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PROCESS WASTEWATER MANAGEMENT DURING BIODENITRIFICATION FACILITY CONSTRUCTION SHUTDOWN

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LETTER

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Department of Energy
FMPC Site Office
P.O. Box 398705
Cincinnati, Ohio 45239-8705
(513) 738-6319

August 4, 1989
DOE-1360-89

Mr. Thomas A. Winston, District Chief
Southwest District Office
Ohio Environmental Protection Agency
40 South Main Street
Dayton, Ohio 45402

Dear Mr. Winston:

PROCESS WASTEWATER MANAGEMENT DURING BIODENITRIFICATION FACILITY CONSTRUCTION SHUTDOWN

The attached information packet summarizes our plans for phased completion of modifications to the Feed Materials Production Center's (FMPC) Biodenitrification (BDN) Facility and a strategy for managing wastewater streams while BDN systems are off-line. This packet supplements the verbal explanation of the Wastewater Management Plan as presented during a June 30, 1989 teleconference involving Mr. Martyn Burt of your office, members of the Department of Energy FMPC Site Office staff and members of the Westinghouse Materials Company. We also provided this information to Mr. Burt in preliminary form via telefax after the June 30 meeting.

Briefly, the phased construction program will include a shutdown of the currently operating two tower BDN demonstration unit for a period of approximately 90-120 days. This outage will occur upon completion of system modifications and improvements which do not require process interruptions. The shutdown will compromise the viability of the bacteria colony currently providing denitrification in the demonstration unit. New seed material (new bacteria) will be used to cultivate the colony required for facility restart. The incubation process will begin as soon as minimal systems, required to support the activity, are available. The lack of denitrification capability during the shutdown period requires establishment of an effective alternate plan to comply with nitrate discharge limits. This plan includes:

a. Relocating and temporarily combining the Nitrates and Ammonia monitoring point 001E (BDN discharge) with monitoring point 001B in the General Sump while the BDN is off-line.

b. Using the Surge Lagoon to accumulate waste streams

containing nitrate concentrations of 500 ppm or less with controlled discharge from the Surge Lagoon through the General Sump to Manhole 175. Flow from the Surge Lagoon will be controlled so that the 62 kg/day daily average and 124 kg/day daily maximum nitrate mass loading limits at 001E are maintained.

c. Discharging the Clearwell to Manhole 175 to reduce the amount of rainfall runoff impacting the volume available for long term storage.

d. Segregation and storage of wastewater streams containing nitrate concentrations greater than 500 ppm in the 500,000 gallon high nitrate storage tank (under construction) and the two 1 million gallon temporary storage tanks.

The BDN Facility Upgrade project is being implemented on an aggressive schedule and reflects our interest in expeditiously enhancing our capability for consistent compliance with regulatory guidelines over the long term. The FMPC has been successful in maintaining the pace of this schedule, due, in large part, to the timely support and assistance concerning NPDES regulatory issues from Mr. Burt. We are hoping that you assist us in this instance also by providing a speedy response. If you need further information, or wish to have further discussion, please contact Mr. Jack Craig of my staff at (513) 738-6159.

Sincerely,

James A. Reafsnyder
FMPC Site Manager

DP-84:Pasko

Attachment: As stated

cc w/att.:

M. G. Burt, OEPA-Dayton
G. E. Mitchell, OEPA-Dayton

bcc w/o att.:

W. E. Pasko, DP-84
P. C. Weddle, WMCO

BIODENITRIFICATION (BDN) FACILITY UPGRADE PROJECT

PHASED CONSTRUCTION AND WASTEWATER MANAGEMENT PLANNING

Narrative Supplement for Attached Presentation Slides

Slide 1

Self explanatory introductory slide

Slide 2

This presentation on BDN phased construction and wastewater management planning was prepared to give a brief summary of current planning and progress toward construction on BDN process and support systems being installed at the FMPC Site. A description of FMPC wastewater storage and processing capabilities is presented in conjunction with a plan for managing process wastewater and stormwater runoff streams collected in the Clearwell during the anticipated construction shutdown period.

Slide 3

BDN phased construction planning incorporates basic requirements to keep currently operating systems active as long as possible to maximize wastewater denitrification capability during the construction effort. Consequently the process shutdown phase of the construction activity is delayed until the latest possible point in time. Consequences of the shutdown include; loss of biomass viability due to extended system down time; the need to store or control the discharge of large volumes of process wastewaters with high nitrate concentrations.

Slide 4

The logic presented in the project implementation approach illustrates that systems will be available to either process or store nitrated wastewaters during this entire construction period. The Neutralized Raffinate (High Nitrate) Storage Tank will be completed early to provide an additional 500,000 gallon storage capacity for high nitrate flows. Bioreactors 1 and 2 will continue to operate while work is underway to upgrade bioreactors 3 and 4 and critical support systems such as the control building. Reactors 1 and 2 will be shut down when this activity is finished to make tie-ins and complete system modifications which cannot be effected with equipment in operation.

Slide 5

The major systems and equipment are identified relative to the phase of construction in which they will be installed or modified.

Slide 6

Self explanatory

Slide 7

The current FMPC wastewater storage and processing systems which impact BDN Facility operation are shown to illustrate flow streams being discharged to Manhole 175. The Clearwell discharge is shown with direct routing to the surge lagoon, however capability still exists to route this stream directly to Manhole 175. Management and routing of other streams is accomplished in the General Sump.

Slide 8

The net wastewater storage volume available at the FMPC is approximately 9.6 million gallons based on the fact that a portion of the total available volume is reserved in the lined storage structures for accumulation of sludge and for retention of a minimum water volume which holds liners in place to prevent dislocation.

Slide 9

Historical rainfall data for 1956 to 1985 was analyzed to determine values for average, maximum and minimum rainfall accumulations likely to occur during the Construction shutdown timeframe. These values were translated into a runoff rate in gallons per day to project the contribution by rainfall to flows leaving the FMPC Site or potentially requiring storage.

Actual wastewater flows processed through the General Sump during the February - March 1989 timeframe were analyzed for volume and nitrate concentrations to project what daily discharge rates and nitrate mass loading would be if water were discharged without nitrate removal. Three different nitrate concentration thresholds were established for this analysis to determine the relationship between nitrate concentration and volume of water releasable with respect to NPDES limits for nitrate mass loading. The study indicates, for instance, that if all wastewater containing 500 ppm or less of nitrates were discharged directly to Manhole 175 without further denitrification, the resulting average flow would have been 63,000 gallons per day with a 16 kg mass loading. This loading is well below the regulated 62 kg/day average. This discharge scenario would have also left approximately 10,000 gallons per day of the total flow through the general sump to be stored due to nitrate concentrations above the 500 ppm discharge limit. Process refinery flows from plant 2/3 are not included in these values because the refinery is not scheduled for operation during the BDN construction shutdown.

Slide 10

Process water flows and portions of the wastewater processing system impacted by the BDN construction shutdown are shown. Clearwell discharge will be routed directly to Manhole 175 while the surge lagoon will be used to store and provide for controlled discharge of low nitrate containing streams. The newly constructed high nitrate tank and the temporary tanks will be used to segregate and store streams containing nitrate concentrations greater than 500 ppm.

Slide 11

Several different combinations of shutdown durations and water storage thresholds based on nitrate concentration were evaluated to project the total volume of water accumulated during the shutdown. Based on the net storage volume available on the site, Clearwell discharges will have to be segregated from process waste streams to assure sufficient capacity is available. The values shown do not account for rainfall accumulation in the storage vessels themselves during the shutdown period nor do they account for those occasions where water is diverted for storage due to other monitored parameters being above regulated discharge limits.

Slide 12

The process wastewater storage and management plan developed for the construction shutdown has been based on a comparison of historical data on FMPC waste stream flows and rainfall with water processing and storage capabilities available during the construction shutdown. The planning duration maximum of 90-120 days provides some contingency for resolution of unanticipated problems which may be encountered during the facility restart and allows some flexibility for re-establishing full viability of the bacteria in the bioreactors.

Capability currently exists for any wastewater monitoring and flow management activities to be carried out at the general sump monitoring point 001B so that it becomes the logical choice to substitute for Nitrate and Ammonia monitoring requirements at Outfall 001E which is currently at the BDN discharge.

Use of the surge lagoon for low nitrate streams, as is the current practice, leaves it available as the largest storage volume for the largest amount of water generated (streams with 500 ppm nitrates or less).

Slide 13

There is confidence that the plan adopted for water management during the shutdown will be effective in maintaining compliance with the terms of the existing permit. It is recognized, however, that heavier rainfall such as that experienced in the winter-Spring 1989 time frame does increase the probability for infrequent instances where water storage limitations may produce a need to discharge water volumes containing nitrate mass loadings slightly higher than the 124 kg daily maximum. All other measures will be taken to alleviate such conditions prior to discharging.

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BIODENITRIFICATION FACILITY UPGRADE PROJECT

PHASED CONSTRUCTION

AND

WASTEWATER MANAGEMENT

PLANNING

BIODENITRIFICATION FACILITY UPGRADE

FMPC

Purpose

- Brief Project Status Overview
- Present Construction Phase Process Wastewater Management Plans

BIODENITRIFICATION

FMPC

BDN Phased Construction Plan Review

Planning Assumptions

- Refinery will not operate during Shutdown period
- Biomass Retention not required for Tower Restart
- Restart Timetable based on 4-8 weeks for Incubating New Biomass
- Towers 1 and 2 operate until Latest Possible Time for Maximum Water Storage Volume
- All available Water Storage Areas will be used during Shutdown
- Towers 3 and 4 Fluidization Tests are Complete before Towers 1 and 2 Shutdown
- Effluent Treatment System alone Drives Consent Decree Compliance Timetable

BIODENITRIFICATION FACILITY UPGRADE

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PROJECT IMPLEMENTATION APPROACH

DESIGN

KEY SPECS.

CONST. PKG.

CONSTRUCTION

EFFLUENT TREATMENT

NEUT. RAFF. STORAGE

TOWERS 3/4, CRITICAL SYSTEMS

TOWERS 1/2, ASSOCIATED SYSTEMS

OPERATION

OPERATE TOWERS 1/2

OPERATE TOWERS 1/2

OPERATE TOWERS 3/4

TEMPORARY STORAGE TANKS

NEUTRALIZED RAFFINATE STORAGE TANK

SURGE LAGOON

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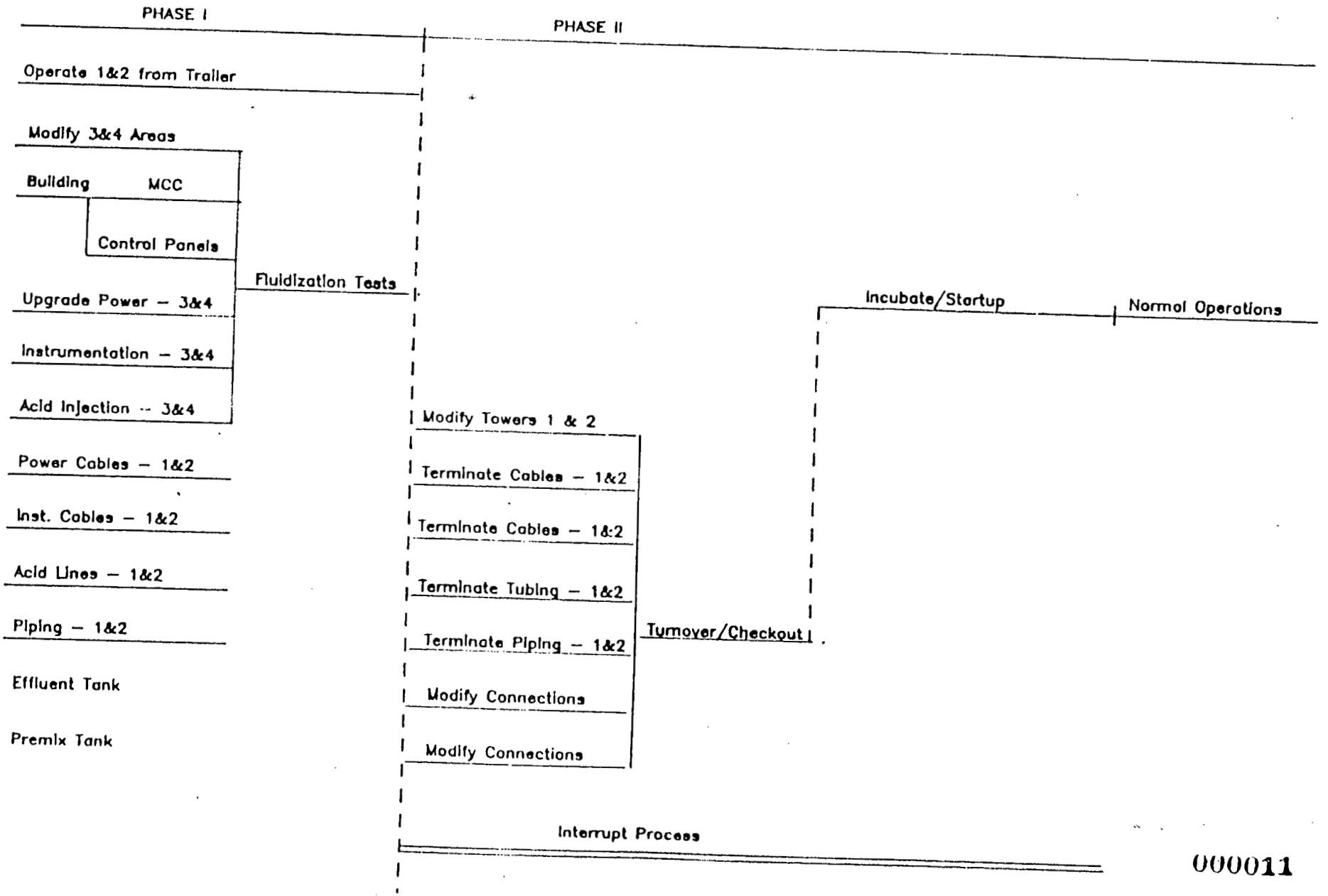
BDN PHASED CONSTRUCTION – SHUTDOWN OPTION



BIODENITRIFICATION FACILITY UPGRADE

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CURRENT STATUS:

- Design Complete
- High Nitrate Tank Under Construction
- Biodenitrification (BDN) Process PTI Approved
- Effluent Treatment System PTI Application in OEPA Review
- Effluent Treatment System Procurement Authorized
- BDN Process Construction Contract Bid/Award Process Underway
- Long Lead Item Procurement Underway

BIODENITRIFICATION FACILITY UPGRADE

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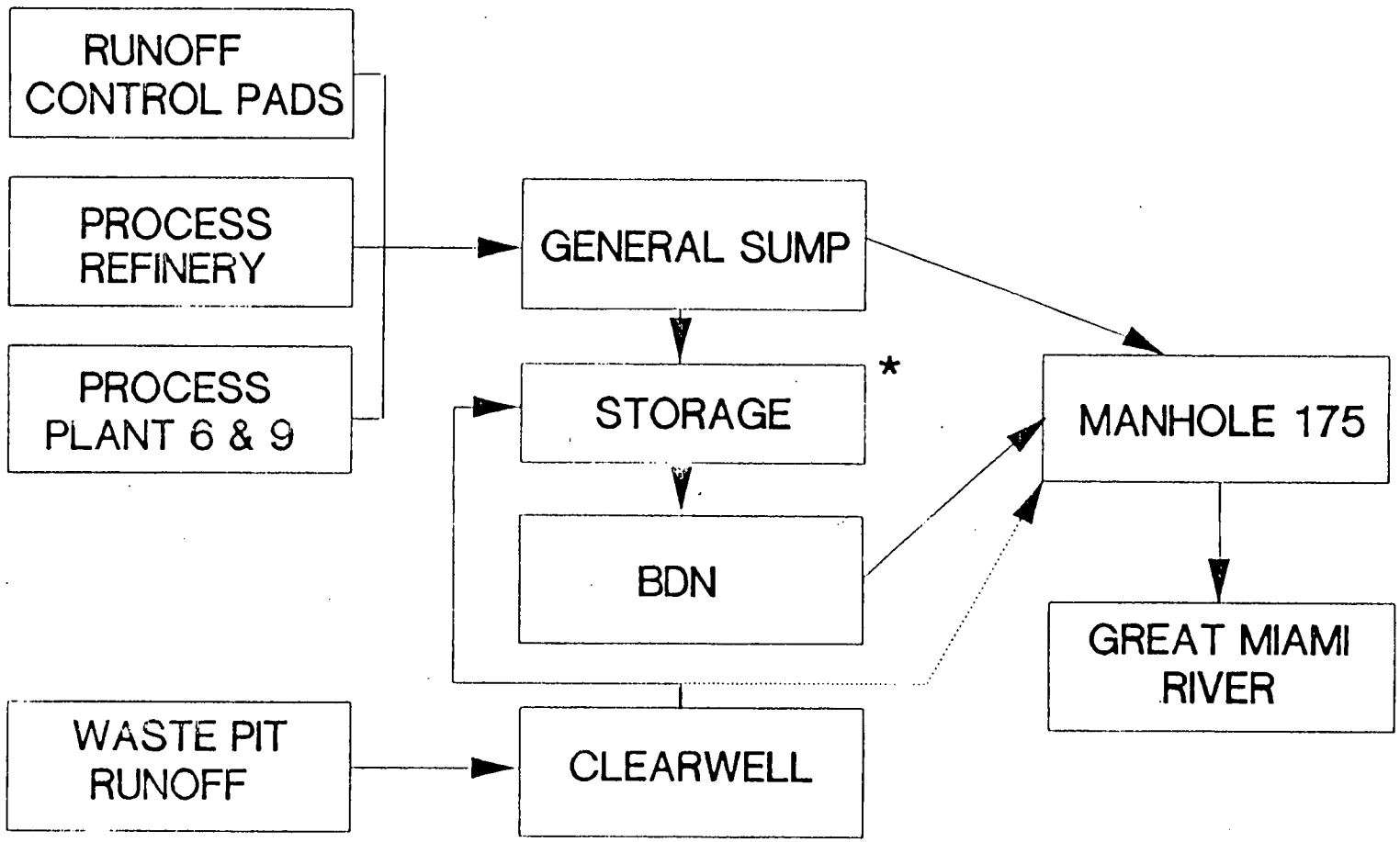
FMPC Water Storage and Processing System (Current)



*Surge Lagoon, North-South Temporary Tanks

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BIODENITRIFICATION FACILITY UPGRADE

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FMPC Process Waste Water Storage Capability

Storage Volume	Capacity	Current Use
Surge Lagoon	8.00 M. Gal.	Low Nitrate Storage (BDN feed)
North Temp. Tank	1.00 M. Gal.	Low Nitrate Storage (Back-up)
South Temp. Tank	1.00 M. Gal.	High Nitrate Storage (BDN Feed Blending)
High Nitrate Tank	.50 M. Gal.	High Nitrate Storage (Under Construction)
General Sump	.40 M. Gal.	Waste Water Flow Management
Total:	11.00 M. Gal.	
Net:	9.60 M. Gal.	

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BIODENITRIFICATION FACILITY UPGRADE

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FMPC Water Discharge Statistics

Rainfall Runoff

	Rainfall (120 Day)*	Runoff Volume (gal/day)
Avg. (in.):	13.26	118,116
Max. (in.):	22.02	196,147
Min. (in.):	7.52	66,895

*Comparison with 20 Year Rainfall Statistics for Shutdown Period

Process Discharges (gal/day)**

Discharge All Water	NOx (Kg/day)	Discharge < 1000 PPM	NOx (Kg/day)	Discharge < 500 PPM	NOx (Kg/day)
73,542	80	67,602	28	63,093	16

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**Based on Actual Process Wastewater Flow Data for Feb. - Mar. 1989

BIODENITRIFICATION FACILITY UPGRADE

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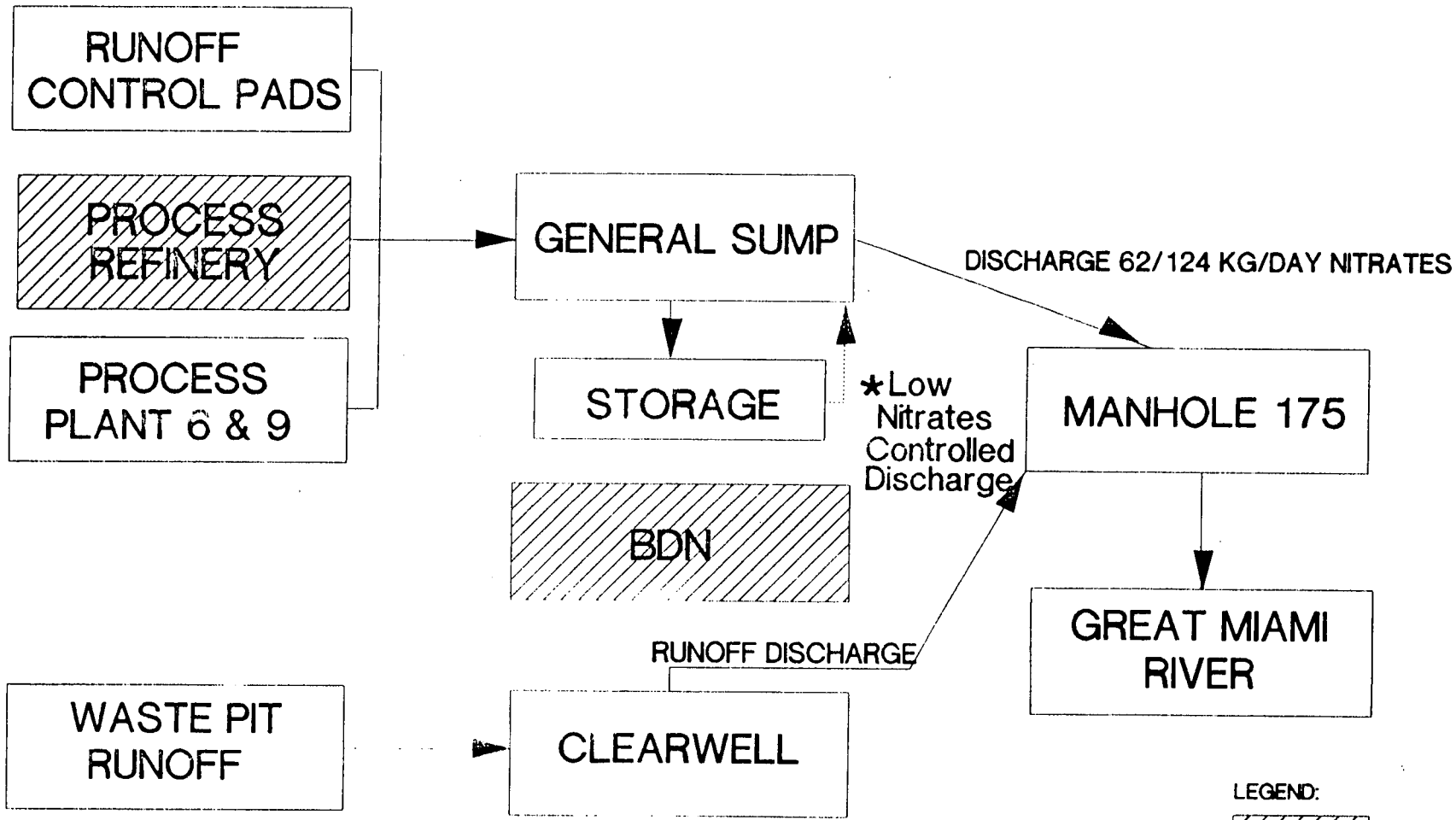
FMPC Water Storage and Processing System (Construction Shutdown)



*Includes: Surge Lagoon (<500PPM Nitrates)
New High Nitrate Tank (>500 PPM Nitrates)
North-South Temporary Tanks (>500 PPM Nitrates)

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BIODENITRIFICATION FACILITY UPGRADE

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Water Volume Storage Estimates

(Volume in Gallons)

Process Wastewater Discharge Concentration Categories

Shutdown Duration	Store All Water	Store >1000 PPM	Store >500 PPM	Store All with Clearwell
6 Weeks	3,089,000	249,500	438,000	10,057,000
12 Weeks	6,178,000	499,000	878,000	20,114,000
18 Weeks	9,266,000	749,000	1,317,000	30,170,000

BIODENITRIFICATION FACILITY UPGRADE

FMPC

FMPC WASTE WATER MANAGEMENT PLAN

Approximate Maximum Duration: 90 - 120 days

MANAGEMENT STRATEGY:

a) Move Waste Water Monitoring Point 001E to General Sump Tank No. 9

b) Use Surge Lagoon for Low Nitrate (500 PPM or less) Water with Controlled Discharge Through General Sump

c) Discharge Clearwell to Manhole 175 to Remove Rainfall Runoff

d) Store High Nitrate Streams In High Nitrate and Temporary Tanks

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BIODENITRIFICATION FACILITY UPGRADE

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SUMMARY

- Most, if not all, water with Nitrate Concentrations of Concern Can be Stored Until Facility Restarts

- Controlled Discharge of Any Nitrate-Containing Waste Waters Will Allow Effective Compliance with 62/124 Limits During Construction

- Emergency Conditions with Rainfall May Result in Infrequent NOx Discharges in Excess of 124 Kg/day Maximum