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STATE OF ILLINOIS
Pollution Control Board

BEFORE THE POLLUTION CONTROL BOARD
OF THE STATE OF ILLINOIS

IN THE MATTER OF:)
)
CITGO PETROLEUM CORPORATION and)
PDV MIDWEST REFINING, L.L.C.,)
)
Petitioners,)
)
v.)
)
ILLINOIS ENVIRONMENTAL)
PROTECTION AGENCY,)
)
Respondent.)

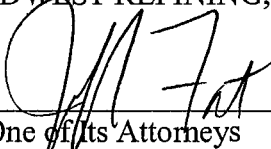
PCB 05-85
(Variance - Water)

NOTICE OF FILING

To: Dorothy Gunn
Clerk of the Board
Illinois Pollution Control Board
100 West Randolph Street - Suite 11-500
Chicago, IL 60601

Please take notice that on November 8, 2004, we filed with the Office of the Clerk of the Illinois Pollution Control Board an original and ten copies of the attached Petition for Variance, a copy of which is serviced upon you.

CITGO PETROLEUM CORPORATION and
PDV MIDWEST REFINING, L.L.C.

By: 
One of its Attorneys

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THIS FILING IS BEING SUBMITTED ON RECYCLED PAPER

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PETITION FOR VARIANCE

PDV Midwest Refining, L.L.C. ("PDVMR") and CITGO Petroleum Corporation petition the Illinois Pollution Control Board ("Board") for a variance authorizing discharges of Total Dissolved Solids ("TDS") and sulfates pursuant to the terms and conditions outlined herein. In the alternative, this Petition seeks a declaration that the discharges described herein will not cause or contribute to a violation of the Board's water quality standards for TDS. PDVMR is the owner of the Refinery described herein, and CITGO Petroleum Corporation is the operator of the Refinery. (Hereafter, these Petitioners will be jointly referred to as CITGO). CITGO has entered into a Consent Decree with the United States Environmental Protection Agency ("U.S. EPA") and the States of Illinois, Louisiana, New Jersey and Georgia to resolve certain alleged air quality violations. The resolution for these claimed violations requires reduction of air emissions at the Refinery. This process will contribute to the wastewater treatment system additional levels of dissolved solids and sulfates. To comply with the Consent Decree, CITGO must construct certain equipment and obtain air and water construction and operating permits from the Agency.

The Agency has advised CITGO that it cannot issue such a wastewater construction permit due to occasional water quality violations for TDS. For the reasons stated below, compliance would pose an arbitrary and unreasonable hardship on CITGO, and CITGO therefore requests a 5-year variance with respect to Chapter 35 of the Illinois Administrative Code, 35 IAC §§ 302.208(g) and 302.407 regarding TDS. In the alternative, CITGO requests a determination by the Board that CITGO would be in unquestioned compliance with the TDS standards. This Petition for Variance (“Petition” or “Variance”) is brought pursuant to Section 35 of the Act, 415 ILCS 5/35, and Part 104 of Chapter 35 of the Illinois Administrative Code, 35 IAC § 104.100 et seq. In support of this Petition, CITGO states as follows:

I. EXISTING CONDITIONS

1. The Refinery was constructed during the period 1967 through 1970. It became operational in late fall of 1969. Currently, the average daily production is 168,626 barrels per day. The Refinery employs approximately 530 people.
2. Approximately twenty-five different products are produced at the Refinery, including gasolines, turbine fuels, diesel fuels, furnace oils, petroleum coke and various specialty naphthas which can be manufactured into many intermediate products, including antifreeze, dacron, detergent, industrial alcohols, plastics and synthetic rubber. Ninety percent of the Refinery’s output goes into making gasolines, diesel fuels, home heating oils and turbine fuels for use in Illinois and throughout the Midwest.
3. The Refinery draws from and discharges to the Chicago Sanitary & Ship Canal (“Canal”). The Refinery takes approximately 4.0 million gallons of water daily from the Canal, and discharges approximately 3.8 million gallons to the Canal, the difference being cooling

tower evaporation and steam losses. The wastewater effluent contains dissolved solids derived from compounds present in crude oil that are removed from the crude by various Refinery operations, as well as concentrating the TDS present in the intake water from the Canal from the evaporation cooling.

4. The Board adopted Title 35 § 302.208(g) to control TDS in the Illinois River system and § 302.407 to control TDS in the Canal. The need for this Variance arises due to the potential impact both in the Canal and downstream at the I-55 Bridge over the Illinois River and whether the increased level of TDS would “cause or contribute to a violation of a water quality standard” even though those exceedances are associated with snow melt conditions independent of TDS discharges from the Refinery.

5. The Refinery operates under a National Pollutant Discharge Elimination System (“NPDES”) permit (No. IL 0001589), issued by the Illinois Environmental Protection Agency (“IEPA”). The NPDES permit became effective September 1, 1994. CITGO filed a timely NPDES renewal application in 1997. The NPDES permit includes outfall 001 at the Refinery at river mile 296.5 on the Canal (Latitude 41°38’58”, Longitude 88°03’31”). The current NPDES permit does not have effluent limits on TDS.

6. The Refinery includes a physical/chemical and biological wastewater treatment plant. The treatment plant performs primary, secondary and tertiary treatment on the generated wastewater before it is discharged into the Canal. The original wastewater treatment plant, which began operation in 1969, included two oil/water separators, a flow equalization tank, a primary clarifier, an activated sludge system and a polishing pond. Several wastewater treatment plant modifications have been made since the original installation. Major changes to the system

induced gas flotation, new oil/water separators, process water storage tanks, a new aeration basin, a high efficiency aeration system, and a second final clarifier.

7. The primary treatment portion of the current plant consists of four sour water strippers for ammonia and sulfide removal, oil/water separators for free oil removal, and equalization tanks.

8. Effluent from the equalization tanks flows to the secondary treatment plant which consists of induced gas flotation ("IGF") and activated sludge treatment system. The activated sludge system includes three aeration basins operated in parallel with a total aeration basin volume of 1.92 million gallons. Aeration is provided by a fine-bubble diffused aeration system. Activated sludge is settled in two 100-ft. diameter secondary clarifiers. Within the aeration basin, phosphorous is added as a nutrient for biological organisms. During the winter, steam is injected to the equalization tank to maintain operating temperatures at a minimum of 70°F in the aeration basin effluent.

9. The tertiary system consists of a 16-million gallon basin. The purpose of the basin is to remove any carryover solids from the secondary clarifier. The basin also serves as a water supply for fire protection.

10. Since 1987, the Refinery has been subject to a site-specific rule concerning ammonia discharges, has made improvements to the wastewater treatment system, and has continued its efforts to reduce the concentration of ammonia nitrogen in its wastewater. The Refinery met these requirements through various upgrades to the wastewater treatment system.

II. EXISTING WATER QUALITY

11. The Refinery discharges into the Canal, upstream of the Lockport Lock & Dam. Below the dam, the Canal merges with the Des Plaines River, passes through Joliet and 11 miles downstream of Joliet passes beneath the I-55 Bridge. Until the I-55 Bridge, the receiving waters are designated as Secondary Contract waters; below the I-55 Bridge, the Des Plaines River is designated as General Use water, the General Use waters begin 18.5 miles below CITGO's outfall. Illinois has adopted different water quality standards for Secondary Contact and General Use streams. The relevant standards are as follows:

	<u>General Use</u>	<u>Secondary Contact</u>
Total Dissolved Solids (TDS), mg/L	1,000	1,500

12. Water Quality Based Effluent Limits are based on low flow stream conditions (7-day, 10-year). Estimated values for stream low flows are listed below:

	<u>Low Flow, MGD</u>
Canal at CITGO Refinery	1,134
Des Plaines River at I-55 Bridge	1,260

13. The peak TDS result (1,902 mg/L) at the I-55 Bridge occurred on March 16, 2000, and was likely due to road deicing activities. The peak recorded TDS on the Canal (1,595mg/L) occurred January 4, 2001, and also was likely due to road deicing activities.

14. Under the Consent Decree, CITGO will install a wet gas scrubber in the Fluid Catalytic Converter ("FCC") unit at the Refinery to remove sulfur dioxide air emissions. The sulfur dioxide is ultimately converted to sodium sulfate salts which are contained in a purge stream. This purge stream is then discharged into the Refinery wastewater treatment system.

The design specifications for the wet gas scrubber blowdown will limit the exit temperature to 90°F, before discharge to the basin. Other design features have been made to address nitrates and ammonia nitrogen levels and avoid the need for relief from any other regulation.

15. The preliminary estimates are that the scrubbing system would add 304,000 lbs/day of TDS.¹

III. PROJECTED IMPACT OF SCRUBBER

16. At low flow conditions, CITGO will increase the sulfate and TDS levels in the waterways after mixing, as follows:

	<u>Incremental Increase</u>	
	Canal	Des Plaines River <u>@I-55 Bridge</u>
Sulfate, mg/L	20	18
TDS, mg/L	32	29

17. The projected sulfates would achieve the applicable water quality standards, after complete mixing, while the TDS probably would continue to exceed the water quality standard during times of snow melt run-off.

IV. REGULATORY CONSTRAINTS

18. Effluent Limits - There are no specific Illinois effluent limits on sulfates or TDS. Therefore, to the extent there are water quality impacts, effluent limits would be based on Water Quality Based Effluent Limits (“WQBELs”), factoring in antidegradation, Total Maximum Daily Limits (“TMDLs”), and mixing zones.

¹ Assumes all sodium salts.

19. Mixing Zone - Under Illinois regulations, the maximum allowable mixing zone is 25 percent of the stream flow. Water quality standards must be achieved at the edge of the mixing zone. Using the projected discharge loadings and only 25 percent of the Canal's low flow yields the following incremental change in water quality results:

	<u>Projected Increase in WQ at Edge of Mixing Zone</u>
Sulfate, mg/L	81
TDS, mg/L	128

20. Categorical Limits - U.S. EPA has promulgated categorical limits on various industries, including the petroleum refining industry. These regulations found, in 40 CFR 419, do not include specific effluent limits on sulfates or TDS. The Board has previously found that the wastewater treatment system goes beyond Best Available Technology ("BAT") requirements.

21. Impaired Waterways - Section 303(d) of the Clean Water Act requires states to identify impaired waterways and the causes of impairment and then develop what is essentially a waste load allocation for addressing the impairment. Illinois prepared its list of impaired waterways in 1998: 738 segments were identified. Illinois also developed a priority list for addressing these 738 segments.

According to IEPA's *Illinois Water Quality Report 2002*, the entire stretch of the Canal and the downstream Des Plaines River both are listed as impaired waterways, for a variety of reasons. However, none of the reasons listed are for sulfates or total dissolved solids.

22. That CITGO should not be responsible for TDS excursions caused by highway deicing is consistent with the Agency's recent decision on the Village of Wauconda's NPDES permit. Dissolved oxygen levels were found downstream of Wauconda's outfall below the water quality standard. The Agency noted in its Response to Comments, Questions and Concerns regarding the Village of Wauconda's NPDES permit: "This information is limited; the extent to which it is representative of normal stream conditions and its relationship to Wauconda discharge is unknown." (emphasis added) (p. 7). The Agency goes on to state in its Response Summary regarding the same:

"The Agency has determined that lowering the NPDES permit limits is not necessary for this discharge since it is believed that this effluent will not cause or contribute to a violation of water quality standards" (p. 13).

The Agency's analysis in the Wauconda NPDES permit review is consistent with CITGO's situation. The elevated TDS levels do not occur under "normal stream conditions" and the TDS violations occur with or without CITGO's contribution. Therefore, CITGO is not causing or contributing to these violations.

23. Based on the foregoing analysis, CITGO submits that the increased discharge of these materials associated with the Consent Decree required controls for air emissions will not cause a violation of any water quality standard. Given that the snow melt conditions are beyond the control of CITGO and that the Agency has not listed the Canal as impaired due to the TDS exceedance associated with snow melt conditions, CITGO requests the Board find that its TDS discharge would be in compliance, thus allowing the issuance of the permit by the Agency.

24. Based on the foregoing, CITGO submits that the relief here requested is not inconsistent with the effluent standards and areawide planning criteria under the Clean Water Act.

V. ARBITRARY AND UNREASONABLE HARDSHIP

25. This proceeding is occasioned by the Consent Decree, to which the Agency is a party, lodged by U.S. EPA to substantially reduce emissions of sulfur dioxide, nitrogen oxides and Particulate Matter. CITGO agreed to these reductions and will be investing over \$120 million at the Refinery, most of which costs are for the very wet gas scrubber which generates the TDS and sulfates identified above. These investments are projected to reduce SO₂ emissions by 15,300 tons/year, NO_x emissions by 1,100 tons/ year, and PM emissions by 80 tons/year.

26. The relative contribution from CITGO is readily within the assimilative capacity of the waterway, and there is no water quality violation for TDS in the Canal and Illinois River, except in association with snow melt conditions.

27. The Agency has been investigating changes in water quality standards for sulfate and TDS. Investigations have occurred and are on-going. These investigations indicate that the existing TDS standard is unnecessary and that a higher numerical standard for sulfate would still be protective of water quality uses. The Agency has advised CITGO that it intends to pursue a change in the TDS and sulfate water quality standards statewide in the near future. Under the Agency's draft proposal, TDS would be removed as a water quality parameter, and sulfate water quality standards would be increased to 1,800 mg/L. At these proposed standards, even during snow melt conditions, there would not be a water quality exceedance.

28. Therefore, there may not be a need for further controls on CITGO's wastewater discharges with respect to TDS. Indeed, the only potential violation of the existing standard for TDS is in association with snow melt conditions, a cause for which CITGO clearly is not responsible. Indeed, the Agency has not listed the Canal or the applicable Illinois River segment as impaired for TDS,

29. CITGO has investigated methods of avoiding releasing the wastewater from the FCC to the existing wastewater treatment system, including deep well disposal and removal technologies.

30. The Agency has rejected the deep well disposal option because in its view this would constitute a Class I injection well. Class I injection wells are permissible only where there exists a cap rock to prevent the injected fluids from migrating upwards. In northeastern Illinois, no cap rock exists over the depth where disposal wells are drilled. This alternative is not viable.

31. Technologies for removing sodium sulfate from a dilute aqueous stream are limited. Electrodialysis has never been applied in the chemical or refinery industries on the scale required at the Refinery. Biological sulfate reduction is theoretically possible, but this will not reduce the overall TDS concentration merely by replacing the sulfate ions with carbonate ions. The concentration of sodium sulfate is too high for reverse osmosis concentration, as scaling problems would develop.

32. The sole technology potentially available is evaporation, an energy intensive approach, which will result in increased carbon dioxide emissions to the atmosphere. The evaporation approach would require a multi-effect evaporator to minimize energy consumption. A falling film evaporator with mechanical vapor recompression ("MVR") is the most energy

efficient approach. Subsequent crystallization would produce a dry sodium sulfate by-product. Whether this by-product would be of sufficient purity to have any market value has not been determined. Attachment A depicts a conceptual process flow diagram of a falling film evaporator with MVR. A feed pump lifts the steam to the top of the evaporator, where the water falls through steam-heated tubes. Once sufficient water is driven off, the stream is cooled, resulting in sodium sulfate crystals in the crystallizer. The water vapor is compressed and routed to the shell side of the falling-film tubes to become steam. The sodium sulfate crystals are directed to a centrifuge to concentrate the solids, followed by a dryer producing a dry sodium sulfate by-product.

The capital cost in 2004 dollars for applying this technology to this wastewater stream is on the order of \$7,000,000. Operating costs, including depreciation, are estimated at \$1,000,000 per year, with 40 percent of this amount representing energy costs. The above cost estimate assumes the Refinery has sufficient steam capacity, and that a new boiler is not required. Moreover, CITGO is not aware of a situation where such a massive evaporation system has been constructed or operated, and further notes the increased energy demand and emission impact that such an evaporation system would entail. Further investigation would be warranted before such an approach were pursued.

33. The schedule for final compliance with applicable Board standards is proposed as follows:

August 5, 2004	CITGO submits amended NPDES permit application
December 31, 2004	CITGO submits wastewater construction permit
January, 2005	Agency issues public notice on draft NPDES permit
March 1, 2005	Public comment period closes
March 15, 2005	Agency issues NPDES permit final if no public comments received

March 31, 2005	Construction permit issued if no public comments received
June 15, 2005	Agency issues amended NPDES permit final if public meeting or public hearing held
June 30, 2005	Agency issues construction permit for wastewater facilities, if public meeting or hearings held
July, 2006	FCC scrubber construction completed and discharge occurs
July, 2007	If revised TDS water quality standard has not occurred, commence design for alternative compliance approach, as needed and provide Agency with quarterly progress reports
February, 2009	Achieve final compliance with 35 IAC §§ 302.208(g) and 302.407

34. Requiring CITGO to install evaporation wastewater treatment for the scrubber discharges into the wastewater system would impose an arbitrary and unreasonable hardship. It is not clear that CITGO is the cause of any water quality standard exceedance. Further, CITGO is investing substantial monies in the Refinery to substantially reduce air emissions and substantially reducing the overall environmental releases from the Refinery, and the wastewater discharge involved is relatively modest. Hence, requiring control of the increased wastewater discharge would impose an arbitrary and unreasonable hardship on CITGO.

VI. REQUEST FOR HEARING

35. CITGO requests a hearing on this Petition. At the hearing, CITGO will present evidence in support of this Petition, as described herein. An affidavit in support of this Petition is Attachment B hereto.

VII. CONCLUSION

36. The hardship to CITGO of compliance with the TDS water quality standard is substantial and there is no benefit to the public or the environment by compelling such compliance. Indeed, there does not appear to be any practical compliance alternative at this time.

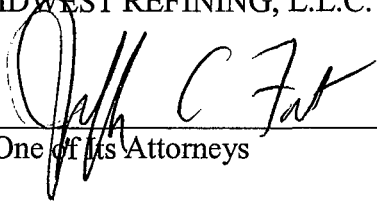
Even if there is an alternative, such would result in substantial adverse affects on the environment in the form of increased emissions to evaporate the wastewater.

37. In conclusion, CITGO would request that the Board either determine that the proposed discharge associated with the Consent Decree as described herein does not cause or contribute to the potential TDS water quality violations, or to grant CITGO this Variance for a period of 5 years from the date of granting this Variance on the conditions proposed herein.

WHEREFORE, CITGO requests that this Petition for Variance be granted.

CITGO PETROLEUM CORPORATION and
PDV MIDWEST REFINING, L.L.C.

By: _____


One of its Attorneys

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THIS FILING IS BEING SUBMITTED ON RECYCLED PAPER

CERTIFICATE OF SERVICE

The undersigned, an attorney, certifies that I have served upon the individuals named on the attached Notice of Filing true and correct copies of the **Petition for Variance** by First Class Mail, postage prepaid, on November 8, 2004.


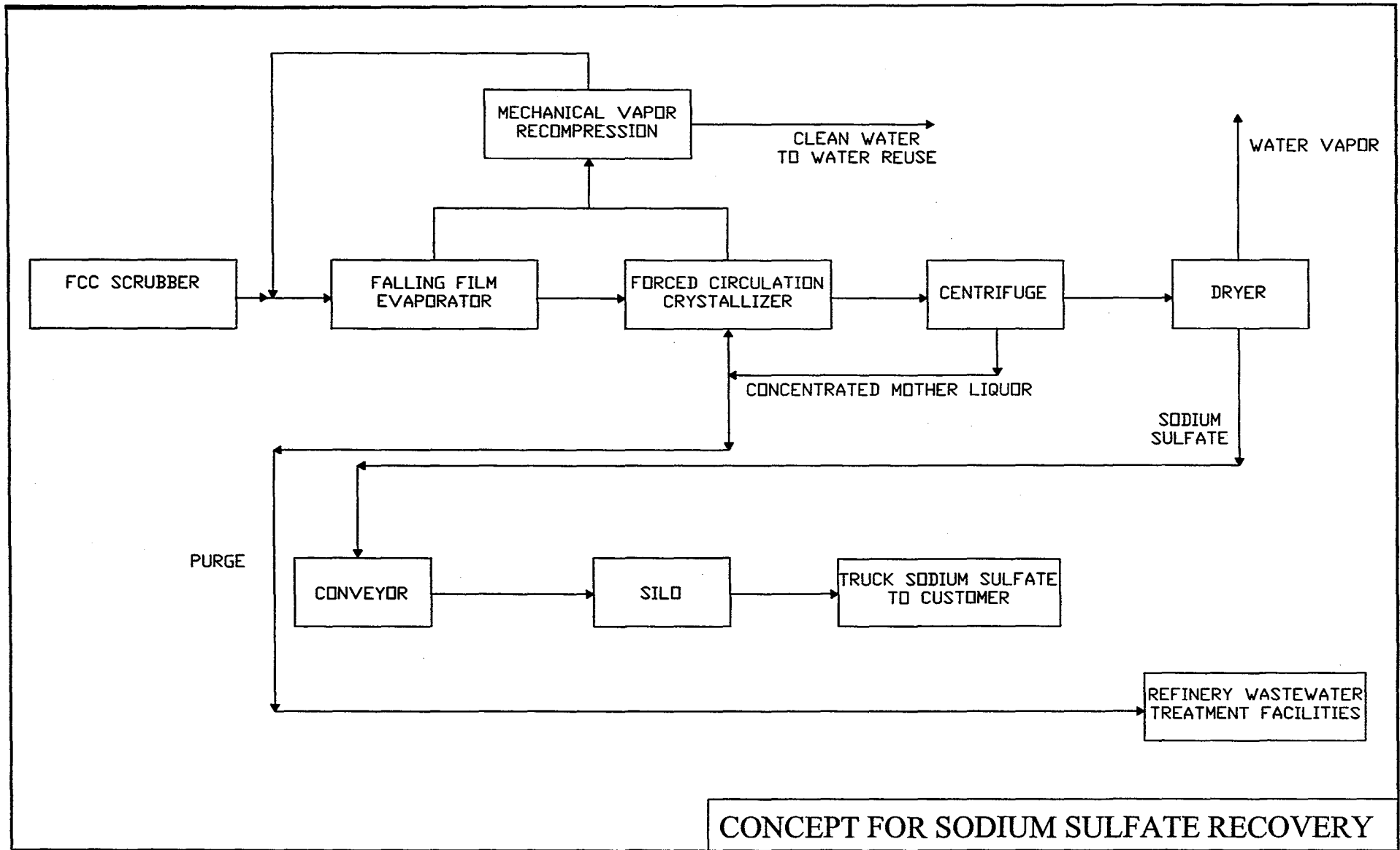


Exhibit A



CONCEPT FOR SODIUM SULFATE RECOVERY

CONCEPTUAL PROCESS FLOW DIAGRAM FOR EVAPORATION ALTERNATIVE

Exhibit B

