Western Refining
GALLUP

ENTERED

WNR LISTED NYSE

September 25, 2009

Mr. James P. Bearzi
Chief, Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Subject: Process Design Report for the Wastewater Treatment Plant Work Plan (Alternative Design)
Western Refining Company Southwest, Inc. (Gallup Refinery)
EPA ID# NMD000333211
HWB-GRCC-09-022

Dear Mr. Bearzi:

Enclosed with this letter is the Process Design Report for the Wastewater Treatment Plant Work Plan (PDR Work Plan). This version of the PDR Work Plan presents an alternative system design and replaces the previous Work Plan submitted on May 26, 2009. The two major changes in the proposed design are as follows:

1. A new equalization tank upstream of the API Separator and a new dissolved gas flotation (DGF) system downstream of the API Separator will be installed. These systems replace the proposed tank-based separator system in the previous submittal.
2. A new macro porous polymer extraction (MPPE) system will be installed for removal of benzene. This system replaces the proposed bioreactor system in the previous submittal.

We are requesting approval from New Mexico Environment Bureau (NMED) and the Oil Conservation Division (OCD) for this alternative design. Please note that we will continue our ongoing design efforts for the alternative system while awaiting approval, in order to maintain the schedule for system implementation presented in Section 5 of the PDR Work Plan.

As part of these ongoing design efforts, we will be conducting an on-site pilot-scale test of the MPPE technology during the month of October 2009 and possibly extending into November 2009. The pilot test is being performed to confirm design criteria for the MPPE vendor as a standard requirement of their design process. A pilot-scale DGF system will be operated upstream of the pilot-scale MPPE system in order to simulate the full-scale treatment scheme. The pilot-scale system will be processing approximately 20 gallons per minute (gpm) of API Separator effluent.

We are also responding to certain comments in your September 1, 2009 letter (Attachment AA) regarding the Approval with Modification of the May 26, 2009 PDR

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Work Plan. We have no response to Comments 1, 2, 4, 9, B, C, E, and G. They are either accepted (*1,4,9,C,E,G*) or do not apply (*2,B*) to the alternative design. Our responses to Comments A and D are provided below as they still apply to the alternative design.

Response to Comment A: We request the approval to continuously discharge flows of less than 30 gpm from the storm sewer to T27 and T28. We agree that T27 and T28 will potentially receive hazardous waste and that hazardous waste cannot accumulate in these tanks for more than 90 days. However, we disagree that these facts are a basis for not allowing the storm sewer to discharge to these tanks during low flow (dry weather) conditions. In fact, our objective in directing dry weather flow to T-27/28 is to improve the RCRA compliance situation at these tanks. If the storm sewer low flow condition is continuously discharged to these tanks and the tanks are operated at a low liquid level, then with the appropriate recordkeeping it can be assured that the 90-day accumulation period would not be exceeded. For example, if the tanks are operated at a 2-ft liquid level (13,000 gallons each), a 1 gpm flow rate from the storm sewer would turn over the contents of the tanks every 18 days. The tanks would be managed to provide turnover of the solids along with the liquid. We believe that this mode of operation is acceptable as a "continuous flow process" as described in the USEPA's February 16, 2007 interpretation letter (attached) regarding the turnover of hazardous waste stored in generator accumulation tanks.

We would also like to note that enough liquid needs to be maintained in T27/28 at all times to allow the floating roof to properly control air emissions (i.e., to remain floating). The tank cannot be completely emptied on a batch basis without landing the roof on its support legs, which is contrary to Clean Air Act (CAA) air emission standards (specifically, the New Source Performance Standards or NSPS at 40 CFR 61 Subpart QQQ). Since the roof supports will be at the 1.5-ft level, the minimum liquid level is approximately 2 ft as discussed above. Some amount of tank turnover will be required to maintain compliance with both the 90-day accumulation requirements and to maintain a floating roof for the air emission standards. Thus, during dry weather periods lasting longer than 90 days, influent sources to T-27/28 other than wet weather stormwater will be required (a minimum of 26,000 gallons every 90 days).

If we were required to always discharge the storm sewer directly to the API separator during dry weather conditions, we would be concerned about the risk of overflowing the API separator during subsequent storm events. A potential failure could occur with the redirection of the storm sewer from the API Separator to T27/28 at the start of wet weather conditions. Thus, our preference is to not have redirection of the storm sewer as a mandatory requirement.

[Note: We believe it is prudent to have interconnectivity between the process sewer and the storm sewer in order to provide flexibility in management of our process wastewaters and storm waters. This "normally closed" interconnection is reflected in Figure 1 of the PDR Work Plan].

Response to Comment D: We request an extension to March 31, 2011 for the date by which the upgraded system has to be installed and operational. The September 4, 2010 deadline presented by NMED is not achievable given the time required to complete the design, obtain an air permit for construction, construct the system, and initiate start-up. The intermediate milestones that comprise the overall March 31, 2011 schedule are provided in Table 5-1 of the PDR Work Plan. To date, we have researched an upgraded wastewater treatment system and completed its process design. However, we have not been able to complete the full design package required for construction due to the negotiation of the recently finalized Complaint and Consent Agreement and Final Order (CAFO). That CAFO now requires compliance with 40 CFR 62.34(a) which has a major impact on the design requirements for the alternative system. Other limiting factors are that construction cannot start until an air permit is obtained and also that the specialized equipment has long lead times. For example, the DGF system will take 20 to 24 weeks to be fabricated and delivered after it is purchased.

During the period of requested extension (September 4, 2010 to March 10, 2011), we will be operating under the Interim Measures Work Plan (IM Work Plan) required by the CAFO. We will have fully implemented the interim measures to cease the discharge of any hazardous wastewater to any surface impoundment, unless such discharge complies with applicable RCRA standards.

Please contact me at (505) 722-0217 if you have any comments or questions regarding the contents of this letter or the enclosed report.

Sincerely,

Ed Riege
Environmental Manager

cc: Mark Turri
Ann Allen
Don Riley
Shane White
OCD
EPA Region 6

Attachment - February 17, 2002 Interpretation Letter

Attachment AA- September 1, 2009 Letter

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

FEB 16 2007

OFFICE OF
SOLID WASTE AND
EMERGENCY RESPONSE

Mr. John Hopewell
Manager, Environmental Affairs
National Paint and Coatings Association
1500 Rhode Island Avenue N.W.
Washington, D.C. 20005

Dear Mr. Hopewell:

Thank you for your October 12, 2006 letter in which you seek clarification of 40 CFR 262.34(a)(1)(ii) in connection with the turnover of hazardous wastes stored in generator accumulation tanks. Specifically, you request guidance on whether a hazardous waste generator accumulation tank has to be completely emptied every 90 days to meet the accumulation time requirement, or whether the tank volume can be "turned over," removing a volume of material equal to or greater than the tank volume from the tank every 90 days. This turnover approach (which EPA refers to in our letter as the "mass balance approach") appears to be used, as described in your letter, in connection with tanks that receive hazardous wastes on an ongoing, continuing basis (which EPA refers to in our letter as a "continuous flow process"). By completing this turnover, you believe that the hazardous waste volume remaining in the tank unit would not be considered as being stored or accumulated for more than 90 days, thus avoiding the need to obtain a Resource Conservation and Recovery Act (RCRA) Part B storage permit. In response to your request, EPA is interpreting 40 CFR 262.34(a)(1)(ii) to allow for the turnover approach you describe in your letter, subject to the various conditions and requirements we discuss in greater detail below.

As you state in your letter, large quantity generators accumulating hazardous wastes in tanks must comply with the 40 CFR 262.34(a)(1)(ii) requirements in order to accumulate hazardous waste on-site in tanks for 90 days or less without a permit, provided they comply with the 40 CFR part 265 Subpart J requirements (except 265.197(c) and 265.200). You believe that, as written, this regulation is unclear and, in the absence of any clarification in this area, may be interpreted to mean that each tank must be completely emptied at least every 90 days even where the tank's "volume capacity" has already been turned over within the 90 day timeframe. You argue instead for an interpretation of this regulation to allow for hazardous waste "turnover" at least once every 90 days.

EPA interprets this regulation to allow large quantity generators accumulating hazardous wastes in tanks to meet the 40 CFR 262.34(a)(1)(ii) requirement by using periodic tank "turnover," so long as hazardous waste entering the tank remains in the unit for no more than 90 days. EPA's interpretation of this regulation is set forth below in greater detail.

Tanks can be operated in one of two ways – in a batch process or in a continuous flow process.

Batch Process

Under a batch process, a tank receives a batch (or batches) of hazardous waste on a one-time or intermittent basis. Under a batch process scenario, the 90-day waste accumulation clock for a large quantity generator starts when hazardous waste first enters the tank. If, for example, the tank fills up in 30 days, and is emptied on day 30, the requirements of 40 CFR 262.34(a)(1)(ii) are met since the hazardous waste has been in the tank for less than 90 days. The next 90 day period begins when hazardous waste is added to the tank that has been emptied (for example, on day 31). If the tank is emptied a second time within 90 days of day 31, the requirements of 40 CFR 262.34(a)(1)(ii) are met.

EPA explained this particular method of 90-day waste accumulation calculation, intended to apply to tanks utilizing a batch process, in the preamble to the generator accumulation final rule promulgated on January 11, 1982 (47 FR 1250):

> As with accumulation in containers, the 90-day period begins the moment the generator first places hazardous wastes in an "empty tank." The generator then must remove all wastes from the tank within 90 days from the time he first places wastes in the "empty" tank. A tank will be considered empty when its contents have been drained to the fullest extent possible. Since many tank designs do not allow for complete tank drainage due to flanges, screens or siphons, it is not expected that 100% of the wastes will always be removed. As general guidance, a tank should be considered empty when the generator has left the tank's drainage system open until a steady, continuous flow has ceased."

Large quantity generators utilizing a batch process must meet the requirements of 40 CFR 262.34(a)(1)(ii). For example, the use of inventory records in conjunction with tank markings may provide confirmation that the tank has been emptied within an appropriate time period. Specifically, the inventory records typically show the dates and associated quantity of hazardous waste entering the tank, as well as the dates the tank was emptied. Shipping or hazardous waste manifest records also may be used to verify when the tank was emptied. Likewise, tanks accumulating hazardous wastes may have information indicating the time and date hazardous waste first entered the tank. There may be other methods to demonstrate that a tank has been emptied, but any method used to confirm compliance with 40 CFR 262.34(a)(1)(ii) must be reasonable and easily discernible to EPA or an authorized state.

Continuous Flow Process

Under the continuous flow process, in contrast to the batch process described above, the tank receives hazardous waste on an ongoing, continuous basis. In the case of hazardous wastes flowing through tanks continuously, there is a means of demonstrating when a tank is "emptied" within 90 days under 40 CFR 262.34(a)(1)(ii) that would not require completely emptying the tank, and may be more suitable for tanks with continuous flow. More specifically, a mass balance approach (i.e., the "turnover" approach, as you referred to it, in your letter) can be used for continuous flow tanks rather than the approach described above for batch process tanks. The key parameters in this mass balance approach are the volume of the tank (e.g., 6,000 gallons), the daily throughput of hazardous waste (e.g., 300 gallons per day) and the time period the hazardous waste "resides" in the tank. In this example, the hazardous waste entering the tank would have a residence time of 20 days ((6,000 gallons/300 gallons per day) = 20 days) and meet the requirements of 40 CFR 262.34(a)(1)(ii) since the hazardous waste has been in the tank for less than 90 days.

Large quantity generators accumulating hazardous wastes through a continuous flow process must also demonstrate that the hazardous waste has not been stored for more than 90 days. This may be achieved by the use of inventory, or some form of accounting or monitoring data. For example, a generator could confirm that the volume of a tank has been emptied every 90 days by recording the results of monitoring equipment both entering and leaving a tank. This recordkeeping, in conjunction with the tank volume, would enable inspectors, as well as facility personnel to demonstrate compliance with 40 CFR 262.34(a)(1)(ii). Likewise, in marking the tank, a generator could mark both the tank volume and estimated daily throughput to allow inspectors to determine the number of days that hazardous waste resides in a tank to determine compliance with 40 CFR 262.34(a)(1)(ii). As noted above, there may be other methods to demonstrate that a tank has been emptied, but any method or demonstration to confirm compliance must be reasonable and easily discernible to EPA or an authorized state.

As you state in your letter, generators also would still be required to meet all applicable hazardous waste tank regulations found in 40 CFR part 265, Subpart J. In addition, if the tank is removed from service, the regulation requires the system to undergo a formal RCRA closure to remove or decontaminate all hazardous waste associated with the tank system.

Please note that this is EPA's interpretation of the federal hazardous waste regulations. Most states are authorized to operate their own hazardous waste management program. As such, states may impose regulations which may be more stringent and/or broader in scope than the federal regulations. Therefore, you should check with the appropriate state agency to determine the requirements applicable to your activities.

Should you have any questions on this subject, please contact Jim O'Leary at (703) 308-8827 or oleary.jim@epa.gov.

Sincerely yours,

Matt Hale, Director
Office of Solid Waste

cc: Tom Kennedy, Association of State and Territorial Solid Waste Management Officials (ASTSWMO)
Barry Elman, OPEI

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CERTIFIED MAIL - RETURN RECEIPT REQUESTED

September 1, 2009

Mr. Ed Riege
Environmental Superintendent
Western Refining, Southwest Inc., Gallup Refinery
Route 3, Box 7
Gallup, New Mexico 87301

RE: APPROVAL WITH MODIFICATION
PROCESS DESIGN REPORT FOR WASTEWATER TREATMENT PLANT UPGRADE (REV. A)
WESTERN REFINING COMPANY, SOUTHWEST, INC., GALLUP REFINERY
EPA ID # NMD000333211
HWB-GRCC-09-002

Dear Mr. Riege:

The New Mexico Environment Department (NMED) has reviewed the *Process Design Report For Wastewater Treatment Plan Upgrade (REV. A)* (Work Plan), dated May 26, 2009, submitted on behalf of Western Refining Company, Southwest Inc., Gallup Refinery (the Respondent). On August 17, 2009, NMED received an e-mail with an attached letter from the Respondent stating "[t]his letter serves as Western Refining Gallup's ("Gallup") withdrawal from NMED's consideration of the Process Design Report For Wastewater Treatment Plan Upgrade (Rev. A) prepared by Brown and Caldwell and submitted to NMED on May 26, 2009. As we discussed, Gallup intends to submit to NMED an alternative wastewater treatment system work plan." The

May 26, 2009 Work Plan is referenced in the EPA Compliant and Consent Agreement and Final Order dated August 26, 2009 (CAFO), paragraph 100.C which states "[t]he Respondent submitted, on May 30, 2009, a Process Design Report for Wastewater Treatment System Work Plan for NMED and OCD approval for the design and construction of the upgraded wastewater treatment system. Upon NMED and OCD approval, all deadlines, work/design requirements, and sampling and monitoring requirements in a Process Design Report for Wastewater Treatment System Workplan shall become part of, and enforceable under, this CAFO."

Comments to the Work Plan already submitted are provided below. NMED understands that the Respondent may submit a work plan for the wastewater treatment system. Nevertheless, the Respondent must adhere to Comments C and D below and all other applicable comments.

Comment 1/Response 1

In the Response Letter (dated May 28, 2009), Response 1, the Respondent states "[n]ote: the Refinery is an interim status facility so the correct regulatory citations are HWA 20.4.1.600 and 40 CFR 265 as indicated in the response, rather than 20.4.1.500 and 40 CFR 264 stated in the original comment." In Section 1.5 (Regulatory Criteria) of the Work Plan, page 1-2, the Respondent states "[o]nce a [National Pollutant Discharge Elimination System] NPDES Permit is issued, the WWTP will be regulated under the Clean Water Act and thus exempt from RCRA's 40 CFR 265[1] requirements. Therefore, the design basis for the WWTP upgrades assumes the compliance with RCRA 40 CFR 265 is not required. If for some reason a NPDES permit cannot be obtained, the design will be revised and resubmitted to reflect compliance with 40 CFR 265." Footnote 1 states "[n]ote: The Refinery is an interim status facility so New Mexico Hazardous Waste Act [sic] 20.4.1.600 and 40 CFR 265 apply rather than 20.4.1.500 and 40 CFR 264."

NMED Response

The following corrections and requirements apply to the Respondent:

a. The Gallup Refinery is not an interim status facility. If the Respondent considered Aeration Lagoons 1 and 2 (AL-1 and AL-2) as interim status units, then the Respondent would have needed to submit a revised Part A Permit Application for those units in accordance with 20.4.900 NMAC (incorporating) 40 CFR 270.10 and a Part B permit application would have been required. In addition, interim status requires compliance with the requirements found in 20.4.1.900 NMAC (incorporating) 40 CFR 270.70 and 270.10(e)(ii). AL-1 and AL-2 are solid waste management units (SWMU), as indicated in Appendix A of the Post-Closure Care Permit (Permit).

b. As long as the Respondent continues to treat wastewater in AL-1 and AL-2 that is characteristically hazardous for benzene, the facility is treating hazardous waste. The CAFO allows the Respondent 120 days from NMED's approval of an Interim Measure Work Plan to achieve compliance.

c. The regulations cited by the Respondent ("HWA [sic] 20.4.1.600 and 40 CFR 265") are incorrect. The Respondent has not met the requirements for interim status; therefore, 40 CFR 265 (20.4.1.600 NMAC) does not apply.

d. The CAFO appropriately requires the Respondent to comply with the hazardous waste generator requirements found in 20.4.1.300 NMAC (incorporating) 40 CFR 262.34(a).

Comment 2/Repsonse 2

In the Response Letter, Response 2, the Respondent states "[s]hould Western Refining elect to perform BOX testing, and should that testing indicate that the addition of the MBBR media is not required, then Western Refining will seek approval from OCD to modify the Bioreactor design to exclude media."

NMED Response: The Respondent must also obtain approval from NMED to modify any portion of the wastewater treatment system.

Comment 4/Response 4

In the Response letter, Comment 4, NMED states "[t]he WWTS must contain influent and effluent sampling ports to accommodate sampling at the new API separator…."

NMED Response: From review of Section 6.1 (Sampling Locations), the influent to the API separator cannot be sampled. NMED reserves the right to require sampling of the influent entering the new API separator and the Respondent must be capable of collecting such samples.

Comment 6/Response 6

In the Response letter, Comment 6/Response 6 addresses dredging of Evaporation Pond 1 (EP-1). The Respondent responded stating "[d]redging of EP-1 will be addressed in the Corrective Measures Implementation Work Plan due to NMED on July 31, 2009. Western Refining will take the position that the initial dredging is not warranted and that the frequency a [of] future dredging events can allow for more than one foot of accumulation."

NMED Response: There have been documented releases when hazardous waste has entered EP-1; therefore, at a minimum, EP-1 contains listed hazardous waste (F037/F038). The upgraded wastewater treatment system is intended to ensure that hazardous waste will not enter EP-1. Dredging will remove residual contamination in order to enable the Respondent to demonstrate future compliance. The Respondent shall comply with the dredging requirements found in NMED's April 15, 2009 Notice of Disapproval (NOD), Comment 6. No revision is necessary.

Comment 9/Response 9

In the Response Letter, Response 9, the Respondent states "[m]eeting the [requirements of] 20.6.2.3103 standards is not a stated treatment objective of the upgraded WWTS. The treatment objectives (as stated in Section 1.4 of the Report) are for there to be no visible free oil and <0.5 mg/L benzene. The concentrations of other parameters are expected to be consistent with the historical data reported for the EP-1 inlet under the GW-32 monitoring requirements." Section 1.4 of the Work Plan states "[t]he treatment objectives for the WWTP upgrade are to provide water quality that is suitable for discharge to the unlined EP-1. Specifically, the objectives are for there to be no visible free oil and <0.5 mg/L benzene. This project design was developed based on these objectives."

NMED Response: As identified in the objectives, the effluent entering into EP-1 must not contain free oil, and benzene concentrations must be below <0.5 mg/L. However, these should not be the sole objectives of the WWTS upgrade. The WWTS and the effluent entering into EP-1 must comply with all applicable requirements found in the Oil Conservation Divisions (OCD) Discharge Plan GW-32, as well as comply with all other applicable regulations. Discharges to the unlined Evaporation Ponds must not create the potential for impacts to groundwater.

Additional NMED/OCD Comments

Comment A

In Section 4.2.1 (Stormwater/Diversion Tanks), page 4-1, paragraph 2, the Respondent states "[o]il that may accumulate on the surface of T27 and T28 [Stormwater/Diversion Tanks] will be captured from a skimmer device mounted on each tank's floating roof. The skimmed oil will be collected by a vacuum truck and transferred to the Refinery's slop oil system for recycling back to the refining process. Solid material that may settle on the bottom of T27 and T28 will be removed on a periodic basis and managed along with similar material collected from the NAPIS. This material is normally recycled to an off-site refining process. If recycling to a refining process is not available, the T27 and T28 bottom solids will be managed as a hazardous waste."

NMED Response: Storm water at the refinery comingles with process water and therefore potentially contains hazardous waste (D018 and F037/F038 listed wastes). The Respondent is not allowed to accumulate hazardous waste in Tanks T27 and T28 for more than 90 days. Therefore, the Respondent's must design their storm water system to direct the ongoing low flow of process wastewater in the storm water system to the API separator except during storm events when higher flows trigger diversion of storm water to Tanks T27 and T28 at flow rates greater than approximately 30 gallons per minute (gpm) to prevent flow rates from exceeding capacity of the API separator or wastewater treatment system.

Comment B

In Section 4.2.4 (Tank-Based Separator), page 4-2, paragraph 5, the Respondent states "[t]he Tank-based separator is not designed to be compliant with 40 CFR 265 Subpart J due to Western Refining's intention to obtain an NPDES permit for the WWTP. If an NPDES permit cannot be obtained, the design of the Tank-based separator will be modified to be compliant with 40 CFR 265 Subpart J."

NMED Response: The CAFO requires the Respondent to comply with the requirements found in 20.4.1.300 NMAC (incorporating) 40 CFR 262.34(a). This applies to all applicable sections within the Work Plan (e.g. Section 4.2.5 (Bioreactors), paragraph 1 and Section 4.5 (Secondary Containment and Leak Detection)).

Comment C

In Section 4.6 (Alternative Upgrade Approach), page 4-6, last sentence, the Respondent states "Western Refining will submit the alternative design approach to OCD for approval prior to implementation."

NMED Response: The Respondent discussed an alternative approach to the upgraded WWTS to NMED and OCD in a meeting on July 1, 2009 that addressed the use of Macro Porous Polymer Extraction and a dissolved gas flotation unit. On August 17, 2009, the Respondent submitted a letter withdrawing the Process Design Report For Wastewater Treatment Plan Upgrade (REV. A). If the Respondent chooses to pursue an alternative wastewater treatment system, a new work plan must be submitted to OCD and NMED for approval by both agencies. The new work plan must describe all aspects of the alternative design. The implementation of an alternative approach will not change the deadline established in Comment D below which provides a deadline for the start of operation of an upgraded WWTS.

Comment D
The Respondent includes a Project Schedule in Section 5.

NMED Response: NMED does not approve the schedule presented in Section 5. The facility has had ample time to research and design an upgraded wastewater treatment system and first proposed upgrades in May 2007. Therefore, the Respondent must have the upgraded wastewater treatment system installed and operating by September 4, 2010.

Comment E
In Section 6.1 (Sample Locations), page 6-1, the Respondent states "[t]he WWTP upgrades will include wastewater sample stations at key locations for monitoring system performance. These locations are indicated by notations on the process flow diagrams in Attachments A and C and are listed below:"

NMED Response: The sampling ports were not described in the Work Plan. The Respondent must ensure that the sampling port mechanisms to be installed are capable of controlling the flow through the sampling ports to minimize volatilization. There are no notations for sample locations in Attachment C. No revision is necessary; the Respondent must install the sampling ports as required in the NMED's April 15, 2009 NOD.

Comment F
In Section 6.3 (Sample Analysis for Regulatory Reporting), page 6-2, the Respondent identifies sampling parameters for the EP-1 influent. The Respondent must address the following:

a. Table 6-2 lists the EPA method for semi volatile organic compounds (SVOCs) as "EPA 8260 C." The correct analytical method for SVOCs is EPA Method 8270. The Respondent must revise Table 6-2 to include the correct EPA Method and submit a replacement page that includes the corrections.

b. The EPA method proposed to be used to detect benzene is 8021B. In addition to benzene, EPA Method 8021B also analyzes for toluene, ethylbenzene, and total xylenes (BTEX). When reporting the analytical data, the Respondent must report all BTEX data. The Respondent must revise the Table 6-2 to include the analysis of toluene, ethylbenzene, and xylenes in addition to the benzene and submit a replacement page. If EPA Method 8260 is used, all analytes listed for the Method must be reported.

c. The Respondent states in Section 6.3 that "Western Refining will seek approval from OCD to discontinue the regulatory reporting requirements for the Pilot Travel Center (i.e., "Effluent from the Pilot Gas Station to the Aerated Lagoon") and the NAPIS

Effluent (i.e., "Effluent from the new API Separator) as required by Condition 19 of GW-032...." The Respondent must also obtain approval from NMED. Since this page is being resubmitted, this proposed revision must be included with the replacement pages.

Comment G

During the month of June 2009, the refinery reported an overflow at the API separator due to intense rain events. The API separator must be able to handle storm water surges caused by rain events. The overflow at the API separator implies that the storm water and the process water sewer systems are still interconnected. The Respondent must account for intense rain events in the wastewater treatment system design to ensure API overflows do not occur in the future.

The Respondent must comply with all comments contained in this letter. The replacement page(s) as specified must be submitted to NMED and OCD on or before September 25, 2009 in the event that an alternate wastewater treatment system design plan is not submitted. Provided that the Respondent complies with all the requirements of this letter, NMED approves the May 26, 2009 Work Plan. In any event, the upgraded wastewater treatment system must be installed and operating by September 4, 2010.

If you have questions regarding this letter please contact Hope Monzeglio of my staff at 505-476-6045.

Sincerely,

James P. Bearzi
Chief
Hazardous Waste Bureau

cc: J. Kieling, NMED HWB
D. Cobrain NMED HWB
H. Monzeglio, NMED HWB
C. Chavez, OCD
G. Rajen, Gallup
J. Dougherty, EPA Region 6
D. Edelstein, EPA Region 6
A. Allen, Western
File: Reading File and GRCC 2009 File
HWB-GRCC-09-002

Process Design Report for Wastewater Treatment Plant Work Plan (Alternative Design)

Western Refining
Gallup, New Mexico

September 2009

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ATTACHMENT B: SUPPLEMENTAL MPPE SYSTEM INFORMATION

1. INTRODUCTION

1.1 Introduction

The Western Refining Southwest's Gallup Refinery is a petroleum refinery located in Jamestown, New Mexico at Interstate 40 Exit 39. This Process Design Report for Wastewater Treatment Plant Work Plan (PDR Work Plan) presents the planned upgrades of the wastewater treatment plant (WWTP) at the refinery. This version of the PDR Work Plan replaces the May 26, 2009 version and presents an alternative design concept.

On August 27, 2007 Western Refining received a renewal of its discharge permit GW-032 from the New Mexico Oil Conservation Division (OCD). The permit required the refinery to complete certain actions related to wastewater management. This Work Plan addresses aspects of the following permit conditions:

1. Condition 16C - Treatment Study and Design
2. Condition 16D - Aeration Lagoons
3. Condition 16E – Evaporation Ponds

In August 2009, Western Refining and USEPA Region 6 agreed to the terms of a Complaint and Consent Agreement and Final Order (CAFO) that imposes additional regulatory requirements on the upgraded WWTP. Paragraph 100 of the CAFO sets forth certain WWTP-related compliance requirements under the Resource Conservation and Recovery Act (RCRA). These include:

1. Paragraph 100 B – "*Respondent shall cease the operation of, and dismantle, all existing Benzene/Air Strippers at its facility. . .*"
2. Paragraph 100 C – "*Respondent shall design, construct, properly permit, and commence operation of an upgraded wastewater treatment system . . . that is capable of treating all wastewater. . .*"
3. Paragraph 100 E – ". . . *The tanks and ancillary equipment in the upgraded wastewater treatment system that are in operation downstream of the API Separator shall be compliant with 40 C.F.R. § 262.34(a) . . .*"
4. Paragraph 100 G – "*Respondent shall limit volatile organic ("VO") air emissions from the upgraded waste water treatment system . . . to the limits in 40 CFR 265 subpart CC.*"

This document is an updated version of the May 26, 2009 Work Plan referenced by the CAFO.

The design presented herein for the upgraded WWTP is intended to meet the requirements of permit GW-032 and the CAFO. The new treatment system components will replace the Benzene Strippers and Aeration Lagoons, which will be taken out of service and dismantled. The effluent quality from the new treatment system will be suitable for discharge to an unlined surface impoundment - Evaporation Pond No. 1 (EP-1).

1.2 Project Scope

The scope of the WWTP upgrade project consists of the following new systems:

- Two existing tanks put in service for the storage of process area stormwater and diversion of off-spec wastewater
- A new equalization (EQ) tank upstream of the existing "new" American Petroleum Institute (API) separator that is connected to the process sewer. [Note: this API separator is referred to as the "API Separator" in this Work Plan. It is also known as the NAPIS]
- A dissolved gas flotation (DGF) system downstream of the API Separator
- A Macro Porous Polymer Extraction (MPPE) system downstream of the DGF system
- A pretreatment system for the sanitary wastewater from the Pilot Travel Center and refinery

The new system will allow the following existing systems to be decommissioned:

- Benzene Stripper Nos. 1, 2 and 3
- Aeration Lagoons Nos. 1 and 2 (AL-1 and AL-2)
- The Old API Separator (OAPIS) that is connected to the storm sewer. [Note: this API separator is referred to as "OAPIS" in this Work Plan]

The following existing equipment will continue to be operated in their current function within the upgraded system:

- API Separator
- EP-1 through EP-12

A flow diagram of the upgraded system is provided in Figure 1 at the end of this Work Plan.

1.3 Related Project - Pilot Travel Center Lift Station

A lift station to collect, screen, and pump the sanitary/restaurant wastewater from the Pilot Travel Center to the WWTP has recently been installed and put into service. A force main conveys the wastewater from the new refinery lift station to the WWTP. In the new, upgraded configuration of the WWTP, the wastewater from the new refinery lift station will be pretreated before being discharged into EP-1.

1.4 Treatment Objectives

The treatment objectives for the WWTP upgrade are to provide water quality that is suitable for discharge to the unlined EP-1. Specifically, the objectives are for there to be no visible free oil and $\leq$0.5 mg/L benzene. The project design was developed based on these objectives.

1.5 Regulatory Compliance

The upgraded WWTP described herein will be designed and constructed in accordance with the requirements of OCD permit GW-032 and the CAFO.

1.6 Report Organization

The PDR Work Plan is organized as follows:

Section 1.	Introduction
Section 2.	Wastewater Sources
Section 3.	Technology Selection
Section 4.	Process Description
Section 5.	Project Schedule

Attachments to the Process Design Report include the following documents:

Attachment A.	Supplemental DGF System Information
Attachment B.	Supplemental MPPE System Information

2. WASTEWATER SOURCES

2.1 Overview

This section of the report reviews the sources of wastewater generated at the refinery. The wastewater sources discharged to the refinery's WWTP fall under two broad categories: those wastewaters generated at the refinery and those generated at the adjacent Pilot Travel Center. The two sources are further described below.

2.2 Refinery Wastewaters

The process wastewaters generated by the refinery are directed to the process sewer that serves as the influent to the API Separator. In addition, two non-oily refinery wastewaters are discharged directly to Evaporation Pond No. 2 (EP-2). These sources are the water softener system and the reverse osmosis (RO) system. Both of these systems are part of the larger boiler feed water treatment system. These wastewaters are not oily and do not contain benzene.

The sanitary wastewater generated at the refinery and the seven adjacent homes owned by the refinery currently discharges to the refinery's newly constructed lift station for the Pilot Travel Center (see Section 2.3 below).

2.3 Pilot Travel Center Wastewaters

The refinery has a contract with the adjacent Pilot Travel Center to treat the sanitary and restaurant wastewaters generated by that facility. The wastewater from the restaurant at the Pilot Travel Center passes through a new grease trap system installed in 2008. The grease trap effluent and the sanitary/restaurant wastewaters from the rest of the Pilot Travel Center flow to a septic tank system. Septage is pumped out of the septic tank system on a scheduled quarterly basis for off-site disposal (as reported by Pilot Travel Center staff). The effluent from the septic tank system gravity flows to a lift station on the Pilot Travel Center

property. This lift station, the grease trap, and the septic tank system are owned and operated by the Pilot Travel Center. The lift station's submersible pumps then transfer the wastewater through a pipeline to the refinery for further pumping and treatment. Western Refining is now operating a new lift station on its property to receive the wastewater from the Pilot Travel Center's lift station and the refinery's sanitary systems.

The Pilot Travel Center generates other wastewaters that are not discharged to the refinery. These other wastestreams include truck washing and vehicle maintenance activities. They are managed with on-site oil-water separators, holding tanks, and retention ponds at the Pilot Travel Center.

The design basis assumes that the wastestream discharges from the refinery's new lift station are only sanitary/restaurant in origin and do not include any sources from vehicle service or vehicle washing operations. On this basis, the Pilot Travel Center wastewater was assumed to be free of benzene and hydrocarbon-based oil and grease (O/G).

2.4 Design Flow

The design flow rates for the individual sources are summarized in Table 2-1.

Table 2-1. Design Flow Rates

	Average, gpm	Maximum, gpm
API Separator Effluent	250	500
Pilot Travel Center	50	120
RO Reject	109	149
Refinery Sanitary	4	--

The design flows for the API Separator effluent were set at an average of 250 gallons per minute (gpm) and a maximum of 500 gpm. The average rate was based on historical data, and allowances for future flows. The maximum flow rate equals the maximum flow capacity of the API Separator with both bays in service.

The contract between Western Refining and the Pilot Travel Center limits the maximum flow to 50 gpm. However, the refinery's new lift station pumps are capable of pumping a combined flow of 120 gpm. Accordingly, the Pilot Travel Center design flows were set at 50 gpm average and 120 gpm maximum.

The average flow rate for the refinery's sanitary sources is based on the number of refinery employees. The maximum flow rate for the refinery's sanitary source is included in the Pilot Travel Center maximum flow rate, since it is also constrained by the combined pumping capacity of the new lift station pumps.

3. TECHNOLOGY SELECTION

3.1 Overview

This Section provides the basis of the two major technologies that were selected for the WWTP upgrade: dissolved gas flotation (DGF) and macro porous polymer extraction (MPPE). The DGF system replaces the Tank-based Separator concept from the prior version of the Work Plan. The MPPE system provides the benzene removal capacity of prior bioreactor concept. For further explanation please see attachment A & B.

3.2 Dissolved Gas Flotation

API separators (including the Gallup API Separator) provide first-stage (i.e., primary) oil-water separation. As such, they provide removal of free oil that readily separates from the wastewater by gravity. A second-stage oil-water separation step is required to provide additional O/G removal beyond what is consistently achievable by an API separator. Second-stage oil-water separation can remove the residual O/G and suspended solids that do not readily separate by gravity (i.e., emulsified O/G). This additional removal is required to provide the appropriate influent quality to the downstream unit process (MPPE).

A DGF system will provide the second-stage oil-water separation process for the upgraded WWTP. DGF systems are a common refinery technology downstream of API separators. The DGF process involves the pressurization of wastewater in the presence of air or nitrogen, creating a super-saturated solution that when passed into the flotation chamber at atmospheric pressure creates small gas bubbles in the liquid. These bubbles unite with the dispersed oil phase to form a collection of distinct gas-oil particles called coagules that are carried to the surface. The float is removed to disposal by mechanical flight scrapers while the underflow is the clarified water effluent. The air or nitrogen is introduced to the wastewater by pressurizing a side stream of DGF effluent and recycling it back to the flotation chamber. Organic polymers are added to the DGF influent stream to facilitate the oil-water separation.

3.3 Macro Porous Polymer Extraction Technology

The MPPE technology removes dissolved and dispersed hydrocarbons from water. Developed in the early 1990s by Akzo Nobel, MPPE is a liquid-liquid extraction process where the extraction liquid is immobilized in a macro-porous polymer particle. MPPE particles have a diameter of 1,000 microns, with pore sizes of 0.1 to 10 microns.

The MPPE technology has been successfully applied to the treatment of process water, offshore produced water, industrial wastewater, and contaminated groundwater since 1994. Dissolved and dispersed compounds that can be removed from water and wastewater with the MPPE technology include aromatics (e.g., benzene, toluene, xylenes, and ethylbenzene); polyaromatic hydrocarbons (PAHs) (e.g., naphthalenes, phenanthrenes, dibenzothiophenes); and aliphatics including halogenated aliphatics. MPPE systems currently in operation are removing dissolved aromatics (principally benzene), PAHs, and aliphatics. The high hydrocarbon removal efficiencies achievable with MPPE technology result from the number of mass transfer stages that are developed in the packed bed, mainly

from the high specific surface area for mass transfer associated with the porous polymer beads. Benzene is the rate limiting constituent and determines the sizing of the MPPE system. The proposed DGF pretreatment system upstream of the MPPE technology will minimize fouling of the porous polymer beads by free oils and solids in the influent wastewater.

A schematic of the MPPE process is provided in Figure 2. Following primary and secondary oil-water separation, the refinery wastewater is passed through a column packed with MPPE particles. The particles are porous polymer beads that contain an appropriate extraction liquid suitable for the removal of aromatic hydrocarbons and PAHs. The immobilized extraction liquid removes only the dissolved hydrocarbons that have a high affinity for the extraction liquid (i.e., the constituents that are removed have partition coefficients that guarantee a high affinity for the extraction liquid). The treated wastewater is then free of the target constituents (e.g., BTEX), which now reside only in the extraction liquid.

The extraction liquid must be regenerated at fixed intervals to sustain effective target constituent removal. The extraction liquid (immobilized on polymer beads) is regenerated by stripping the hydrocarbons from the MPPE bed with low pressure steam. The stripped hydrocarbons are condensed and separated from the water phase by gravity. This 100 percent pure hydrocarbon phase is recycled to the refinery for reprocessing. The condensed water is recycled to the MPPE system. . The design of the MPPE system employs two extraction columns allowing continuous operation in one column with simultaneous extraction and regeneration in the other column. A cycle time of one-hour extraction and one hour regeneration is typical.

The MPPE technology provides the following benefits:

- The dual-column system can be sized for the specific flow requirements and optimized for benzene removal.
- Pure hydrocarbon phase recovery is feasible.
- The wastewater flow turndown ratio can be adjusted to less than 20 percent of the installed flow capacity of the unit.
- The system is flexible in that it can be adjusted to changing flow and target constituent concentration levels while maintaining consistent effluent quality.

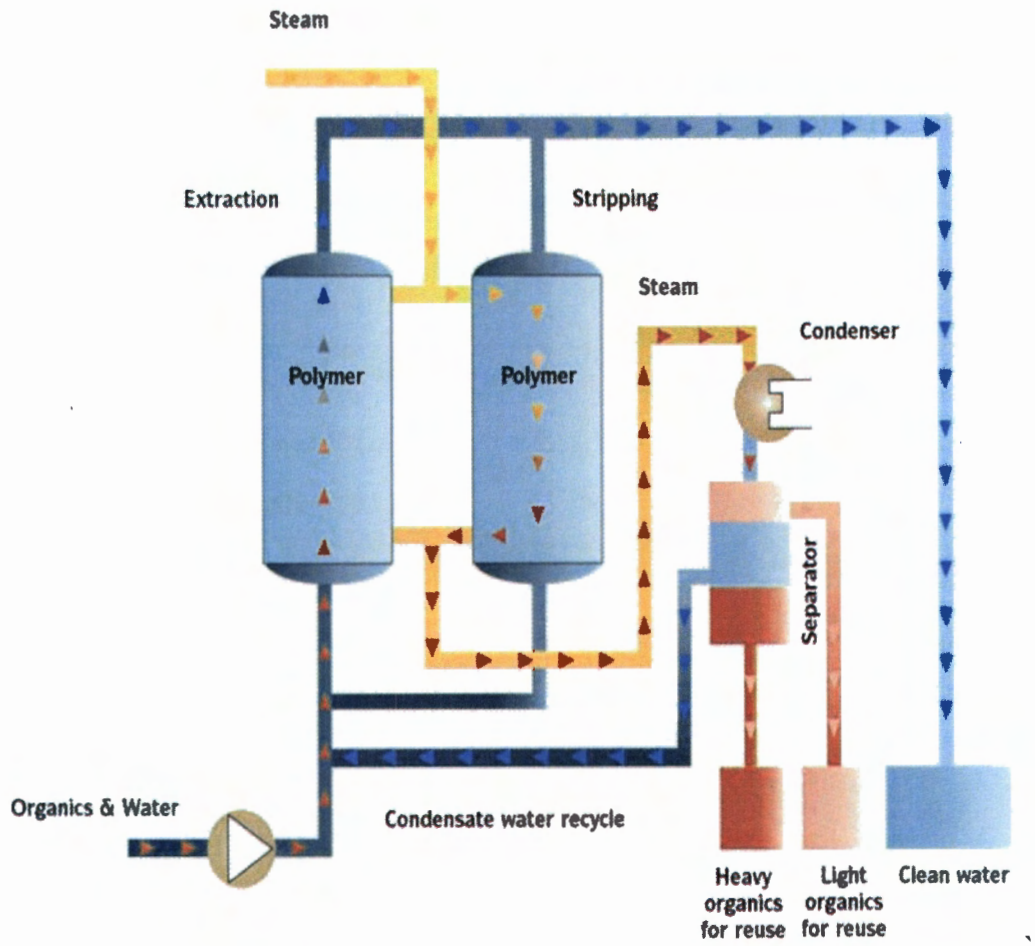


Figure 2. MPPE Process Schematic
(courtesy of Veolia Water)

4. PROCESS DESCRIPTION

4.1 Overview

This section provides a process description of the new systems that will comprise the refinery's WWTP following implementation of the upgrades. The first subsection discusses the new systems to be installed as part of the WWTP upgrades. The second subsection discusses the existing systems that will be decommissioned as part of the WWTP upgrades. This section concludes with a discussion of management of off-spec wastewater, and secondary containment and leak detection. A flow diagram is included as Figure 1 at the end of this Work Plan.

4.2 New Systems

A description of the major equipment for the new WWTP is provided below.

4.2.1 Stormwater/Diversion Tanks

A new stormwater management system will be constructed for the stormwater collected in the process area. This stormwater is currently collected in a dedicated sewer that discharges to the OAPIS. In the new system, stormwater will flow by gravity to two Stormwater/Diversion Tanks. These tanks are existing with a designation of Z84-T27 and T28. The tanks have dimensions of 33 ft-5 inch diameter by 32 ft height, for a volume of 210,000 gallons each. The combined volume of 420,000 gallons will provide storage capacity for a 100-yr, 1-hour storm event (415,886 gallons). The tanks will have internal floating roofs for air emissions control. Stormwater that collects in the tanks will be pumped at a rate of 50 to 200 gpm in a dedicated line to the new API Separator. Two variable speed pumps will be provided (one operating, one standby). Because the stormwater will be diverted and treated in the new API Separator, the OAPIS will be taken out of service (see Section 4.3.3).

Oil that may accumulate on the liquid surfaces of T27 and T28 will be captured from a skimmer device contained within each tank's floating roof. The skimmed oil will be collected by a vacuum truck and transferred to the refinery's rerun oil system for recycling back to the refining process. Prior to pumping the T27/28 contents to the API Separator, solid material that may have settled on the tank bottom will be re-suspended through mixing.

Cleanouts will be installed on the conveyance pipelines to and from the Stormwater/Diversion Tanks. Cleaning events will be scheduled on a regular, recurring basis with collected material managed along with similar material collected from the API Separator. This material is normally recycled to an off-site refining process. If recycling to a refining process is not available, the cleanout material will be managed as a hazardous waste. Underground piping will be buried below the frost line to prevent freezing. Aboveground piping will be electric heat traced to prevent freezing. The piping design is referenced in section 4.5.

The Stormwater/Diversion Tanks will also be configured to accept diverted off-spec wastewater from various points within the WWTP including API Separator effluent/DGF influent, DGF effluent/MPPE influent, and MPPE effluent that is diverted away from EP-1.

4.2.2 Equalization Tank

A new Equalization (EQ) Tank will be constructed to dampen variability in both flow and concentration prior to the API Separator and the rest of the WWTP. It will operate with a variable level/volume. The process sewer will gravity flow into the EQ Tank. Pumps will transfer the wastewater from the EQ Tank to the API Separator. The tank will have a floating roof for air emissions control. Oil will be recovered from the water surface using a skimming device contained in the floating roof. There will be sample ports for both the EQ Tank influent and effluent.

During dry weather conditions, the EQ Tank will be operated at a less than full capacity, such that the EQ Tank can provide surge capacity during wet weather events. This available surge capacity will be used to help prevent potential overflow of the API Separator during storm events.

4.2.3 DGF System

The DGF system will be in a covered above-ground vessel. The API Separator effluent will be pumped to the DGF system using the existing API Separator effluent pumps. Polymer will be injected into the DGF influent line to enhance flocculation. Dissolved gas for flotation will be either plant nitrogen or plant air from the refinery's utility system. The gas will be injected into a pumped recycle stream of the DGF effluent. The choice of gas (air or nitrogen) will be made following a process hazard evaluation.

The clarified effluent wastewater from the DGF system will be pumped to the MPPE system.

The DGF float material will be skimmed from the top of the DGF using a variable speed scraping mechanism. The skimmed float will be sent to the DGF float storage and dewatering system. The float system will consist of retention tanks with gravity dewatering. This material will normally be recycled to a refining process (on-site or off-site). If recycling is not available, the float material will be managed as a hazardous waste.

4.2.4 MPPE System

The MPPE system will consist of two columns operating in parallel. One column will be in service while the other is being regenerated. The columns will switch their mode of operation on a routine schedule (e.g., hourly). The operating column will receive pumped DGF effluent. The wastewater will pass through the column in an up-flow mode and discharge to EP-1 by gravity. Steam will be used to regenerate the non-operating column. The steam will be supplied by the plant utility system or an electric boiler as part of the MPPE skid. The steam will pass through the column in down-flow mode and will extract the hydrocarbons that had previously been retained by the polymer beads. The hydrocarbon-laden steam will then be sent through a condenser to convert the stream to a cooled liquid phase. The hydrocarbon-water liquid mixture will then go to a separator phase. The separator will produce a water stream that is recycled to the operating column and a pure hydrocarbon stream that will be sent to the refinery for reprocessing.

4.2.5 Pilot Travel Center Pretreatment

The sanitary wastewater from the Pilot Travel Center and the refinery will be pretreated prior to discharge to EP-1. The wastewater already receives treatment for solids removal by the upstream septic tank (owned and operated by Pilot) and the screening system in the new refinery lift station. The new pretreatment system will provide removal of soluble organics. The technology selection for the system has not been finalized, but candidate technologies include:

- A new lined aeration lagoon (treating only Pilot Travel Center and refinery sanitary wastewaters)
- Vertical flow wetlands

- A recirculating media filter

4.2.6 Evaporation Pond No. 1

The MPPE effluent will flow by gravity into EP-1. A flow meter will be installed on this EP-1 influent line to track discharge volumes. EP-1 will not be lined or otherwise modified because the MPPE effluent will be free of floating oil and will have a benzene concentration ≤0.5 mg/L. This EP-1 influent quality will be assured by the following WWTP upgrades:

- Less variability in flow rates and wasteloads provided by the EQ Tank
- Improved upstream oil-water separation provided by the DGF system
- Reliable removal of benzene and other hydrocarbons using the MPPE technology

4.3 Decommissioned Systems

Placing the new WWTP systems into service will allow some of the existing systems to be decommissioned.

4.3.1 Benzene Strippers Nos. 1, 2 and 3

The MPPE system will replace the benzene removal capacity of the two Benzene Strippers (Z84-V4 and Z84-V5) located at the WWTP and the one Benzene Stripper located in the process area of the Refinery (Z84-V7). These units will be decommissioned and dismantled. The associated Benzene Stripper Air Blowers (Z84-AB3, Z84-AB4 and Z84-AB5) will also be decommissioned and dismantled.

4.3.2 AL-1 and AL-2

The two Aeration Lagoons (AL-1 and AL-2) will be decommissioned. The associated surface aerators will also be decommissioned. The Corrective Measures Implementation Work Plan for the Wastewater Aeration Lagoons (Solid Waste Management Unit No. 1) has been submitted separately to NMED (July 30, 2009).

4.3.3 OAPIS

The OAPIS currently collects stormwater from the process area. In the future, this sewer will be directed to the Stormwater/Diversion Tanks in the new stormwater system. The Stormwater/Diversion Tank contents will then be pumped to the API Separator. Therefore, the OAPIS will be decommissioned. A separate work plan to be submitted to NMED will address the closure of the OAPIS (Solid Waste Management Unit No. 14).

4.4 Management of Off-Spec Wastewater

Off-spec events are not anticipated for the MPPE effluent. However, contingencies have been included in the design as safeguards. If at anytime the MPPE effluent is deemed unsuitable for discharge to EP-1, it will be diverted to the new Stormwater/Diversion Tanks. Process monitoring will be used to identify when this diversion is needed. The diversion would be "all or nothing" rather than a partial diversion and partial flow to EP-1. For added flexibility, diversion lines to the Stormwater/Diversion Tanks will also be provided for the API Separator effluent and DGF effluent.

4.5 Tank Design, Secondary Containment, and Leak Detection

Under the terms of the CAFO, the tanks and ancillary equipment downstream of the API Separator, including diversion tank systems, are subject to 40 CFR §262.34(a). By reference, these systems are therefore subject to 40 CFR 265 Subpart J for tank systems. Accordingly, the systems downstream of the new API separator will comply with the tank design requirements of 40 CFR 265 Subpart J, including secondary containment and leak detection. Since the CAFO was signed just recently, Western Refining is still determining how the specific design requirements of the CAFO will be implemented. In general, the secondary containment requirements for tanks will be met through concrete or impermeable liner containment areas. Containment volumes will be 1.3 times the volume of the largest tank within that area to include an allowance for precipitation. Leak detection for tanks with bottoms that cannot be visually inspected will be provided by installing double bottoms with leak detection on those tanks. The secondary containment and leak detection requirements for piping systems covered by the CAFO will also be implemented where required.

In the event that there are new tank(s) or ancillary equipment not covered by the CAFO, such as those upstream of the API Separator, those systems will be designed to standards in accordance with GW-032 and related OCD requirements.

4.6 Air Emissions Control

The upgraded WWTP will meet the air emission regulatory requirements, including Paragraph 100 G of the CAFO as applicable, through the following measures:

- The Stormwater/Diversion Tanks will have floating roofs that will generate negligible air emissions.
- The DGF system will be enclosed but will generate a continuous point source air or nitrogen emission. If a control device is determined to be required for the DGF air emissions, the off-gas will be routed through an activated carbon bed system prior to discharge to the atmosphere.
- The MPPE units will be enclosed and generate negligible air emissions.

5. PROJECT SCHEDULE

The required project schedule for design and construction of the WWTP upgrade is 18 months as presented in Table 5-1.

Table 5-1. Project Schedule Through Construction

Description	Period
Detailed Engineering	October 2009 - March 2010*
Air Permit Application Submittal	December 2009
Contractor Bidding	March-April 2010
Air Permit Issuance	April 2010**
Contract Award & Notice to Proceed	May 2010
Equipment Procurement, Fabrication and Delivery	May through November 2010
Construction	June 2010 through February 2011
Testing, Start-up, and Clean-up	February through March 2011
Operational	March 31, 2011

*Start date pending NMED and OCD approval. ** The project cannot proceed beyond the April 2010 milestones above until the required air permit(s) have been issued by the NMED Air Quality Bureau.

Attachment A – Supplemental DGF System Information

poseïdon

POSEÏDON SATURN CLARIFIER™

HIGH PERFORMANCE FLOTATION CLARIFIER

SYSTEM DESCRIPTION AND OPERATION PRINCIPLE

The patented Poseïdon SATURN Clarifier™ uses dissolved air flotation technology to separate particles from water. The unique design of the Poseïdon SATURN Clarifier™ (Patent # 5.565.009) provides cost efficient water treatment and allows for the achievement of a high solids capture rate and thicker sludge with maximum operational flexibility.

Poseïdon SATURN Clarifiers™ offer a column shape configuration. The SATURN units are modular, extremely space-efficient and require very small footprints and minimal field erection.

FEEDING THE CLARIFIER

The raw water to be treated is collected in a feed chest and pumped into the inlet compartment at the bottom of the flotation unit. The Poseidon SATURN Clarifier™ can be fed on either constant or variable flow, and tolerates variations in feed concentration, which allows operational flexibility. On a variable flow system, it is required to install a proportional flow regulator for the chemical dosage pumps. A dual chemical or a single chemical system may be required for optimum suspended solids removal. In a dual chemical system, a coagulant is mixed with the influent at the suction of the feed pump in order to coagulate the finely dispersed material. Downstream, prior to the inlet compartment of the flotation unit, a polyelectrolyte (flocculant) is mixed into the stream, initiating floc formation. In a single chemical system, the flocculant is also mixed into the stream prior to the inlet compartment.

RECIRCULATION SYSTEM

The micro-bubbles required for flotation are produced with a recirculation system. This system, designed to operate on a continuous basis, meets the essential conditions for proper air dissolution and micro-bubbles generation. It also ensures a high solids capture rate by allowing the combining of flocs and microscopic air bubbles, forming air-floc conglomerates.

The recirculation system is composed of a pneumatic box, a patented Poseïpump™ recirculation pump (U.S. Patent 5.385.443), a header, an injection valve and a bleeder valve. The efficiency of the recirculation system is mainly attributed to the Poseïpump™, which ensures fine air dispersion into the recirculated water and builds a proper pressure to allow for air dissolution (90-100 psi). The Poseïpump™ is fed from the clarified water outlet, the recirculation water ratio being about 15% of the total flow. From the recirculation pump, the water passes into a header, which provides required retention time for air dissolution. The micro-bubbles are formed when the recirculated water is released to atmospheric pressure prior to entering the inlet compartment of the clarifer.

The Poseïdon dissolving air system generates very small air bubbles (30-40 μm) and ensures the combination of the micro-bubbles with the flocculated particles, increasing their buoyancy. The floatable air-floc conglomerates along with the rest of the wastewater stream, enters into the flotation unit inlet compartment and then into the separation cell. The floatable material then rises to the surface and any heavy settleable particles (sand, grit, etc.) settle into the cone-shaped bottom.

INTERMEDIATE CAPTURE SURFACE ZONE

The Poseïdon SATURN Clarifier™ is equipped with an intermediate capture surface zone that maintains a low overflow rate and ensures a high capture rate. The separation cones also allow for low polymer consumption. Particles having different densities will rise and form the sludge layer at different rates. Fast rising particles will rise rapidly without entering into the intermediate capture surface zone while smaller, slow rising particles, will be either entrained with the fast rising particles which are forming a filtering layer in the peripheral zone of the intermediate capture surface zone, or be separated within the intermediate capture surface, located prior to the outlet of the flotation unit. The clarified water flows down the separation cones where it is collected through a water collection system towards the bottom of the flotation unit.

SLUDGE REMOVAL SYSTEM

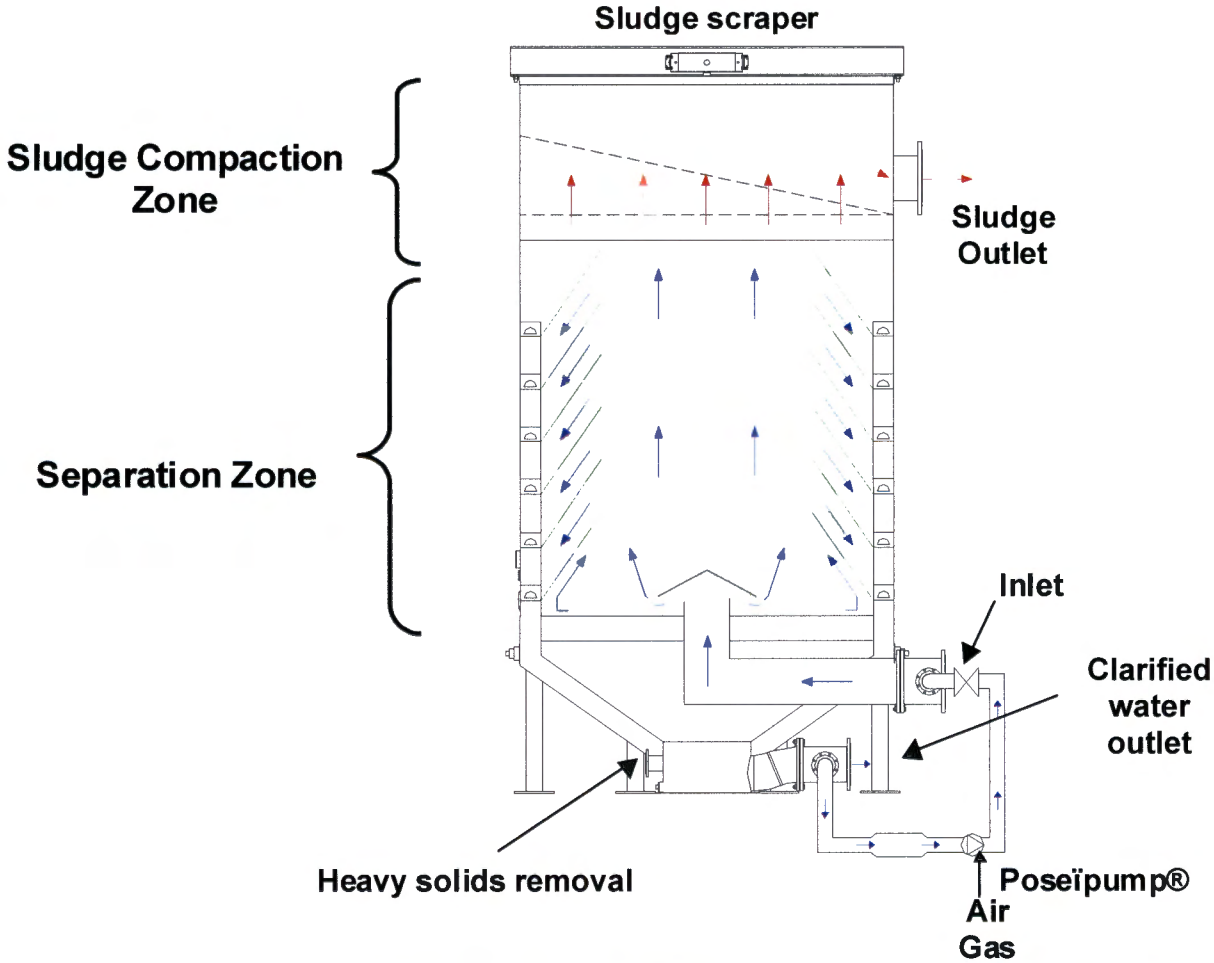
The Poseïdon SATURN Clarifier™ is equipped with a rotative sludge removal system which allows continuous proper removal of the floating sludge. This system includes a motoreducer with variable speed adjustment capability, this allows for flexibility on the sludge consistency and removal.

LEVEL ADJUSTMENT

The Poseïdon SATURN Clarifiers™ are equipped with an automatic level control system consisting of a level control valve and a level transmitter. This type of level adjustment allows flexibility on sludge consistency and removal, and also increases the stability of the treatment by maintaining a constant level in the unit, even during flow and solids loading variations of the raw water.

SEDIMENT REMOVAL SYSTEM

In order to avoid any build-up of heavy solids in the bottom of the clarifier, an automatic drain valve is installed at the cone-shaped bottom of the unit. The sequence of drainage is set upon applications.



The Patented Poseïdon SATURN Clarifier™ (US patent No. 5662804)

HIGHLIGHTS

HIGH PERFORMANCE AND OPERATIONAL FLEXIBILITY

- Highest TSS capture rate
- Tolerates upstream variations in flow rate and feed concentration
- Tolerates high solids loading
- High sludge consistency (5% - 12%)

LOW INSTALLATION COSTS

- Modular and pre-mounted
- Space efficient:
    - Column configuration
    - Smallest footprints
- Minimal field erection: unload, position and connect

LOW OPERATING COSTS

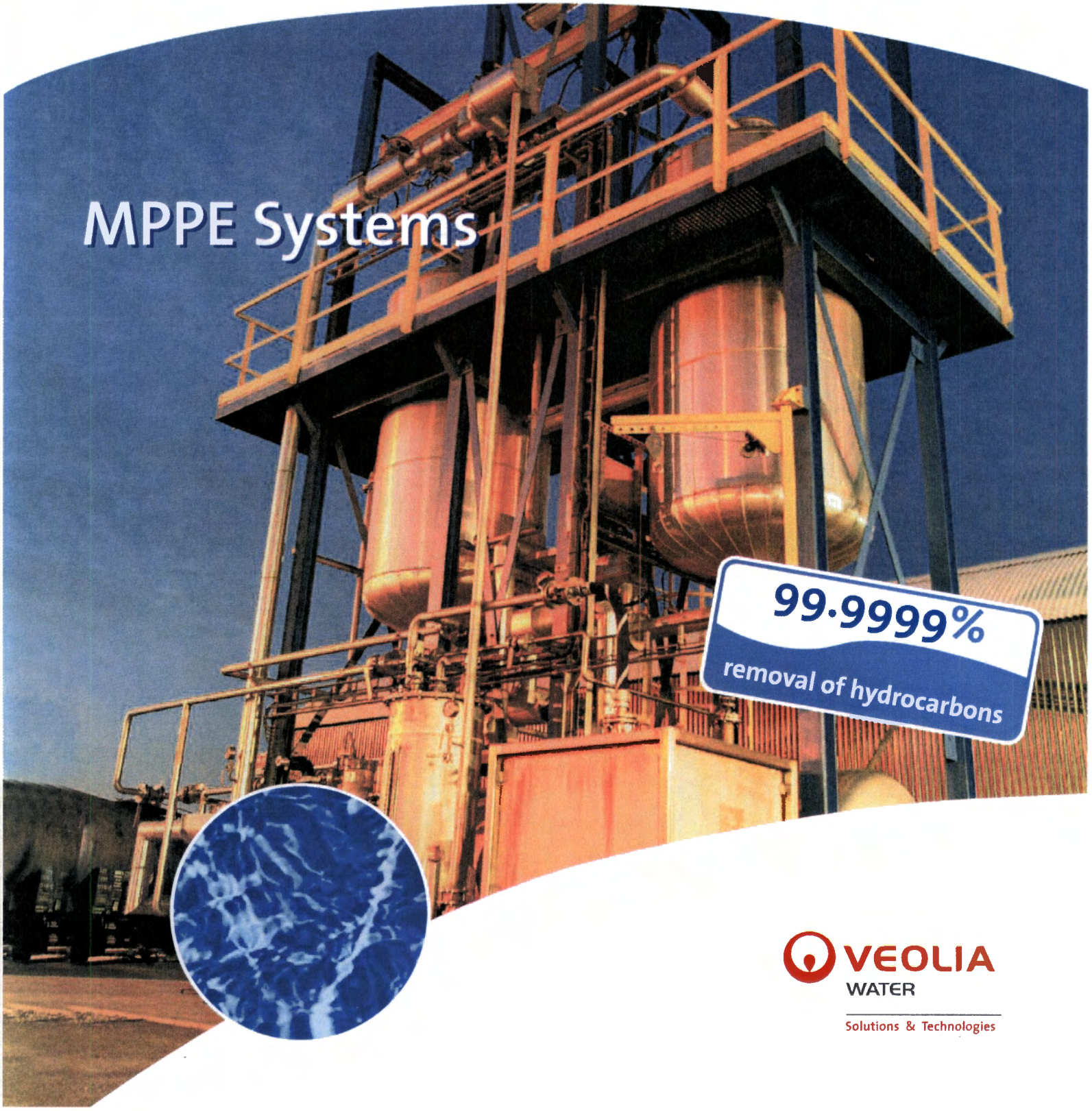
- Minimum operator attention
- Minimum maintenance
- Low polymer consumption
- Complete stainless steel, corrosion-proof construction

Poseidon Inc.
1290, avenue Van Horne, Suite 310, Outremont (Quebec) Canada H2V 4S2
Tel. (514) 270-9593 – Fax. (514) 270-9355 – E-mail: info@poseidoninc.com

Attachment B – Supplemental MPPE System Information

WHITTIER FILTRATION

MPPE Systems



VEOLIA WATER

Solutions & Technologies

MPPE Benefits

price quotation within one week

1 **Very High Separation Performance**
Reduction factor 1,000,000 times = 99.9999% removal if required

2 **Cost Competitive**
Cost competitiveness proven compared with air stripping and activated carbon, steam stripping and biotreatment systems

3 **Low Energy Consumption**
- Low energy input to release hydrocarbons from MPPE particles (in situ regeneration)
- Energy consumption up to 50 times lower than steam stripping

4 **Robust, No Fouling**
- Anaerobic operation at ambient temperature. No interference from dissolved iron, heavy metals, surfactants, salt and polar compounds, and no scaling
- No biological fouling because of periodic in situ regeneration by steam

5 **Reliable and Easy Operation**
- Fully automated
- Remote control using laptop and mobile telephone

6 **Flexible Operation**
Once installed, the unit can treat higher and lower flows and concentrations. For example, if the concentration is 50% higher, effluent requirements can still be maintained with only a 10% lower flow.
At lower feed concentrations, higher flows can be treated while still meeting the effluent demand

7 **Compact Equipment**
Compared to existing technologies, the unit is compact with a small footprint

8 **Ideal for Upstream Process Integration**
Because it is compact, robust, reliable, fully-automated, remote controlled, easy-to-operate and flexible, it is ideal for process integrated applications

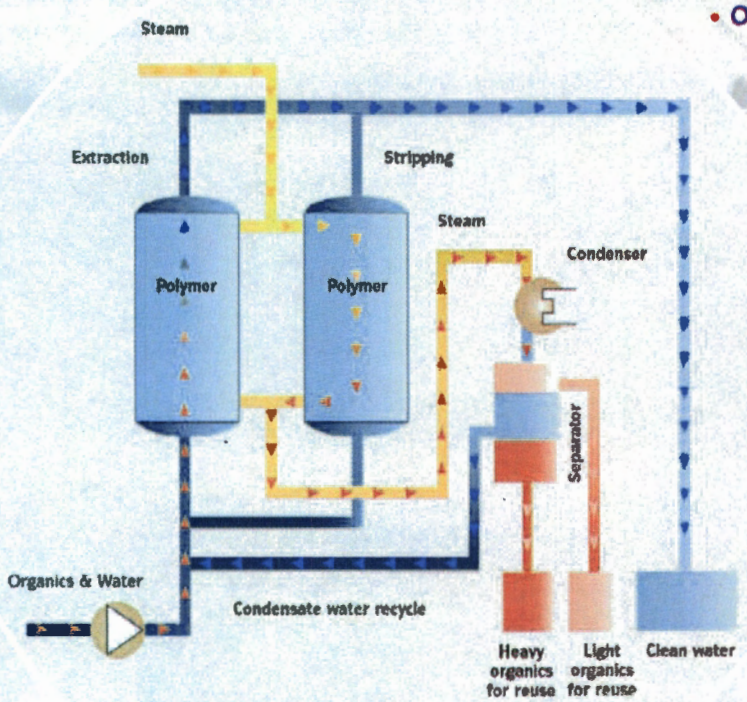
9 **Performance Guarantee during Operational Life**
The material performance is guaranteed during the operational life of the unit, regardless of how many times the MPPE material is changed.

10 **Environmental Benefits**
- Practically pure, separated hydrocarbons for use/reuse
- Low waste of polymer
  - Long lifetime
  - Reuse of spent material
- Low energy consumption
- Low noise
- No addition of chemicals
- No emission to air
- No sludge formation
- No (chemical) iron hydroxide waste

MPPE Systems

The Macro Porous Polymer Extraction (MPPE) system is a highly-effective, fully-automated, remote-controlled and guaranteed technology for removing hydrocarbons from water by means of extraction in a Macro Porous Polymer (MPP) bed.

The MPPE Process



MPPE systems are used for:

- **Process water**
- **Offshore produced water**
- **Groundwater remediation**
- **Wastewater**

MPPE systems remove dissolved and dispersed hydrocarbons with efficiencies 99.9999%, down to below ppb level, or as specified. This applies to different types of hydrocarbons, including:

- Aliphatic
- Aromatic
- Polyaromatic
- Halogenated, such as chlorinated, bromated

The MPPE Process Description

In the MPPE process, hydrocarbon-contaminated water is passed through a column packed with MPPE particles. The particles are porous polymer beads, which contain a specific extraction liquid. The immobilized extraction liquid removes the hydrocarbons from the water. Only the hydrocarbons, which have a high affinity for the extraction liquid, are removed. The purified water can either be reused or discharged. Periodical in situ regeneration of the extraction liquid is accomplished by stripping the hydrocarbons with low-pressure steam. The stripped hydrocarbons are condensed and then separated from the water phase by gravity. The almost 100% pure hydrocarbon phase is recovered, removed from the system and ready for use/reuse or disposal. The condensed aqueous phase is recycled within the system. The application of two columns allow continuous operation with simultaneous extraction and regeneration. A typical cycle is one hour of extraction and one hour of regeneration.

Industrial Process & Wastewater

Process water streams are treated upstream and end of pipe for possible reuse of water in the production process, or for discharge to surface water or to site/community biological wastewater treatment.

Typical challenges MPPE can meet:

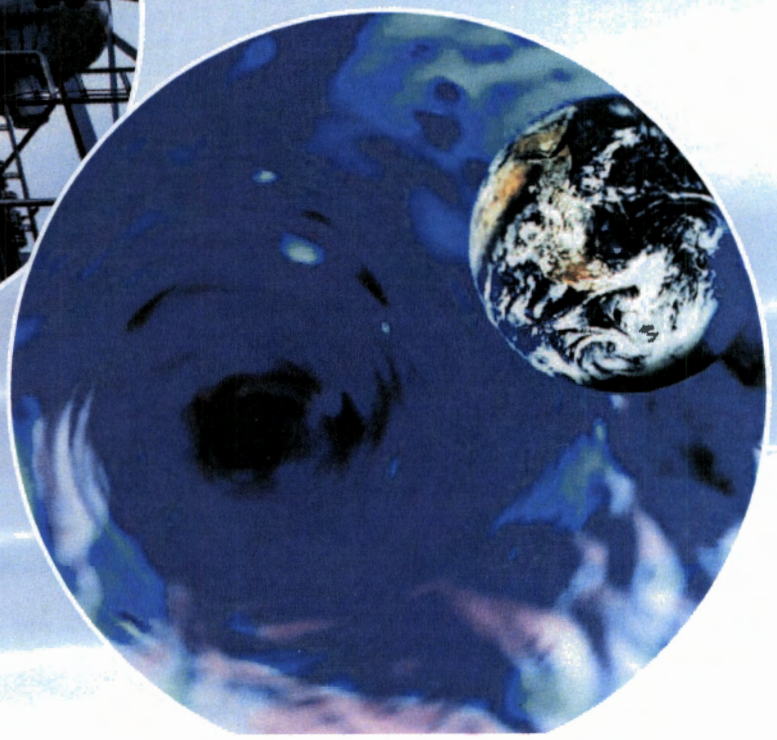
- High influent concentrations
- High reduction factors
- Varying concentrations and compositions
- Varying flows
- Varying/wide pH range
- Presence of salts, surfactants, heavy metals, alcohols, monomer residues, pre-polymers, etc.

Extra benefits are:

- Small footprint
- Upstream integrated operation with remote control
- Scope for adding other process and groundwater streams, for treatment in one unit
- Reduced sludge formation in biotreatment
- Modular setup for large flows (thousands of m^3/hr)

Industries

- Natural gas production/treatment
  - Aromatics, polyaromatics, aliphatics (3000 ppm and above)
- LNG terminals/gas to liquid plants
  - Aromatics, polyaromatics, aliphatics
- Underground gas storage
  - THT (tetrahydrothiophene), aromatics
- Water, oil, gas/condensate produced onshore
  - Aromatics, polyaromatics, aliphatics
- Chemical, specialty chemical and pharmaceutical raw material producers
  - Broad range of aromatics, aliphatics and halogenated (chlorinated/bromated) hydrocarbons
- Chemicals/oil storage distribution industry
  - Tank cleaning process water
  - Aromatics, aliphatics and halogenated hydrocarbons
- Resin production
  - Solvents/aromatics removal from process streams containing monomer residues
- Electronics Industry
  - Solvents removal (toluene) e.g. television screen factories
- Rayon/viscose industry
  - Carbon disulphide (CS_2), aromatics, aliphatics
- Over 40 years accumulated experience



Removal of total spectrum of non-polar and polar organics proven in practice:
Non-polar toxic non-biodegradable compounds and polar biodegradable compounds are removed by MPPE in series with biotreatment.

Full turnkey contracting is possible, as is partnering with local biotreatment suppliers.

Offshore Produced Water

Regulations for offshore produced water are becoming more and more stringent. New technologies are required for this challenging segment in order to meet future emission standards that are being set by international organizations, for example OSPAR* for the Northeast Atlantic.

MPPE systems proven in removal of dissolved and dispersed:

- Aromatic hydrocarbons (BTEX)
- Polyaromatic hydrocarbons (PAHs)
- NPD (naphtalenes, phenanthrenes, dibenzothiophenes)
- Aliphatics
- Hydrophobic components in oil field chemicals (e.g. inhibitors)

Robust and can withstand:

- Salt, methanol, glycols
- Corrosion inhibitors
- Scale inhibitors
- H_2S scavengers
- Demulsifiers
- Defoamers
- Dissolved (heavy) metals

Environmental aspects:

- Separated hydrocarbons are recovered in practically pure form for use as a product
- No emissions to air and water and no sludge formation
- Small footprint

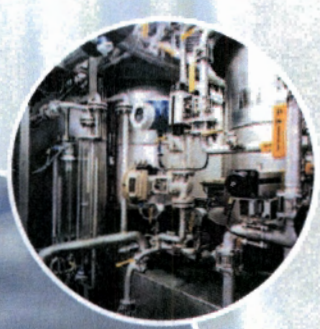
Evidence of success:

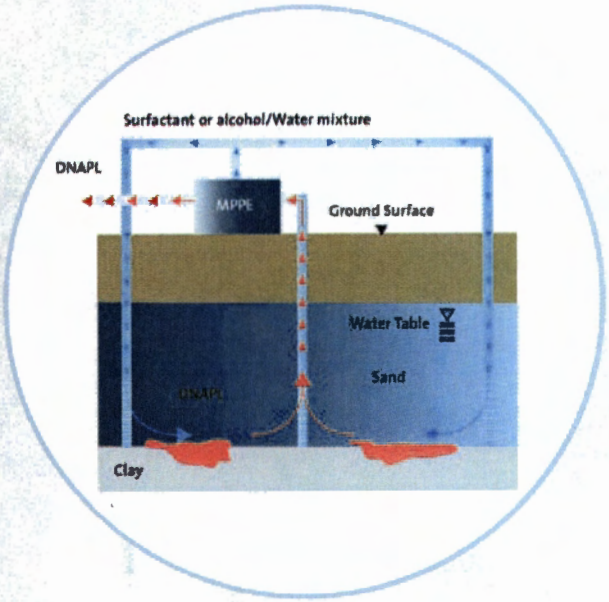
- Verified by Orkney Water Technology Center on water produced with oil and gas
- MPPE selected as best option from among 55 technologies (Government and Oil & Gas Industry Study)
- MPPE listed by OSPAR* as Best Available Technology (BAT)
- Experiences published in SPE Conference (TOTAL & Akzo Nobel) and Offshore Technology Conference (Shell/Exxon & Akzo Nobel)
- Commercial units running at TOTAL, NAM (Shell/Exxon), Statoil, and Hydro/Shell with over 25 years accumulated experience.

*OSPAR: Oslo Paris Convention for the Protection of the Marine Environment of the Northeast Atlantic

Groundwater

Aromatic, polyaromatic and halogenated hydrocarbons in groundwater can be found in lower concentrations dissolved in water diffused over the area or concentrated as DNAPLs (dense non-aqueous-phase liquids) or LNAPLs (light non-aqueous-phase liquids) creating an enduring source of contaminant supply to the water phase.





DNAPL and LNAPL removal by solvent or surfactant enhanced aquifer remediation (SEAR)

- Surfactant or alcohol injection enhances the dissolution of chlorinated hydrocarbons, PAHs, DNAPLs and LNAPLs in water from a few ppm to 10,000 - 50,000 ppm
- Organics recovered in two weeks equaled eight years of normal pump and treat
- MPPE proven as the ideal separation technology for these extremely high concentrations in surfactant/alcohol water mixtures
- Surfactant/solvent consumption savings as MPPE enables recirculation and recovery

MPPE benefits for meeting challenges in groundwater applications are:

- Ideal for handling a broad range of compositions
- Able to cope with unexpected higher influent compositions at no additional costs
- No iron removal necessary (anaerobic process)
- Robust, can withstand salts, humic acids, surfactants, heavy metals, dissolved/suspended solids, high/low pH, etc.
- No sludge formation (as with iron removal and biotreatment)
- Scope for combination with other ground and process water streams in one unit

MPPE applied in

Jacksonville, Florida	USA	Alcohol injection
Alameda, California	USA	Surfactant injection
Tampa, Florida	USA	Alcohol injection
Schkopau	Germany	Surfactant injection
Leipzig	Germany	Surfactant injection
Castrop Rauxel	Germany	Surfactant injection

How to start...

In practice, local situations, water compositions and effluent requirements are always specific, as is the technology to be chosen.

Preliminary cost estimate within one week

A preliminary cost estimate can be made based on

- influent specification
- effluent requirements
- flow rate
- non/availability of steam

Laboratory test

If economically attractive, the usefulness of the various types of laboratory tests compared with an immediate field test can be jointly evaluated.

Onsite field demonstration

An onsite field demonstration on customer premises can be arranged upon request for either offshore or onshore.

Lease/rent or buy

Options for lease or buy can be evaluated. Various mobile units are available for immediate leasing for periods ranging from weeks to years.

Turnkey delivery of integrated units

The investment cost is based on turnkey delivery including startup and, if applicable, including other technologies to be combined with the unit, such as:

- Pretreatment/pre-filter unit
- After-treatment/polishing, such as:
  - Biotreatment
  - Activated carbon
  - Air stripping

Ongoing Performance Guarantee and Service

A clear annual operating expenditure overview will be given for the MPPE technology, including an ongoing performance guarantee and service. This is valid for the total operational life of the unit and independent of the frequency of MPPE material exchange.

Mobile unit/operating characteristics:

- Self-contained, including a steam generator
- Can be installed and started up in one day
- Designed for onshore and offshore with all necessary HSE provisions
- Remote control by means of a mobile telephone connection or direct line
- Built in a container for operations in remote areas
- Turndown ratio to <10% of design capacity
- Operational support by remote control and onsite possible
- Onsite training and education of local personnel
- Operation by Whittier Filtration MPP Systems possible

WHITTIER FILTRATION

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Whittier Filtration is a subsidiary of Veolia Water Solutions & Technologies and combines technology innovation with industry experience to provide economical and effective operation of filtration and water treatment applications.

LEAF FILTERS:
Auto-Jet®, Filtra-Matic, Verti-Jet

TUBULAR FILTERS:
Auto-Shok, Auto-Pulse

MEDIA FILTERS:
L'eau Claire Upflow
High-Rate Sand Filters

SEPARATORS:
Autoflot®, Power Clean Systems

ION EXCHANGE/SOFTENERS

SPARE PARTS AND SERVICE

VEOLIA
WATER
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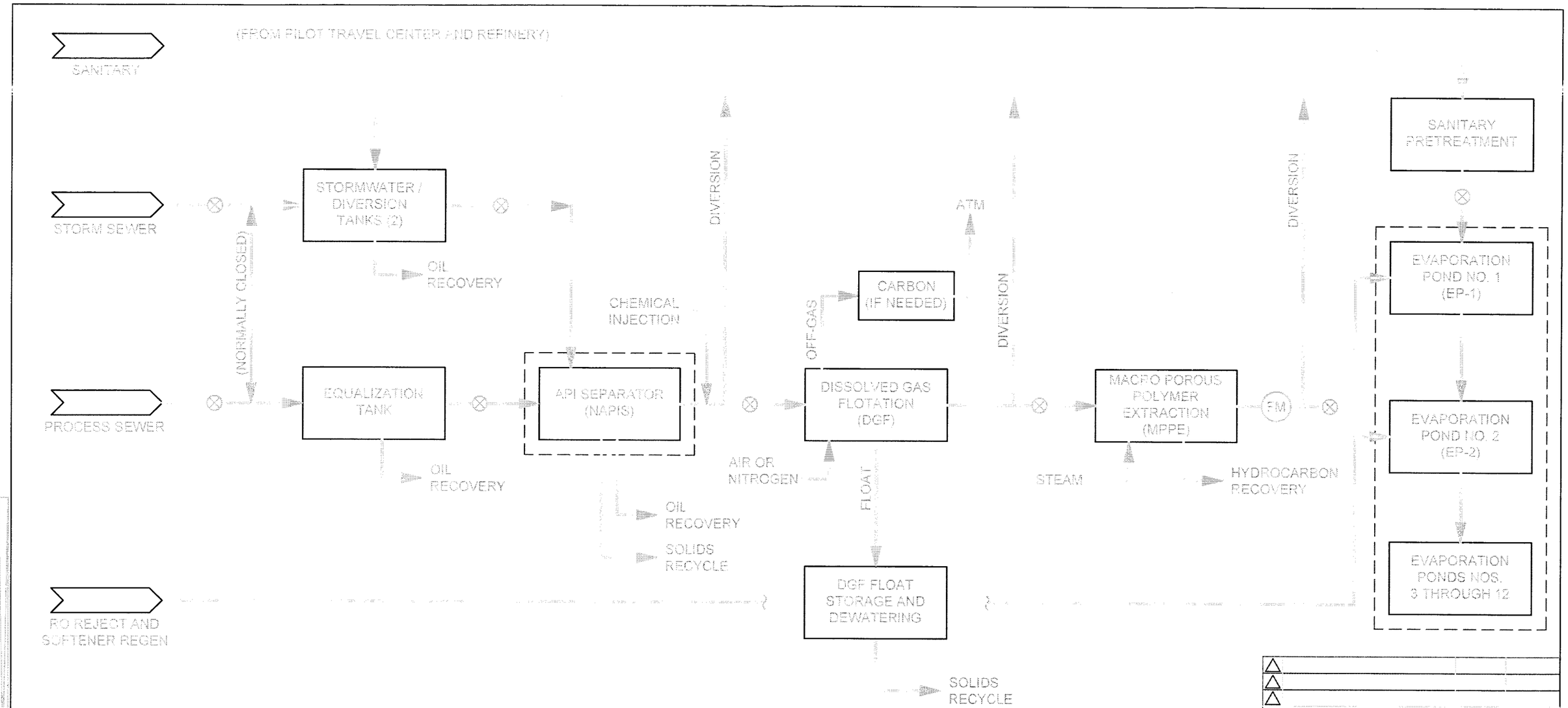
MPPE 10/2008



LEGEND

FM — FLOW METER

⊗ — SAMPLE POINT

[ ] — EXISTING

NOTE:
PUMPING SYSTEMS NOT SHOWN.

REV.	REVISION DESCRIPTION	RFC No.	DATE

P&ID DWG. REV.

PIPING ORTHO. DWG. REV.

LINE No.	SIZE	SPEC	OPER. TEMP°F	OPER. PRESS	DESIGN TEMP.°F	DESIGN PRESS	HYDRO TEST	INSULATION THK.	INSULATION TYPE	STRESS RELIEF

Western Refining
Gallup Refinery

RFE No:		INSP/RT/UT:	
DRN. BY:	DATE: 09/23/2009	WELD SPEC:	
CHK'D. BY:	DATE:	PAINT:	
APP'D. BY:	DATE:	CAD REF:	
DRAWING NO.		SHEET	REV