OFFICE OF INSPECTOR GENERAL

Catalyst for Improving the Environment

Ombudsman Report

Review of Actions at Stauffer Chemical Company Superfund Site, Tarpon Springs, Florida

Report 2004-P-00018

June 3, 2004

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Abbreviations

ATSDR	Agency for Toxic Substances and Disease Registry
EPA	U.S. Environmental Protection Agency
OIG	Office of Inspector General
OU	Operable Unit
ROD	Record of Decision
RPM	Remedial Project Manager
SMC	Stauffer Management Company

Cover photo: Photo of the South Parcel, Stauffer Chemical Company Superfund Site, Tarpon Springs, Florida (EPA OIG photo).

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

OFFICE OF
INSPECTOR GENERAL

June 3, 2004

MEMORANDUM

SUBJECT: Ombudsman Report:
Review of Actions at Stauffer Chemical Company
Superfund Site, Tarpon Springs, Florida
Report 2004-P-00018

FROM: Paul D. McKechnie *Paul D. McKechnie*
Acting Ombudsman
Office of Congressional and Public Liaison

TO: J. I. Palmer, Jr.
Regional Administrator, Region 4

Attached is our final report on our review of complaints regarding the Stauffer Chemical Company Superfund site conducted by the Office of Inspector General (OIG). We undertook this work as a result of issues brought to the attention of the former Environmental Protection Agency (EPA) Ombudsman and, subsequently, the OIG Acting Ombudsman, by citizens in Tarpon Springs, Florida. There is local and Congressional interest in the citizens' issues.

This report contains findings and recommendations that describe needed improvements the OIG has identified and corrective actions the OIG recommends. This report represents the opinion of the OIG and the findings contained in this report do not necessarily represent the final EPA position. Final determinations on matters in this report will be made by EPA managers in accordance with established audit resolution procedures.

On April 15, 2004, the OIG issued a draft report to EPA's Region 4 for review and comment. On May 6, 2004, we held a teleconference call with the Agency to answer questions and discuss the draft and the Agency's expected comments. We received the Agency's response to the draft report on May 21, 2004. The Agency's comments in their response to the draft focused on the accuracy of the report and provided suggestions for clarifications. In general, the Agency agreed with our report and its findings and recommendations. We provide a summary and general evaluation of Agency comments and our response at the end of each section of this report. We include the full text of EPA's comments in Appendix B.

The findings in this report are only applicable for OIG Ombudsman purposes. Additionally, these findings are not binding in any enforcement proceeding brought by EPA or the Department of Justice under the Comprehensive Environmental Response, Compensation, and Liability Act to recover costs incurred not inconsistent with the National Contingency Plan. We have no objection to the further release of this report to the public.

Action Required

In accordance with EPA Manual 2750, you are required to provide this office with a written response within 90 days of the final report date. The response should address all recommendations. For corrective actions planned but not completed by the response date, please describe the actions that are ongoing and provide a timetable for completion. Reference to specific milestones for these actions will assist us in deciding whether to close this report in our assignment tracking system.

If you or your staff have any questions regarding this report, please contact me at (617) 918-1471 or Fran Tafer, the Assignment Manager, at (202) 566-2888.

Executive Summary

The Environmental Protection Agency (EPA) Office of Inspector General (OIG) conducted a review of issues that citizens brought to the Ombudsman's attention regarding the Stauffer Chemical Company Superfund site in Tarpon Springs, Florida. For purposes of this report, we have grouped the citizens' concerns and our findings into three subject areas. Following are those issues and what we found regarding each.

1. Selected Remedy: Including the additional technical studies performed in 2001-2003, is the remedy selected and presented in the 1998 Record of Decision (ROD) feasible for the Stauffer Chemical Company Superfund site in Tarpon Springs?

An independent expert – a hydrogeologist – retained by the OIG agreed with the conclusion reached by Stauffer Management Company (SMC) that EPA's selected remedy is feasible because geophysical characteristics of the Stauffer Chemical Company Superfund site should support it. SMC's conclusion was based on the information provided by the additional geophysical and groundwater studies that SMC performed in 2001-2003, under an agreement with EPA Region 4. This conclusion should allow the Superfund process to continue to the remedial design phase. However, the remedy is only feasible if the remedy design incorporates the cautionary recommendations included in the draft report of the 2001-2003 geophysical study, and if additional groundwater characteristics information and analysis lacking in the 2003 draft groundwater report is addressed. We recommended that the cautions listed above be implemented and that groundwater characteristics be adequately defined for remedial design. Region 4 agreed to implement our recommendations.

2. EPA Oversight: Was EPA Region 4 oversight of the Superfund process at Stauffer Chemical Company adequate?

We concluded that EPA Region 4 appropriately monitored: site activity; early geophysical and groundwater studies; and site contaminant identification. EPA Region 4 Remedial Project Manager (RPM) time and travel related to the site were appropriate given the specific issues at the site. Contractors, representing EPA, oversaw site activities even when EPA personnel were not present.

However, we do not believe that EPA adequately supported the remedy presented in the 1998 ROD. Specifically, EPA should have ensured that the additional technical studies performed in 2001-2003 were completed earlier in the process. Karst, an area of limestone formations that often contain sinkholes and is widespread in Florida, was not discussed in any of the study reports prior to 2000. According to the OIG's hydrogeologist, in an area so prone to karst, an understanding of the regional and site geology and hydrogeology should have been incorporated into the process. We recommended that EPA Region 4 require that any future

studies in known karst areas include geophysical and related groundwater studies for karst. Region 4 agreed to implement our recommendation.

3. Community Involvement: Why is part of the community opposed to the selected remedy?

Although Region 4 generally met the community involvement requirements, a segment of the community was dissatisfied with the EPA efforts and the remedy selected in the ROD. Some members of the community believed Region 4 had failed to be open and frank in their discussions and did not take the community concerns seriously. In several instances, Region 4 did not promptly address community concerns. As a result, some community members were skeptical about EPA's decisions, particularly concerning the remedy selected. The Agency requires no formal public participation during the remedy design phase, so community members doubted that their remaining concerns would be addressed. We recommended that EPA Region 4 revise its January 1993 community relations plan to include site visits during the design phase and obtaining community input on design documents. Region 4 agreed to implement our recommendation.

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Introduction

Purpose

The Environmental Protection Agency (EPA) Office of Inspector General (OIG) conducted a review of issues that citizens brought to the Ombudsman's attention regarding the Stauffer Chemical Company Superfund site in Tarpon Springs, Florida. The goal of the OIG Ombudsman is to review and report on public concerns regarding EPA activities, including Superfund.

Based on the issues raised, our objectives were to determine:

- Including the additional technical studies performed in 2001-2003, is the remedy selected and presented in the 1998 Record of Decision (ROD) feasible for the Stauffer Chemical Company Superfund site in Tarpon Springs?

- Was EPA Region 4 oversight of the Superfund process at Stauffer Chemical Company adequate?

- Why is part of the community opposed to the selected remedy?

Background

From 1947 until 1981, Stauffer Chemical Company and a predecessor company processed elemental phosphorous at their facility on a 160-acre site (130 acres of which was dry land). The ore being processed was mined off-site. During operations, phosphate ore was heated in an electric arc furnace, removing the elemental phosphorous in its gaseous state, and returning it to a liquid state in an on-site condenser. The remaining sludge was re-heated to recover additional phosphorous. Process wastes were disposed of on-site in unlined lagoons. Dismantling the facility began in the early 1990s.

Anclote River from Stauffer Chemical Company Superfund Site (EPA OIG Photo)

The site is located along the Anclote River, about one mile north of the City of Tarpon Springs, Florida, and about two miles upstream from the

Gulf of Mexico. The site has two parcels, the South Parcel where most of the processing occurred, and the North Parcel, with a State road separating the two parcels. The surrounding land use is a mixture of light industrial, commercial, recreational, and residential, including an elementary school directly across the street from the northern edge of the North Parcel. Approximately 9,000-10,000 people live within a mile of the site. There are numerous wells, private and municipal, near the site. Though use of the wells for human consumption has not been confirmed, some citizens maintain that some of the wells are used by the public for drinking water. Region 4 officials concluded that groundwater contamination is limited to the site, and are unaware of any wells that have been affected by site contaminants.

EPA reports that the hydrogeology of the area consists of two aquifers: a sandy, thin surficial aquifer 8 feet below the surface; and a deep aquifer, the Floridan, which is the primary source of drinking water for a large area. Generally, the surficial aquifer, which is used for irrigation, is separated from the deeper aquifer by a clay layer, though this layer can be thin or nonexistent under the site. EPA further reports that groundwater flows to the southwest into the Anclote River, though citizens have questioned whether EPA has enough data to make this statement.

Citizens and citizen groups contend that the area's hydrogeology contains:

- Old and forming sinkholes of varying sizes.
- Little differentiation between the surficial and the Floridan aquifers.
- An unknown or tidal groundwater flow.
- An influence on groundwater movement due to groundwater usage.

Some citizens believe that site sinkholes could cause any structures at the Superfund site to subside when the underlying ground sinks, and could create ready pathways for pollutants to travel between the surficial and Floridan aquifers. Indeed, much of Florida, including this area, is underlain by a limestone base, sections of which have developed a highly permeable topography, known as karst. Karst is an area of irregular limestone in which erosion can produce fissures, sinkholes, underground streams, and caverns. With the possibility of sinkhole pathways, citizens also expressed doubts about how potential pollutants (contaminants of concern) were identified. These issues led to citizen questions on the adequacy of EPA's oversight of activities at the site.

The site was proposed for the Superfund National Priority List in 1992 and listed in 1994 under the name Stauffer Chemical Company (Tarpon Springs Plant). The responsible party, Stauffer Management Company (SMC), which was created by the divestiture of Stauffer Chemical Company in 1987, entered into a voluntary Administrative Order on Consent to conduct the Remedial Investigation/ Feasibility

Study in 1992. Using contractors, SMC completed the Remedial Investigation/Feasibility Study in 1996 under EPA Region 4's oversight. SMC conducted a removal action in 1997 to remove phosphorus sludge from above-ground storage tanks. A fire occurred during the removal when the phosphorous was exposed to air. Since it burns spontaneously on exposure, digging up phosphorus waste during remediation could also cause fires.

EPA signed the ROD addressing cleanup of heavy metals and radiation in soil and waste at the site (Operable Unit #1, or OU1) in 1998. EPA planned to address groundwater in a second operable unit (OU2) while evaluating it as part of the original Remedial Investigation/Feasibility Study. The consent decree, which documents the agreement between EPA and SMC to implement the ROD for OU1, was entered in Federal Court in November 1999. The major components of the (originally) $9 million planned remedy in the ROD included:

- Excavating contaminated soils that exceed residential cleanup standards and moving the soils to consolidation areas on site.
- Solidifying and/or stabilizing contaminated materials below the water table in the consolidation areas.
- Capping the consolidation areas (including contaminated material above the water table that is not being solidified)
- Prohibiting residential use of the site through institutional controls.

EPA subsequently put the remedy on hold by withdrawing the consent decree. This was due to citizen complaints about: the effectiveness of geophysical and groundwater testing; the potential effectiveness, long-term stability, and potential dangers of the proposed remedy; and the lack of public comment requirements during the remedial design/remedial action phase. EPA and SMC signed an agreement in August 2000 for SMC to do additional studies (geophysical, groundwater, and treatability) before continuing with the remedy. The draft report on the groundwater study, issued in May 2003, and the geophysical study, issued in June 2003, were made available to the public for comment. The treatability draft study was issued in December 2003. Final reports had not been finished as of March 11, 2004, when we ended our work.

Scope and Methodology

Due to citizen complaints and concerns, as well as related letters from a Florida Congressional representative in 1999 and 2000, the former National Ombudsman (then located in EPA's Office of Solid Waste and Emergency Response) opened a case on the Stauffer Chemical Company Superfund site in Tarpon Springs. The case was transferred to the OIG when it acquired the Ombudsman function in April 2002. After

a preliminary assessment phase during 2002, the OIG Acting Ombudsman determined a review of the issues was warranted.

We conducted our review from March 2003 through March 2004. We researched the files we obtained from the former Ombudsman and EPA Region 4. We traveled to the site for an overview, discussed issues and concerns with citizens and citizens' groups, and reviewed their comments in site records. We interviewed key officials in Region 4 who worked on the Superfund site, as well as SMC representatives and contractors.

We also obtained an opinion and report, which is attached as Appendix A, from an independent expert (a hydrogeologist) on certain hydrogeologic and geophysical considerations. The hydrogeologic aspects of this site concerned the development of Florida's karst, geophysical testing for past and potential sink holes and their effects; adequacy and effectiveness of the 2001-2003 groundwater and geophysical studies; and sufficiency and reasonableness of testing and site characterization before the planned remedy of in-situ solidification, mounding, and capping was chosen. The draft report on the treatability study was not provided in time to be included in our review.

We performed our Ombudsman review and analysis in accordance with *Government Auditing Standards*, issued by the Comptroller General of the United States.

The findings contained in this report are only applicable for OIG Ombudsman purposes. Additionally, the findings in this report are not binding in any enforcement proceeding brought by EPA or the Department of Justice under the Comprehensive Environmental Response, Compensation, and Liability Act to recover costs incurred not inconsistent with the National Contingency Plan.

Results of Review

1. Selected Remedy

Question: Including information from the additional technical studies performed in 2001-2003, is the remedy selected and presented in the 1998 ROD feasible for the Stauffer Chemical Company Superfund site in Tarpon Springs?

An independent expert – a hydrogeologist – retained by the OIG agreed with the conclusion reached by Stauffer Management Company (SMC) that EPA's selected remedy is feasible because geophysical characteristics of the Stauffer Chemical Company Superfund site should support it. SMC's conclusion was based on the information provided by the additional geophysical and groundwater studies that SMC performed in 2001-2003, under an agreement with EPA Region 4. This conclusion should allow the Superfund process to continue to the remedial design phase. However, the remedy is only feasible if the remedy design incorporates the cautionary recommendations included in the draft report of the 2001-2003 geophysical study, and if additional groundwater characteristics information and analysis lacking in the 2003 draft groundwater report is addressed.

2001-2003 Geophysical Study

OIG obtained an independent expert to review the raw data collected during the 2001-2003 geophysical study and the related draft report. This OIG expert found the geophysical investigations and subsequent interpretations to be comprehensive, documented, and detailed. Different geophysical testing methods were correctly performed with technical competence to provide an overlapping picture of the site, allowing interpretation of site hydrogeologic details from various perspectives. The study identified three subsidence areas, including a paleocollapse feature[1] along the eastern boundary of the Superfund site. The draft report noted that the remaining area of the site did not show any obvious indications of subsidence activity, and should physically support the remedy. However, the OIG expert stated that (within the limits of the expertise of geologists and hydrogeologists, but not engineers) if the recommendations of the geophysical study are followed, the remedy can be protective of human health and the environment.

[1]Paleocollapse feature is a term we are using to describe paleokarst – an ancient collapse of karst, or sinkhole, that later filled in with sediment. Estimated age is over 40,000 years old.

The 2003 draft report on the geophysical study recommended that the remedy implemented must not breach the semi-confining layer between the surficial and Floridan aquifers, and should avoid the paleocollapse area. According to the OIG expert, the remedy design should specifically consider the variations in depth and thickness of the semi-confining layer; consider the potential for ground settlement, particularly during construction; put setbacks in place from the paleocollapse area; and provide adequate monitoring and control of groundwater flow. The OIG expert further noted that the final remedial design should be prepared by specialized engineers who are highly qualified and have experience in similar designs in karst areas.

2001-2003 Groundwater Study

Although the 2001-2003 groundwater study provided information that supported the selected remedy, the OIG expert indicated the draft report did not fully address the data collected. The 2003 draft report on the geophysical study stated simply that the "groundwater flow in the South parcel is to the southwest toward the Anclote River." The OIG expert's review of this study concluded that the groundwater flow is much more complex than the 2003 draft study report would suggest. The lower water-level in the well near the northeast corner may indicate that the paleocollapse features are influencing the groundwater flow in that area. This influence is such that the local flow is sometimes opposite the overall southwesterly flow. The draft report did not explain this potential influence of the paleocollapse features. The deficiencies in the draft groundwater report should be addressed in the design phase, with a better understanding of groundwater flow near the paleocollapse feature.

View Toward Northeast Corner
of South Parcel (EPA OIG Photo)

Another question that the OIG expert believed should have been answered in the draft report for the 2001-2003 groundwater study was why there were areas of high contaminant concentration ("hot spots"). According to the OIG expert, if the contaminants were migrating, there should be elongated areas of contaminants spreading out from the point source (plumes). The OIG expert stated that if no plumes exist, explaining why there are no plumes and only hot spots is critical to understanding the site hydrogeology. EPA Region 4 indicated that it is the nature of the contaminants

involved to bind together with minimal leaching and not to plume. The issue of "hot spots" and plumes should also be clarified in groundwater studies during the design phase.

Summary

According to the OIG expert, the 2003 draft groundwater report did not sufficiently address the site hydrogeology in a comprehensive fashion. However, as long as the understanding of the hydrogeologic framework of the site governs the remedial process and the cautionary recommendations in this report are followed, the remedy can be protective of human health and the environment. The hydrogeologic framework is described in the draft 2003 geophysical report and subsequent comments and responses.

Recommendations

We recommend that the Regional Administrator, Region 4:

1-1. Require his staff and SMC to implement the cautionary recommendations in the draft report of the 2001-2003 geophysical study and obtain expert geotechnical engineering support appropriate for addressing geophysical and groundwater issues in a karst setting for the site during the design phase.

1-2. Require further study of groundwater and collection of necessary data during the design phase to ensure that groundwater characteristics are adequately defined for remedy design.

Agency Comments

The Regional Administrator agreed to implement these recommendations.

2. EPA Oversight

Question: Was EPA Region 4 oversight of the Superfund process at Stauffer Chemical Company adequate?

We concluded that EPA Region 4 appropriately monitored: site activity; early geophysical and groundwater studies; and site contaminant identification. EPA Region 4 Remedial Project Manager (RPM) time and travel related to the site were appropriate given the specific issues at the site. Contractors, representing EPA, oversaw site activities even when EPA personnel were not present.

However, while we consider the monitoring appropriate, we do not consider EPA's decision to delay detailed geophysical and groundwater testing for the remedy until the design phase to be prudent. We do not believe the remedy in the 1998 ROD was adequately supported by early technical testing; EPA should have ensured that the additional technical studies performed in 2001-2003 were completed earlier in the process. Karst, an area of limestone formations that often contain sinkholes, was not discussed in any of the study reports prior to 2000.

Monitoring Site Activity

We compared EPA RPM site activities to Agency requirements and found that the RPMs were meeting these requirements through such activities as:

- site visits;
- coordination with the responsible party and other involved agencies;
- ensuring that required studies were completed; and
- obtaining comments, including public comment, to complete required reports.

We noted that the time charged to the Stauffer Chemical Company Superfund site by the assigned RPMs averaged between 26 and 36 percent of total time available, which is appropriate for RPMs assigned to oversee three or four Superfund sites simultaneously.

Other EPA Region 4 personnel also completed functions related to the Stauffer site, including document review and technical and legal comment and input. In addition to direct EPA Region 4 oversight, we found that EPA Region 4 Superfund contractors were present to oversee some of the SMC site activities, and provided specific EPA support, including completion of the site 1995 Baseline Risk Assessment and a 2000 data gap analysis that identified deficiencies in early geophysical and groundwater testing at the site.

Overall, we concluded that EPA Region 4 was appropriately monitoring the Stauffer site.

Early Geophysical and Groundwater Testing

The remedy presented in the 1998 ROD was based on geophysical and groundwater testing performed in the late 1980s and early 1990s. EPA Region 4 indicated that they had planned to perform more detailed geophysical and groundwater studies during the upcoming remedial design phase. EPA guidance allows flexibility in the depth of studies and timing of studies at Superfund sites, balancing the need to know more with the related costs, so EPA's decision to delay the detailed testing was allowable. However, we do not believe that the EPA decision was prudent, given the known influence of karst processes in Florida, as well as the drinking water source involved in this specific site. More technical testing should have been performed before issuing the 1998 ROD.

The tests performed prior to the ROD narrowly focused on specific issues, such as identifying buried drums. To cover a large area for one geophysical test, the site was laid out in grids, with the grid lines so far apart that only large quantities of drums could have been identified. Background conditions and methodology for this test were not reported. Follow-on studies were more thorough, but were only somewhat effective because complete use of testing methods was not implemented. For example, in one study, neither the inphase nor quadrature phases of appropriate electromagnetic testing was measured; having the information on both phases is important because the relationship of these phases allows a knowledgeable operator to identify if changes in terrain conductivity are due to geologic conditions or the presence of buried metal objects.

The role of karst processes in the site hydrogeology was not recognized until 2000, when an EPA contractor identified data gaps in prior geophysical and groundwater studies performed at the site. The OIG expert noted that the karstic nature of the site should have been integrated into the understanding of the hydrogeologic framework of the site from 1992 onward and the Agency should have identified and corrected the omission of this information. Our expert considered the omission to impact the validity of the early hydrogeologic reports, the ROD, and the remedy selected.

Site Contaminants

Citizens expressed concerns that soil contamination was not being adequately identified at the site. For example, citizens were concerned that EPA had not obtained information letters from the responsible party, as allowed under section 104(e) of the Comprehensive Environmental Response, Compensation, and Liability Act. Consequently, the citizens believed not all information about site contaminants was

obtained. Additional concerns were expressed that contaminants of concern were improperly eliminated from consideration.

Although EPA did not require the responsible party to submit section 104(e) information letters, the contaminants of concern were identified. The responsible party, SMC, was cooperating with EPA Region 4, and the information that the letters contain (including potential contaminants) had already been provided to EPA Region 4. Testing, sampling, and screening processes were also conducted to identify potential contaminants of concern. Our review of reports and other information related to the sampling, testing, and screening found that appropriate processes were followed to determine contaminants to remediate.

Groundwater

EPA usually gives priority to the most critically needed cleanup work at a site, and it is not uncommon for EPA to address large and complicated sites by breaking the work into smaller units (operable units). EPA decided for Stauffer to clean up soil contamination first (OU1) and then address groundwater contamination (OU2). It is appropriate to address the contamination source first, to prevent leaching of soil contaminants into groundwater, and to address groundwater separately through OU2 was allowable and reasonable. However, the OU1 delay postponed activity related to OU2. Further, the OIG expert stated that addressing OU2 earlier in the process might have provided an understanding of the relationship between the surficial and Floridan aquifers, part of the site hydrogeology that is critical information for OU1. We believe this concern is another indication that the groundwater studies performed were not adequate. Determination of groundwater issues should be a higher priority when the site characterization indicates a karst topography and drinking water sources are potentially affected.

Recommendation

2-1. We recommend that the Regional Administrator, Region 4, require that any future Remedial Investigation/Feasibility Study in known karst areas, especially if drinking water sources are potentially affected, should include geophysical and related groundwater studies for karst.

Agency Comments

The Regional Administrator agreed to implement this recommendation.

3. Community Involvement

Question: Why is part of the community opposed to the selected remedy?

Although Region 4 generally met community involvement requirements, a segment of the community was dissatisfied with the EPA efforts and the remedy selected in the ROD. Some community members believed Region 4 had failed to be open and frank in discussions, and did not take community concerns seriously. We found that, in several instances, Region 4 did not promptly address community concerns. As a result, some community members were skeptical about EPA's decisions, particularly concerning the remedy selected. The Agency requires no formal public participation during the remedy design phase, so community members doubted their remaining concerns would be addressed. We believe it is important for Region 4 to continue to involve the community during the design phase.

Region 4 Generally Met Requirements for Community Involvement

One of the goals of the Superfund program is to promote public involvement that is informed, reasonable, thoughtful, solution-oriented, and collaborative. Both law and EPA guidance have requirements pertaining to community involvement in activities at a Superfund site, and Region 4 generally complied with these requirements. Specifically, Region 4:

- Developed a community relations plan in January 1993.
- Conducted public meetings when starting the remedial investigation, proposing the remedy, and issuing the ROD.
- Issued fact sheets and paid for advertisements for the above significant events.
- Maintained an information repository, including an Administrative Record, at the Tarpon Springs Public Library.
- Kept numerous records of public participation and public comments.
- Funded a technical advisory group through an EPA grant as a vehicle for public understanding and participation.
- Invited technical experts representing various organizations to comment on several recent work plans and reports.

Community Expected More From Region 4

According to correspondence between EPA and selected individuals living near the site, some residents believed EPA officials did a poor job, both technically and in communicating with them. These residents indicated problems included: withholding

information, not responding promptly, and not addressing their concerns (such as slag and asbestos). A segment of the community may be influenced by their disagreement with the selected remedy (i.e., they want all of the waste hauled away, which EPA believes would pose a greater threat and cost significantly more). In this case, there was no indication that EPA withheld information from the community, although there did seem to be a pattern of delays in addressing concerns. Details follow.

Information Flow

EPA held public meetings mandated by law. Additionally as required, in March 1993, EPA set up an information repository at a public library near the site, and released a flyer providing its location. This repository included the Administrative Record, as well as other documents relevant to any cleanup decisions made by EPA. A review of the Administrative Record indicated that it included key documents, such as the remedial investigation report, feasibility study, record of decision, and explanations of significant differences. These documents were generally put in the repository promptly, in some cases within a few days. Thus, Region 4 did not appear to withhold information.

Response to Questions and Concerns

Community members complained several times, especially before 1998, about EPA not promptly responding to their questions and concerns. For example, in a letter dated August 1997 to EPA Administrator Browner, a resident asked EPA to replace the RPM, in part, because of communication problems:

> *The community's right to know about a Superfund site is not being met. There has been no improvement in the flow of information since our last letter to you. Generally, questions are still being ignored - not only our questions, but other members of the community.*

We found that there was a basis for the community's concern about the delays in communication. We reviewed correspondence in the site file related to 25 written inquiries from the author of the above letter. As shown in the box on the following page, the Agency did not always respond promptly to the inquiries.

Days Between Inquiry and EPA Response

Elapsed Days	Number of Inquiries	Comments
Unknown	6	The elapsed days for these six inquiries could not be determined because either the original request or the Agency response was not in the file.
0-31 Days	9	We considered these to be timely responses.
Over 31 Days	10	The Agency responses were from 44 to 134 days after the inquiry.
	25	

Addressing Concerns

On numerous occasions, community members criticized EPA's investigation of the site. Two issues on which they expressed particular concern were off-site slag and asbestos on the site. In both cases, citizens said they told EPA about the problem, but EPA did not address the issue (i.e., EPA did not listen to them). Documentation in the site files supported that EPA knew about slag from the beginning, but not about the asbestos. In neither case did the contamination require remediation under Superfund.

Slag: During a May 1987 site visit, EPA learned that slag from the plant was sold and used in railroad ballast and road building. Also, radiation readings taken during the visit showed elevated levels of radiation in the slag pit area. The September 1988 report on the expanded site investigation noted "Slag was . . . crushed and sold as construction material"; a 1989 letter from a community member pointed out to Region 4 that slag was "incorporated in road and construction materials all around"; and another local resident said the RPM was told about the off-site slag problem on several occasions. However, the resident said that because representatives of the responsible party denied it, EPA did nothing.

Following the May 1996 public meeting on the proposed remedy, EPA realized the matter was an issue that needed to be addressed. Initially, EPA let a State agency do so, but there were complaints from community members about State efforts. About April 1998, EPA decided to test some of the off-site slag to determine whether it presented a health problem, and in July 1998 collected samples of off-site slag. At a January 1999 public meeting, representatives of EPA and the Agency for Toxic Substances and Disease Registry (ATSDR) discussed the results. ATSDR concluded that there was currently no general health hazard posed by the off-site slag, although

some members of the public believed there was not enough testing to support this conclusion.

Asbestos: Asbestos was reportedly used to insulate various process units at the Tarpon Springs plant and was stored in bulk on the site. Thus, the site soil may have been contaminated with residual asbestos fibers, which can cause significant health problems if inhaled. EPA did not test for asbestos in the soil during the early studies of the site; asbestos was not on the target list of inorganic substances for which EPA would usually test. The first document we found in the site file indicating asbestos may be a problem concerned a public meeting in December 1996. At this meeting, EPA officials learned that in 1987 an employee of Stauffer Chemical Company contracted a debilitating lung disease from asbestos at the plant. Although EPA intended to wait and test for asbestos before removing the soil, SMC tested the soil for asbestos in 1997 and 1998 as part of the soil/slag leachability study and site-wide sampling for asbestos. The results showed that asbestos was not a significant or widespread contaminant at the site. However, EPA identified asbestos as a contaminant of concern in the July 1998 ROD.

Summary

We concluded that local citizens and citizen groups wanted to be involved in the Superfund activities, and Region 4 took positive steps to involve them. However, EPA did not always promptly address community questions and concerns. Regarding both off-site slag and asbestos, EPA delayed taking action (although SMC did not). As discussed in section 2 concerning geophysical and groundwater testing, EPA guidance allows flexibility in the depth and timing of studies at a site. For the Stauffer site, EPA indicated it intended to do asbestos testing and further geophysical testing during a later phase. However, SMC completed the asbestos testing before the ROD. EPA amended the consent decree to include geophysical studies during the remedial design phase. Some local citizens were skeptical that EPA would actually implement the geophysical testing properly. We believe the EPA delays in performing the off-site slag, asbestos, and geophysical studies, especially to the level envisioned by concerned citizens, upset some of the local citizens, many of whom are opposed to leaving the contaminants on the site. Although EPA may never be able to reconcile them to the selected remedy, good community involvement can be achieved without unanimous agreement on remedy selection.

We believe continued citizen involvement will help ensure that the design phase of the cleanup is carried out in the best possible way. Although the requirements do not specify much community involvement during the design phase, EPA should nonetheless ensure that community involvement continues, and it should document such intention.

Recommendation

3-1 We recommend that the Regional Administrator, Region 4, require staff to revise the January 1993 community relations plan to include (a) visits to the site by the remedial project manager and other appropriate Region 4 staff during the design phase so that they are available to personally interact with the local citizens, and (b) specific steps to periodically obtain community input on design documents.

Agency Comments

The Regional Administrator has agreed to implement this recommendation.

Appendix A

Report of OIG Expert

Evaluation of Geophysical and Hydrogeologic Studies Conducted on the Stauffer Chemical Company Superfund Site near Tarpon Springs, Florida

Prepared for

U. S. Environmental Protection Agency
Office of Inspector General

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March 2004

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Lois D. George, Florida PG # 619

PELA Reference Number 659200

Introduction

P.E. LaMoreaux & Associates, Inc. (PELA) has been contracted to provide an independent assessment, verbally and in writing, of whether (a) the Stauffer-Tarpon Springs Superfund site was properly characterized before the remedy was selected and whether (b) the Additional Studies provide reasonable assurance that the remedy, as planned, will provide long-term effectiveness. This work is being performed under Contract Number GS00K97AFD2162, Order Number 11CVT681010, A&T Project Number 1400-031.

The basis of PELA's assessment is a detailed review of previous investigations and geophysical studies by various consultants (both prior to and subsequent to the Record of Decision [ROD], July 1998) as provided by the Office of Inspector General (OIG)of the US Environmental Protection Agency (EPA), including the current studies by Parsons Engineering Science, Inc. and O'Brien and Gere Engineers, Inc. & Technos, Inc.1, and a site visit (August 13, 2003), attendance at two Technical Review Committee meetings (August 14 and October 22, 2003), a meeting on September 15, 2003 with Lynn Yuhr, a geophysicist with Technos, Inc., independent background research, and the personal expertise of PELA's staff. The previous studies by various consultants, as provided to PELA by the EPA OIG, will collectively be referred to as "the Record."

The specific subtasks or items to be assessed are provided below, in bold. Each is directly followed by PELA's evaluation/opinions.

TASK ONE: Whether testing done and studies conducted prior to Superfund site clean-up remedy selection were both effective and timely enough to characterize the site, especially considering hydrogeologic considerations.

In Chapter 3 of **Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA** (October 1988; referred to herein as simply "the Guidance") the components of the site characterization process and relevant field investigation methods are described. By definition, the site characterization process provides the information needed to determine the extent and scope of a specific contamination problem and to adequately design remediation strategies.

An important component of site characterization is the investigation of the site's physical features (Section 3.2.2), including surface features, geology, and hydrogeology. Determination of the site hydrogeology (Section 3.2.2.5) involves identifying geologic characteristics, hydraulic properties and ground-water use. Further definition is provided in accompanying tables in the Guidance, including:

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1 Technically, the Geophysical Studies report, 2003, was prepared by O'Brien and Gere Engineers, Inc., to whom Technos was a subcontractor. O'Brien and Gere Engineers, Inc. is the only firm that is cited on the cover or title page. However, it is obvious to all who attended the Technical Review Meetings, that this report was prepared by Technos under subcontract to O'Brien and Gere, as noted within that report. It appears to be more appropriate to reference this document as being prepared by O'Brien and Gere Engineers, Inc. and Technos, Inc.

Geology of unconsolidated overburden and soil deposits –
- Thickness and areal extent of units
- Lithology; mineralogy
- Particle size and sorting; porosity

Geology of bedrock
- Type of bedrock
- Lithology; petrology
- Structure (folds, faults)
- Discontinuities(joints, fractures, bedding planes, foliation)
- Unusual features such as igneous intrusive bodies (dikes), lava tubes, **or solution cavities in limestone (karst)** [Bold added for emphasis.]

Based on a review of the Record, PELA concludes that the National Contingency Plan (NCP) and the Guidance were acknowledged as authoritative guidance documents in both the EPA comments and in responses by the consultant(s) for the Potentially Responsible Parties (PRPs). This guidance applies to the development of work plans for the Remedial Investigation (RI) and to the reports of previous site work.

Therefore, an understanding of the regional and site geology and hydrogeology should have been incorporated into all comprehensive reports, although this general framework need not have been mentioned in specialized reports such as tabulations of analytical results or reports specifically focused on one aspect of the problem—such as the possible existence of buried drums. Moreover, as demonstrated by the current (2003) report by O'Brien and Gere Engineers, Inc. & Technos, Inc., geophysical technology could have been used to great advantage to document the hydrogeologic framework of the site between the widely-spaced data from borings.

Initial geophysical investigations were conducted by Delta (1986), and subsequently by NUS (1988a) and Weston (1990). In these investigations, the geophysics was directed at answering two questions: (1) Was there a large cache of metal drums on site, and (2) Was there a contaminant plume. Although the Delta investigation used technology that was then appropriate for the state-of-practice, the report did not explain any background conditions, methodology, or methods of interpretation. There was no discussion of how "noise" was eliminated or why the data they recorded were valid. A large volume of magnetometer data was included in an appendix, but no explanation or column headers were included, making the data difficult to evaluate. In Delta's discussion of the methodology of the magnetometry, survey consideration should have been given to the spacing of the grid lines. The density of readings along the traverse should be related to the wavelength of anomalies of interest such that several readings are obtained for any such anomaly. A trial line with relatively dense stations is usually attempted first to determine the required station density. In the report it is stated that the local 60' grid was measured at 30' intervals. This is such a coarse grid spacing that only very large quantities of barrels spread over a broad area might be detected. However, Delta did cover a large area with their investigation.

Presentation of Delta's magnetic data should have included several profiles to show the variation from a magnetically quiet area to an area of anomalous activity. Effective interpretation requires profiles which preserve all the detail of the original readings, and contour maps which allow trends and patterns to be identified. The plotting by Delta of only high, medium, and low anomalies is a subjective process and does not allow the reader to see and interpret the data in intermediate areas. Also, there was no discussion of the potential depth of the identified anomaly areas, which could have been interpreted based on the characteristics of the anomaly wavelength.

Further, Delta performed only 6 vertical electrical sounding (VES) resistivity surveys, with somewhat inconclusive results and a lack of discussion or correlation to magnetic data. Of the five times that "possible sludge material" is noted as layer 1 of the interpretation, three times the resistivity is below 50 ohm meters, and in the subsequent two times it is above 100 ohm meters with no explanation of the change. Also NUS (1988a) and O'Brien and Gere Engineers, Inc. & Technos, Inc. (2003) both state that the surface layer is extremely resistive, which affects the accuracy of the data. However, the site conditions at the time of Delta's investigation are unknown.

Using the Delta interpretation as a starting point, NUS (1988a) provided a more complete and technical report, which adequately described methodology and interpretation. NUS confirmed the location of subsurface metallic materials in three areas where drum disposal was suspected, based on magnetometer and EM (electromagnetic) data, but did not measure both the inphase and quadrature phase of the EM-31 signal. The relationship of these phases allows a knowledgeable operator to determine if a change in the bulk terrain conductivity is from a change in subsurface geologic conditions or the presence of buried metallic objects. The very coarse data grid used by NUS introduced an inherent bias into the data in which almost all "bull's-eye" anomalies correlate to only one data point. NUS also determined that the saltwater encroachment into the surficial aquifer would mask any conductivity variations possibly caused by a contaminant plume, a conclusion which would not actually have required any field work. Thus, these investigations using magnetometer and EM data were somewhat effective, but in a limited capacity.

The **Site Sampling Report** (Roy F. Weston, Inc., 1990) used EM and magnetic gradiometry to attempt to locate a buried off-take duct and a roaster barrel. This is the most technically complete and useful of the three geophysical studies conducted prior to the issuance of the ROD (1998) and the current geophysical report by O'Brien and Gere Engineers, Inc. & Technos, Inc. (2003). Accurate field methods were demonstrated by conducting a control grid to define background conditions, and by establishing a base station to record diurnal variations. Appropriate use of technology was demonstrated by measuring and recording both inphase and quadrature phase components of the EM-31 data. The quadrature phase is related to the bulk conductivity of the subsurface. It is influenced by soil type, the amount of soil moisture, the conductivity of the soil moisture, and the presence of metal. The inphase portion of the induced signal is influenced primarily by the presence of metal. This combination of responses allows the geophysicist to separate the influence of

various objects. However, Weston did not address the quadrature EM data; in their report there was no discussion and no diagram.

In general, the application of geophysics to the Stauffer site prior to the ROD exhibits a number of shortcomings.

1. From the beginning there should have been an integrated approach between hydrogeology and geophysics, using geophysics to refine characterization of the hydrologic framework. Geophysics was used primarily as a metal detector.

2. While boreholes were being installed to study the ground water, geophysical logs would have been helpful to provide a more comprehensive understanding of the subsurface strata. As shown later, by O'Brien and Gere Engineers, Inc. & Technos, Inc. (2003), geophysical logs could be used to verify the presence and thickness of the semi-confining layer (SCL).

3. Geophysical investigations should have been expanded to include background areas that were not impacted by construction, burial, or contamination, so that a comparison could be made.

4. Much of the early geophysical data did not provide adequate coverage—the grid was too coarse (e.g., a 30'x60' grid for detecting drums).

The site hydrogeology is a specific subset of the regional hydrogeologic framework. The hydrogeology in West-Central Florida has been modified by the development of karst which is common to the Tertiary aquifers developed around the Gulf of Mexico, from Florida to Yucatan and including the Caribbean islands (Beck, 1986b). The detailed understanding of the impact of karst development on the hydrogeologic framework in Florida began to be common professional knowledge in the 1980's with the meetings and publications of the Florida Sinkhole Research Institute at the University of Central Florida. The Florida Sinkhole Research Institute was established in 1983 and began conferences in 1984. The Institute was an authoritative source for accumulating and clearing information through the time it was dissolved for lack of funding in 1992. During the 1980's the USGS also issued numerous publications documenting the karstic nature of this area of Florida, as did the State Geological Survey (Table 1).

Earlier publications, such as **Ground Water Resources of Pinellas County, Florida** (Heath and Smith, 1954) did not include the role of karst processes in their understanding of the hydrogeologic framework in this area. As late as 1974, Cherry and Brown, in a published evaluation of the hydrogeology of a sanitary landfill site near Tampa Bay, did not mention the impact of karst on the potential for pollution of the Floridan Aquifer.

Table I **A Selection of References to Karst in West-Central Florida** **Published Prior To and Including 1993.**
Sinclair, W.C. and Stewart, J.W., 1985. Sinkhole Type, Development, and Distribution in Florida: U.S. Geological Survey, Map Series No. 110
Sinclair, William C., Stewart, J.W., Knutilla, R.L., Gilboy, A.E. and Miller, R.L., 1985, Types, Features, and Occurrence of Sinkholes in the Karst of West-Central Florida, Water Resources Investigation Report 85-4126, U.S. Geological Survey, Tallahassee, Florida., 81 p.
Beck, Barry F., 1986, A Generalized Genetic Framework for the Development of Sinkholes and Karst in Florida, U.S.A.: Environ Geol Water Sci. Vol. 8, Nos. 1/2, p. 5-18.
Beck, Barry F., 1986, Ground Water Monitoring Considerations in Karst on Young Limestones: Proceedings of the Environmental Problems in Karst Terranes and Their Solutions Conference, Oct. 28-30, 1986, Bowling Green, KY, National Well Water Association, Dublin, Ohio. p. 229-247
Lane, Ed, 1986, Karst in Florida, Special Publication No. 29, State of Florida, Dept. of Nat. Res., Div. of Resource Mgmnt., Bureau of Geology, Tallahassee, Florida. 86 p.
Beck, Barry F. and Wilson, William L., 1987, The Karst Hydrogeology of the Central West Coast of Florida and some Associated Engineering Techniques: Report No. 86-87-1, Florida Sinkhole Research Institute, University of Central Florida, Orlando, 79 p.
Trommer, John T., 1987, Potential for Pollution of the Upper Floridan Aquifer from Five Sinkholes and an Internally Drained Basin in West-Central Florida: Water Resources Investigation Report 87-4013, U.S. Geological Survey, Tallahassee, Florida., 103 p.
Beck, Barry F., and Jenkins, Dwight T., 1988, Potential for Groundwater Pollution of the Floridan Aquifer, Based Upon Surficial Drainage, Karst Development, and Overburden Characteristics: Map Series 87-88-1, Florida Sinkhole Research Institute, University of Central Florida, Orlando, 6 p.
Beck, Barry F., Bloomberg, Diane, Trommer, John T., and McDonald, Kathleen, 1989, A Field Guide to Some Illustrative Karst Features in the Tampa Area, Hillsborough County, Florida: Report No. 89-90-1, Florida Sinkhole Research Institute, University of Central Florida, Orlando, 60 p.
Beck, Barry F., and Sayed, Sayed, 1991, The Sinkhole Hazard in Pinellas County: A Geologic Summary for Planning Purposes: Report No. 90-91-1, Florida Sinkhole Research Institute, University of Central Florida, Orlando, 58 p. plus appendix. Distributed by Pinellas County, Florida.
Frank, Edward F. and Beck, Barry F., 1991, An Analysis of the Cause of Subsidence Damage in the Dunedin, Florida Area 1990/1991: Florida Sinkhole Research Institute, University of Central Florida, Orlando, 60 p.
Trommer, John T., 1992, Effects of Effluent Spray Irrigation and Sludge Disposal on Ground Water in a Karst Region, Northwest Pinellas County, Florida: Water Resources Investigation Report 91-4181, U.S. Geological Survey, Tallahassee, Florida., 32 p.
Barr, G.L., 1993, Application of Ground-Penetrating Radar Methods in Determining Hydrogeologic Conditions in a Karst Area, West-Central Florida: Water Resources Investigation Report 92-4141, U.S. Geological Survey, Tallahassee, Florida., 26 p.

However, by the late 1980's and early 1990's the role of karst was part of the state-of-practice in hydrogeology in Florida. See, for instance, the 1987 USGS publication **Potential for Pollution of the Upper Floridan Aquifer from Five Sinkholes and an Internally Drained Basin in West-Central Florida**, Water-Resources Investigation Report 87-4013 by John Trommer, wherein it states with reference to the semi-confining layer in the Summary and Conclusions (p. 99) "A clay layer, ranging from about 1 foot to 100 feet in thickness, **is often discontinuous, or breached by relict sinks in many places at all the sites**." (Bold added for emphasis.) Trommer (1992) in reporting on a site close to the Stauffer site with a similar semi-confining layer, illustrates the interconnection of the Surficial and Floridan Aquifers via karst features (see Figure 1 herein) and states, "…the residuum is breached in many places, allowing good hydraulic connection to the underlying limestone." (p. 11.)

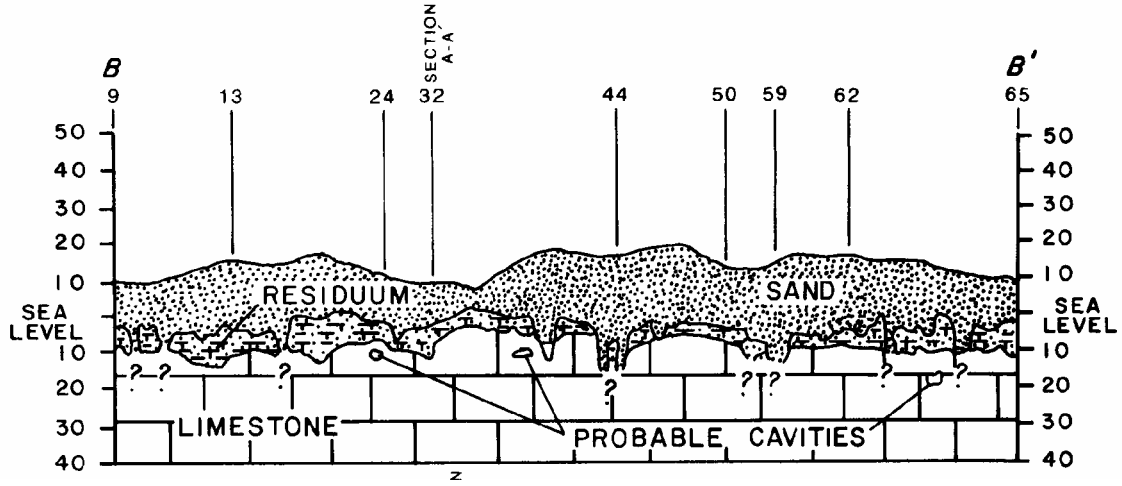

Figure 1: Cross-section of the surficial aquifer, the semi-confining layer (residuum), and the Floridan Aquifer in northwest Pinellas County near Wall Spring showing the discontinuous nature of the residuum and the common presence of karstic "shafts" connecting the surficial and Floridan aquifers. From Trommer (1992, Figure 5.) The orientation of the section is approximately N-S, with B' to the North, and the width of the entire cross-section is approximately one mile.

At the Stauffer site the occurrence of karst and the role of karst processes in the site hydrogeology was not mentioned in the Record until after completion of the Feasibility Study and issuance of the ROD (1998). The first reference to the karstic nature of the site appearing in the Record is Black & Veatch, 2000, which was written under contract to EPA.

The karstic nature of the site impacts the potential for pollution of the Floridan Aquifer because karstic features commonly breach the SCL. Moreover, it complicates the remedial design because of the potential for ground collapse or subsidence. The Record shows that none of the reports written until 2000 mentioned the karstic nature of the site, including the ROD (1998). This is a technical omission which impacts the validity of the hydrogeologic reports, the ROD, and the remedial selection. The karstic nature of the site should have been integrated into the understanding of the hydrogeologic framework from at least 1992 onward. By 1992, numerous reports that documented the karst setting of the region had been published and were publicly

available (see Table 1). Moreover, this shortcoming should have been detected and corrected in the technical review process.

A specific shortcoming in the site studies is that the interpretation of the ground-water flow on site has been generalized and does not reflect the actual field data. Beginning with Seaburn and Robertson (1987) and continuing though Parsons, 2003, the reports have consistently said "the net ground-water flow direction at the site, in both aquifers, is to the southwest toward the Anclote River" (Seaburn and Robertson, 1987, p. 28) or some variation of that statement. However, the water-level data from the site, even historically (Seaburn, 1987 in Figures 10 and 11 and Weston, 1993, in Figures 4-8, 4-10 and 4-11), indicated a change in gradient over a significant area of the site. The spacing and orientation of the contours changes dramatically. The water-level data points were too widely spaced, the number of well nests limited, and further investigation was warranted. Supplemental wells (Additional Studies) have been recently installed and similar variations in gradient and also direction continue to be documented (Parsons, 2003, in Figures 6, 7, 8, 9, 10, 11, 14, 15, 16, 17, 18, 19, and 23 and diagrams provided at the Technical Review Committee meeting [October 22, 2003]). However, consultants for the PRP (Parsons, 2003, p. 3-5) report their generalized interpretation as "the ground-water flow direction in the South Parcel consistently is to the southwest towards the Anclote River."

For some water-level plots, the generalized depiction of ground-water flow was contradictory to the data and incorrect at specific locations. As an example supporting this statement, follow this discussion on Figure 2 herein (an unmodified copy of a portion of Figure 6, Parsons, 2003). The black arrow in the center of the site indicates ground-water flow to the southwest. Well MW 93-4 (located generally southwest of the arrow-head on the figure) indicates a ground-water level of 3.73 feet above sea level. Well MW 93-2 (generally northeast of the arrow end) indicates a ground-water level of 3.58 feet above sea level, lower than at well MW-93. Because water flows downslope, that arrow should be generally opposite to its orientation on Parson's figure.

While some generalization of water-table contours is common, the generalization shown in Figure 2 does not consider important details and thus makes the interpretation of the flow locally incorrect. When all the data points are interpreted together, the arrow showing the flow direction would be generally opposite to its current orientation, pointing approximately northeast, and the flow net would be more complicated than shown. If a more detailed flow net was drawn on Figure 2, there would be a large area with ground water flowing toward well MW 93-2 and sinking there. This data may be indicative of the interconnection between the surficial aquifer and the Floridan aquifer at the paleokarst collapse feature later identified by O'Brien and Gere Engineers, Inc. & Technos, Inc. (2003) near MW 93-2. A detailed interpretation and discussion of the shallow water table data, as explained for Figure 2, has not been presented to date.

In comments on the recent ground-water study (Parsons, 2003) the Pinellas County Health Department stated "This report was less than adequate in collecting sufficient groundwater elevation data in the pond and process areas to estimate the vertical and lateral hydraulic gradients of the surficial and Upper Floridan aquifers" and "This report was less than adequate in documenting the potential for cross-connection

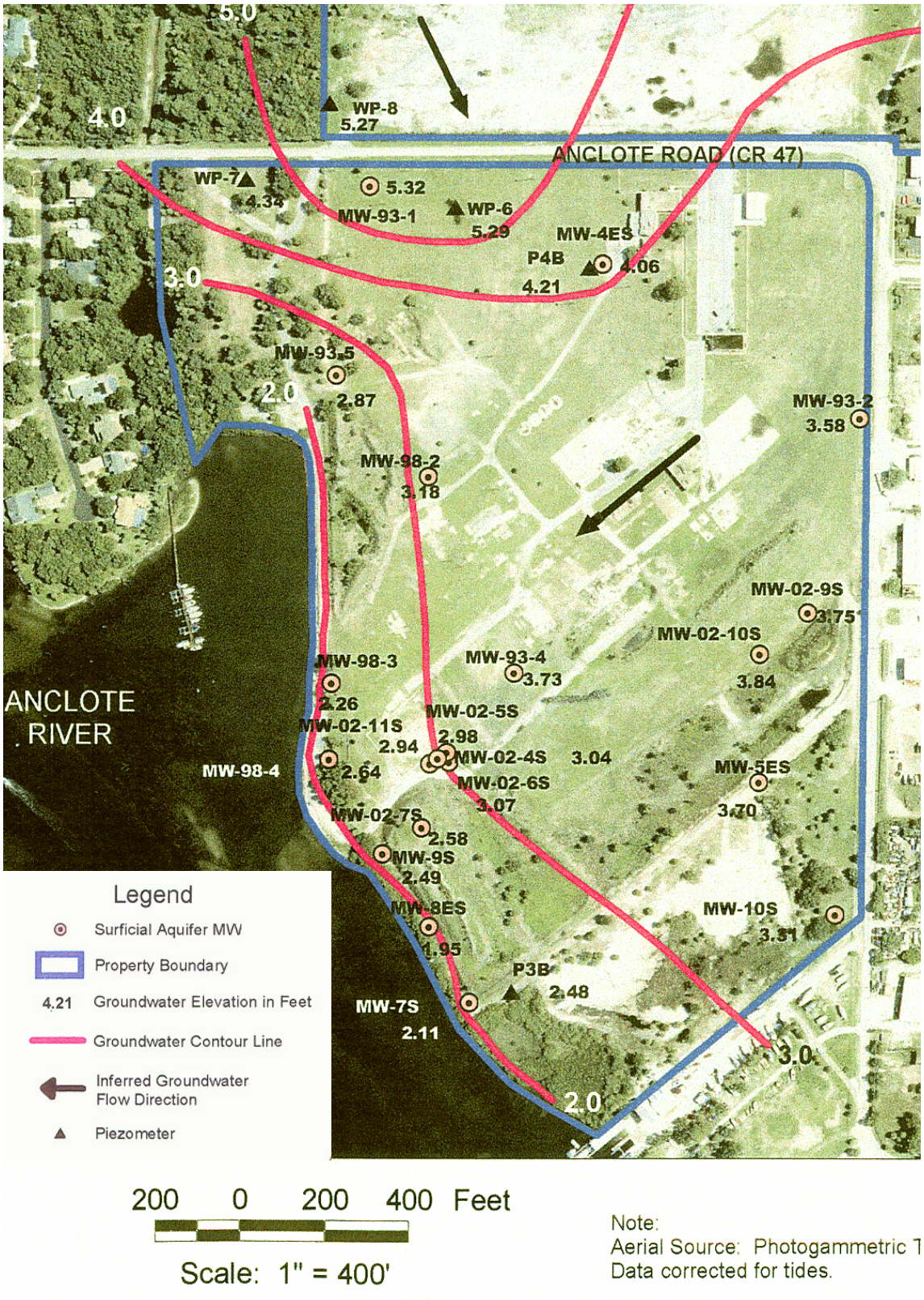

Figure 2: A portion of Parsons' Figure 6 (2003). North is toward the top of the diagram.

between the surficial and Upper Floridan aquifers." In the **Response to Comments, Pinellas County Health Department-July 22, 2003, Ground-water Studies Report** by Parsons Engineering Science, Inc., page 1, regarding ground-water elevation data, Parsons responds "This frequency of water level measurements was sufficient to estimate ground-water flow direction and gradients at the site." Throughout these responses Parsons states that the contaminant concentration data and the ground-water elevation data are adequate to define the flow system and the interconnection between the shallow and deep aquifers. Whether or not the data itself is adequate, no *detailed* flow net analysis has been completed to define the flow pattern relative to a potential interconnection between the surficial and Floridan aquifers. If a *detailed* flow pattern were plotted on the water table data shown in Figure 2 (Parson's data from Figure 6, 2003) it would define a sinking point indicating interconnection between the aquifers.

The ROD for the Stauffer site defines two operable units, OU-1 and OU-2, as follows. "This is the first of two operable units planned for the Site. This operable unit addresses the source of the soil and ground-water contamination by treating and containing the source material. The second operable unit will address the contaminated ground water in the surficial aquifer." (ROD, 1998, Declaration, p. 1). During the Superfund process it is not uncommon for operable units to be established, studied separately, addressed in distinct documents, and then to be remediated individually. However, it appears that in this case, after the separate operable units were "established," OU-2 was not addressed further. The extent of contaminants in ground water is not well defined, and the interrelationship of the surficial aquifer and Floridan aquifer in the vicinity of the paleokarst feature is not defined/understood. The density of sampling points (wells) is too coarse to detect and delineate a small plume. However, water samples from the surficial aquifer could be collected by direct push methods without incurring the cost of additional well construction. It is noted that the occurrence of constituents of concern appears in "hot spots" rather than plumes. If there is migration of these constituents, there should be a plume or plumes. If, as noted, no plume exists, then it is a critical part of understanding the site hydrogeology to explain why there is no plume.

In summary, the question at hand is "Whether testing done and studies conducted prior to Superfund site clean-up remedy selection were both effective and timely enough to characterize the site, especially considering hydrogeologic considerations." PELA's comments are briefly summarized below.

1. A thorough description and understanding of the regional and site geology and hydrogeology should have been incorporated into all comprehensive reports. Hydrogeologic characterization prior to Black and Veatch (2000) was not adequate.

2. Geophysics should have been used to supplement the understanding of the site hydrogeology, including measurement of geophysical logs for the monitoring wells. Prior to the report of O'Brien and Gere Engineers, Inc. &

Technos, Inc. (2003) geophysical technology was utilized largely as a metal detector.

3. The karstic nature of the site could have a major impact on contaminant migration and the design of the remedy. It was not addressed until Black and Veatch (2000). It should have been an integral part of the understanding of the site hydrogeology, at least from 1992 onward.

4. A detailed interpretation of the surficial ground-water flow pattern and the relationship between the surficial aquifer and the Floridan Aquifer was not made in a timely fashion, and has not been made to date.

5. The migration of contaminants in the ground water (OU2) has not been adequately studied and considered.

TASK TWO: Whether the Additional Studies, chiefly the ground-water and geophysical studies, adequately demonstrate the remedy will be protective of human health and the environment and alleviate, as far as is technically practicable, the pre-eminent concerns of local stakeholders, citizens, and citizen groups.

The **Additional Studies** have provided the necessary information on the site hydrogeology. The geophysical investigations and subsequent interpretations by O'Brien and Gere Engineers, Inc. & Technos, Inc. are more comprehensive, better documented, and more detailed than the recent site work and interpretation by Parsons, even with respect to the hydrogeologic setting of the site. Parsons (2003) has not addressed the ground-water flow in the shallow aquifer in sufficient detail regarding direction of movement and the relationship of the surficial and Floridan aquifers, as described above in Task One comments. Moreover, the hydrogeologic report does not address numerous other questions that the data raises: for example, (1) What happened to the 900 drums of roaster fines, (2) Why were contaminants detected across the river initially but are not any longer, and (3) Why are there only hot spots and no plumes? In general, if later data on the extent of contamination contradicts earlier data, there should be an explanation. O'Brien and Gere Engineers, Inc. & Technos, Inc. (2003) have identified the critical components of the site hydrogeologic framework through their geophysical studies. Parsons (2003 and comments) has not integrated the findings from O'Brien and Gere Engineers, Inc. & Technos, Inc. (2003) fully into their understanding of the hydrogeology and has not sufficiently addressed the site hydrogeology in a comprehensive conceptual fashion.

However, as long as the understanding of the hydrogeologic framework of the site, as described in O'Brien and Gere Engineers, Inc. & Technos, Inc. (2003) and subsequent comments and responses, governs the remedial process, and if the recommendations of the current geophysical report are followed, then the remedy can be protective of human health and the environment. The remedial design should alleviate, as far as is technically practicable, the concerns of local stakeholders, citizens, and citizen groups. However, remedial activities must not result in a breach of

the SCL and should avoid the paleocollapse area, as defined by O'Brien and Gere Engineers, Inc. & Technos, Inc. (2003).

PELA agrees, in concept, that the information now available is adequate for the remedial design and to protect human health and the environment, although the understanding of the ground-water flow system should be expanded and refined. However, the final remedial design should be prepared by specialized engineers qualified and experienced in similar designs **in karst settings.** Further, the remedial design should address variations in the depth and thickness of the SCL, setbacks from the paleokarst feature, the potential for ground settlement, adequate monitoring and control of ground-water flow and the potential for induced settlement during construction and any dewatering. As long as the remedial action solidifies the contaminants into a non-leachable solid with a long life-span, whether it is one large mass or broken into smaller pieces, then the process should be protective of human health and the environment.

TASK THREE: Whether the planned remedy of in situ solidification and mounding and capping will protect human health and the environment and be effective in the long term, taking into consideration all we (EPA) know about potential dangers such as: karst formations: sink hole potential; severe weather events like hurricanes; and the proximity of the Floridan ground-water/drinking water source, tidal forces, and drought and urbanization influences.

PELA concurs that the conceptual design of the remedy should be effective, within the limits of their expertise as geologists/hydrogeologists, not engineers. However, the design at this stage is only a concept. The specific engineering design of the remedy must be prepared by a qualified engineering firm that is experienced in similar designs in karst settings. The detailed remedial design must take into account the karstic nature of the site with respect to both ground-water flow and structural stability. Ample evidence should be provided that the final *in-situ* solid resulting from this process will be stable and not leach contaminants, whether it is in one large mass, or smaller pieces. If, as was discussed during one of the Technical Review Committee meetings, the remedial process may produce a granular mass resembling dry granola, then it must be amply demonstrated that these particles, even if they have subsided downward into voids in the Floridan Aquifer or if they are uncovered by a hurricane and transported in seawater, will not leach or weather at a rate that will be deleterious to human health or the environment.

TASK FOUR: Whether the Additional studies, segments of them and/or prior studies should have been conducted earlier (prior to when they were conducted), differently, and/or better, taking into consideration the Superfund criteria and technology of the "day".

The efforts and comprehensive objectives of the Additional Studies should have been undertaken prior to the ROD or at least as part of the Remedial Investigation

phase. The Additional Studies are not "too" late, but they are unnecessarily late. It is a credit that the need for the Additional Studies was realized.

The review and comment period, based on the Record, occurred starting in 1991 continuing through January 1993. The reviews of the plans and previous investigations were completed by various EPA scientists and representatives of NOAA. Geophysical techniques were discussed only in very limited comments, the responses to which indicated that the investigations to that date (Delta, NUS and Weston) had been for specific areas and were not successful because of "anthropogenic interference," such as underground utility lines, construction debris, existing plant operations or metal bearing rock.. As discussed in other portions of this report, the Additional Studies recently completed were multi-technique, comprehensive and conclusive. The need for such studies should have been recognized during the comment period (1991 through January 1993).

The comments (and subsequent responses) during this specific period were focused primarily on soils, sediments and the compounds to be analyzed—the *mechanics* of completing the tasks and not necessarily the *elements* or the *concept* of the tasks. Comments often addressed the information that was provided in the reports, rather than what information *should* have been provided in the reports. Deficiencies in hydrogeologic information *were* recognized in some of the comments. Additional wells, additional work to establish the direction of ground-water movement, determination of site specific aquifer characteristics based on quantitative data, and a better understanding of the relationship between the surficial and Floridan aquifers and the intervening semi-confining clay layer were all suggested. Note that some of these aspects of hydrogeologic information have still been discussion topics during recent Technical Review Committee meetings in 2003. As described above in the Task 1 comments, some of these issues still have not been thoroughly addressed.

The Remedial Investigation was completed in December 1993. Drafts of the report and any comments and responses issued prior to finalization of the RI Report are not indicated in the Record. Based on review of the Record, from the inception of site investigations and through the Remedial Investigation process, the investigations were most focused on collecting data and evaluating the anthropogenic features of the site, such as process areas, waste ponds, sediments, etc., and the resulting potential impacts to the site. The comprehensive hydrogeologic framework and conceptual model of the site, within which those features and impacts occur and which controls them, was not established from either a regional or a site specific perspective; and there was no recognition of the critical importance of the karstic nature of the site.

The timing and level of effort of the Additional Studies is a unique situation (post-ROD) in that so much investigation has been accomplished recently, after the ROD and remedial selection. Several potentially critical findings, such as the existence of the paleocollapse area, have only recently been documented. The Additional Studies represent up-to-date techniques and methodologies, are generally technically competent, and generally provide an adequate interpretation and reporting of subsurface conditions on the site, although they still do not provide a detailed

interpretation of the shallow ground-water flow and contaminant transport. These studies should have been conducted earlier. These studies should have taken place prior to or in concert with a comprehensive ground-water study. Site characterization using geophysical techniques, as in the current Geophysical Report (O'Brien and Gere Engineers, Inc. & Technos, Inc., 2003), should have been conducted prior to the ROD. However, the investigation should have started with a geophysical reconnaissance of the entire site with one technique, and then been refined using a second, different geophysical technology and possibly a third. Since no single method of measurements will uniquely define subsurface conditions, the combination of measurements and integrated sources of data offers a significantly improved capability to assess subsurface conditions and reduce the uncertainty of the conceptual model. However, the entire site did not need to be investigated using all geophysical methods.

PELA's extensive comments relevant to *Task One*, above, also pertain to this question.

TASK FIVE: Whether the planning, implementation, and any results (briefed, draft, or final) of the Additional Studies and the indirect techniques used are providing an effective means to determine if the planned Superfund site remedy of in situ solidification and mounding and capping will be effective, long-term, and without undue dangerous side effects. The expert must also take into consideration whether acquisition and quality control of the data are adequate, appropriate, and accurate.

Yes, the multiple and overlapping geophysical techniques that have been applied and interpreted during the Additional Studies have provided an effective means of studying the site hydrogeologic framework. The additional nested wells, the analyses of ground water therefrom, and the geophysical logs thereof, have all helped refine the understanding of the site hydrogeology, although not all of the hydrogeologic data has been adequately interpreted regarding the direction of ground-water movement and the relationship of the surficial and Floridan aquifers, as described above in Task One comments. Again, the concept of the remedial technology has been planned, but the detailed remedial design is forthcoming and will require specialized engineering expertise to formulate and implement a detailed design and to monitor that implementation.

TASK SIX: If the proposed remedy is not adequate to protect human health and the environment and/or if its long-term effectiveness is doubtful, and/or its use would endanger the Floridan aquifer's usefulness as a drinking water source for about half of Florida's residents, we (EPA) will need detailed input regarding what would be required to adequately plan an alternative remedy, hydro-geologically.

See Tasks Two, Three and Five, above.

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Agency Response to Draft Report

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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May 21, 2004

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Acting Ombudsman
Office of Congressional and Public Liaison
EPA Office of Inspector General
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1200 Pennsylvania Avenue, N.W.
Washington D.C. 20460

SUBJ: Stauffer Chemical Superfund Site, Tarpon Springs, Florida

Dear Mr. McKechnie:

Thank you for the opportunity to review your draft report concerning community complaints about the Stauffer Chemical Superfund Site in Tarpon Springs, Florida. EPA Region 4 is committed to addressing all of the community's concerns relating to the clean-up of the site, and we welcome your recommendations to help us in this effort.

We have reviewed the draft final report of your investigation, and have the following comment for your consideration:

> Background Section: It is stated that numerous private and municipal wells are located "near the site." The text implies that these wells could be impacted by the site because of their proximity. EPA is not aware of any municipal drinking water wells close enough to be potentially affected by site contaminants. Further, EPA is not aware of any private well that has been contaminated by the site. All of the groundwater studies conducted at the site show that groundwater contamination is limited to areas of contaminant sources. No off-site migration pathways have ever been identified.

We have considered the recommendations outlined in the report and agree to implement them without modification. It is our belief that the additional studies have sufficiently addressed the community concerns regarding site conditions and effectiveness of the selected remedy.

Thank you again for the opportunity to review the report and for your valuable input.

Sincerely,
J. I. Palmer, Jr. /s/
Regional Administrator

Appendix C

Distribution

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