STATE OF MISSISSIPPI
DEPARTMENT OF ENVIRONMENTAL QUALITY

P.O. BOX 2339
JACKSON, MS 39225

** INVOICE**
** UNCONTROLLED SITES VOLUNTARY EVALUATION PROGRAM**

HERCULES INCORPORATED
TIM HASSETT
1313 NORTH MARKET ST.
WILMINGTON, DE 19894-0001

INVOICE #: VEP-00004430
DATE: 06-17-2011

FINANCIAL:
AVELEKA MOORE - (601) 961-5031
ACCOUNTS_RECEIVABLE@DEQ.STATE.MS.US
ENGINEER:
TONY RUSSELL - (601) 961-5318

CUSTOMER # VEP-40470039
CUSTOMER PO# 4500777456

Date Due: 07-17-11

Please include Customer # on check made payable to MDEQ

DESCRIPTION	QTY	UNIT	PRICE	EXT-PRICE
MAY 2011 / W. MCKERCHER - DIVISION 4047	3	STAFF HOUR(S)	100.00	$300.00
			TOTAL AMOUNT DUE	**$300.00**

STATE OF MISSISSIPPI
DEPARTMENT OF ENVIRONMENTAL QUALITY

P.O. BOX 2339

JACKSON, MS 39225

** INVOICE**
** UNCONTROLLED SITES VOLUNTARY EVALUATION PROGRAM**

HERCULES INCORPORATED
TIM HASSETT
1313 NORTH MARKET ST.
WILMINGTON, DE 19894-0001

INVOICE #: VEP-00004394
DATE: 05-17-2011

FINANCIAL:
AVELEKA MOORE - (601) 961-5031
ACCOUNTS_RECEIVABLE@DEQ.STATE.MS.US
ENGINEER:
TONY RUSSELL - (601) 961-5318

CUSTOMER # VEP-40470039
CUSTOMER PO# 4500777456

Date Due: 06-16-11

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DESCRIPTION	QTY	UNIT	PRICE	EXT-PRICE
APRIL 2011 / W. MCKERCHER - DIVISION 4047	0.5	STAFF HOUR(S)	100.00	$50.00
			TOTAL AMOUNT DUE	**$50.00**

STATE OF MISSISSIPPI

HALEY BARBOUR
GOVERNOR

MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY

TRUDY D. FISHER, EXECUTIVE DIRECTOR

** INVOICE**
** UNCONTROLLED SITES VOLUNTARY EVALUATION PROGRAM**

HERCULES INCORPORATED
TIM HASSETT
1313 NORTH MARKET ST.
WILMINGTON, DE 19894-0001

INVOICE #: VEP-00004320
DATE: 03-22-2011

FINANCIAL:
AVELEKA MOORE - (601) 961-5031
ACCOUNTS_RECEIVABLE@DEQ.STATE.MS.US
ENGINEER:
TONY RUSSELL - (601) 961-5318

CUSTOMER # VEP-40470039
CUSTOMER PO# 4500777456

Date Due: 04-21-11

Please include Customer # on check made payable to MDEQ

DESCRIPTION	QTY	UNIT	PRICE	EXT-PRICE
FEBRUARY 2011 / W. MCKERCHER - DIVISION 4047	2	STAFF HOUR(S)	100.00	$200.00
			TOTAL AMOUNT DUE	$200.00

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Hercules Incorporated
50 E. RiverCenter Blvd.
P.O. Box 391
Covington, KY 41012

10008726
Page 1 of 1
DATE 01/11/2011

Vendor Number	Hercules Incorporated	Check Number
0002067579		10008726

Reference Number	Credit Amount	Invoice Amount	Discount Amount	Net Amount
VEP00004214		50.00	.00	50.00

4047 0039

FOR SECURITY PURPOSES, THE FACE OF THIS DOCUMENT CONTAINS A BLUE-GREEN BACKGROUND PRINTED ON WATERMARK PAPER

Hercules Incorporated
50 E. RiverCenter Blvd.
P.O. Box 391
Covington, KY 41012

SUNTRUST BK
ATLANTA

10008726
64-79 / 611

DATE
01/11/2011

AMOUNT
$*******50.00

PAY EXACTLY Fifty And No/100 Dollars

VOID AFTER 180 DAYS

149

TO THE ORDER OF
MISSISSIPPI DEPT OF ENVIRONMENTAL QLTY
PO BOX 2339
JACKSON, MS 39225-2339

AUTHORIZED SIGNATURE

SIGNATURE HAS A BLUE-GREEN BACKGROUND - BORDER CONTAINS MICROPRINTING

⑈10008726⑈ ⑆061100790⑆ [redacted]

RECEIVED
JAN 14 2011
MS DEPT. OF ENVIRONMENTAL QUALITY
ACCOUNTS RECEIVABLE

Mississippi Department of Environmental Quality

Groundwater Assessment and Remediation Division

Annual Certification Report

For use to satisfy Brownfield Agreed Order and Restricted Use Agreed Order Site reporting requirements. Should additional discussion be necessary, please submit information as an attachment to this form

Site Name	Hercules Incorporated Plant
Site ID number	40470039
Surface Owner of the Property	Hercules Incorporated, a wholly owned subsidiary of Ashland Inc.
List current leaseholders or tenants on the property	

I hereby confirm that over the last year, the above referenced property has not been sold or transferred without the proper written notice supplied to MDEQ 30 days prior to that transaction.

I hereby confirm that over the last year, there has been no excavating, drilling or other activities that could create exposure to contaminated media without prior approval from MDEQ.

I hereby confirm that the Site has been restricted to commercial or industrial use only; and

I hereby confirm that the appropriate signs of size, shape, construction, and layout approved by MDEQ, are posted at the physical location of the site (if required). Photographs are attached which verify their current location and condition.

The attached photo was taken on 10/26/2011.

BY: RS Bolton 10/27/11

TITLE: Regional Plant Manager

Submit to:

Groundwater Assessment and Remediation Division
Mississippi Department of Environmental Quality
Post Office Box 2261
Jackson, Mississippi 39225


STOP - CALL BEFORE YOU DIG
(601) 961-5171
Request to Speak with Someone in Assessment Remediation Branch
Regarding Site 40470039
STOP
WARNING

ARCADIS
Infrastructure · Water · Environment · Buildings

ARCADIS U.S., Inc.
10352 Plaza Americana Drive
Baton Rouge
Louisiana 70816
Tel 225 292 1004
Fax 225 218 9677
www.arcadis-us.com

ENVIRONMENT

Mr. Willie McKercher, P.E.
Office of Pollution Control
Mississippi Department of Environmental Quality
P.O. Box 2261
Jackson, Mississippi 39225

Subject:
2011 First Semiannual Groundwater Monitoring Report
Hattiesburg, Mississippi
MDEQ A.I. No. 2022

Date:
10 October 2011

Contact:
John Ellis, P.G.

Extension:
208

Email:
john.ellis@arcadis-us.com

Our ref:
LA002999.0006.0302A
2999.6/C/1/bbn

Dear Mr. McKercher:

ARCADIS U.S., Inc. (ARCADIS) is pleased to submit this 2011 First Semiannual Groundwater Monitoring Report on behalf of our client, Hercules Incorporated (Hercules) for the site referenced above.

If there are any questions concerning this submittal, please contact Hercules Project Coordinator Mr. Timothy Hassett at (302) 995-3456 or one of the undersigned at (225) 292-1004.

Sincerely,

ARCADIS U.S., Inc.

Craig Derouen, P.E.
Senior Engineer

John Ellis, P.G.
Principal Geologist/Project Manager

Copies:
Mr. Timothy Hassett, Hercules

HERCULES

Hercules Incorporated
Hercules Plaza
1313 N. Market Street
Wilmington, DE 19894

September 30, 2011

VIA ELECTRONIC DELIVERY

Mr. Larry Lamberth
Chief, South Section
RCRA and OPA Enforcement and Compliance Branch
RCRA Division
United States Environmental Protection Agency, Region 4
61 Forsyth Street, S.W.
Atlanta, Georgia 30303-3104

Ms. D. Karen Knight
Chief, Corrective Action Section
Restoration and Underground Storage Tank Branch
RCRA Division
United States Environmental Protection Agency, Region 4
61 Forsyth Street, S.W.
Atlanta, Georgia 30303-3104

Mr. Chris Sanders
Chief, Environmental Compliance and Enforcement Division
Mississippi Department of Environmental Quality
515 Amite Street
Jackson, Mississippi 39201

Subject: Submission of Phase II Workplan for Administrative Order
Hercules Incorporated, Hattiesburg Facility
Hattiesburg, Forrest County, Mississippi
USEPA ID No. MSD 008 182 081
Docket No. RCRA-04-2011-4251

Dear Ms. Knight, Mr. Lamberth, and Mr. Sanders:

Hercules Incorporated hereby submits the attached Phase II Sampling and Analysis Work Plan pursuant to Paragraph 75 of the Administrative Order (Order) received from the U.S. Environmental Protection Agency (USEPA) on May 10, 2011. This document is submitted in accordance with an extension request granted in an e-mail from Ms. Meredith Anderson to Mr. Timothy Hassett on September 6, 2011.

As specified in Paragraph 95 of the Order, the following certification is made:

I certify that the information contained in and accompanying this submission is true, accurate, and complete. As to those identified portions of this submission for which I cannot personally verify the truth and accuracy, I certify as the facility official having supervisory responsibility for the person who, acting upon my direct instructions, made the verification, that this information is true, accurate, and complete.

Signature: Karen T. Murphy

Name: Karen T. Murphy

Title: Vice President, Environmental Health & Safety, Ashland Inc.

If there are any questions concerning this submittal, please contact Hercules Project Coordinator Mr. Timothy Hassett at (302) 995-3456.

Sincerely,

Karen T. Murphy
Vice President
Environmental Health & Safety
Ashland, Inc.

KTM/TDH/cep

cc: Meredith C. Anderson – EPA Region IV, Atlanta, GA
Javier E. Garcia – EPA Region IV, Atlanta, GA
Bruce J. Hough – Ashland/ Hercules, Wilmington, DE
Rodney Bolton – Ashland/ Hercules, Milwaukee, WI
Kristina Woods – Ashland/ Hercules, Dublin, OH
John Ellis – ARCADIS/ Baton Rouge, LA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

SEP 30 2011

OCT 5 2011
Office of Pollution Control

Karen Murphy
Vice President, Environmental Health and Safety
Ashland, Inc.
1313 N. Market Street
Wilmington, DE 19894

SUBJECT: Approval of Limited Phase I Activities–Private Well Sampling
RCRA 3013(a) Administrative Order
Docket No. RCRA-04-2011-4251
Hercules, Inc.
Hattiesburg, MS

Dear Ms. Murphy:

The EPA wishes to thank the staff of Hercules, Inc. and its consultant for a productive and well-organized site tour and technical meeting on Tuesday, September 27, 2011. Several important issues were discussed and resolved, and we feel that significant progress was made toward final approval of the Phase I Sampling and Analysis Work Plan under this Administrative Order.

Regarding the private well sampling activities presented in the Phase I Sampling and Analysis Work Plan, the EPA approves the proposed private well identification, verification, and sampling activities and authorizes Hercules to proceed with this effort as soon as possible. Specifically, the EPA approves the following Phase I actions:

- confirmation of existing private wells within a ½-mile radius of the Hercules facility;
- field verification of identified existing wells within a ½-mile radius of the facility;
- acquisition of access from property owners for sampling verified wells within a ½-mile radius of the facility; and
- sampling of wells for which access has been granted by property owners.

We are currently clarifying the specific analytical method by which these samples should be analyzed and will contact you as soon as possible with that information.

Again, thank you for the efforts of your staff during our site visit, technical meetings, and community session this week. Please contact Meredith Anderson, Corrective Action Project Manager, at 404-562-8608 or anderson.meredith@epa.gov if you need additional information.

Sincerely,

D. Karen Knight

D. Karen Knight, CHMM
Chief, Corrective Action Section
RCRA Division

cc: Melissa Collier, MDEQ
John Ellis, Arcadis
Tim Hassett, Ashland/Hercules
Larry Lamberth, EPA
Willie McKercher, MDEQ
Chris Sanders, MDEQ

HERCULES

Hercules Incorporated
Hercules Plaza
1313 N. Market Street
Wilmington, DE 19894

September 19, 2011

VIA ELECTRONIC DELIVERY

Mr. Larry Lamberth
Chief, South Section
RCRA and OPA Enforcement and Compliance Branch
RCRA Division
United States Environmental Protection Agency, Region 4
61 Forsyth Street, S.W.
Atlanta, Georgia 30303-3104

Ms. D. Karen Knight
Chief, Corrective Action Section
Restoration and Underground Storage Tank Branch
RCRA Division
United States Environmental Protection Agency, Region 4
61 Forsyth Street, S.W.
Atlanta, Georgia 30303-3104

Mr. Chris Sanders
Chief, Environmental Compliance and Enforcement Division
Mississippi Department of Environmental Quality
515 Amite Street
Jackson, Mississippi 39201

Subject: **Submission of Revised Phase I Workplan for Administrative Order**
Hercules Incorporated, Hattiesburg Facility
Hattiesburg, Forrest County, Mississippi
USEPA ID No. MSD 008 182 081
Docket No. RCRA-04-2011-4251

Dear Ms. Knight, Mr. Lamberth, and Mr. Sanders:

In response to the U.S. Environmental Protection Agency (USEPA) comment letters dated August 25, 2011 and August 30, 2011, Hercules Incorporated hereby submits the attached Revised Phase I Sampling and Analysis Work Plan pursuant to Paragraph 74 of the Administrative 3013 Order (Order), May 10, 2011. Hercules and ARCADIS discussed these comments during a conference call with representatives from EPA and MDEQ on September 1, 2011. The parties mutually agreed that many of EPA's comments would be most efficiently addressed by Hercules' impending submittal of the Phase II workplan. We have addressed the remainder of EPA's comments in this revised the Phase I Workplan. The parties agreed that they will conduct a technical meeting to discuss all responses and comments once the Phase II workplan is submitted.

As specified in Paragraph 95 of the Order, the following certification is made:

I certify that the information contained in and accompanying this submission is true, accurate, and complete. As to those identified portions of this submission for which I cannot personally verify the truth and accuracy, I certify as the facility official having supervisory responsibility for the person who, acting upon my direct instructions, made the verification, that this information is true, accurate, and complete.

Signature: Karen T Murphy

Name: Karen T. Murphy

Title: Vice President, Environmental Health & Safety, Ashland Inc.

If there are any questions concerning this submittal, please contact Hercules Project Coordinator Mr. Timothy Hassett at (302) 995-3456.

Sincerely,

Karen T Murphy

Karen T. Murphy
Vice President
Environmental Health & Safety
Ashland, Inc.

KTM/TDH/cep

cc: Meredith C. Anderson – EPA Region IV, Atlanta, GA
Javier E. Garcia – EPA Region IV, Atlanta, GA
Bruce J. Hough – Ashland/ Hercules, Wilmington, DE
Rodney Bolton – Ashland/ Hercules, Milwaukee, WI
Kristina Woods – Ashland/ Hercules, Dublin, OH
John Ellis – ARCADIS/ Baton Rouge, LA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

AUG 3 0 2011

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Tim Hassett, Project Coordinator
Hercules-Hattiesburg facility
Ashland, Inc.
500 Hercules Road, 8139/13
Wilmington, DE 19808

SUBJECT: Review of Phase I Sampling and Analysis Work Plan, dated July 14, 2011
Hercules, Inc.
Hattiesburg, MS
MSD 008 182 081

Dear Mr. Hassett:

The EPA and the Mississippi Department of Environmental Quality (MDEQ) have reviewed the above-referenced document in accordance with the requirements of the RCRA 3013(a) Administrative Order (AO), Docket No. RCRA-04-2011-4251, and other pertinent RCRA policies and guidelines for environmental investigations. Disapproval and general comments regarding this document were transmitted to you on August 25, 2011. In accordance with the AO and subsequent discussions, the EPA has requested a revised submittal by September 19, 2011.

For further clarification of what the EPA expects to see in the revised Phase I Work Plan, please see the detailed technical comments that the EPA is enclosing with this letter. These comments represent a combined response from several EPA and MDEQ program areas. Please contact me for any clarification of these comments, or to schedule a meeting. I can be reached at 404-562-8608 or by email at anderson.meredith@epa.gov.

Thank you in advance for a timely re-submittal of the revised Phase I Work Plan.

Sincerely,

Meredith C. Anderson
Corrective Action Project Coordinator
RCRA Division

Enclosures (2)

cc: Jerry Banks, MDEQ
Melissa McGee-Collier, MDEQ
Willie McKercher, MDEQ
Chris Sanders, MDEQ
Rick Sumrall, MDEQ
Chris Wells, MDEQ

ENCLOSURE 1

Phase I Sampling and Analysis Work Plan, July 14, 2011
Hercules, Inc.
Hattiesburg, MS
MSD 008 182 081

Specific Comments:

Section 2.2, p. 3

1. Reference is made to the non-routine groundwater monitoring reports, which are summarized in Appendix A. It would be appropriate, given that proposed work is based on previous investigations, to include a discussion or summary of previous groundwater data, especially the more recent routine semi-annual monitoring and Impoundment Basin groundwater monitoring results. This data should be presented in a manner that supports the investigation activities that are proposed in later portions of the Work Plan.

Section 2.3, p. 4

2. Volatile Organic Compounds (VOCs) were detected in groundwater above the Mississippi Target Remediation Goals (TRGs) in "other areas". Please specify these other areas. Off-site sources upstream of Hercules in Green's Creek are indicated. Please elaborate on this reference.

Section 2.3, p. 5

3. VOCs and dioxathion were detected in monitoring wells down gradient of the sludge pits. Please specify where these areas are.

Section 2.3, p. 6

4. "Since 2007, Hercules has conducted groundwater sampling and submitted routine groundwater monitoring reports to MDEQ in accordance with the Restricted Use Agreed Order (RUAO). To date, after 5 years of monitoring, Constituents of Concern (COC) concentrations have not changed at the Site to warrant implementation of contingency plans called for in the Remedial Action Plan." Investigations at the site prior to the Remedial Action Plan and RUAO did not take into account current conditions compounded by the impoundment basin and its potential for off-site impacts. Although there may have been no significant changes in the previously identified COCs, recent sampling showing the concentrations and locations of the COCs calls for modification of the outdated Conceptual Site Model.

Section 3, page 6

5. Paragraph 1: Sediment should be added as a potential pathway at the Site.

Section 3.2, p. 8

6. Paragraph 4: The groundwater divide at the site trends southwest to northeast (not northwest).

7. Paragraph 5: MW 6 is located outside the former landfill area; MW 7 is not in the former production area and is more closely located at the former Delnav production area. It would be helpful to have a clearly labeled map of these areas with monitoring well locations, groundwater contours, and groundwater flow directions.

Section 3.3, p. 10

8. On-site ditches should be discussed and added to Figure 5. The topographic divide should also be indicated on this figure. Are there other drainage features that leave the site? For instance, there is a drainage ditch (or stream) in the northwest portion of the Site that runs through the sludge pit area. This ditch is not indicated on the figure. The Delnav Production Area is not labeled on any figure in the Work Plan (WP).

Section 3.4.2, p. 11

9. Paragraph 2: Direct discharge, spills, and land application should be considered as potential migration pathways for constituents to impact environmental media.

Section 3.4.3, p. 11

10. "The Site is inactive and thus exposure of current Site workers is not expected to be significant;..."; however, a skeleton maintenance staff remains active at the facility, and these site workers may be potential receptors of site constituents.

Section 3.4.4, p. 12

11. Hercules should be aware of the possibility of entry to the Site via a gap in fencing in the northwest portion of the Site (drainage ditch (or stream) that runs through the sludge pit area).

Section 4, p. 12

12. After the evaluation of recent and historic groundwater data, the proposed list of COCs for this Administrative Order (AO) investigation must be developed by Hercules and approved by the EPA and MDEQ. The process that will be utilized to develop this COC list should be discussed in more detail. This activity should take place as soon as possible.

Section 6.1, p. 14

13. Top of page: All wells within the ½-mile radius of the Site, including on-site wells, will be sampled for the agreed upon AO COCs. The decision matrix on Figure 7 would apply, then, to wells outside the ½-mile radius of the Site.

14. Paragraph 2: Describe more fully the method used to identify the 806 wells in the search radius.

15. According to Appendix E, a well exists on the ½-mile radius boundary (well #173). This well should be added to Figures 5 and 9 and included in the sampling program (bringing the total to 21 wells).

Section 6.1.1, page 14

16. The five municipal water supply wells located within the four-mile radius should be indicated on a figure. Are these wells in close proximity to the Site?

Section 6.1.2, p. 15

17. All wells within the ½-mile radius of the Site, including on-site wells, will be sampled based on the schedule in Table 2.

18. Figure 5 indicates that there are at least six groundwater extraction wells located within the facility boundaries that were historically utilized as supply wells for the facility. As described by Hercules during the June 2011 meeting in Atlanta, these are deep wells that penetrate the underlying Hattiesburg Clay Formation and represent a potential conduit for contamination. As these wells represent a threat to the deeper drinking water aquifer and provide potential for unidentified off-site contamination, the EPA and MDEQ require that these wells be sampled as part of Phase I sampling.

19. Provide the EPA and MDEQ with an example of the form to be used to interview well owners at the time of sampling.

20. Deviations from practices in the guidance should be noted in the draft and final reports, as well as in the project record.

21. The table presented on the bottom of p. 15/top of p. 16 is not referenced in the text. Because all wells within the ½-mile radius of the Site will be sampled, this table should specifically identify the sampling priority for each of the wells on Figure 5, including well #173.

Section 6.1.3, p. 16

22. Please add a Section 6.1.3, entitled "Schedule of Sampling", as is included in the sampling discussion of other media (see pp. 19, 21, etc.).

Section 6.2, p. 16

23. Paragraph 1: All surface water features that have been the subject of citizen complaints over the years should be included in the surface water/sediment sampling and analysis plan, especially complaints voiced at the 5/12/11 community meeting.

Section 6.2.1, p. 17

24. In accordance with the AO, surface water and sediment sampling **will** occur within a ½-mile radius of the Hercules facility.

25. The on-site drainage features referenced in paragraph 1 should be included on a figure. Even though they are typically dry, periods of heavy rainfall would cause these ditches to potentially overflow their banks and cause downstream flooding that may carry a contaminant load. These potential areas should be included in the surface water/sediment sampling plan.

26. In addition to Drainages A, B, and C, are there other drainages leaving the Site (such as the drainage ditch through the sludge pits, drainage along Providence St., etc.)?

27. The surface water inventory should confirm that Green's Creek is not used for recreational purposes (as stated in 1993 B&V report).

Section 6.2.1, p. 18

28. Figure 8 should reflect that surface water/sediment sampling will occur within the ½-mile radius of the Hercules facility. The decision flow chart then applies to additional sampling outside the ½-mile radius.

29. The drainage pathway labeled on Figure 5 as "Drainage C" was an open ditch for decades prior to the water being routed into culverts on its way to the Bouie River. The EPA and MDEQ require that subsurface soil samples be collected along "Drainage C" from native soils that would have served as the basin of the drainage pathway. One sample shall be collected per 500 feet minimum, bottom and sidewall. These sample locations should be noted on Figure 9.

30. Deviations from practices in the guidance for surface water sampling should also be documented in the draft and final reports (see sediment sampling procedures on p. 19 also).

Section 6.3, p. 19

31. Is there a Decision Flow Chart for Groundwater as there is for other media? None is included in the set of figures.

32. This Section incorporates elements of Phase II activities pertaining to groundwater monitoring well installation and sampling; however, a specific sampling plan indicating the number and locations of wells per area of interest is not presented. Based on an evaluation of existing data, specific sampling locations for direct push technology (DPT) and monitoring wells (MW) (Steps 1 and 2) should be proposed in this work plan, and MW construction details should be included in this discussion.

Section 6.3.1, p. 20

33. Five locations are selected for collection of screening level groundwater data. Elaborate on how these areas were selected, e.g., was existing data evaluated to determine where areas of concern existed? If so, describe this process and present the results. Why is the area near MW 22 and MW 23 not included? Existing data

indicates high levels of Site constituents in this area. A detailed sampling plan, based on the existing data evaluation, should be presented, including the number and locations of groundwater sampling points.

34. Include a description of how screening level data from DPT will be evaluated to identify where permanent monitoring wells will be installed. This decision method should allow for DPT/MW placement to extend off-site as far as necessary to delineate a plume and identify potential areas for the vapor intrusion portion of this study.

Section 6.4, p. 22

35. The AO requires that soil gas samples will be collected within the ½-mile radius of the Site. The Work Plan should propose the number and location of soil gas samples in areas where potential concern exists for exposure via this pathway (therefore, Figure 10 would apply to decision-making as we step out from the initial sampling only). Existing groundwater data and groundwater data collected during the activities presented in Section 6.3 should be used to refine this sampling proposal.

36. If screened (not modeled) soil gas data is determined to be of concern, indoor air samples will be warranted (see comment #43 below also).

Section 6.4.1, p. 23

37. Tables 3 and 4 need to be corrected (screening levels presented in Table 3 are not the same as those presented in Table 4 – explain) and calculations should be provided (the most current RSLs (June 2011) should be used in these calculations).

38. Paragraph 2: As screening levels will be utilized in the decision matrix for additional sample collection on off-site properties not owned by Hercules, the residential numbers calculated for a $1x10^{-6}$ risk level will be utilized as the screening levels for all off-site groundwater investigation. Should contaminants be identified that are not listed on Tables 3 and 4, then the appropriate screening levels will be calculated in the same manner.

39. Paragraph 3: Exceedences above the 10^{-6} groundwater to indoor air screening level (or MCL) warrant the collection of soil gas samples; therefore, soil gas samples should be collected in the southeast portion of the Site at a minimum (not just "additional evaluation of constituents in shallow groundwater" (paragraph 3)) and should not be delayed until the completion of the shallow plume delineation. Also, please provide rationale for the statement that VOCs in shallow groundwater are not migrating off-site. Have shallow groundwater samples been collected off-site to date to indicate this?

Section 6.5, p. 23

40. Again, soil gas samples will be collected within ½-mile radius of the Site in areas of potential concern for exposure via the vapor intrusion pathway. This will not depend on delineation of the shallow groundwater and will not be restricted to public rights-of-way. Additional sampling outside this area may be warranted based on the results to define the extent of concern.

Section 6.5.1, p. 24

41. Soil gas samples will be collected in areas of concern and will not be limited to public rights-of-way.

42. All proposed sampling locations should be presented in this Work Plan for approval by both the EPA and MDEQ.

43. Figure 10 is referenced for the decision logic to be used for soil gas sampling. Johnson and Ettinger (J&E) modeling should be removed from this flow chart. Given the relatively shallow depth to groundwater, once groundwater is delineated to screening levels and buildings are identified within a distance of 100 feet, Hercules should immediately move to collection of soil gas samples.

Section 6.5.2, p. 24

44. The soil gas sampling procedures direct users to Appendix K for soil gas sampling standard operating procedures. However, Appendix K only addresses collection of sub-slab soil gas, indoor air, and ambient air samples. It does not address the procedures for the soil gas sampling proposed in the document.

45. At the time of soil gas sampling, Hercules and its contractors should collect construction details of potentially affected homes to determine if they are slab on grade, ventilated crawlspace, etc. for use in future assessments.

Section 6.5.4, p. 24

46. J&E modeling should not be used as one of the multiple lines of evidence for soil gas data (see comment #43).

Section 6.5.4, p. 25

47. The EPA and MDEQ must approve a "no further analysis" option concerning whether constituents are site-related.

48. As stated above, soil gas data will be evaluated against the calculated screening levels for the soil gas to indoor air exposure pathway. If any constituent exceeds the screening level (not modeled predictions), sub-slab/indoor air monitoring is warranted.

Section 6.6, p.26

49. Based on the findings of the groundwater and soil gas sampling, sub-slab and indoor air sampling may be required outside the ½-mile radius from the Site.

Section 7, p. 27

50. Reporting limits for all constituents must be at or below Regional Screening Levels (RSLs) or TRGs, whichever are lower. If a reporting limit is above an RSL or TRG for a particular chemical, it is to be assumed that the chemical is present in the sample, and this chemical will continue to be evaluated as a COC under this AO.

Section 8, p. 27

51. "Applicable USEPA and MDEQ standards and screening levels…" should be identified as the current EPA RSLs or MDEQ TRGs, whichever are lower.

52. Figure 9 is referred to as a decision matrix for groundwater; however, Figure 9 is a proposed sample location map, and no groundwater decision matrix is included in this report.

Section 8, p. 28

53. The final constituent list for this investigation (see comment #12 above) must be approved by the EPA and MDEQ, and the corresponding 10^{-6} RSLs/TRGs (as of June 2011) will be used for screening purposes throughout this investigation, not a 10^{-4}or 10^{-5} risk level (see Step 2 on page 4-1 of QAPP also). If constituents are found to exceed these levels, additional sampling and/or evaluation will be conducted according to the approved work plan (not resubmitted for approval). If results from these investigations indicate that human health or the environment may be at risk from constituents from the Site, the EPA and MDEQ will work with Hercules to develop an appropriate response plan.

Section 9, p. 28

54. Monthly progress reports should be submitted to EPA and MDEQ during periods of increased activity, such as during field investigations. Quarterly progress reports can be utilized during other stages of the project. Progress reports should, at a minimum, include a summary of work performed during the reporting period, a discussion of work expected to be performed in the next reporting period, a summary of results of any part of the investigation received during the reporting period, and issues that have arisen and/or been resolved.

Section 10, p. 28

55. Based on the above comments, soil gas sampling should be implemented during the field investigation phase, along with sampling of groundwater, drinking water, surface water, and sediment. This would then allow sub-slab and indoor air sampling to occur earlier in the process also. The schedule in Table 2 should also indicate when the site-specific COCs will be developed and when the surface water inventory will take place.

Table 1

56. "EDR" in the title should be spelled out and described in greater detail in the footnote. Units should be specified in the table headings, as appropriate. The abbreviation for well type "H" should be specified. Missing data should be provided, such as ownership of wells #136 and #183, and well type for well #183. Well #173 should be added to this table and included in the sampling plan referenced in Section 6.1.2.

Table 2

57. Identification of COCs and Surface Water Inventory tasks should be added to this table. The Surface Water Sampling task will include sediment sampling as well. Soil Gas Sampling will be implemented within a ½-mile of the Site (not "if warranted") and should take place simultaneously with the other media sampling. Indoor air sampling, if warranted, would then be moved forward in the schedule.

Table 3

58. These calculations should not be called "Regional Screening Levels", as that term is used to reference specific agency-approved screening levels for soil, air, and tap water. Units of measure should be included throughout this table. In some cases, the calculated levels for the different risk levels are identical for the same chemical. This should be corrected. Please explain why these calculations are different than the calculations presented in Table 4. The "*" designation for some table values should be defined. All table values that are less than the reporting limit should be shaded and/or bolded if the reporting limit is above a risk screening level. These should be considered as areas of potential concern.

Table 4

59. The comments presented for Table 3 apply to Table 4 as well, except the comment referring to the title.

Figure 1

60. The Bouie and Leaf Rivers should be labeled on this map.

Figure 5

61. Please add well #173 to this map (see Appendix E).

Figure 6

62. Discharge and land application should be included in the list of Primary Release Mechanisms. Surface water should be considered as a Secondary Source, and sediment should be considered as a Secondary Source Mechanism. Surface soil, sediment, and surface water should be considered potential exposure mediums for off-site residents and workers.

Figure 7

63. This decision flow chart should reflect that all wells in a ½-mile radius of the Site will be sampled and that the decision logic applies, therefore, to wells outside the

½ mile radius. Note (a) should specify that the constituent list for this AO investigation will be approved by the EPA and MDEQ prior to sampling.

Figure 8

64. Step 2 should include the determination of threatened and endangered species, along with use determinations. The flow chart should reflect that surface water and sediment samples will be collected within the ½-mile radius of the Site and that the decision logic applies to sampling outside this radius. Note (a) should specify that the constituent list for this AO investigation will be approved by the EPA and MDEQ prior to sampling. Note (b) should identify that ecological screening levels will be utilized as well.

Figure 9

65. As previously stated, sediment sampling points should be included beneath/along the culverted portion of "Drainage C". Add well #173 to this figure.

Figure 10

66. This decision flow chart should reflect that soil gas samples will be collected within the ½-mile radius of the Site in areas that are of potential concern (rights-of-way/utility easements and other areas) and that the decision logic applies to sampling outside of this ½-mile radius. The decision flow cart should be modified to remove J&E modeling. J&E modeling should not be used as part of this decision logic – data evaluated against the calculated screening values will determine if the logic will proceed to the next step. Note (a) should specify that the constituent list for this AO investigation will be approved by the EPA and MDEQ prior to sampling.

Appendix A

67. The EDR Database Findings, included at the end of this appendix, should be included as part of Appendix E instead. Can the names and locations of sites listed in columns 4 and 5 be provided?

Appendix B

68. What is the purpose of this appendix - it appears to be data only (some of which is nearly impossible to read) and is not referenced in the text.

Appendix C

69. Signatures are required.

70. Page vii, EPA phone numbers should be updated (Chief, South Section, ROECB is 404-562-8590; Chief, Correction Action Section, RUSTB is 404-562-8885).

71. Page 1-2, Andrea Teal is listed as the QA Manager but is not named as the QA Manager on the signature page – Lidya Gulizia is named on the signature page.

72. Page 1-7, the Organizational Chart does not coincide with the Organizational Chart in Appendix L and should be updated per the comment below.

73. Page 4-1, site-specific constituents for this AO investigation have not been determined and therefore are not presented in the Work Plan, as stated in Step 1. For Step 2, as stated above for pages 12 and 28, the list of COCs for this AO investigation will be approved by the EPA and MDEQ, and identification of these constituents should begin as soon as possible. A 10^{-6} risk screening level will be used during this investigation and no recalculation of alternate acceptable concentrations will take place.

74. Page 4-2, Step 5: If a reporting limit is above an RSL or TRG for a particular chemical, it is to be assumed that the chemical is present in the sample, and this chemical will continue to be evaluated as a COC for this AO.

75. Pages 4-4 and 4-5: Drinking water wells are not to be analyzed by non-drinking water methods. The methods listed are Solid Waste methods (SW-846) and are not approved for drinking water analyses. Comparable USEPA approved drinking water methods are available for most App. IX analytes (see 40 C.F.R. §§ 141.23 and 141.24) and must be used where available.

76. Pages 9-1 and 9-2: Individual(s) responsible for corrective actions of analytical data issues (and field procedures) must be listed (see also Section 16.4). Again, appropriate methods must be used for analyzing drinking water samples.

77. Pages 16-2 and 16-3: Individuals responsible for ensuring that corrective actions are taken and documented whenever field or lab activities occur that do not meet the specifications of project plans should be noted here and in the Organizational Charts (p. 1-7 of QAPP and Appendix L).

78. Table 1: The QC listed in this table does not represent the requirements for several of the methods used. If the method has more stringent requirements than Table 1, then the method requirements must be met. This should be noted on the table or in a footnote associated with the table. Also, the number of samples for each media is designated in column 1; however no sampling plans are presented in the Work Plan (except for surface water and sediment). More information should be provided about where these samples will be collected. For the surface water/sediment sampling, the Work Plan proposes 5 samples on 3 downstream drainages and 5 samples upstream of the site, totaling 20 samples (only 15 are noted on Table 1).

79. Tables 3a – 3e: Lab reporting limits should be at or below appropriate RSLs or TRGs, whichever is lower, for each chemical. Of particular concern are the RLs for some pesticides, PCBs, and dioxins. The EPA is available to discuss the analytical methods and corresponding RLs further at your convenience. If a reporting limit is above an RSL or TRG for a particular chemical, it is to be

assumed that the chemical is present in the sample. Perhaps the EPA RSLs **and** the MS TRGs should be presented in these tables. This would prevent the incorrect screening level from being used. For instance, the RSL of 10 ug/l should be used as the "screening level" for arsenic in ground water, surface water, and drinking water (not the 50 ug/l TRG). Additional information regarding the lab method proposed for the Delnav compounds is necessary for the EPA to approve this method. Also, TRGs used for dioxins in soil should be converted correctly, and "RL" should be defined in the footnotes of these tables.

80. Table 3b specifies an inappropriate lab method for drinking water samples.

81. Appendix A: EQuIS lab SOP: This SOP appears to be requirements for ARCADIS's labs to submit data into the ARCADIS EQuIS format, and no mention is made of the EPA EDD format. The EPA format is significantly different from the standard EQuIS format and will therefore require modification to any data in their database. This modification will need to be performed in order to submit data to the EPA and MDEQ.

82. Appendix C: Several methods have been combined into one SOP, which can often cause conflicts. This is particularly the case with drinking water methods, which are prescriptive and cannot be changed. Also, while it is acceptable to use any of the SW-846 Method versions (for non-drinking water and non-NPDES compliance (wastewater) samples), if any of the latest versions are followed, the latest QA methods must also be followed. For example, Method 8260B can refer to and use the requirements of Method 8000B. However, the laboratory uses Method 8270D, which refers to Method 8000C. There are significant differences in the two QA method (8000) versions. It would be best to use the latest version of SW-846 for all methods, if possible.

Appendix D

83. The map on page "a" is not visible. Where is the Site located on this map?

84. On page 1, what is "Country of Webster Sheriff"?

85. On page 6, the list of COCs is for previous investigations only and has not been established and approved yet for this AO investigation. This table and all other references to site chemicals (e.g., pages 17-20) should be updated when the COCs for this investigation are approved. Also on page 6 (and elsewhere), "sustained readings" should be defined.

86. Pages 10-11, the Project Manager/Task Manager and Site Safety Officer should be included in the Project Management Plan (PMP) and all Organizational Charts.

87. Air monitoring requirements are not presented in Section 7, as referenced on p.18.

88. Page 19 refers to a project Health and Safety Manager – this person should be included in the PMP and all Organizational Charts.

Appendix K

89. This appendix is referenced in Section 6.5.2 for procedures for soil gas sampling, and is titled as such; however, only sub-slab soil gas procedures are included in this appendix.

Appendix L

90. The Organizational Chart appears to have omitted several key functions/individuals that were referenced in the QAPP and/or HASP, such as Field Coordinator, Field Operations Manager, QA Manager, Project Health and Safety Manager, Task Manager, Lab Project Manager, Lab QA Officer, Site Safety Officer, and the name of the laboratories that will be used.

91. MDEQ should also appear on this chart.

Enclosure 2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION 4
61 Forsyth Street
Atlanta, Georgia 30303-3104

4WD-TSS

MEMORANDUM

August 30, 2011

SUBJECT: Hercules RCRA Site Phase 1 Work Plan dated July 14, 2011
FROM: David N. Jenkins, Environmental Scientist
Technical Support Section, Superfund Support Branch
THROUGH: Glenn Adams, Section Chief, Technical Support Section, Superfund Support Branch
TO: Meredith Anderson, Remedial Project Manager

Meredith,

I have read portions of the Phase 1 Work Plan dated July 14, 2011as you requested. Here are my comments. Please call me at 404-562-8462 if you have any questions.

The document reviewed is titled:

ARCADIS, 2011, Phase 1 Sampling and Analysis Work Plan, prepared for Administrative Order EPA ID No. MSD008182081, ARCADIS, Inc., July 14, 2011.

I have no previous experience with this site and have not reviewed any other reports regarding this site. I have not seen the site and I have not participated in any meetings regarding this site. I have read portions of the Administrative Order (AO) dated May 9, 2011. This site has been under investigation for decades and many previous reports have been prepared. I would expect any work plan which follows so many earlier investigations to present a clear statement of what happened at the site, what is known to be contaminated, where the uncertainties are and how these uncertainties will be resolved. The complete work plan document is 1,174 pages long, but it is anything but clear and complete. This work plan assumes the reader is familiar with the site, familiar with the findings of previous investigations. Key information which describes the extent of contamination is either relegated to the appendixes or is not in the report. Much of this work plan summarizes the activities which occurred in previous investigations, but little interpretation of the data obtained in the previous investigations is presented.

The objectives for this investigation are stated in Section 5:

> ***5. Phase I Project Objectives***
> ***5.1 Administrative Order Objectives***
> *The objectives of the Phase I Work Plan are to:*
> - *Determine the presence of Site-related Constituents at off-site locations; and*
> - *Evaluate the nature and extent of Site-related Constituents at off-site locations.*
>
> *Execution of the activities set forth in this Work Plan will obtain data that can be used to determine if impacts exist off site. Media that will be evaluated may include surface water, groundwater, sediment, soil gas, and/or indoor air.*

The text in Section 1.1 continues to say "*The Work Plan approach includes incorporating and utilizing existing sampling data previously collected as part of Site-related assessments conducted in the area by …*" various parties. A key purpose of the work plan is to determine "*…the presence, magnitude, extent, direction, and rate of movement of the constituents …* ", yet relatively little of this previous information is interpreted in this report.

A groundwater monitoring program was established in 1997, and after 14 years of sampling, we should know where the plumes are and whether the plumes are expanding, stable or receding. We should know whether the plumes are approaching a property boundary. But the main body of the report doesn't contain a map showing groundwater flow directions, or a map showing groundwater contaminant plumes or trend graphs showing contaminant concentrations in groundwater monitoring wells. Without these tools, the two bulleted in Section 5.1 (shown above) can't be demonstrated in the main body of the work plan because the plan doesn't show which boundaries are vulnerable to contamination. Three water level contour maps are provided in the various appendixes of this report. None of these maps are utilized in

the main body of the Phase I Sampling and Analysis Work Plan to describe where the plumes are and what direction they are moving.

While not explicitly stated as an objective for this work plan, the results of this work plan must show groundwater contamination is being monitored effectively. All readers and reviewers (EPA, the State and the public) must be convinced by presentations in future reports that all groundwater plumes have been identified, that all plumes are being monitored and all plumes will be remediated by the measures to be proposed. The evaluation of potential exposure pathways for contamination, such as exposure to contaminated drinking water and vapor intrusion, are strongly dependent on good maps of the plumes. Based on the figures presented in this work plan, it is not clear that the work plan intends to define the extent of groundwater contamination and establish an effective monitoring well network around the property boundary.

The background history portions of this work plan should summarize results from previous investigations by showing where the plume is, where it was and where it is going. The Conceptual Site Model (CSM) provided in this work plan is excellent as far as it goes. This CSM will help readers understand the features of the site and basic natural processes which control how this site works. The CSM is needed and valuable and should be retained, but this site has been under investigation for decades and should be past basic process and conceptual demonstrations. There are at least 24 monitoring wells on the site. There are at least 2 plumes of contaminated groundwater, but neither plume is shown on the figures in the main body of the report except in conceptual form on the cross-section Figure 4, so it isn't clear in the main body of the report specifically where the known problems are or whether these plumes are close to the property boundary where sentinel wells should be present. Without a presentation which shows the effectiveness of the groundwater monitoring network, the work plan fails to show that human health and the environment will be protected.

The existing monitoring well network should be shown with the existing plumes, with the water level contours, with the property boundary and with known and potential source areas labeled to provide the EPA project manager and the public with a summary of where the contamination is and where the gaps in the monitoring system might be. In fairness, the consultant could argue that some of the comments and deficiencies identified in these comments will be addressed in the Phase II Work Plan (Administrative Order May 9, 2011, p.16 Point 75). This may be a valid point. But the Phase II Work Plan has yet not been submitted for review and presentations showing the extent of contamination should have been part of many previous investigations and should have been presented here. The maps and tables in this Phase I Work Plan raise many questions and many issues which must be answered or solved during the studies in the Phase I and Phase II work plans. The presentations in this Phase I work plan do not describe what is already known about the site sufficiently to determine whether some of these questions should be in Phase I, will be in Phase II or are already answered in some previous report not included in the 1,174 pages of this Phase 1 Work Plan.

Hopefully, this memo will help identify issues which should be addressed in the Phase II work plan, if not in this Phase I work plan. I have tried to be fair with these comments and I recognize that a lot of other reports have been prepared for the site, but I don't know what is in those reports. You may choose to apportion some of the comments and tasks recommended in the next section of this memo to either the Phase I or Phase II work plans, but without knowing the site and without being familiar with the results from previous investigations, I am not able to do this in all cases.

SUMMARY OF RECOMMENDATIONS:

Water Level Elevation Contour Map (Shallow Zone) – Present a map in the main body of the report showing water level elevation contours from a recent sample event. The map should incorporate surface water elevations where groundwater discharges to surface water, thus defining entire groundwater pathways from recharge areas and through source areas to areas where groundwater reaches surface water. This map should be the base map for plumes of contamination in the upper water bearing unit. Features on the base map in addition to basic physical features such as roads and buildings should include the property boundaries, known source areas and the boundaries of site-specific activities which might be related to

groundwater contamination, plus various surface water features such as streams, ditches, ponds, lagoons, etc.

Contaminant Plume Map – Present a map in the main body of the report showing contaminant concentrations. The contaminant concentration data should be contoured based on groundwater flow directions and relationships between source areas, groundwater recharge and discharge areas. The plume map should provide a clear illustration of the areas which are contaminated, the direction of contaminant migration and the relationship between the plumes and the property boundaries.

Hydrogeology – Present maps showing elevation contours on the top of Hattiesburg Formation and map showing saturated thickness of upper water bearing unit.

Monitoring Well Construction – Present a table showing monitoring well construction information, particularly well screen length and depth below land surface. Results should be directly comparable to the map showing saturated thickness of upper water bearing unit. Thickness of aquifer at each monitoring well location should be easily determined if not included in the table.

Cleanup Time Estimates – Perform calculations and present a clear statement of cleanup time calculations to be used as a benchmark to measure the progress of Monitored Natural Attenuation (MNA) prescribed under the 2005 Correction Action Plan.

Water Level Elevation Contour Map (Deep Zone – Catahoula Formation) – The depth to water should be determined where possible when the wells within ½ mile of the site are sampled. These data should be used to create a water level elevation contour map for the Catahoula Formation to be used to confirm which of the sampled wells are likely to be down gradient from the site.

Establish a perimeter monitoring well network. Lateral and vertical hydraulic gradients along the property boundary should be defined. The two water level contour maps and the map of the shallow zone thickness should be used to demonstrate that critical areas along the down gradient property boundaries are being monitored. EPA should request additional groundwater sampling along portions of the northern and eastern boundaries of the site, particularly along the Sludge Pits property boundary, and down gradient from the former landfill and the processing area in the northeastern corner of the site.

COMMENT REGARDING THE PROGRESS TOWARD THE REMEDIAL ACTION OBJECTIVES:
The Work Plan states on page 5: "*In 2005, MDEQ approved the implementation of MNA of groundwater and surface water and institutional controls as proposed in the 2005 CAP. In January 2008, Hercules also entered into RUAO with MDEQ to restrict the land use and activities on site while constituents in site-wide groundwater attenuate.*" The MNA remedy has been in place for 6 years. The RUAO agreement has been in place for most of 4 years. The successful performance of the MNA remedy is absolutely critical to evaluating this work plan because protection of human health and the environment off-site depends on controlling the plumes on site. If MNA is not on track to clean the site in a reasonable time, then the activities of this work plan might need to be very different because the groundwater plumes may not be under control and may be approaching the property boundaries. This work plan provides no information regarding the stability of the known groundwater plumes or the expected cleanup time.

This work plan does not describe the progress made by the MNA remedy, or whether the remedy is on track to accomplish the site cleanup in any detail. No contaminant concentration trend graphs are presented. The only statement regarding the progress of MNA appears on page 6 (PDF p.15/1174) of the work plan. The statement reads:

"*To date, after 5 years of monitoring, COC concentrations have not changed at the Site to warrant implementation of contingency plans called for in the Remedial Action Plan.*"

A statement that concentrations have not changed enough to warrant implementation of the contingency plan is far from the usual expectation that a MNA remedy will show a clear and meaningful decrease in contaminant concentrations over time. In fact, if this statement is accurate, the MNA remedy is making no progress toward cleanup because "*...after 5 years of monitoring, COC concentrations have not changed ...*". The "*Attenuation*" part of MNA appears to be missing. MNA remedies, like any other remedy, are expected to clean the site in a reasonable time. "*Reasonable*" is always a site specific decision with many considerations including protectiveness, future needs for the resources, cost and comparison to cleanup times which could be achieved by other remedies. The last two considerations, cost and comparison to cleanup times by other remedies, typically are part of the engineering studies which accompany the selection of any remedial measure. Clearly, all parties are interested in the remedial measure which cleans the site in the most reasonable time for the most reasonable and usually the smallest cost, so the cost and cleanup time for the selected remedy and potential alternative remedies should already be available from the reports which justified the selection of the MNA remedy.

The Phase II Work Plan must describe the progress of the MNA remedy and compare the rate of progress with long-term cleanup goals agreed by the Responsible Party, the State and EPA. Cleanup times should be clearly stated so there is a target suitable for tracking progress toward cleanup and for deciding whether the contingency plan should be implemented if progress is inadequate to meet the cleanup goals. If the remedy is not on track, if MNA has not resulted in a clear and meaningful decrease in contaminant concentrations over time, then the Phase II Work Plan should describe steps needed for the implementation of the contingency plan. Contaminant concentration trend graphs should be presented to support these decisions.

COMMENT REGARDING SECTION 3.4 Preliminary Conceptual Exposure Model:
The Conceptual Site Model is presented in two forms, a hydrogeologic cross-section (Figure 4 PDF p.68/1174) and an exposure pathways diagram (Figure 6 PDF p.70/1174). The issues illustrated in Figure 4 can be divided three ways: northwest, southeast and down. The same divisions are present but less obvious in Figure 6.

NORTHWEST: Figure 4 shows Green's Creek is the natural discharge area for groundwater contamination northwest of the groundwater flow divide in the shallow water bearing unit beneath the property. As shown in Figure 4 contamination from the Industrial Landfill area and from the Sludge Pits ultimately will reach Green's Creek unless natural attenuation successfully degrades the contamination in the travel time and distance to the creek. The same is true for any potential source areas elsewhere on the site beneath where groundwater flows to either of the other two surface water drainages (B & C). These other drainages are mapped on Figure 5, but are not in the cross-section Figure 4. Because MNA was selected as a remedy in 2005, the work plan should be expected to show contamination is controlled by a successful MNA remedy and will not reach any property boundary or any of the surface water drainages.

SOUTHEAST: Figure 4 shows contamination southeast of the main plant area will migrate down gradient toward the property line. Less obvious are the sewer lines which are located below the water table on this figure. Sewer lines typically leak. If the lines are below the water table, contaminated groundwater may leak into the pipes. If the lines remain below the water table, any contamination intercepted by the sewers would leave the site in the sewers. If the sewer lines later rises above the water table, plumes of contaminated water may be created off-site as sewer water leaks from the pipes. The work plan for off-site characterization should be expected to consider the relationship between the plumes of contaminated water at the site and the existing sewer lines which could short-circuit groundwater flow paths and accelerate contaminant travel velocities from the site. The work plan should be expected to show now or propose methods to show contamination controlled by a successful MNA remedy will not reach any property boundary or other pathways from the site such as the sewers.

The work plan should be expected to address each of the conditions described above by showing the current extent of groundwater contamination using maps with boundaries of the plumes clearly delineated. A recent water level contour map should be the base map for these plume maps so groundwater flow directions relative to the plumes, the property boundaries and the surface water drainages can be easily determined, and the location of sentinel wells along the flow paths to the

groundwater discharge areas can be demonstrated to EPA managers and the public. Such a presentation is not in this work plan. If it cannot be made with the data available, the tasks in the work plan must insure that needed data will be acquired. All readers and reviewers must be convinced by the presentations that groundwater plumes have been identified, are being monitored and will be remediated. Based on the figures presented in this work plan, it is not clear that the work plan intends to accomplish this task.

DOWN: Figure 4 shows that a natural or man-made breach in the Hattiesburg Formation caused by erosion of the confining unit or a water well could be a pathway for the vertical movement of contamination. The work plan does not describe vertical hydraulic gradients beneath the area, but pumping wells are present near the facility and pumping wells often create downward hydraulic gradients. Figure 5 shows the location of 20 wells reported to be present within the area ½ mile of the property boundary. These wells, and any other unreported wells in the area, will need to be located and inspected. The total depth of each well should be measured where possible to verify the well identification and the depth reported in the drilling records. The depth to water in each well should be measured where possible to provide data for a water level contour map of the deep aquifer. These tasks are not covered in the Phase I work plan.

The Administrative Order (p.15 bullet a) states "... *all such wells either on or within a half-mile radius of the Facility*" will be sampled. As noted elsewhere in these comments, Figure 7, the Decision Flow Chart for Drinking Water and the table in Section 6.1.2 Water Well Sampling Procedure (p.15 PDF p.24/1174) are not consistent with the Administrative Order.

The Administrative Order (p.15 bullet a) also states "*This initial half-mile radius may be extended depending on the results of the initial sampling activities.*" The depth to water measurements obtained from the 20 wells and any other measurements which can be obtained readily should be used to map groundwater flow directions in the Catahoula Formation to help guide future sampling and groundwater monitoring requirements beneath the site if the initial sampling activities indicate the initial half-mile radius should be expanded. This activity is not included in the work plan.

The exposure pathway to the off-site resident for groundwater from the Catahoula Formation is marked as an incomplete pathway on Figure 6, but there will be no proof for this conclusion until after the groundwater sample results from the 20 wells inside the ½ mile radius from the site are available as required by Administrative Order (p.15 bullet a). At this time, this pathway would be better described with the "?" option like some of the other pathways.

There is another factor regarding vertical movement of groundwater which is implied but not particularly obvious on Figure 4. Figure 4 shows the former production units are located on the highest point in the area. This topographic high is a both surface water divide and a groundwater divide which controls surface water runoff and groundwater flow directions beneath the site. The primary direction of groundwater flow near a groundwater flow divide is vertically downward. Rainwater which seeps into the soil and leakage from ponds and lagoons near the former production units flows vertically to the water table. Then the water from the former production area will continue to flow vertically toward the bottom of the aquifer because the influence of the natural groundwater discharge areas on either site of the divide is approximately equal near the center of flow divide beneath the ridge top. This effect of topography may influence contaminant migration beneath the site and should be considered when placing monitoring well screens and interpreting the sample results.

As stated elsewhere in these comments, a map showing the thickness of the upper water bearing zone is not provided in this memo. Neither is construction information for the 24 existing monitoring wells on the site. The CSM shown in Figure 4 shows the upper water bearing zone is about 30 feet across the cross-section. It isn't clear how much the cross-section has been idealized and no thickness information is provided for other portions of the property. If the existing wells were constructed in the same manner as the new wells for this work plan, described in the Monitoring Well Installation Procedure SOP (PDF p.1120/1174), then 20 feet or more of the upper water bearing zone is not monitored by the existing monitoring wells. However, Figure 4 shows the monitoring wells screened at the bottom of the upper water bearing zone. The well installation procedure states "*The screen length will be determined in the field,*

but will not exceed 10 feet in length" (PDF p.1120/1174). So whether the well screens are at the top or the bottom of the upper unit, if the existing screens also are no more than 10 feet long, and if the upper water bearing zone averages 30 feet thick, 2/3 of the zone is not being monitored. This is a major gap in the Phase I work plan which should be resolved, particularly along the property boundaries where new monitoring wells may be required to verify that contamination is not migrating from the site. The same information will be required inside of the facility and should be included in the Phase II work plan. Note that if presentation in Figure 4 is correct, the upper portion of the water bearing zone is not monitored beneath the central and southeastern portions of the site. Floating contaminants, and contaminants diverted to shallow discharge areas such as the sewer lines and ditches are not being monitored by the monitoring wells shown in Figure 4.

COMMENT REGARDING THE AQEQUACY OF THE GROUNDWATER MONITORING NETWORK:
Factors such as vertical hydraulic gradients, aquifer thickness and contaminant density must be considered in evaluating the adequacy of the groundwater monitoring network. As described in other comments of this memo, a key goal of this work plan must be the demonstration that the groundwater monitoring network is adequate and capable of detecting contaminant migration. I have not read the 2005 Corrective Action Plan (CAP), but nearly all of the bullets regarding the CAP described in Section 2.3 (p. 4 PDF p. 13/1174) must be evaluated using data from the groundwater monitoring network at the site. The provisions of the CAP cannot be evaluated, and EPA cannot verify protection of human health and the environment unless the adequacy of the groundwater monitoring network is verified first. The figures presented in the work plan do not accomplish this task. The tasks described in the work plan will not accomplish this task.

Monitored Natural Attenuation (MNA) is a key remedial measure being used at this site (Section 2.3 p.5 PDF p. 14/1174). Demonstrating the success of the remedy is entirely a function of the adequacy of the monitoring well network. The same is true for accomplishing the goals of the Phase 1 Work Plan (Section 5.1) and the goals of the 2005 CAP (Section 2.3). The monitoring well network must be seen to be clearly capable of monitoring the property boundaries, the down gradient edges of known plumes, the approaches to known groundwater discharge areas, and the pathways from known source areas before the public will accept the remedies for this site. The figures in the main body of this report do not show contaminant plumes with groundwater flow direction information, monitoring wells in the plumes, uncontaminated monitoring wells down gradient and laterally around the plumes, etc. The figures in this report do not show that the groundwater plumes are under control. Better figures may be available in other reports, but they are not in this work plan. The work plan does not include an evaluation of the groundwater monitoring network. The products of this work plan must provide maps and graphs which help the EPA Project Manager demonstrate the progress of remediation and the protectiveness of the remedial measures to EPA Senior Managers and the public.

The work plan also states (Section 4 p.12 PDF p.21/1174):

> *"... the Appendix IX constituent list will be initially considered to identify preliminary COCs for the Phase I investigation. Currently, plans are in place to conduct the next semiannual groundwater sampling event pursuant to the RUAO utilizing the Appendix IX analyte list. An evaluation and screening of the groundwater data and historic data will be conducted to modify the Appendix IX constituent list and identify the Site-related constituents on which to focus future assessments. Factors to be considered in the data evaluation step may include protection of human health and the environment and availability of analytical standards with which to identify the presence or absence of a constituent in environmental media."*

This extensive Appendix IX list is summarized on QAP page 4-4 (Section 4.2.1 PDF p.194/1174). It isn't clear from the work plan that this complete list has been used for the semi-annual monitoring which has occurred at the site, so it isn't clear what the current sampling plan has been looking for. The tables in Appendix B-5 (PDF p.139/1174) list VOC results only. The Appendix IX constituent list for the contaminant categories should be utilized at when sampling the wells within ½ mile of the property boundary. The results are likely to be most informative if samples from the wells monitored under the RUAO are collected at the same time and analyzed for the same parameters. This area-wide sample event would be the baseline for the re-evaluation of the Appendix IX list. The re-evaluation would be performed with water level elevation data from this same event so the relationships between the sampled wells and potential source areas can be demonstrated.

The last sentence in Section 4 (p.12 PDF p.21/1174) states "*... the data evaluation step may include protection of human health and the environment ...*". EPA expects "*... the data evaluation step **WILL** include protection of human health and the environment ...*". This is EPA's mission and expectation for the proposed investigation. While this difference probably is only a matter of the choice of words, the second portion of this same sentence may contain an issue with which EPA should not agree. Section 4 (p.12 PDF p.21/1174) ends with the statement: "*...and availability of analytical standards with which to identify the presence or absence of a constituent in environmental media.*" The analytical standards issue and the potential difficulty which may be associated with identifying unusual contaminants which may be related to this site will be considered by EPA in evaluating the long-term list of COCs for this site. But migration of contaminants in groundwater near this site is not understood well enough at this time to limit the factors which will be considered in the data evaluation step. Samples from on-site and off-site wells within ½ mile of the site should be analyzed for the Appendix IX list summarized on QAP page 4-4 (Section 4.2.1 PDF p.194/1174). When these data are available and groundwater flow directions around the site can be demonstrated, the list of analytes for future samples can be evaluated.

COMMENT REGARDING SECTION 3.2 Site-Specific Hydrogeology:
A portion of the text in Section 3.2 is unclear and may need revision. The text states on page 8 (PDF p.17/1174):

> "*In the former production areas, which are located in the southeastern portion of the Site, the potentiometric surface indicates the presence of a groundwater divide, which trends southwest and northwest. Potentiometric surface maps (Appendix B) indicate that groundwater located to the northwest of the divide moves northwestward toward Green's Creek. Groundwater southeast of the divide moves southeastward.*" (Red underline added)

The water level contour map for March 5, 2003 in Appendix B (Figure 5 PDF p.97/1174) "*... surface indicates the presence of a groundwater divide, which trends southwest and north...*"east, not southwest to northwest. This probably is just a minor descriptive error which occurred as the text was written. The flow divide is an important feature of the site hydrogeology. The text on page 8 should be clarified and generalized to be useful for most if not all water level contour maps presented in the report.

COMMENT REGARDING SECTION 6.1.1 Identification of Drinking Water Well Locations:
The Work Plan states (p.14, PDF p.23/1174):

> "*Hercules will also perform a neighborhood survey of residents and businesses located within a 0.5-mile radius of the Site by distributing a questionnaire to collect information on the presence and use of public and private wells. A copy of the questionnaire is provided in Appendix F. The questionnaire will be mailed to residents and businesses located within the 0.5-mile radius to inform them of the importance of the survey and will request that respondents provide information regarding wells on their property.*"

Curiously, the form in Appendix F (PDF p.1064/1174) is titled "**Site Traffic Awareness and Response (STAR) Plan Roadways and Parking Areas**". It is hard to see how information regarding the distribution of traffic cones is relevant to the distribution of water wells around the site.

A more appropriate questionnaire form is presented in the other Appendix F which appears 9 pages (PDF p.1073/1174) after the first Appendix F. The introductory letter and the questionnaire on PDF p.1075/1174 seem appropriate and useful. Based on experience from other surveys, a common use for private wells not used for drinking water includes swimming pools, but this use is sometimes not reported under the "Other" category. Lawn watering is not always reported under "Irrigation", though it seems it clearly should be. It might be more effective to add a few examples in parentheses following some of the categories to guide the well owner's response toward the appropriate category, making the survey results more reliable and useful.

Also, besides 2 Appendix F's, the Work Plan also contains 2 Appendix E's on (PDF p.1063/1174) and (PDF p.1071/1174). The second Appendix E and the second Appendix F appear after Appendix G on PDF p.1068/1174. The Appendixes should be reordered, re-lettered or renamed.

COMMENT REGARDING SECTION 6.1.2 Water Well Sampling Procedure:

The Work Plan states (p.15. PDF p. 24/1174):

> *"Hercules will pursue access to properties where wells exist within the 0.5-mile radius and where sampling is advised based on the schedule outlined in Table 2. The schedule utilizes the decision logic process illustrated on Figure 7 to prioritize the collection of samples for wells having the highest potential for being influenced by Site-related Constituents."*

Prioritization of the wells to determine the "*...wells having the highest potential for being influenced by Site-related Constituents*" is not necessary because the Administrative Order directs that all of these wells within ½ mile of the site boundary be sampled. Further, this work plan describes a site-characterization effort, so failure to collect samples, well depth, well construction and depth to water from any of these wells this close to the site boundaries diminishes the value of the entire investigation.

Some well construction information regarding the water supply wells within ½ mile of the site is presented in Table 1 (PDF p.41/1174). Based on the reported well depths, date drilled and Owner of Record, some of the wells listed may be duplicates. Most of the wells listed in this table are more than 300 feet deep. Well construction information for the on-site monitoring wells is not present in the work plan, so it isn't clear whether any on-site monitoring wells sample the deeper aquifer.

The well depths, well screen lengths and geology information can be used to determine which water bearing unit the well screen was placed in. All wells within ½ mile of the site boundary are screened in one of two possible aquifers. Shallow wells within ½ mile of the site boundary (if any) probably are screened in the same water bearing unit which contains site related contaminants within the property boundaries. Deep wells within ½ mile of the site boundary probably are screened in the Catahoula Formation (Figure 4 PDF p. 68/1174). The deep aquifer is used for water supply purposes in this area, but few (if any?) of the monitoring wells on the site are screened below the Hattiesburg Formation (Figure 4 PDF p. 68/1174). So in general, most of the samples from the existing and proposed monitoring wells on and near the site boundaries probably will be from the upper water bearing zone, while most of the samples from 20 wells reported to exist outside of the property boundary but within ½ mile of the facility are likely to be from the Catahoula Formation.

The Conceptual Site Model (Figure 4) shows the Hattiesburg Formation to be a 70+ foot thick un-breeched confining layer between the upper and lower water bearing units. Nothing in this work plan proves that the Hattiesburg Formation has not been penetrated by deep water supply or injection wells near the facility which may be pathways for contamination into the deeper aquifer. Nothing in this work plan describes groundwater flow directions or water quality in the deeper water bearing unit, Catahoula Formation, except that 806 wells are known to be within 4 miles of the site and 20 wells are known to be within ½ mile (Section 6.1 p.14, PDF p. 22/1174 - see maps of wells PDF p.69/1174 and PDF p.1972/1174). The number of existing wells within 4 miles from the site suggests the aquifer in this area produce reasonably large yields and provide good quality water. No information regarding vertical hydraulic gradients is provided in the work plan, but with this many wells in the around the site, many of which are likely to be in the deep aquifer, there is likely to be a downward hydraulic gradient around the site.

Figure 5 shows the locations of 20 existing wells within ½ mile of the property boundary. These 20 wells surround the property. Samples from these wells would be a good demonstration of the water quality in the Catahoula Formation and the impacts, if any, from the plant on the Catahoula. It would be cheaper, faster and more effective to use existing wells to define water quality and groundwater flow directions in the Catahoula Formation around the site, consequently, the procedure described in Figure 7 should not be used within ½ mile of the site. If the water quality and groundwater flow directions in the Catahoula Formation around the site is not or cannot be reliably defined using existing wells, a network of deep monitoring wells will be necessary. It would be better to determine groundwater flow directions and water quality in the deep aquifer without drilling holes in the Hattiesburg Formation beneath the site, but a network of deep monitoring wells could be installed if it becomes necessary to define the quality of water in the Catahoula Formation beneath the site. A successful sampling program would use the existing wells to define groundwater flow directions in the Catahoula Formation, and provide at least a preliminary

indication of water quality in the formation. If the study is able to sample a sufficient number of wells which can be proven to be down gradient from the facility and which have not been impacted by facility, then future remedial measures should focus only on the upper water bearing zone. If Catahoula Formation is not contaminated, and if on-site remediation is progressing as expected and the shallow plumes are receding, then the deep wells may not need to be sampled again.

COMMENT #1 REGARDING DECISION FLOW CHART FIGURE 7:
Figure 7 (PDF p. 71/1174) is the Decision Flow Chart for Drinking Water. The third decision box on Figure 7 states "*Are groundwater impacts migrating vertically or offsite?*" If the response to this question is NO, the decision is "No Further Action". The No Further Action (NFA) decision at this point is based entirely on pre-existing data because the first decision to collect samples occurs two levels farther down the table. If the wells haven't been sampled yet, all decisions using Figure 7 will be NFA.

Figure 7 shows there are 3 ways to get to NFA before any samples are collected. This flow chart is not consistent with the Administrative Order which requires all wells within ½ mile of the site boundary be sampled. Further, the questions in the 1st 3 decision boxes simply can't be answered without collecting samples. Figure 7 simply doesn't work.

The 1st decision box asks "*Are Site-Related Constituents Present in Shallow Groundwater?*" How will this question be answered at a well ½ mile from the site boundary if the well hasn't been sampled? If there are no shallow wells ½ mile from the site (Table 1PDF p.41/1174) this question can't be answered without drilling additional wells which are not described in this work plan. Figure 7 simply doesn't work.

These questions are important because if contamination is migrating anywhere, the plume is getting bigger and ultimate cleanup costs are likely to increase. Further, if a plume is getting bigger, the probability of impact to a potential receptor may increase with time unless the plume has attenuated by natural attenuation. But natural attenuation is not addressed in this flow chart and samples aren't collected until after the decisions are made. Figure 7 simply doesn't work.

The fourth decision box on Figure 7 states "*Are Wells within the Target Zone Present in the Direction of Groundwater Flow?*" The work plan isn't clear about what the "*Target Zone*" is, and the direction of flow would be understood better after a water level contour map of the deep aquifer was available.

Figure 7 should be discarded. The wells identified by green dots on Figure 5, and any other wells within the ½ mile radius identified by questionnaire, interview or other means, should be sampled and analyzed. Well construction data should be determined, total depth and depth to water should be measured. The screen interval in each well should be attributed to either the shallow aquifer or the Catahoula Formation aquifer depending on the geology and the estimated screen depth. Water level elevations should be mapped and contoured. Groundwater flow directions in the off-site area should be interpreted.

If any property boundary well or off-site well in the shallow water bearing zone is contaminated, it is clear the plume has spread this far and may continue to expand. The extent of contamination must be determined. The adequacy of the existing well network must be evaluated. A future work plan should describe the decision process for sampling the wells, establishing concentration trends if contamination is detected, and insuring that off-site plumes are monitored sufficiently to demonstrate the progress of MNA or demonstrate that additional remedial measures are needed if the plumes are not receding fast enough to result in a cleanup in a reasonable time.

If any wells in the Catahoula Formation contain site related contamination, it is clear the barrier created by the Hattiesburg Formation has not been fully effective. The extent of contamination must be determined, but groundwater flow directions in this aquifer must be determined first. Water level elevations from the deep wells should mapped and contoured. Groundwater flow directions in the Catahoula Formation should be interpreted. The necessity for additional monitoring wells should be evaluated. If data from existing wells in either the shallow or deep aquifer can't be interpreted reasonably, some down-hole geophysical investigation may be necessary to help define the local geology and the well construction.

COMMENT #2 REGARDING DECISION FLOW CHART FIGURE 7:
The priority system for sampling presented on page 15 and 16 (PDF p.24/1174) is not consistent with the AO. The AO states drinking water wells within ½ mile will be sampled. The bottom of the priority table on page 16 states wells >500 feet from the site boundary will receive the lowest sampling priority. The AO does not recognize the 500 foot boundary. The AO (p.15 bullet a. states a schedule will be provided "*... for the sampling of all such wells either on or within a half-mile radius of the Facility.*" The sampling priority table which begins on page 15 contains 20 categories which have a sample priority of 1-5. There are only 20 known wells in this area, so having 20 categories in the priority table seems unnecessary. This table could be greatly simplified using the 0.5 mile radius criterion from the AO. The table on page 15-16 is an entirely different format than the one used in the Decision Flow Chart for Drinking Water (Figure 7 PDF p. 71/1174), Figure 7 doesn't mention the 500 foot decision, so even if these processes worked, it isn't clear which one should be used. The priority table which begins on page 15 should be deleted because it is inconsistent with the AO.

COMMENT #3 REGARDING DECISION FLOW CHART FIGURE 7:
Flow charts for environmental investigations have been created for many types of remedial investigations. The issues, strategy and questions asked in these flow charts may be useful input for process flow charts for this site now and in the future. The Interstate Technology Regulatory Council prepared a flow chart for MNA and Enhanced Attenuation of Chlorinated Organics (ITRC, 2007, A Decision Flowchart for the Use of Monitored Natural Attenuation and Enhanced Attenuation at Sites with Chlorinated Organic Plumes). Decision trees have been developed for other sites. This process should describe the investigation, assure the regulatory agencies, the public and the responsible party that human health and the environment will be protected and that meaningful progress toward cleaning the site will occur in a reasonable time.

COMMENT REGARDING SECTION 6.2 Surface Water and Sediment:
Figure 9 (PDF p.73/1174) shows the locations of 16 proposed surface water /sediment samples. The relationship between the sample locations shown on Figure 9 and the Decision Flow Chart for Surface Water and Sediment (Figure 8) is unclear. The Decision Flow Chart for Surface Water and Sediment (Figure 8 PDF p.72/1174) begins with 4 information/process description boxes. None of these boxes describes collecting the samples. There are two ways to get to an NFA decision before any samples are collected.

The decision flow chart for surface water and sediment sampling (Figure 8) does not describe the decisions for selecting surface water and sediment sample locations. There may not be much to the sample location selection process because the locations identified in Figure 9 are uniformly spaced in all known, unlined surface water drainages within ½ mile of the site. No other considerations are apparent in the process for selecting the surface water /sediment sample locations shown on Figure 9.

If the samples mapped on Figure 9 are assumed to be collected before Figure 8 is used, then the first decision box in Figure 8 which asks "Are Site-Related Constituents Present in Surface Water and Sediment?" is useful. But at the bottom of the flow chart, the "Re-evaluate" step isn't clear. It would seem that the sampling effort would do more than simply highlight a segment of the surface water drainage in which the screening levels were not met. Will sampling be conducted between the contaminated sample and the next sample up gradient to define specific contaminated inflow areas? Will monitoring wells be installed between the contaminated sample and the next sample up gradient to identify groundwater plumes discharging to surface water? The process in Figure 8 does result in 3 NFA decisions. The only non-NFA decision results in further sampling and "Re-Evaluate". The process in Figure 8 does not result in conclusions which will support remedial design decisions for treating contaminated surface water or removing the groundwater contribution causing the contaminated surface water because the only action is "Re-Evaluate".

This site has been under investigation for decades. Appendix A lists 11 investigations which have occurred since 1989. Figure 6 lists various pathways for contamination to reach potential receptors. If contamination is detected in surface water or sediments in a specific portion of the facility, what questions will be asked to determine which Primary Source or which Primary Release Mechanism (Spills and Releases or Leaching and Infiltration – See Figure 6) is the cause of the contamination? Are sewer lines

above or below the water table in this specific area where contamination is detected? Does groundwater near the contaminated surface water or sediment sample location discharge to the ditch or does the ditch near the contaminated sample location leak to groundwater? The work plan states (p.6) "*Sources, source area constituents of concern (COCs) concentrations, and vertical and horizontal extent of groundwater containing COCs were defined sufficiently for remedial planning purposes*". If this is accurate, then contamination detected in a specific media in a specific potion of the site with the specific relationships to groundwater and surface water in that portion of the site should have followed predictable physical pathways from known sources to that sample point. Process flow charts should describe how this work plan will provide information for remedial action where needed, not simply for NFA or continue sampling.

Figure 8 does not focus on known sources or known pathways and does not fully describe a process to get information needed for a remedial design. Figure 8 does not for example determine if the contaminated segment of the surface water drainage was contaminated by a release and over-land runoff to the drainage, or by groundwater inflow.

The Phase I Project Objectives (Section 5 p. 13, PDF p. 22/1174) are:

- *Determine the presence of Site-related Constituents at off-site locations; and*
- *Evaluate the nature and extent of Site-related Constituents at off-site locations.*

Figure 8 does not describe the process for accomplishing the second objective.

COMMENT REGARDING Additional Groundwater Sampling Locations:
Section 6.3.1 (p.20 PDF p.29/1174) lists 5 areas shown on Figure 9 from which "... *groundwater screening data from the upper water-bearing zone will be collected* ... ". Neither Section 6.3.1 nor 6.3.2 describes why the areas were selected or how many samples will be collected from each of the 5 areas. How do these five areas relate to known source areas and to groundwater flow directions?

The longest dimension of the 5 areas is typically about 500 feet. Water level elevation contours are not shown on Figure 9, so it isn't immediately clear on Figure 9 whether the five proposed sampling areas are oriented 90° to the direction of local groundwater flow. This makes a difference in the number of samples which might be required for a given area.

The width of a plume in any given area is likely to be controlled most strongly by the width of the source area perpendicular to the direction of groundwater flow, and by the hydraulic gradient. Hydraulic gradients can be estimated from the water level contour maps in the appendixes. But there is relatively little information in this report about the typical width of contaminant plumes at this site. The map in Appendix B2 showing the benzene plume near MW-8 suggests the width of the more concentrated portion of the plume is 50 – 100 feet wide. The line of samples in each area should be oriented at right angles to the local direction of ground water flow. More than one sample may be necessary in each of the 5 areas identified on Figure 9.

The 5 areas identified for sampling on Figure 9 are discussed in more detail elsewhere in this memo. But the width of a typical plume versus the distance between monitoring wells along the perimeter of the property needs to be considered. Figure 9 and the water level contour maps in the appendixes shows the groundwater flows from the site along the entire length of the property boundary from the northwest corner near MW2 to the southeast corner near TP2 in Area 4, a distance of about 5,400 feet. This entire length is down gradient from the various activities which occurred at this site. There are few monitoring wells along this property boundary, and none of the five areas proposed for groundwater sampling locations (Figure 9) are in this portion of the site.

Other sites have generated maps with multi-colored property boundaries, where the color of a boundary segment defines the type or quality of information used to determine that a given segment of the property boundary has been monitored or sampled, and that this segment is clean or that investigation is required. An example might include decisions which made 150 foot segment of the boundary (twice the average width of a plume) green where that segment was protected by a monitoring well. Segments of the boundary where groundwater flows into the site might also be green. Segments of the property down

gradient only from non-contaminating activities, such as office buildings might also be green. Segments of the property down gradient from contaminated soils which already have been excavated might be yellow if the groundwater beneath the excavation is slightly contaminated and green if the groundwater is uncontaminated. Segments of the property boundary which are not monitored by wells closer than 3x the average plume width might be colored red, etc. If this approach were used at this site, the ideal scheme would have to be designed as a work plan product which would help EPA and the public visualize the work proposed in the work plan and the process used to show human health and the environment will be protected.

The distance between monitoring wells at two locations along the northern and eastern boundaries is greater than 1,200 feet, which is much greater than the probable average width of a plume. These gaps will not be closed by sampling the 5 additional areas shown on Figure 9. The absence of monitoring wells in long segments of the down gradient property boundary must be justified and documented through some kind of presentation in the work plan, or monitoring should be proposed to close the gap.

COMMENT REGARDING VERTICAL DELINEATION AT GROUNDWATER SAMPLING LOCATIONS:
The approach for mapping the evidence for protection and the adequacy of the perimeter monitoring system described in the previous comment works in map view only. A 10 foot well screen in a 30 foot thick aquifer may not be sufficient unless measures have been implemented to determine that the screen is in the most contaminated portion of the plume. Such measures might be vertical sampling, borehole geophysics, knowledge of contaminant properties, particularly density, etc.

Section 6.3.2 (p.21 PDF p.30/1174) states "*The wells will be screened so that the top of the well screen is just above the water table*". Also, "*The prepacked screens are constructed in 3- to 5-foot length sections, ... but will not exceed 10 feet in length*" (PDF p.1120/1174).

The work plan doesn't provide information regarding the thickness of the upper saturated zone or provide information describing whether the plumes are expected to float or sink. The report doesn't provide information describing whether the plume is expected to be 1 foot thick or 20 feet thick. So given the well construction information cited above, if the upper water bearing unit is more than about 8 feet thick, the lower portion of the zone will not be monitored. The work plan does not demonstrate that groundwater quality will be characterized vertically or provide assurance that the extent of contamination will be determined.

Vertical delineation of contamination typically is accomplished by drilling or direct pushing through the entire thickness of the water bearing zone while observing the geology and taking measurements of various indicator parameters. This information is used to set the well screen in the most contaminated portion of the formation. Indicator parameters might include direct observation of contamination or discoloration, high PID or FID readings in specific split-spoon sample intervals, etc. Water samples can be collected at discrete intervals and sampled in the field using PID or FID readings, ColorTec tubes, pH measurements, specific conductance or other indicators appropriate for the specific contaminants of the area. The work plan should include appropriate, site-specific procedures to determine the thickness of the upper water bearing unit and the vertical distribution of contamination in this unit.

As described in more detail elsewhere in this memo, this work plan does not present a map describing the thickness of the upper water bearing unit. Also, the work plan does not describe whether groundwater contamination occurs as a floating or sinking plume. There is no information presented regarding the distribution of total dissolved solids or specific conductance, either of which might indicate water which has passed through processes or materials different from natural recharge in uncontaminated areas. This information could indicate that contaminated water might tend toward either the top or the bottom of the aquifer. Similarly dissolved oxygen concentrations and ORP levels can identify portions of the aquifer which are either oxidizing or reducing, information which may be useful to identify areas not along contaminated flow paths from areas down gradient from VOC or cVOC source areas. These techniques are used at other sites. After decades of investigation, plenty of these data should be available, but it is not utilized for preliminary delineation of sample areas, and the work plan does not describe using these approaches to place the well screens or help interpret the sample results collected under this work plan.

The work plan should discuss whether the plumes are likely to be found near the top, bottom or middle of the aquifer thickness. The work plan should describe the logic for selecting the vertical sampling interval in each monitoring well, not simply declare "*The wells will be screened so that the top of the well screen is just above the water table*" Section 6.3.2 (p.21 PDF p.30/1174). Maps showing:

1.) the elevation and shape of the top of the Hattiesburg Formation surface and
2.) the thickness between the top of the Hattiesburg Formation and the water table

are essential to verifying that the monitoring well network will detect and successfully monitor the plume.

COMMENT REGARDING SECTION 6.3.1 Identification of Groundwater Sampling Locations
Note that section 6.3.1 addresses groundwater sampling locations screened in the shallow water bearing zone above the Hattiesburg Formation only. Figure 5 shows the location of 20 wells reported to be present within the area ½ mile of the property boundary. Most of these wells are probably screened in the deep water-bearing zone, but the depth of those wells and the aquifer they are screened in must be verified as part of that separate sampling activity.

Section 6.3.1 (p.20 PDF p.29/1174) lists 5 areas shown on Figure 9 from which "... *groundwater screening data from the upper water-bearing zone will be collected* ... ". The 5 areas listed on page 20 are not described or targeted in any way to any specific source area or activity at the site. There is no explanation in the work plan of why these areas were selected. The effort to sample shallow groundwater is one of the most important tasks included in this work plan. Yet a water level elevation map is not included in the main body of the Phase I Sampling and Analysis Work Plan. Groundwater flow directions are not shown on any of the 10 figures in this work plan except the idealized groundwater flow arrows on the cross-section Site Concept Model (Figure 4). Without groundwater flow directions and clearly identified source areas, the value of sampling each of the 5 areas cannot be evaluated easily.

A water level contour map from March 2003 is presented in Appendix A (PDF p.97/1174). Another water level contour map from October 2003 is presented in Appendix B (PDF p.110/1174). But groundwater flow directions, the locations of potential sources and receptors, and the location of monitoring wells in the pathways between the sources and receptors are not displayed prominently in the main body of the report. So no figure in the main body of the report supports the selection of the 5 areas based on groundwater flow directions.

The description of the shallow groundwater sampling effort, and in particular, the description of how much the proposed sampling adds to our understanding of the site deserves to be expanded and presented in a manner which will convince EPA managers and the public that the extent of contamination will be determined by the sampling proposed. The 5 areas proposed for groundwater sampling should be shown on a separate map. The base map for this figure should include water level elevation contours and ground water flow directions. The figure also should include the locations of potential source areas such as the outline of the former Waste Water Treatment plant and the Impoundment Basin, the outline of the former "Back Forty" sludge pits, etc. All potential source areas and all known contaminant plumes should be shown so that the purpose of sampling the 5 areas is more obvious.

Areas of potential concern for shallow groundwater contamination which are not included in the 5 areas proposed for groundwater sampling shown on Figure 9 can be identified using the water level contour maps shown in Appendixes A and B, the proposed sample locations shown in Figure 9 and the location of major site activities shown on Figure 1. But this interpretation should be formalized and made more accessible for the record.

The 5 areas for additional groundwater sampling plus some additional areas of potential concern for shallow groundwater contamination which may require additional investigation and possible sampling are described below.

1.) The northeastern boundary of the property along the "Back Forty" and the sludge pits is approximately 1,600 feet long and is monitored by wells MW2, MW3, MW5, MW6 and MW12.
    a. The groundwater flow directions on the maps in Appendix A and B show that MW2 monitors water quality from the area of residential and commercial property west of the

site. MW2 provides little information regarding impacts to groundwater by the Hercules site because most of the flow path to this well is not beneath the site.

b. MW6 and MW12 are down gradient from the Former Industrial Landfill area and provide no information regarding the quality of groundwater down gradient from the sludge pits.
c. MW5 is up gradient from the sludge pits.
d. MW3 is the only monitoring well along this 1,600 foot portion of the property boundary which is monitoring the former Sludge Pits area.
e. The depths of these monitoring wells are not shown in the Sampling and Analysis Work Plan. It isn't clear that the well screens are screened in the appropriate portion of the aquifer. The properties of groundwater in this area aren't obvious either. It isn't clear whether the monitoring wells are designed to find floating contaminants, sinking contaminants, water with high dissolved solids content due to both evaporation and to industrial processes, or whether the well screens are tens of feet long and the samples are a diluted mix of all of the above.
    i. A map showing the contoured elevations of the top of the Hattiesburg Formation should be prepared. This map may indicate preferential pathways from the site which are not monitored by the existing monitoring wells and areas where the wells are not deep enough to sample portions of the shallow aquifer.
    ii. Water level elevation contours in the shallow water bearing unit should also be shown on this map.
    iii. A map should be prepared showing the thickness of the shallow aquifer (elevations from map 1.e.ii minus map 1.e.i). If the hydraulic conductivity of the upper water bearing unit is relatively uniform, then the highest transmissivity is in the thickest part of the aquifer. In the absence of any other data, monitoring wells should be down gradient from potential source areas where the transmissivity is greatest.
f. EPA should request additional groundwater sampling along the Sludge Pits property boundary. One monitoring point along this boundary is not sufficient to accomplish the objectives of this work plan and insure that contamination is not migrating from the site.

2.) The groundwater flow directions on the maps in Appendix A and B shows that shallow groundwater in the far western portion of the site west of MW10 flows both westward and northward, away from the rest of the site.
    a. No existing monitoring well provides water quality information in this area regarding impacts to groundwater by the Hercules site.
    b. Groundwater Sample Area 1 (Figure 9) is intended to address the western component of groundwater flow from this area.
    c. Groundwater Sample Area 1 does not address the 1,000 foot long property boundary parallel to Green's Creek in the far western portion of the property (Figure 9). Groundwater in this area flows northward beneath the area identified as having "Light Industrial" land use (Figure 3).
    d. The former use of the western most parcel of the site and the kinds of sampling already performed in this area are not obvious in the work plan. This northern boundary should be evaluated for additional sampling. This northern boundary must be sampled and monitored if the results from Groundwater Sample Area 1 show site related contamination has reached the western property boundary.

3.) Area 2 is shown on Figure 9. The water level contour maps in Appendixes A and B show this area along the property boundary is oriented approximately 45° to the direction of groundwater flow. Area 2 is down gradient from the Roseland Park Cemetery and is not far from the groundwater flow divide which passes through the area. The reasons for targeting this area for sampling are not described in Section 6.3.1 (p.20 PDF p.29/1174). Metals contamination has been observed in groundwater around cemeteries, particularly arsenic depending on the age of the cemetery. Besides the potential for false positive results for metals, it would be wise to control the turbidity of samples from this area carefully.
    a. <u>REGARDING TURBIDITY:</u> Samples should not be sent to the laboratory for metals analysis and probably not for pesticide or PAH analysis unless the turbidity is less than 10 NTUs. This may be difficult to achieve using pre-packed well screens in temporary wells and special well purging procedures may be required. Further, given the relatively

large number of sample categories summarized on QAP page 4-4 (Section 4.2.1 PDF p.194/1174), the chances to inadvertently increase the sample turbidity will be high. EPA R4 has experience at metals sites with elevated turbidity in samples which is accompanied by apparently high metals concentrations. Sometimes these difficulties were due to steps in the sampling procedures which resulted in turbid samples after the last turbidity reading was recorded to be less than 10 NTUs. But because these sampling steps were performed after the last turbidity reading was recorded, the problem was not recognized until numerous sample events had occurred and a special field effort was needed to prove the high metals results were due to high turbidity.

b. People do not drink turbid water for an extended period of time and typical water supply wells do not produce turbid water once the well has been fully developed. Therefore, lab results from turbid samples do not represent long-term exposure point concentrations. Samples for metals analysis should not be collected until the turbidity is less than 10 NTUs. This recommendation requires changes at various places in the work plan. Further, EPAR4 recommends the time and pre-sample turbidity should be recorded on the field sampling record, then the sample should be collected and the sample time should be recorded, then the post-sample turbidity should be re-measured and recorded with the time on the field sampling record to verify that the turbidity of the water in sample bottle is less than 10 NTUs. If the post-bottling turbidity exceeds 10 NTUs, the sample should be discarded, and the well should be purged until the turbidity does not exceed 10 NTUs. This procedure becomes more important as the site approaches cleanup and must become part of the SOP for this site. The procedure is also important in this work plan because of the use of temporary well screens. The appropriate descriptions of Field Sampling Procedures and Field Logbook Documentation should be altered to be consistent with this comment and should clearly specify that turbidity will be measured and recorded before and after the metals sample is bottled, and that the turbidity of the bottled sample will be less than 10 NTUs.

c. EPA R4 has no evidence that turbidity may result in false positive results for pesticide or PAH samples, but it wouldn't be surprising for any compound with a tendency to adsorb to fine grained sedimentary particles. It may be necessary to record the turbidity frequently while collecting the sample bottles for the list described in QAP page 4-4 (Section 4.2.1 PDF p.194/1174). EPA does not want discussions regarding contamination which may be due to false positive results caused by acid preservation of turbid samples. Be sure the turbidity in specific sample bottles is confirmed to be less than 10 NTUs.

d. EPAR4 can assist with methods likely to achieve samples with low turbidity, as well as with field methods to determine if additional well development time or lower purging rates might lower the turbidity.

4.) Area 3 and Area 4 are shown on Figure 9. The water level contour maps in Appendixes A and B show these areas are along the southern most property boundary oriented with the long axis of the areas approximately parallel to the direction of groundwater flow. The reasons for targeting these areas for sampling are not described in Section 6.3.1 (p.20 PDF p.29/1174), so barring the presence of some Area specific source area, one sample from each of these areas, collected at the appropriate depth should be sufficient because in map view both areas are along the same general flow path. Area 4 also should be considered with Area 5.

5.) Area 4 and Area 5 are shown on Figure 9. The water level contour maps in Appendixes A and B show Area 5 is along the eastern property boundary oriented with the long axis of the area approximately perpendicular to the direction of groundwater flow. The reasons for targeting these areas for sampling are not described in Section 6.3.1 (p.20 PDF p.29/1174), so local information regarding site-specific activities and factors which influence local groundwater flow directions must be evaluated. Drainage C (Figure 5) is present nearby, and data is available from monitoring wells MW19-MW24, some of which are contaminated. Issues regarding the appropriate depth for the samples in Area 5 must be clarified as described elsewhere in this memo. Area 5 includes 500 feet of the property boundary, so as many as three samples at the appropriate depth might be appropriate for this area. Cross-sections like Figure 4 but based on real data from the existing monitoring wells should be created and evaluated before these samples are collected.

6.) The length of property boundary from Area 5 to the northeast corner of the site is nearly 2,400 feet long. MW18 is the only monitoring well in this segment of the property boundary. The entire eastern boundary of the property is down gradient from only half of the site according the water level contour maps in Appendixes A and B because the other half of the property is on the other side of the shallow water groundwater flow divide. This area along the eastern boundary of the site is down gradient from the Delnav Production Area. The work plan should propose additional investigation for this portion of the property boundary or justify why additional monitoring wells are not needed. The properties of the products manufactured in this area plus the properties of any mixtures, carriers, cleaners or solvents used in the manufacturing processes also should be evaluated.

7.) There are no monitoring wells in the direction of groundwater flow between MW6 to MW18. The length of property boundary from northeast corner of the site to MW6 is approximately 800 feet long. This length of the property boundary is along the groundwater flow divide which separates the east and west half of the property, but the flow divide itself dips toward the Boule River which is the ultimate discharge area for all shallow groundwater on the site. Consequently, this area is down gradient from the Delnav Production Area, though the primary direction of groundwater flow this close to the flow divide will be vertically downward. The map showing the thickness of the upper water bearing unit described in other comments of this memo should be evaluated in this area to estimate the thickness of the upper water bearing unit. Because of the vertical flow component which is likely to exist in this area, at least one monitoring well which samples the lower portion of the upper water bearing unit should be proposed for this portion of the property boundary.

8.) Regarding the eastern boundary, 4/6 of the wells on this side of the property contain site related contamination (MW19, 21, 22 and 23, Table 4 PDF p. 55/1174 to 63/1174). Contaminant concentration trend graphs are not presented report, but Table 4 shows some contaminants in these wells exceed groundwater screening levels, and it is clear from Table 4 that concentrations of some contaminants in wells MW21 and MW23 probably are increasing. Well MW20 and well MW24 do not appear to show site related contamination. The depth of these wells below the land surface and the vertical position of these well screens relative to the water table and to the top of the Hattiesburg Formation is not shown in the work plan. So it isn't clear whether MW20 is up gradient from the source area or whether contaminated groundwater flow paths pass under MW20 then rise as they approach the groundwater discharge area at Drainage C (Figure 5). MW20 could also be too far south to detect the plume at MW21. It isn't clear why MW24 is not contaminated. The water level contour map for this area (See PDF p.129/1174) shows MW24 is generally down gradient from the other contaminated wells, but MW24 is not exactly in the flow path from contaminated wells MW21 or MW23. MW24 may be too deep, too shallow, influenced by Drainage C or the plume simply may not be there. But clearly, the extent of contamination around these wells will not be determined by sampling only in Area 5 which is south of this area (Figure 9). MW21 and MW23 are 200 to 600 feet from the various property boundaries, so monitoring should verify that off-site migration is not occurring. Additional wells and piezometers will be needed in the area down gradient from the MW21 & MW23 plumes to determine the extent of contamination, refine groundwater flow directions and identify the groundwater discharge area for these plumes.

9.) There is only one well (MW3) on the northern side of the facility which is known to be down gradient from a probable source area. Groundwater beneath much of the northern boundary is not monitored. It isn't clear that the depth of the screen in any of the wells on the property boundary is located appropriately to characterize the contamination along the facility boundary.

10.) The activities described in this work plan, particularly the activities which concern groundwater monitoring, will not characterize groundwater conditions at the site sufficiently. Neither EPA nor the public will have confidence that the groundwater monitoring well network will detect groundwater contamination migrating from the site. The objectives of the work plan described in Section 5.1 will not be accomplished.

COMMENT REGARDING SECTION QAPP 6.4.3 Computer Tape and Hard Copy Storage

Please don't send computer tape! The text in QAPP Section 6.4.3 (PDF p.202/1174) states the laboratory will retain the records for not less than 5 years. However, EPAR4 expects to retain the laboratory records in our digital format until long after the site is clean and closed. The remedies for this

site which have been selected to date all include Monitored Natural Attenuation. The proof that a MNA remedies are working always require extensive use of maps, graphs and tables of data, and it is critical to have access to old data just to be able to graph how bad things used to be. Data should be delivered by e-mail to EPAR4 in the Electronic Data Deliverable formats, not on computer tape. The QAPP states in the last paragraph of Section 6.5.2 Laboratory Data Reporting (PDF p.204/1174) laboratory data will be delivered in an EDD as outlined by the EQuIS SOP in Appendix A (PDF p.268/1174). I have not reviewed Appendix A in any detail to verify consistency with the EPAR4 DART system, which also uses EQuIS as the software managing the database. The presentation format in Appendix A is similar to the EPAR4 EDD format. A detailed review is unnecessary at this time because all EDDs are scanned by the EPAR4 Electronic Data Checker, an EQuIS program which scans the all EDDs e-mailed to EPAR4 to verify completeness and consistency with EPAR4 valid value lists. EDDs which pass the data checker get posted to the database. EDDs which fail to pass the data checker are returned automatically to the sender with a report describing the problems.

If needed, EPAR4 Electronic data reporting requirements are described at the following websites.
The current version of the EPA R4 SOP is available at:
http://www.epa.gov/region4/sesd/fbqstp/
Information regarding the EPA R4 DART program is available at:
http://www.epa.gov/region4/waste/sf/edd/edd.html

COMMENT REGARDING SECTION QAPP 6.5.1 Field Data Reporting:
The text in QAPP Section 6.5.1 (PDF p.202/1174) states "*Information collected in the field through visual observation, manual measurement, and/or field instrumentation will be recorded in field notebooks or data sheets and/or on forms.*" EPAR4 expects field measurements and field information typically recorded in log books and on forms to be submitted to EPAR4 digitally using the appropriate Electronic Data Deliverable (EDD) format. Depth to water measurement, field chemistry (pH, ORP, dissolved oxygen, conductance, turbidity, temperature, etc) is essential information for the interpretation of groundwater sample results and should be available for utilization with the laboratory data. Well construction and geology information traditionally recorded on paper forms in the field need only be submitted once per well. The same comments apply to SOP Section VIII Data Recording and Management (PDF p.1086/1174) and other sections where field data is recorded on forms or in logbooks.

COMMENT REGARDING SOP: Groundwater Sample Collection page 4:
The criteria for measuring turbidity described in point J5 (PDF p.1009/1174) states:
"*5. A constant non-turbid discharge (<10 nephelometric turbidity units) is achieved, or turbidity over three consecutive readings varies no more than 10 percent.*"
As described elsewhere in this memo, EPA recommends that this language be changed to delete the last phrase starting with the comma. The work plan proposes to use pre-packed well screens in temporary wells. While these installations are useful and perfectly acceptable, getting samples from these wells which doesn't increase the probability of false positive results for metals is often problematic. But the cost of arguing over false positive results will be very expensive. EPA recommends that samples not be sent to the laboratory for analysis unless the turbidity is less than 10 NTUs. Because the sample analysis list for this site is extensive EPA recommends the turbidity be measured and recorded immediately before and immediately after all metals samples are collected to verify the turbidity of the water in the bottle. It may be advisable to follow this procedure for all pesticide sample bottles and for any other compound which is likely to adhere to fine sediment in the formation.

EPAR4 can provide suggestions for low-flow purging, long purging intervals and field tests to determine whether additional purging is worthwhile.

ARCADIS

SUBJECT: EPA/MDEQ Site Visit
Sign-IN

JOB NO: HERCULES

BY: DATE: 9/2/11

CHKD: DATE:

PAGE

SHEET 1

NAME	ORG/ROLE	EMAIL
D. KAREN KNIGHT	USEPA RY chief, CAS	KNIGHT.karen@EPA.GOV
JAVIER GARCIA	USEPA - LI RCRA	GARCIA JAVIER @ EPA.G
WILLIE MCKERCHER	MDEQ - GARD	WILLIE_MCKERCHER@deq.state.ms.
TIM HASSO	ASHLAND/HONOLULU	TDHASSO@ASHLAND.com
Craig Derouen	ARCADIS	Craig.Derouen@arcadis-us.co.
John Ellis	ARCADIS	john.ellis@arcadis-us.c
Cynthia Peurifoy	USEPA-RY-EJ.	Peurifoy.Cynthia@EPA.gov ✓
Meredith Anderson	USEPA	anderson.meredith@epa.gov
Gloria Tatum	MDEQ-Contractor	Gloria-Tatum@deq.state.ms.us
Jim Vitak	Ashland	jevitak@ashland.com
Betsy Weltner	consultant Ashland	betsy@weltner.com
Gary Shelley	Site Contact	gfshelley@ashland.com
Charlie Jordan	Former Emp.	CSJORDAN@ASHLAND.com