATER SEPARATION APPLIED TO LCLAB WASTEWATERS (CPI UPGRADE, DAF)**
 - **VOLATILIZATION UPGRADE APPLIED TO LCVCM WASTEWATERS (EXISTING STRIPPER UPGRADE)**
 - **DISPERSED OIL EXTRACTION AND STEAM STRIPPING (PROVIDED BY EXAM) APPLIED TO ETHYLENE WASTEWATERS**
 - **REDUNDANT SOURCE CONTROL SYSTEM (TANKAGE, DAF, STEAM STRIPPER)**

CASE 4 (CONTINUED)

- **END-OF-PIPE TREATMENTS**
 - **EQUALIZATION/NEUTRALIZATION**
 - **POWDERED CARBON ACTIVATED SLUDGE TREATMENT**
 - **TERTIARY FILTRATION**
 - **TERTIARY EQUALIZATION**
 - **REVERSE OSMOSIS AND ASSOCIATED PRETREATMENTS**
- **RESIDUALS MANAGEMENT (SOLIDS, BRINES, SOLVENTS, VOC's) BY INCINERATION, BRINE CONCENTRATION, AND WET AIR OXIDATION OF POWDERED CARBON**

(Indication of approved waste management practices)



COMMON ADVANTAGES

- **REDUCE AND/OR ELIMINATE THE RELEASE OF TOXICS TO THE AIR (REDUCTION OF SARA 313 EMISSIONS)**
- **REDUCE THE AMOUNT OF SOLID RESIDUALS GENERATED DURING TREATMENT (EXCEPT CASE 4) (MINIMIZATION, LAND BAN)**
- **PROVIDE GREATER SYSTEM OPERATION PERFORMANCE RELIABILITY (100% COMPLIANCE)**
- **PROVIDE GREATER FLEXIBILITY FOR SYSTEM RETROFIT AND/OR EXPANSION (NO DOUBLE SPENDING)**
- **REDUCE THE OVERALL LAND REQUIREMENTS FOR WASTEWATER TREATMENT**

SOURCE CONTROL WITH END-OF-PIPE TREATMENT
(MAJOR PHILOSOPHY ITEMS ADDRESSED)

- 1. NO SURFACE IMPOUNDMENTS**
- 2. COMPLETE GED STORMWATER SEGREGATION (MINIMUM)**
- 3. BYPASS OF "CLEAN" STREAMS**
- 4. IN-UNIT TREATMENT: SOURCE CONTROL**
 - HAZARDOUS CHEMICALS: STEAM STRIPPING/ WET AIR OXID.**
 - FREE OILS/ALCOHOLS: COALESCERS**
 - SOLIDS; CPI/FILTERS**
- 5. ABOVE-GROUND TREATMENT FACILITY**
- 6. ONE BIOLOGICAL TREATMENT SYSTEM FOR LCCC**
- 7. STORMWATER TREATMENT (DAF, STEAM STRIPPING)**

COST

CASE

1	ONE END-OF-PIPE LCCC TREATMENT SYSTM	40.3
2	SOURCE CONTROL WITH ONE END-OF-PIPE LCCC TREATMENT SYSTEM	37.5
3	SOURCE CONTROL WITH SEPARATE END-OF-PIPE TREATMENT SYSTEMS FOR LCCP/LCLAB AND LCVCM	40.1
4	ZERO WATER DISCHARGE	-

COST FORECAST (\$MM)

	<u>FY89-90</u>		<u>FY92-94</u>	<u>FY95+</u>
	<u>CASE 1</u>	<u>CASE 2</u>	(SAME)	(SAME)
WASTEWATER TREAT.	7.4	5.0		
STORMWATER SEG.	<u>3.1</u>	<u>3.1</u>		
	10.5	8.1		
WAO (SPENT CAUSTIC)	0-5.6			
STORMWATER TREAT.			3.8	
TANK-BASED ASU			<u>4.2</u>	
			8.0	
PACT/WAO				10.2
INCINERATOR				<u>6.0</u>
				16.2

APPENDIX K (Partial)

The following is a sampling of articles which provide random industry, environmentalist, regulatory agency and media viewpoints on regulatory issues. These articles can be quickly skimmed by reading the underlined passages.

THE ENVIRONMENT

AIR: HOW CLEAN IS CLEAN ENOUGH?

Bush wants to put a bigger broom to the skies, but most major pollutants have fallen. How dangerous is all this stuff now? And how fast do we need to move? ■ *by Edmund Faltermayer*



Meteorologist Viney Aneja studies what's killing trees on North Carolina's Mount Mitchell.

GEORGE BUSH campaigned as a foursquare environmentalist, claiming that he wants to be the most ecology-minded occupant of the White House since Teddy Roosevelt. Congress is more than eager to go along. After eight years of inactivity, it is primed to make the air fresher and the world brighter. But does the evidence justify the expense of the President's new clean-air proposals? Do the health hazards and the damage to crops, forests, and lakes cry out for legislation that could cost industry and consumers up to \$19 billion a year by the mid-1990s?

Compared with other threats—drug
REPORTER ASSOCIATE Sandra L. Kirsch

gangs, slum schools, the budget and trade deficits—a tainted atmosphere seems less urgent. Besides, this is one enemy that is on the run (see charts opposite), thanks to the \$34 billion a year the U.S. already spends on pollution abatement. But the progress appears to be slowing. Some acceleration of the cleanup makes sense, even though the research so far—some of it frightening—is largely inconclusive.

Among the President's goals:

■ Drastically reducing airborne toxic chemicals. About half these substances—a grab bag of 320 poisons—emanate from industry. By applying the best abatement techniques or devices available, factories would reduce their wastes so that cancer

deaths associated with them—1,500 to 3,000 a year, the Environmental Protection Agency says—would fall 75% to 90% by the mid-1990s.

■ Cutting sulfur dioxide emissions, the main ingredient in acid rain, almost in half by the year 2000. Coal-burning electric utilities in the Midwest and Appalachia would carry out and pay for most of the cleanup. Power companies would also have to reduce nitrogen oxides, another contributor to acid rain escaping from their stacks.

■ Breaking an impasse on ozone. A saint in the stratosphere, where it filters radiation from space, ozone is an irredeemable sinner at ground level, where it is the nastiest ingredient in smog. Some 81 urban areas theoretically face federal "sanctions"—bans on new factories, for one—because they have been unable to reduce maximum ozone readings to an EPA health standard that was set in 1979. The President wants stricter controls on auto tailpipe emissions, from which ozone forms, and on fuel vapors that escape from vehicles and gas stations. His plan would also phase in methanol (which is easily made from natural gas) and other clean-burning motor fuels, and would restrict the use of volatile, ozone-creating chemicals at petroleum refineries, paint shops, and dry-cleaning establishments. Under the cleanup plan all but the three most ozone-prone cities would meet the EPA standard by the year 2000. The exceptions—Los Angeles, Houston, and New York City—would get a reprieve until 2010.

Bush's offensive against ozone, the most persistent of the main pollutants, is hard to quarrel with. It is also difficult to oppose the President's clampdown on air toxics, which are believed to be linked to respiratory illnesses and birth defects as well as to cancer. But in the proposal to wring out acid rain, the politics have leaped ahead of the science. Proof that acid rain is murder

Cont'd

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ing trees and fish is still not established. And while Washington worries about mountain lakes, concerns about the health effects of sulfur dioxide have been widely overlooked.

For all its ambition, the Administration's plan is not as drastic as clean-air bills already circulating in Congress. Nor does it embrace some of the draconian steps that Los Angeles authorities have called for in a 20-year smog-fighting plan, which may ultimately require electric cars on those ten-lane freeways.

Commendably, the Bush plan allows for flexibility. Power companies, for example, would be allowed to pick their own method for bringing down sulfur dioxide and could even trade pollution permits among themselves. The President also advocates that industry use the cheapest, most cost-effective measures in the early years. Thus, before the big spending must kick in, researchers can learn more about pollution's health risks. And the country can get a clearer idea of how far and how fast it really needs to go.

It has already come a long way. For more than a decade the EPA has set "air-quality criteria" for six major pollutants, mostly expressed as the maximum allowable parts per million. The six are lead, sulfur dioxide, nitrogen dioxide, particulates, carbon monoxide, and ozone. Except for ozone, says Dr. Bernard Gold-

stein, former EPA research chief and now director of New Jersey's Environmental and Occupational Health Sciences Institute, "we have done a reasonably creditable job of cleaning up."

YOU SURE CAN'T say that about airborne toxics, which were largely ignored when the country went after the six-pack of pollutants. Because of legal hurdles under present law, the EPA has been able to set emissions standards for only seven of the 320 substances. Air toxics include the benzene that leaks from refineries and cars, solvents like acetone, bits of synthetic rubber, and chemicals with names like 1,2-dibromo-3-chloropropane (just call it DBCP). Also on this rogue's roster are metals—cadmium and mercury—suspended as tiny particles in the air.

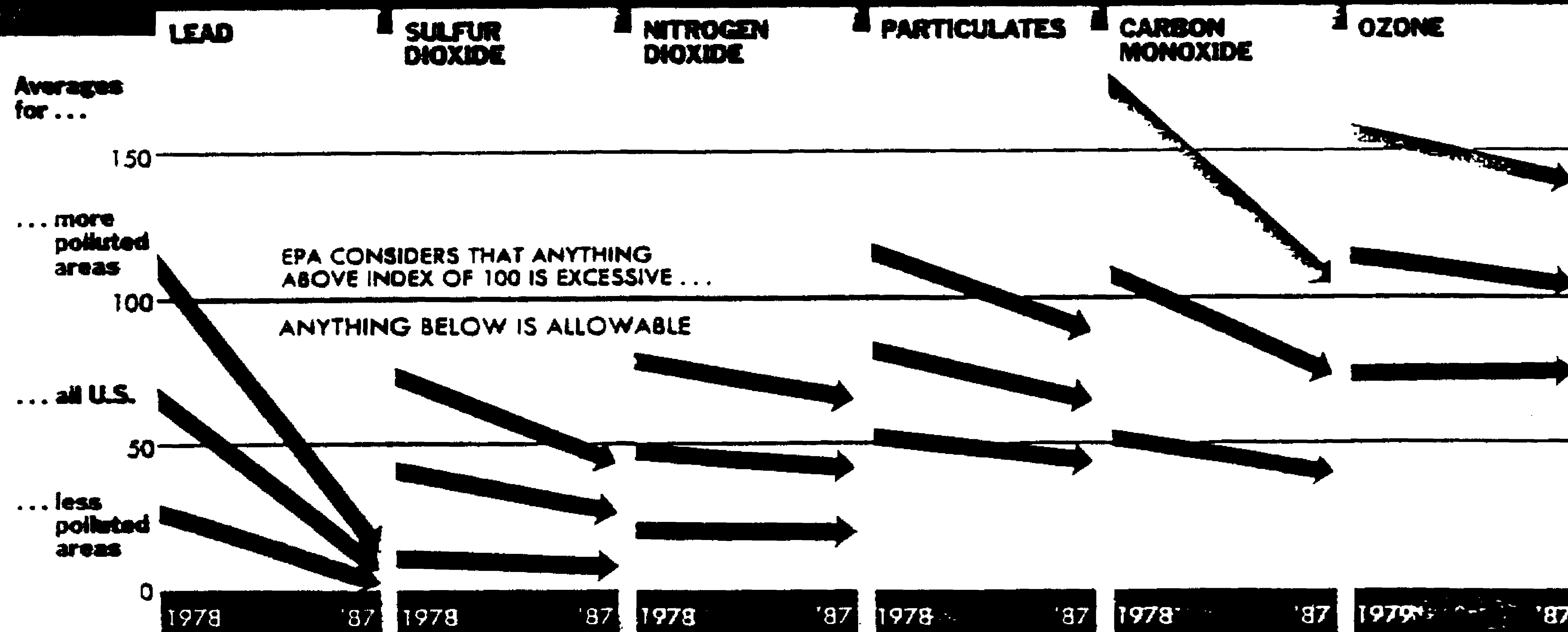
After the Bhopal disaster in India, Congress passed a law requiring factories to disclose how much of these toxics they emitted. In March the EPA announced the total: 2.7 billion pounds in 1987. "The numbers are staggering," says Senator Frank Lautenberg of New Jersey, who together with Representative James Florio, a candidate for governor of the same state, held a press conference in April to dramatize the problem. They stood at what they called "toxic ground zero" amid the refineries and petrochemical

plants near Newark Airport, where estimated emissions are 110 times the national average. Lautenberg has introduced one of several bills that would force industry to button up.

The President, too, is indignant, saying at his clean-air announcement: "People who live near industrial factories should not have to fear for their health." The neighbors' increased chances of getting cancer, according to the EPA, may be as high as 1 in 1,000. Still, keep a few facts in mind before making wide detours around Newark. The cancer risks assume day and night exposure over a 70-year lifetime and are based on animal studies open to debate.

An EPA investigation several years ago shows that people may have more to fear from everyday pollutants, such as cigarette smoke and paint thinners, than from the chemical plant next door. For two days some 350 residents of Elizabeth and Bayonne, New Jersey—"ground zero" country for sure—wore monitors so sensitive they registered the effect of a visit to the dry cleaner. The dosage of volatile air toxics from those satanic industrial plants, it turned out, was a fraction of the total inhaled—anywhere from one-half to one-seventieth, depending on the pollutant. The total intake of perilous stuff was no greater than in a light industrial city in North Carolina used for comparison, or the farm town

AIRBORNE JUNK IS HEADING DOWN



Since the nation declared war on six major pollutants in the 1970s, four have been driven safely below the EPA's standards (indexed

here at 100). Carbon monoxide is a problem in congested areas, while ozone, the lung-burning ingredient in smog, remains too high.

THE ENVIRONMENT

of Devil's Lake, North Dakota. Other research suggests that airborne metal dust near factories may be a more serious worry than toxic chemicals.

Even if the health effects of air toxics are hard to nail down, industry lobbyists are not inclined to resist this cleanup. Jon Holtzman, a vice president of the Chemical Manufacturers Association, says health arguments in the debate over toxic air are "inconsequential if the public thinks there's too much." Cancers caused by air toxics are believed to have fallen 50% since 1970, but the President's further cleanup seems like a good idea. At a cost of roughly \$2 billion a year when in full swing, it is the least expensive part of his clean-air plan.

FAR MORE CONTROVERSIAL is the proposed assault on acid rain—politically the sexiest item on Bush's checklist. Canada, where much acid rain lands, has pressured Washington to cut way back. President Reagan stalled while awaiting more data. But his successor proudly telephoned Prime Minister Mulroney just before announcing his proposal to halve sulfur dioxide emissions to ten million tons a year.

Why the hurry? Explains economist Paul Portney of Resources for the Future, an environmental research group in Washington:



Fill 'er up: California tests clean-burning methanol fuel.

A ten-million-ton-a-year reduction in sulfur dioxide "has become the threshold of credibility" within the beltway. Congress, led by Senate majority leader George Mitchell of Maine, is so determined to battle acid rain that anything below eight digits would have seemed the proverbial drop in the bucket.

Yet sulfur dioxide emissions have already fallen 20% since 1977, to 20 million tons a year, despite a huge increase in coal consumption by utilities. Scrubbers under construction at new power plants promise further, albeit slow, improvement. Nearly all cities are below the EPA health standard for both sulfur dioxide and nitrogen dioxide, each of which can return to earth as acidic fog, rain, or snow.

The science underlying that magic ten

million tons is not much firmer than an acid cloud. Last year the agency disclosed that 2.7% of all the miles of streams surveyed in the East were acidic, and blamed industry and the automobile for most of it. Yet an interim report of the National Acid Precipitation Assessment Program, a \$500 million, ten-year interagency study that still has a year to go, found no proof that acidity in streams and lakes is getting worse.

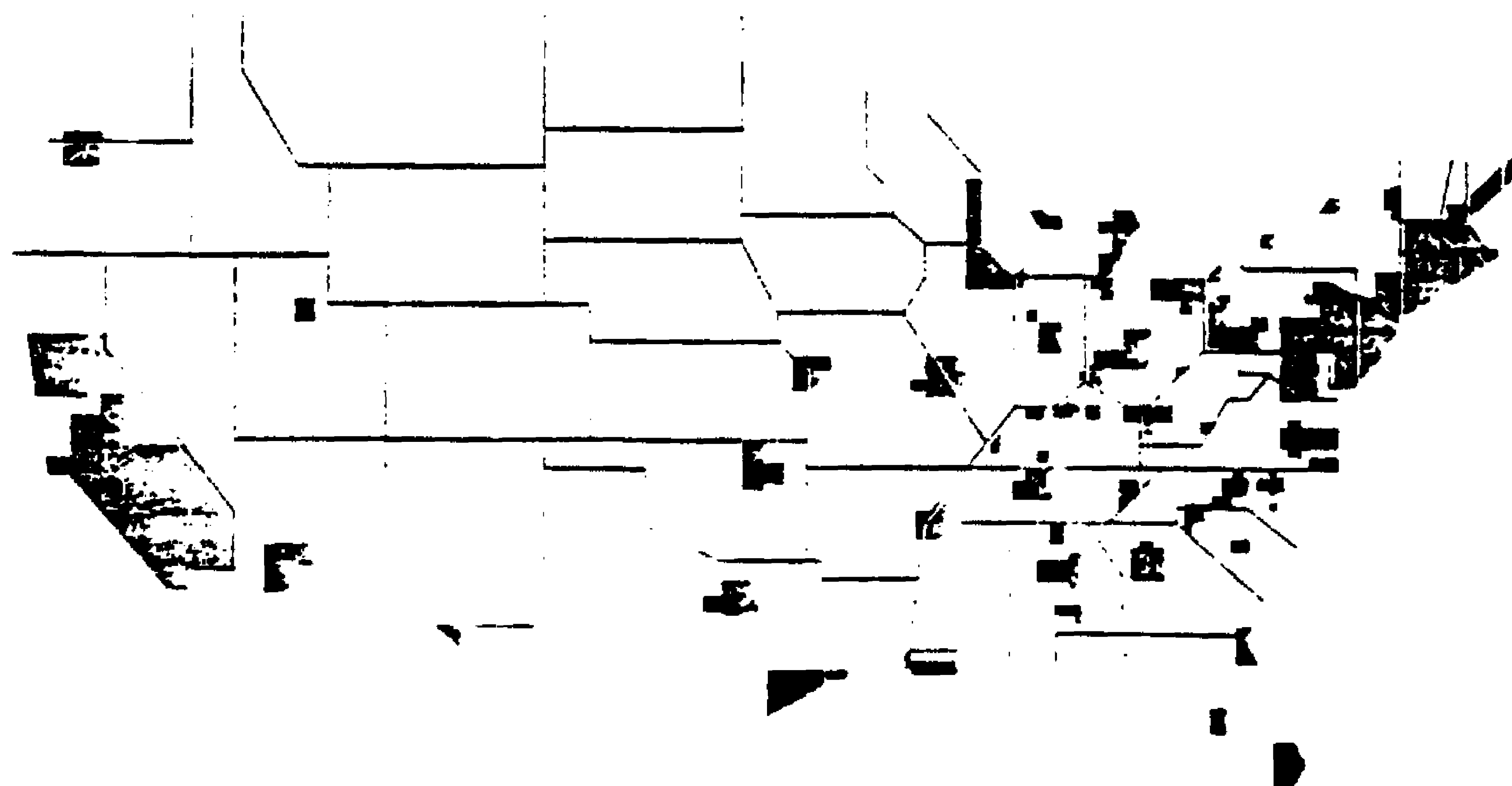
Neither did the interim report indict acid rain as a destroyer of forests. Here the evidence is decidedly mixed.

Maple syrup production in the province of Quebec, whose decline in recent years had been partly blamed on acid rain, rebounded 69% last year. According to the U.S. Forest Service, the culprit killing trees at the summit of North Carolina's Mount Mitchell, the highest mountain in the East, is not pollution but an insect called the balsam woolly adelgid, which feasts on Fraser firs. Even so, a combination of acid fog and ozone may have made trees on this and other Eastern summits more vulnerable to bugs, weather, and drought. Volker Mohnen, an atmospheric chemist at the State University of New York in Albany, who monitors the effects of acid rain in the Northeast, says pollution should be brought down a lot even though its role in forest damage has not been firmly established.

Health concerns, largely overlooked in the crusade to save the trees and fish, may turn out to be one of the best reasons to keep whittling away at the emissions that cause acid rain. About 25,000 of the country's ten million asthmatics are prey to violent bouts of constricted breathing when the sulfur dioxide level is high but still within the EPA's health standard. Because of this the agency has considered—but dropped for now—adopting a stiffer criterion.

The EPA is also looking more closely at so-called acid aerosols (no kin to aerosol sprays in consumer products) that can form from both sulfur dioxide and nitrogen oxides. A Harvard study, which has been following the respiratory health of 18,000 children and 10,000 adults in six cities since 1974, has found that children's bronchitis rates go up when the aerosols rise. Other researchers have noticed higher hospital admissions—even a small but significant number of premature deaths—following an increase in sulfate particulates that are associated with acid aerosols. The EPA may eventually set a separate air-quality

WHERE THE OZONE IS WORST



Based on 1988 data, these areas can't get peak ozone readings below the EPA maximum.



Utilities scorn scrubbers, like this one straddling an American Electric Power stack in Ohio, as an obsolete way to curb acid rain. President Bush would let them choose other methods.

dard for acid aerosols. But until more is known, the President's attack on acid rain, which could raise residential electric bills as much as 20% in the Midwest, may be overkill.

POUND FOR POUND, ozone is by far the most toxic of the usual outdoor pollutants," says environmental physician Goldstein. Sunshine and two parents produce ozone at ground level: nitrogen oxides, which result from any kind of combustion, and volatile organic compounds (VOCs) like gasoline. The destructive offspring is a variant of oxygen composed of three atoms instead of the usual two. It can hardly wait to get rid of the loosely attached extra atom, which oxidizes—or burns—anything from paint to soybean crops to the inside of your lungs.

The tailpipes on today's new cars emit 76% less nitrogen oxides and 96% less VOCs than those of a generation ago. But vehicle traffic has soared, and other ozone outputters—manufacturing companies and utilities—have cut back less or not at all. A typical city's ozone concentrations declined only 9% between 1979 and 1987. With no new legislation, improvement would continue for a while as older cars are scrapped. But with traffic still increasing, total VOC emissions—and ozone—will start to climb around the turn of the century. David Hawkins of the Natural Resources Defense Council, an environmental group, contends

that ozone is "a public health emergency."

Anyone coming to the subject cold might wonder what the fuss is about. Some 100 million Americans live in those 81 urban areas that exceed the federal ozone standard, but the numbers overstate the risks. A city "violates" the standard if only one of several monitoring stations has a reading above 0.12 parts per million (ppm) for one hour on two separate days in an entire year. Even in the Los Angeles area, the readings on 35 monitors are below that level 95% of the time. During the 1984 Olympics in Los Angeles, athletes did not complain about smog. So what's the big deal?

To begin with, the Olympians benefited from good weather and strict temporary measures to reduce freeway congestion. Every year thousands of healthy people experience chest pains, coughing, or short-

THE ENVIRONMENT

ness of breath while playing tennis or golf on summer days in Los Angeles. And the EPA says ozone's damage to crops is costing farmers \$2.5 billion a year nationwide.

In 1984 Dr. Henry Gong Jr., associate chief of UCLA's pulmonary disease division, put 17 Olympic and other cyclists through one-hour tests in a smog chamber at various ozone levels. They pedaled vigorously for most of the period, using 80% of their lung capacity, and then made an all-out effort as if approaching a finish line. When Gong revved up the ozone to the federal standard of 0.12 ppm, he says, the cyclists "couldn't tell the difference" over normal air. But a level of 0.20 ppm "significantly compromised them. They couldn't ride as long or as hard." Other research has shown that at that level, the lung capacity of healthy people decreases by about 15%. After repeated one-hour exposures, the effects diminish, suggesting that the body adapts. But what if such exposures go on for years?

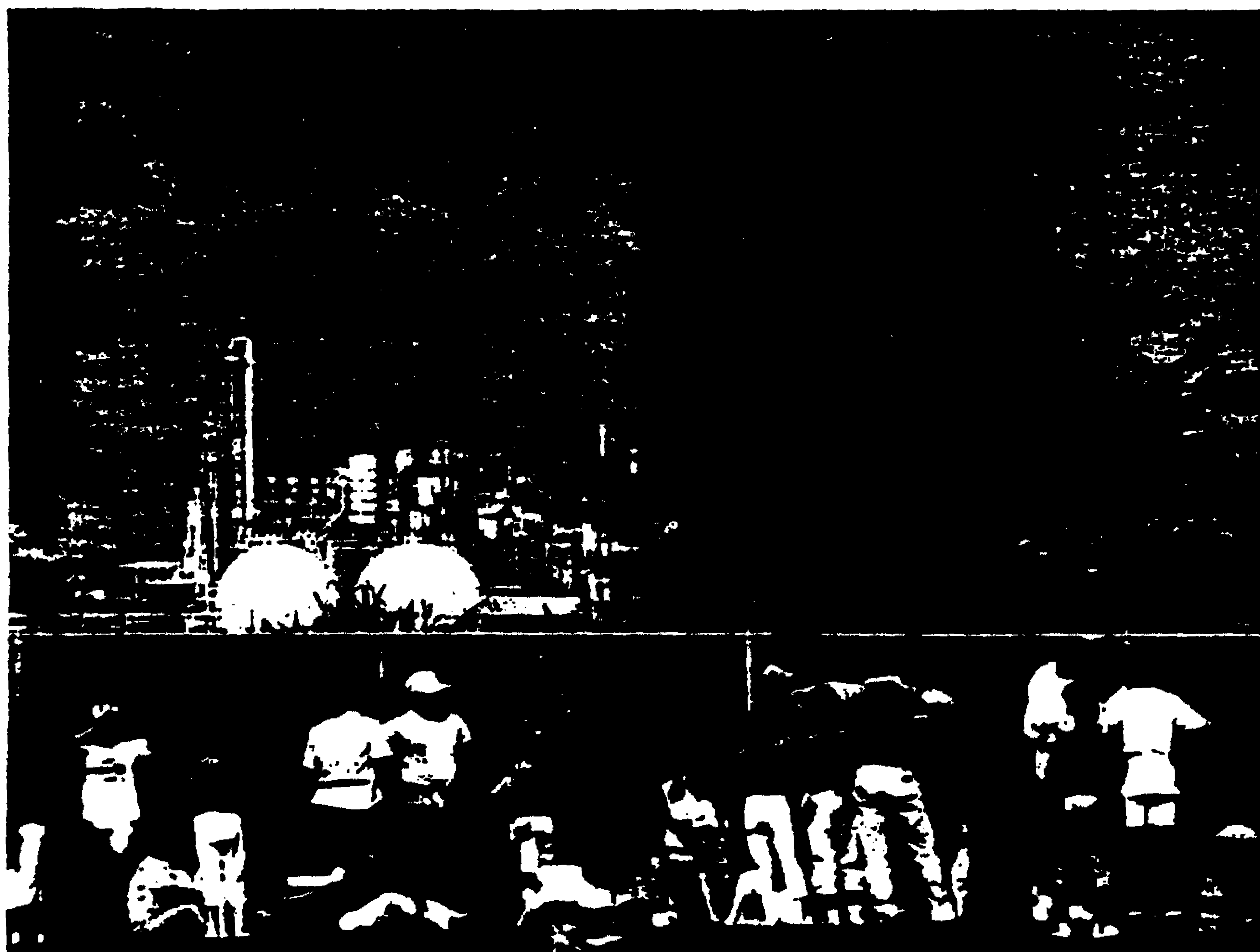
They have in Glendora, an affluent suburb of 50,000 at the foot of the haze-obscured San Gabriel Mountains, which trap the smog moving east from Los Angeles. Glendora was America's ozone capital last year, breaching the federal standard of 0.12 ppm on 148 days. But the number of alerts has fallen significantly. The last second-stage alert, which comes when ozone hits 0.35 ppm, was about ten years ago. Fourteen first-stage alerts, called at 0.20 ppm, took place in the 1987-88 academic year. But because of unusually good climatic conditions, only three occurred in the school year just ended. During the alerts, typically in the late afternoon, a black flag with the letters S-M-O-G goes up at the high school. To the grousing of athletes and coaches, outdoor team practice is delayed for about an hour and a half until readings drop back to a safer level.

More than 1,100 nonsmoking Glendorans age 7 to 59 participated in the only study of the long-term effects of ozone on humans. A team led by Dr. Roger Detels, a UCLA epidemiologist, compared the volunteers' lung functions with those of a similar-size group in Lancaster, a town beyond the hills and far less polluted. The subjects were retested five years later. Everyone's lung capacity increases through the late teens and then goes into a steady decline. But the Glendora group had somewhat lower capacity to begin with. Moreover, children's lung capacity grew more slowly there,

Dr. Gong monitors bicyclists in a UCLA smog chamber.



THE ENVIRONMENT



RAY GOLD

Vinyl chloride plants like this one in Louisiana have emitted large amounts of air toxics.

and adults' declined more rapidly than in Lancaster. The \$2.5 million study had methodological pitfalls, but strongly suggests that ozone is bad stuff. Says Detels: "We've looked at other possible explanations for the differences in the two groups, and haven't been able to find them."

Don't cry just for Glendora. Your own community may have ozone problems too. In most of metropolitan Los Angeles, says Dr. Jack Hackney of the University of Southern California, a longtime pollution researcher, ozone episodes come in short but intense bursts. In the East and Midwest, cities exceed the federal standard fewer days per year—typically 20 or so in the New York City area. Peak readings are lower, with New York reaching 0.21 ppm for at least one hour last year to Glendora's 0.34. But the ozone in the Northeast Corridor, particularly during heat waves as the air travels from one city to the next, extends far. Kennebunkport, Maine, was repeatedly above the federal standard last summer, as a deputation of environmentalists reminded the President when he was preparing his legislation. Even when the readings are not especially high, Eastern and Midwestern ozone can linger at, or just below, the federal standard for most of the day.

Instruments in Camden, New Jersey, often pick up ozone levels that average more

than 0.10 ppm over eight hours. Such readings occurred on 38 days over a three-year period in the mid-1980s. That put the area just over the Occupational Safety and Health Administration's all-day standard for exposure on the job. As recent studies at the EPA's smog chamber in North Carolina show, that's high enough to affect anyone outside, from kids to carpenters. At that level and even lower, the lung capacity of 22 nonsmoking males who exercised moderately but with rest periods over 6.6 hours—walking briskly up a slight incline—dropped by 7% on average, which the researchers found statistically significant. Just as meaningful, the loss of lung power became progressively greater after each hour of exposure.

In normal air the next day, the test subjects regained full breathing capacity. But recovery may take longer after a prolonged ozone spell. That was the experience of children at a New Jersey summer camp who were examined several years ago after four successive days in which readings shot past the federal standard for at least an hour. Their lungs were impaired for up to a week after clear skies returned. Based on what has been learned in animal tests, researchers believe that in long episodes ozone burns away cells that take five to ten days to regenerate. Years of burning and

healing can produce stiffened lungs. Hawkins of the Natural Resources Defense Council likens the effect to that of repeated sunburn, which turns the skin leathery.

Eastern and Midwestern ozone may have a partner in crime. Dr. Morton Lippmann, a deputy director of New York University's Institute of Environmental Medicine, who ran the New Jersey summer camp study, suspects that acid aerosols aggravate the lung damage. Is ozone shortening people's lives? Nobody knows, Lippmann says, "but it could be reducing the quality of life at the end of our lives." Fran Du Melle of the American Lung Association adds, "We may be producing a generation of children who will have significantly reduced lung function or chronic lung disease as adults."

Goldstein finds the lack of good statistics deplorable: "We're talking billions for expenditures to cut ozone, when only pennies are needed for research that might give us the answers." For now, jogger Goldstein is putting his running shoes where his mouth is. During heat waves he gets his run in early near his New Jersey home, before the sun sends the ozone climbing.

IF HIS HUNCHES are right, the air cleanup should not just coast along until hundreds more bicyclists have huffed and puffed in smog chambers and thousands of citizens have paraded past epidemiologists. How big a bill should industry and consumers be required to pay? Says Portney of Resources for the Future, who has been working on cost-benefit studies of the Los Angeles 20-year plan and who has felt his own lungs burning there: "We may not want to spend every last dime to get ozone down to the EPA standard everywhere. But we will probably want to spend a lot to lower it."

Whatever the right goal, let's also be looking for ways to achieve it at the lowest cost. James Lents, a tall Tennessean in charge of air pollution control for the Los Angeles area, believes his region's plan will prompt an outpouring of money-saving business innovation. Under the proposal, furniture makers must drastically reduce volatile emissions when applying varnish. Lents asks, "What if we come up with a better method of coating the product? Is that bad?"

A debt-laden nation with such a big agenda has no choice but to pinch pennies, even on something as precious as the planet. Especially when the dimensions of some parts of the problem are still as hazy as New York City on a smoggy summer day.

SPECIAL REPORT

WATER TREATMENT

New laws buoy sales but could swamp small firms

The diverse field of water treatment is growing ever more complex. Legislation and regulatory concerns are to a large degree driving growth in the industry; they've been the focus of previous special reports on water treatment (CW, May 18, 1988, p. 18). This year, we've peppered the perspective with insight from producers and users of water treatment goods and services.

Chemical companies are concerned with the enormous financial burdens imposed by current legislation and regulations. They argue that some requirements are redundant. And in certain cases, practical technology doesn't yet exist to meet the government's water purity standards.

While the regulations will clearly benefit water treatment firms, they may well threaten small chemical companies' survival. Plus, EPA's recently released figures on emissions to air, water, and land have set off a clamor for even more stringent environmental laws.

New treatment technology is emerging fast, especially in automation, substitutes for environmentally unacceptable treatment chemicals, and alternative container and delivery systems.

And as chemical companies realize that the best way to deal with pollution is to limit its production, recycling and waste minimization are becoming increasingly important.

INDUSTRY FACES TOUGH NEW EPA RULES

The chemical industry lost a major battle over clean water regulations this spring when the U.S. Court of Appeals for the Fifth Circuit in New Orleans sweepingly rejected its challenges to EPA wastewater regulations. The March 30 court decision, which upholds EPA's 1987 Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF) effluent limitation guidelines, will require new technologies and tighter discharge limits for some 1,000 chemical plants.

The chemical industry also faces tougher regulations on a variety of other fronts. On May 2 EPA sought to nearly double the number of pollutants subject to federal standards under the Safe Drinking Water Act. The agency now has limits on 34 contaminants but must issue regulations for a total of 83 contaminants by June. The action could significantly affect industry, because such standards are used as reference levels in the cleanup of hazardous-waste sites under both Superfund and Resource Conservation and Recovery Act (RCRA) laws.

Meanwhile, legislative initiatives under the Clean Water Act, reauthorized by Congress in 1987, will tighten rules on nonpoint source pollution and "toxic hot spots" in waterways.

And EPA recently proposed new regulations on toxics in sludges and storm-water runoff that could eventually mean additional pollution controls for the chemical industry.

In mid-April EPA released statistics to detail the potential water-pollution problem. As part of its first comprehensive inventory of chemicals emitted into the nation's water, air, and land, EPA noted that 9.7 billion pounds of chemicals were released in bodies of water, and 1.9 billion pounds were sent to municipal wastewater-treatment plants.

To be sure, the environmental significance of the numbers is undeter-

mined. For one thing, sodium sulfate constituted 95% of the reported releases, and EPA has proposed—in response to an industry petition—to delete that chemical from the toxic-emission reporting list because it has determined the chemical has no apparent adverse human-health or environmental effects. The other five percent consisted primarily of 12 chemicals, some of which are regulated by EPA.

High price tag. The New Orleans court decision could—by EPA estimates—cost industry some \$500 million/year. Indeed, experts say the tougher limits will roughly double the price of treating wastewater. The decision could be particularly crippling for small manufacturing plants; some industry observers predict a substantial number will be driven out of business by the costs of the new regulations.

The EPA rules set tough limits on the discharge of pollutants in several categories. Based on what it determined were best-available-technologies (BATs), the agency established limits for the direct discharge of 63 toxic chemicals. It also set limits for conventional pollutants, based on best-practical-technologies (BPTs). Finally, the EPA regulations include pretreatment standards for wastewater sent by a plant to publicly owned treatment works (POTWs).

The rules have been a long time coming. Original 0001125239



Wastewater plants hike pretreatment standards.

SPECIAL REPORT

proposed in 1974 and 1976, they were finally issued by EPA in November 1987. Almost immediately, the regulations were legally challenged in separate petitions by the Chemical Manufacturers Association (CMA) and the Synthetic Organic Chemical Manufacturers Association (SOCMA), as well as a number of chemical companies. Taking issue with different specifics, the groups generally challenged both the economic and technical feasibility of the rules. But in March, the court—siding with EPA—broadly rejected all industry arguments.

"We are disappointed with the ruling of the court," says Charles Malloch, Monsanto's director of regulatory management. "Faced with highly technical issues, it appears the court gave great deference to [EPA's] judgments." Suggests Douglas Kliever, a lawyer who represented SOCMA in the case, "the regulations will have an adverse impact on U.S. industry, without commensurate environmental benefits."

Small chemical plants could have particular economic problems complying with the regulations, says Kliever, because they lack the economies-of-scale associated with larger plants. Moreover, many of the small facilities tend to be batch producers for whom control of effluents will prove more difficult, he suggests. In its petition, SOCMA argued that a separate category with less stringent pretreatment requirements be established for small chemical plants that discharge wastewater into POTWs.

According to EPA's estimates, says Kliever, about half of small plants will be significantly and negatively affected. "No doubt," he adds, "we will lose some plants and some products" due to the costs of compliance.

Meanwhile, CMA challenged technical procedures and economic analyses EPA used to develop the regulations. CMA counsel Dell Perelman says that while EPA is bound to "look at economics" in establishing the regulations, it failed to use appropriate cost-

analysis in setting BPT limitations.

CMA also objected strongly to the technical basis used in establishing the BATs and the resulting limits on effluent releases. CMA argued, for example, says Perelman, "that [EPA] distorted data" by questionable methods to determine limits possible with BATs.

hard work. But, he adds, "it can be achieved."

The battle is all but over. While CMA has petitioned for a limited rehearing on a few points in the court decision, others say they will not continue the legal struggle. In any case, says Campbell, "industry needs to get on with it. Clearly, companies can't stop and wait; they have to be in the compliance mode. Industry representatives should not think there is any realistic hope of turning this around."

Despite its involvement in the court case, says Monsanto's Malloch, his company has been actively moving to meet the regulations since 1987. "In some cases we'll have to scratch," he says, "but we will meet them."

FEDERAL LAWS AFFECTING WATER QUALITY

The Clean Water Act, revised in 1987, provides grants for wastewater treatment plants and sets limits on discharge of pollutants. Recent amendments address nonpoint source pollution, toxics, sludge disposal, and estuary management.

The Safe Drinking Water Act requires EPA to set national drinking water standards, protects drinking water from underground waste injection, and provides special protection for wellheads located in sole-source aquifers. EPA must issue regulations for 83 contaminants by June 1989. The 1986 amendments will impose new burdens on the drinking-water industry, requiring further surface-water

treatment and disinfection, radionuclide control, and a ban on lead solder and pipes.

The Resource Conservation and Recovery Act, reauthorized in 1984, protects groundwater by requiring stronger, safer tanks for underground storage of chemicals and petroleum and establishes a system of response to petroleum spills and financial liability rules for tank owners.

The Superfund law, reauthorized in 1986, provides EPA with authority to act swiftly to protect groundwater in emergencies. A primary goal is to prevent toxics at hazardous-waste sites from leaching into groundwater.

Source: Congressional Research Service

Even the best or most appropriate technology cannot meet the standards all the time. Given EPA's own methodology, explains Hugh Campbell, consultant manager for the wastewater treatment consultant group in Du Pont's engineering department, even a model plant will be in compliance only 99% of the time because of effluent variability. "It really puts you in a liable situation," says Campbell. "We wanted EPA to acknowledge the problem and deal with it on a formal basis. But we got no relief from the court."

Not surprisingly, EPA strongly supports both the regulations and the process by which they were developed. Dov Weitman, EPA's acting assistant general counsel for effluent guidelines, points out that the final regulations were the result of over a decade of analysis, visits to industry, and several preliminary drafts. Indeed, he says, the cost analysis "was probably as detailed as [any] the EPA ever did."

In determining BATs, explains Weitman, the agency extensively analyzed the best performing facilities in the industry. The purpose of the regulations, he says, was to "see that the entire industry improved to the level of the best performer." Getting there, he acknowledges, will entail expense and

effluents. The main thrust of the Clean Water Act continues to be construction of wastewater treatment facilities; nearly \$50 billion has been distributed since 1972 to aid communities in building plants. EPA is still developing and improving the pretreatment program that requires industries to treat their wastewater before discharging it into POTWs. The agency is forcing 1,500 municipal wastewater treatment plants that handle more than 80% of all industrial wastewater discharged to such facilities to develop effluent limits for industries responsible.

While most of the facilities have developed a plan, many are just beginning to implement them, and one EPA report says that at least 47% of the POTWs with approved programs may still not be in compliance.

Another area getting increased attention from EPA is nonpoint source pollution, such as rain runoff from farms, urban areas, and construction sites, contributing as much as 65% of water pollution. The 1987 revisions to the Clean Water Act require states to develop control programs and identify waters where standards are not being met. EPA has just completed work on a strategy for controlling such pollution, but funding woes have held up any real

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some of the standards." Baker contends. He calls for logical and fair rules that could not only lead to a better environment but also "make the playing field even" for all competitors in the business. "If you are an ethical company, and you spend millions on water treatment, but the guy down the river doesn't spend a dime, there is no way you could compete with him," he adds.

But as Monsanto environmental protection manager Mike Foresman says, "We are looking at regulations that have been through a lot of review. So while we may not like them, there is no sense standing around and yelling about it. The realization is that we have deadlines to meet if we are going to stay in business and continue to operate."

He does believe permit-review hearings for individual sites will allow the company a chance to work with regulators, ironing out compliance problems and perhaps proposing changes and alternatives.

Several industry experts observe EPA may intentionally set new effluent levels at the outer edge of the existing technology to force development of new systems and methods. "That might not be the intention," says Hugh Campbell, manager of wastewater treatment for Du Pont, "but that will be the outcome—and that is not a fair ballgame."

One engineer responds a bit less subtly. "That's great," he exclaims, "but they're not the ones who have to pay for all the new stuff."

In light of the failed court challenges, Bob Gomperts, general supervisor of wastewater treatment at Eastman Kodak (Rochester, NY), notes a strategy that is just now paying off: "We spent our money investigating and building treatment technology, rather than in court."

95/5. New regulations are a great obstacle in terms of time and money, because the law of diminishing returns has replaced economy of scale.



Keilman: 'There isn't much of a margin for error.'

Gomperts claims that the Kodak water treatment system is one of the best. Still, those last few parts per billion will be elusive. He cites a common equation in wastewater treatment: The equipment and chemicals needed to remove the last 5% of the organics in a waste stream may cost up to twice as much as those used to remove the first 95%. Numbers vary widely by company, effluent characteristics, and condition of the receiving stream. "We've been throwing around numbers like 50 or 75 million [dollars] to come into full compliance with the new EPA organic effluent guidelines. And that's just organics. Metals and inorganics are completely another thing," he adds.

Doug Keilman, director of environ-

mental affairs for Hercules, says, "A basic biological unit will do the job most of the time, but there isn't much of a margin for error. It's so much easier to get the first 95% than it is to get the last 5%, especially with OCPSF guidelines in the 5-to-10-parts-per-billion range."

"As you invest oodles more money to get that last percentage," notes Gomperts, "usually you have to add something to get something else out. And everything you add you've got to pull out again. That means oxidize—with ozone, with chlorine, with ultraviolet light—or filter or sorb. But then what? We'd have to put in another incinerator for that sludge."

Even when capital is available for specialized treatment, there may be no good way to spend it. On the more exotic tertiary treatment methods, such as carbon sorption and reverse osmosis, Dow's Kilpatrick thinks the technology might not even exist—at a practical scale and a reasonable price—to

handle a 10- to 20-million gallon-per-day (MGD) system. While he agrees that the large prices such systems command will generate intense development and competition, he doesn't expect a low-cost solution to result any time soon.

Gomperts—whose plant treats 30 MGD and could handle six MGD more—doesn't expect new developments to solve the problem to any great extent. "There are a lot of neat little technologies, but they are just not applicable to a 36-MGD stream. I've been going to the trade shows for the past five years, and I haven't seen much progress, not in large scale systems. All the refinements are for 2-MGD plants or smaller."

The developers of treatment technology "are just not responding to our needs at this stage, but it's hard to get people to take a risk. There really should be something else [besides regulation] to spur development," says Campbell. But he is hopeful: "Maybe new technology will be coming, now that the market is there."

Shifting the load. New methods notwithstanding, wastewater treatment facilities must always be viewed as part of the whole processing line. Changes anywhere in that line will affect the whole system.

3M (St. Paul, MN), for example, installed a wet scrubber on a new rotary kiln, which just moved the contamination from outgoing air to outgoing water. The company recycled 60% of the water and precipitated the rest of the particulate with a simple lime treat-

ment. But a high volume of sludge resulted.

Russell Susag, director of environmental regulatory affairs for 3M, notes that this is often the case with scrubbers. And steam or air stripping the waste stream only returns the pollutants to the air. "As you get down to that nth de-

gree, you are actually generating large amounts of secondary waste and using lots of energy to do it," he says.

Nevertheless, Susag feels that his company can increase the efficiency and reliability of its existing system. "We won't need the exotic methods if the system is reliable."

Less is less. "There is work to be done on optimizing the cost of waste treatment," says Monsanto's Foresman.

Can the product support the water treatment research?

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progress, says Jim Horn, policy director for EPA's Office of Water.

Congress has also established a program to deal with "toxic hot spots." States must list waterways that don't meet health and aquatic protection standards and propose cleanup strategies. This can involve tracing pollution back to an industrial source. EPA must approve such cleanup plans by June for states that have submitted lists, and waters are scheduled to be in compliance in three years.

In December 1988, EPA proposed that thousands of industrial sources apply for permits to deal with stormwater discharges. New manufacturing facilities will have to install collection ponds to allow pollutants to settle before the water is released into waterways.

The agency also has issued a controversial proposal to regulate contaminants in sludges produced by municipal sewage-treatment plants. Such measures, say industry observers, are sure to eventually affect some of the chemical facilities that rely on POTWs.

Groundwater remains the hottest legislative item in water pollution, because it is the only major area still unregulated at the federal level through a comprehensive law. EPA reports that at least 8,000 wells across the U.S. have been closed or degraded because of contamination. Late last year, the agency confirmed that 46 pesticides had been detected in the groundwater of 26 states due to normal agricultural use.

Both houses of Congress approved money for further groundwater research but didn't enact the bills before last year's session ended. Anyway, says Velma Smith, director of groundwater programs for the Environmental Policy Institute (Washington, DC), "the environmental community will be pressing for a bill that requires more than research. We want a national regulatory program for groundwater." This year, that's not likely; Congress is too wrapped up in Clean Air Act revisions to make much notable progress on groundwater.

Meanwhile, in the absence of coherent federal policy, some states have

adopted their own groundwater-protection programs. Among the toughest are Florida's systems for classification, monitoring, and wastewater-discharge permitting. And Iowa has placed a tax on the sale of pesticides and hazardous household chemicals to help pay for groundwater cleanup.

But even as more rules take effect, some observers see a fundamental regulatory shift from specific technology-based discharge limits to ones based on water quality. The move, explains Monsanto's Malloch, means the next round of permits will start requiring companies to run biomonitoring tests—identifying any toxics in waterways and eliminating the toxicity—rather than just responding to specific limits on a list of pollutants. That, he says, will "make it more complex" for companies. And while he is not opposed to the change, he adds, "Let's make sure that it is done right."

CONRAD MACKERRON
in Washington
with David Rotman

WATER TREATMENT RESTRICTIONS SINK IN

For several years, chemical companies have sought to minimize or modify effluent streams, anticipating the day when costly regulations would mandate such treatment.

That day has arrived. And one source says the price tag to meet all the new water standards will be "at least a couple of billion [dollars] on top of what we already have in place."

Most firms use a series of treatment levels: pretreatment to remove specific substances and return others to the process; primary systems to screen, filter, skim, and settle; secondary treatment with biological activity; and added tertiary chemical systems. But the expense of such methods pales compared to what is now required.

"The cost of further reducing [the pollutants in] an effluent stream is tremendous," says Steve Kilpatrick, water issues manager with the Environmental Quality Department of Dow Chemical. Two Wilmington, DE giants have tried to quantify the tremen-

dous costs: Hercules says its upcoming capital budget for domestic pollution control is \$30 million, three-quarters of which will go for wastewater treatment; Du Pont estimates its allotment will be somewhere between \$100 and \$200 million.

Faced with such expenses, "we challenged the EPA Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF) regulations and failed," states Jim Baker, associate director of environmental affairs for Union Carbide's

chemicals and plastics business.

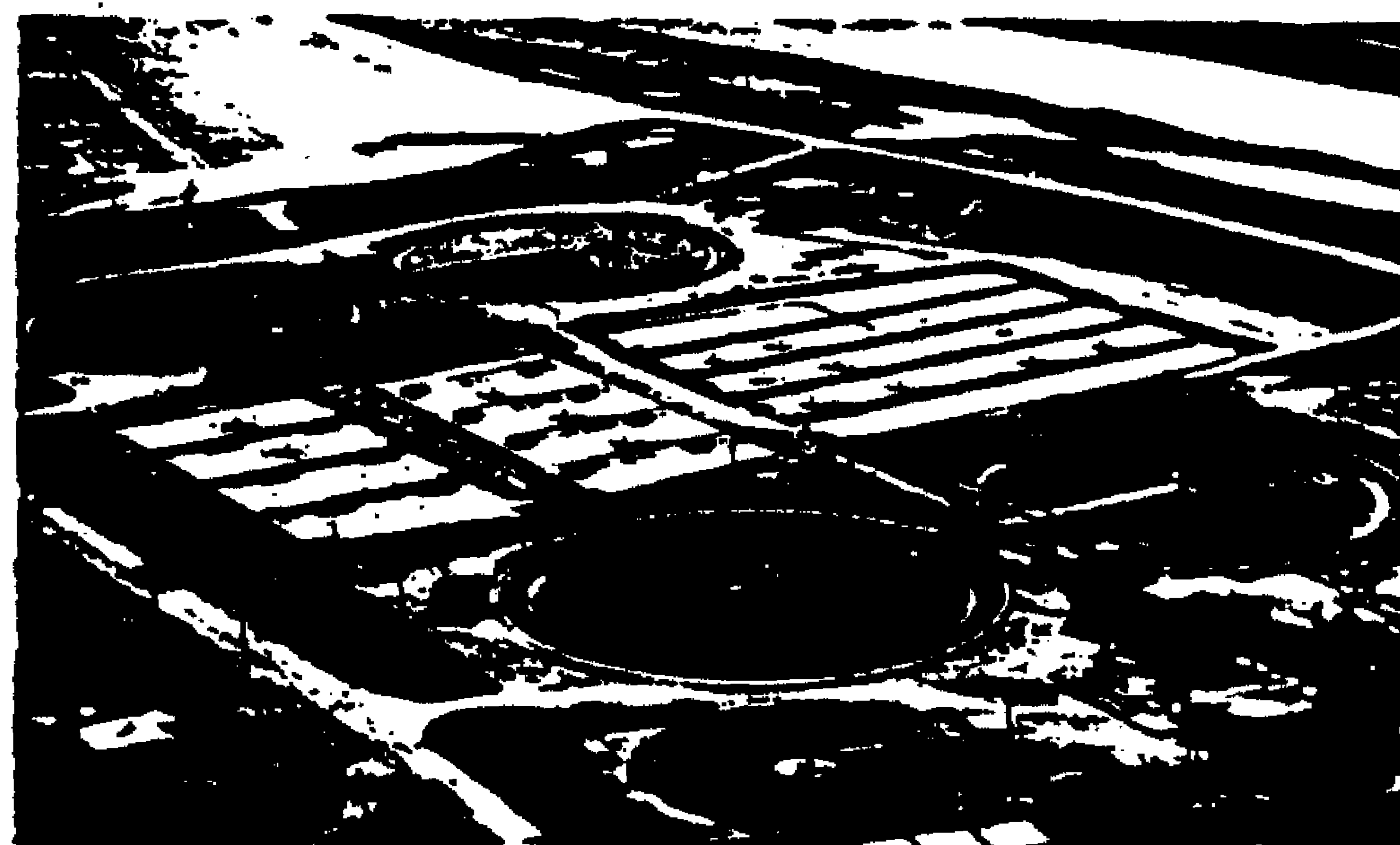
He says Carbide's main facility in Texas City, TX, designed in cooperation with Sterling Chemicals (Houston) and Monsanto (St. Louis), was specifically equipped to handle industrial wastes. Yet the new regulations require additional pretreatment.

"It will take \$50 to \$60 million for Carbide to meet the OCPSF guidelines, half of which will be redundant," Baker predicts. Variances and removal credits—which allow removal of a given substance at one site to compensate for pollutants at other locations—won't be "practically available" until 1992, he maintains.

What everyone in the chemical industry wants is "logical and fair regulation, uniformly applied," according to Baker. "We support the wise use of all resources, and that includes the time and money of the regulatory agencies," he says, implying that the government's resources might benefit business and the environment more with a different type of regulation.

Chemical companies aren't opposed to clean water—"We drink the water, we swim in it, and we fish in it," says Baker—but they question the logic behind some of the rules.

"We're not sure the technology even exists to meet



Dow's Midland, MI water treatment facility.

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"There's great incentive to modify the processes, to reduce waste [requiring treatment]. That is where the money will be. All the easy stuff has already been taken out."

As regulations get tougher, the costs of waste treatment factored into the whole cost of manufacturing can tip the balance against marginally profitable products or obsolescent processes that might have to be completely replaced. "We have to look at processes that aren't efficient," says Foresman. "We have to figure, 'do we really need the product?' In some cases the answer is 'no.'"

He also believes forward thinking can save a lot of money down the pipe. While it is impossible to predict which substances considered safe today may be restricted in the future, many effluent professionals are forcing research and development staffs to take educated guesses. Foresman espouses a simple philosophy: The key question is, "Can the product support the [water treatment] research?"

Decades ago, questions like these weren't asked: waste treatment was simple. "We started in the 1960s with the settling ponds and have backed up into the system since then," says 3M's Susag. "Now those same ponds are called 'polishing ponds,' at the very end of the treatment process."

And such "backing up" goes all the way to the design stage of new products and processes. All developments must undergo an environmental review to see if any hazardous or excessive wastes will be put into the effluent stream. Such reviews, as well as recovery and recycling, go on at most companies, says Susag.

One man's meat.... Recycling does not have to mean just returning process chemicals to the system. At Colgate-Palmolive's Jeffersonville, IN plant, surplus acid from a manufacturing line is used to adjust the pH of the equalization basins, and condensate from the power/steam plant is used to maintain biological activity in the activated sludge basins during harsh weather.

Recycling doesn't have to be restricted to a given process, a given facility, or even a given state. "One of our plants in Alabama was treating zinc chloride as waste in its effluent," Susag relates. "Then we discovered that another plant, in Connecticut, was buying zinc chloride as a raw material. So we started shipping the stuff up to Connecticut." The cost of shipping still allows a considerable savings—for both sites.

3M took the theory one step further. "We had a problem with ammonia in one waste stream," Susag relates. "We would have had to spend more than a million dollars on a removal system. But instead we spent that money on a concentration system, and now we

recover the cost of treatment by selling the ammonia as a feedstock for fertilizer."

Making the whole business profitable could be the ultimate advancement in water treatment.

GREGORY DL MORRIS