LONGHORN ARMY AMMUNITION PLANT

KARNACK, TEXAS

ADMINISTRATIVE RECORD

VOLUME 9 of 10

1995

Bate Stamp Numbers
016227 - 016327

Prepared for:

Department of the Army
Longhorn Army Ammunition Plant
Marshall, Texas 75671-1059

1995

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
ADMINISTRATIVE RECORD - CHRONOLOGICAL INDEX

VOLUME 9 of 10

1995

E.
Title: Letter - Subject: Agendas for Meetings, Longhorn Army Ammunition Plant
Site(s): General
Location: Longhorn Army Ammunition Plant, Marshall, Texas
Company: Environmental Protection Agency
Author(s): Mr. David Tolbert, Project Manager, Longhorn Army Ammunition Plant
Recipient: Michael A. Moore, RI / FS II Unit, Superfund Investigation Section
Date: October 3, 1995
Bate Stamp: 016227

F.
Title: Letter - Subject: Transmittal of Final Record of Decision and Request for Concurrence Letter for LHAAP Sites 13 & 14 at Longhorn Army Ammunition Plant
Group(s): 3
Site(s): LHAAP-13 Suspected TNT Burial Between Active Landfill And Old Landfill
LHAAP-14 Area 54 Burial Ground
Location: Longhorn Army Ammunition Plant, Marshall, Texas
Agency: Department Of The Army, Longhorn Army Ammunition Plant
Author(s): Darrell W. Chinn, Captain, U.S. Army
Recipient: Executive Director (M-143), Texas Natural Resource Conservation Commission
Date: October 5, 1995
Bate Stamp: 016228

G.
Title: Final Plan - Transmittal of Final Work Plan for the Preliminary Assessment Site Investigations Group No. 5 at Longhorn Army Ammunition Plant, Karnack, Texas
Group(s): 5
Site(s): LHAAP-50 Former Waste Disposal Facility
LHAAP-52 Magazine Washout Area
LHAAP-17 No. 2 Flashing Area / Burning Ground
LHAAP-60 Former Storage Building 411 and 714
LHAAP-63 Burial Pits
Location: Longhorn Army Ammunition Plant, Marshall, Texas
Agency: Department Of The Army, Longhorn Army Ammunition Plant
Author(s): Darrell W. Chinn, Captain, U.S. Army
Recipient: Lisa Marie Price, Remedial Project Manager, Superfund Texas Enforcement
Date: October 5, 1995
Bate Stamp: 016229

H.
Title: Final Plan - Transmittal of Final Work Plan for the Preliminary Assessment Site Investigations Group No. 5 at Longhorn Army Ammunition Plant, Karnack, Texas
Group(s): 5
Site(s): LHAAP-50 Former Waste Disposal Facility
LHAAP-52 Magazine Washout Area
LHAAP-17 No. 2 Flashing Area / Burning Ground
LHAAP-60 Former Storage Building 411 and 714
LHAAP-63 Burial Pits

1995

Location: Longhorn Army Ammunition Plant, Marshall, Texas
Agency: Department Of The Army, Longhorn Army Ammunition Plant
Author(s): Darrell W. Chinn, Captain, U.S. Army
Recipient: Michael A. Moore, RI / FS II Unit, Superfund Investigation Section
Date: October 5, 1995
Bate Stamp: 016230

I. **Title:** Final Plan - Transmittal of Final Work Plan for the Preliminary Assessment Site Investigations Group No. 5 at Longhorn Army Ammunition Plant, Karnack, Texas
Group(s): 5
Site(s): LHAAP-50 Former Waste Disposal Facility
LHAAP-52 Magazine Washout Area
LHAAP-17 No. 2 Flashing Area / Burning Ground
LHAAP-60 Former Storage Building 411 and 714
LHAAP-63 Burial Pits
Location: Longhorn Army Ammunition Plant, Marshall, Texas
Agency: Department Of The Army, Longhorn Army Ammunition Plant
Author(s): Darrell W. Chinn, Captain, U.S. Army
Recipient: Mr. H. L. Jones, Texas Natural Resource Conservation Commission
Date: October 5, 1995
Bate Stamp: 016231

J. **Title:** Letter - Subject: EPA's Transmittal of Comments for Draft Project Work Plans Interim Remedial Action at Landfill Sites 12 and 16
Group(s): Landfill Caps Interim Action
Site(s): LHAAP-12 Active Landfill
LHAAP-16 Old Landfill
Location: Longhorn Army Ammunition Plant, Marshall, Texas
Agency: Department of The Army, Longhorn Army Ammunition Plant
Author(s): Lisa Marie Price, Remedial Project Manager, Superfund Texas Enforcement
Recipient: Mr. David Tolbert, Project Manager, Longhorn Army Ammunition Plant
Date: October 9, 1995
Bate Stamp: 016232 - 016234

K. **Title:** Letter - Subject: Response to EPA's Comments on Design Work Plan Interim Remedial Action at Burning Ground No. 3, Longhorn Army Ammunition Plant
Group(s): Early Interim Action At Burning Ground No. 3
Site(s): LHAAP-18 & LHAAP-24 Burning Ground / Washout Pond & Unlined Evaporation Pond
Location: Longhorn Army Ammunition Plant, Karnack, Texas
Recipient: Mr. David Tolbert, Project Manager, Longhorn Army Ammunition Plant
Agency: Department of The Army, Longhorn Army Ammunition Plant
Author(s): Lisa Price, Remedial Project Manager, Superfund Texas Enforcement
Date: October 9, 1995
Bate Stamp: 016235 - 016238

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
ADMINISTRATIVE RECORD - CHRONOLOGICAL INDEX

VOLUME 9 of 10 (Continued)

1995

L.
Title: Letter - Subject: October 1995 Project Coordinators Meeting
Site(s): General
Location: Longhorn Army Ammunition Plant, Marshall, Texas
Company: Environmental Protection Agency
Author(s): Lisa Price, Remedial Project Manager, Superfund Texas Enforcement
Recipient: Mr. David Tolbert, Project Manager, Longhorn Army Ammunition Plant
Date: October 9, 1995
Bate Stamp: 016239

M.
Title: Letter - Subject: Comments on Army's Responses to TNRCC's Comments on General Work Plan Interim Remedial Action at Burning Ground No. 3, Longhorn Army Ammunition Plant
Group(s): Early Interim Action At Burning Ground No. 3
Site(s): LHAAP-18 & LHAAP-24 Burning Ground / Washout Pond & Unlined Evaporation Pond
Location: Longhorn Army Ammunition Plant, Karnack, Texas
Recipient: Mr. David Tolbert, Project Manager, Longhorn Army Ammunition Plant
Agency: Department of The Army, Longhorn Army Ammunition Plant
Author(s): Michael A. Moore, RI / FS II Unit, Superfund Investigation Section
Date: October 10, 1995
Bate Stamp: 016240-016270

N.
Title: Letter - Subject: Transmittal of Draft Final Site Characterization Summary for the Remedial Investigation for Group 1 Sites for LHAAP in Karnack, Texas
Group(s): 1
Site(s): LHAAP-1 Inert Burning Grounds
LHAAP-11 Suspected TNT Burial Site at Avenues P and Q
LHAAP-27 South Test Area
LHAAP-54 or LHAAP-XX Ground Signal Test Area
Location: Longhorn Army Ammunition Plant, Marshall, Texas
Agency: Department of the Army, LHAAP
Author(s): Darrell W. Chinn, Captain, U.S. Army
Recipient: Ms. Lisa Price, Superfund Enforcement, USEPA
Date: October 16, 1995
Bate Stamp: 016271

O.
Title: Letter - Subject: Transmittal of Draft Final Site Characterization Summary for the Remedial Investigation for Group 1 Sites for LHAAP in Karnack, Texas
Group(s): 1
Site(s): LHAAP-1 Inert Burning Grounds
LHAAP-11 Suspected TNT Burial Site at Avenues P and Q
LHAAP-27 South Test Area
LHAAP-54 or LHAAP-XX Ground Signal Test Area

1995

Location: Longhorn Army Ammunition Plant, Marshall, Texas
Agency: Department of the Army, LHAAP
Author(s): Darrell W. Chinn, Captain, U.S. Army
Recipient: Michael A. Moore, RI / FS II Unit, Superfund Investigation Section
Date: October 16, 1995
Bate Stamp: 016272

P. **Title:** Letter - Subject: Transmittal of Draft Final Site Characterization Summary for the Remedial Investigation for Group 1 Sites for LHAAP in Karnack, Texas
Group(s): 1
Site(s): LHAAP-1 Inert Burning Grounds
LHAAP-11 Suspected TNT Burial Site at Avenues P and Q
LHAAP-27 South Test Area
LHAAP-54 or LHAAP-XX Ground Signal Test Area
Location: Longhorn Army Ammunition Plant, Marshall, Texas
Agency: Department of the Army, LHAAP
Author(s): Darrell W. Chinn, Captain, U.S. Army
Recipient: Mr. H. L. Jones, Texas Natural Resource Conservation Commission
Date: October 16, 1995
Bate Stamp: 016273

Q. **Title:** Letter - Subject: Transmittal of TNRCC's Comments on Draft Project Work Plan of Landfill Sites 12 and 16
Group(s): Landfill Caps Interim Action
Site(s): LHAAP-12 Active Landfill
LHAAP-16 Old Landfill
Location: Longhorn Army Ammunition Plant, Marshall, Texas
Agency: Department of The Army, Longhorn Army Ammunition Plant
Author(s): Michael A. Moore, RI / FS II Unit, Superfund Investigation Section
Recipient: Mr. David Tolbert, Project Manager, Longhorn Army Ammunition Plant
Date: October 17, 1995
Bate Stamp: 016274 - 016276

R. **Title:** Letter - Subject: Transmittal of Army's Responses to TNRCC's Comments on Interim Remedial Action Preliminary Design at Landfill Sites 12 and 16
Group(s): Landfill Caps Interim Action
Site(s): LHAAP-12 Active Landfill
LHAAP-16 Old Landfill
Location: Longhorn Army Ammunition Plant, Marshall, Texas
Agency: Department of The Army, Longhorn Army Ammunition Plant
Author(s): Michael A. Moore, RI / FS II Unit, Superfund Investigation Section
Recipient: Mr. David Tolbert, Project Manager, Longhorn Army Ammunition Plant
Date: October 17, 1995
Bate Stamp: 016277-016309

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
ADMINISTRATIVE RECORD - CHRONOLOGICAL INDEX

VOLUME 9 of 10 (Continued)

1995

S. **Title:** Letter - Subject: Transmittal of Draft Phase II Investigations of 125 Waste Process Sumps And 20 Waste Rack Sumps
Group(s): 4
Site(s): LHAAP-35 Process Wastewater Sumps - Various
LHAAP-36 Explosive Waste Pads
Location: Longhorn Army Ammunition Plant, Marshall, Texas
Agency: Department Of The Army, Longhorn Army Ammunition Plant
Author(s): Darrell W. Chinn, Captain, U.S. Army
Recipient: Ms. Lisa Price, Superfund Enforcement, USEPA
Date: October 19, 1995
Bate Stamp: 016310

T. **Title:** Letter - Subject: Transmittal of Draft Phase II Investigations of 125 Waste Process Sumps And 20 Waste Rack Sumps
Group(s): 4
Site(s): LHAAP-35 Process Wastewater Sumps - Various
LHAAP-36 Explosive Waste Pads
Location: Longhorn Army Ammunition Plant, Marshall, Texas
Agency: Department Of The Army, Longhorn Army Ammunition Plant
Author(s): Darrell W. Chinn, Captain, U.S. Army
Recipient: Michael A. Moore, RI / FS II Unit, Superfund Investigation Section
Date: October 19, 1995
Bate Stamp: 016311

U. **Title:** Letter - Subject: Transmittal of Draft Phase II Investigations of 125 Waste Process Sumps And 20 Waste Rack Sumps
Group(s): 4
Site(s): LHAAP-35 Process Wastewater Sumps - Various
LHAAP-36 Explosive Waste Pads
Location: Longhorn Army Ammunition Plant, Marshall, Texas
Agency: Department Of The Army, Longhorn Army Ammunition Plant
Author(s): Darrell W. Chinn, Captain, U.S. Army
Recipient: Mr. H. L. Jones, Texas Natural Resource Conservation Commission
Date: October 19, 1995
Bate Stamp: 016312

V. **Title:** Letter - Subject: Cultural Resources Inventory of a Suspected High Explosive Dump Site at Longhorn Army Ammunition Plant
Group(s): 5
Site(s): LHAAP-50 Former Waste Disposal Facility
LHAAP-52 Magazine Washout Area
LHAAP-17 No. 2 Flashing Area / Burning Ground
LHAAP-60 Former Storage Building 411 and 714
LHAAP-63 Burial Pits

VOLUME 9 of 10 (Continued)

1995

Location: Longhorn Army Ammunition Plant, Marshall, Texas
Agency: Department of the Army, LHAAP
Author(s): G. David Steele, P. E., Chief, Planning Division, U. S. Corps of Engineers, Tulsa District
Recipient: Mr. Curtis Tunnell, Executive Director, Texas Historical Commission, Department of Antiquities Protection
Date: October 19, 1995
Bate Stamp: 016313-016321

W. **Title:** Memorandum for Commander - Subject: Review of the Draft Site Work Plan for Interim Remedial Action at Landfill Sites 12 and 16
Group(s): Landfill Caps Interim Action
Site(s): LHAAP-12 Active Landfill
LHAAP-16 Old Landfill
Location: Longhorn Army Ammunition Plant, Marshall, Texas
Agency: Department of The Army, Longhorn Army Ammunition Plant
Author(s): Jack M. Heller, Ph. D., Acting Program Manager, Health Risk Assessment and Risk Communication
Recipient: Jonna Polk, U.S. Army Corps of Engineers, Tulsa District
Date: October 24, 1995
Bate Stamp: 016322

X. **Title:** Letter - Subject: Record of Decision Concurrence for LHAAP Sites 13 & 14 at Longhorn Army Ammunition Plant
Group(s): 3
Site(s): LHAAP-13 Suspected TNT Burial Between Active Landfill And Old Landfill
LHAAP-14 Area 54 Burial Ground
Location: Longhorn Army Ammunition Plant, Marshall, Texas
Agency: Department Of The Army, Longhorn Army Ammunition Plant
Author(s): Dan Pearson, Executive Director, Texas Natural Resource Conservation Commission
Recipient: Mr. Myron O. Knudson, P.E., Director Superfund Division, U.S. Environmental Protection Agency
Date: October 30, 1995
Bate Stamp: 016323

Y. **Title:** Letter - Subject: Transmittal of Record of Decision for No Further Action at LHAAP Sites 13 & 14 at Longhorn Army Ammunition Plant
Group(s): 3
Site(s): LHAAP-13 Suspected TNT Burial Between Active Landfill And Old Landfill
LHAAP-14 Area 54 Burial Ground
Location: Longhorn Army Ammunition Plant, Marshall, Texas
Agency: Department Of The Army, Longhorn Army Ammunition Plant
Author(s): Michael A. Moore, RI / FS II Unit, Superfund Investigation Section

1995

Recipient: Ms. Lisa Price, Superfund Enforcement, USEPA
Date: October 30, 1995
Bate Stamp: 016324

Z. **Title:** Letter - Subject: Transmittal of EPA's Comments on Site Characterization Summary for the Remedial Investigation for Group 1 Sites for LHAAP in Karnack, Texas
Group(s): 1
Site(s): LHAAP-1 Inert Burning Grounds
LHAAP-11 Suspected TNT Burial Site at Avenues P and Q
LHAAP-27 South Test Area
LHAAP-54 or LHAAP-XX Ground Signal Test Area
Location: Longhorn Army Ammunition Plant, Marshall, Texas
Agency: Department of the Army, LHAAP
Author(s): Ms. Lisa Price, Superfund Enforcement, USEPA
Recipient: Mr. David Tolbert, Project Manager, Longhorn Army Ammunition Plant
Date: November 1, 1995
Bate Stamp: 016325-016327

016227

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

October 3, 1995

CERTIFIED MAIL
P 836 901 712
RETURN RECEIPT REQUESTED

David Tolbert, Project Manager
Longhorn Army Ammunition Plant
Attn: SIOLH-OR
Marshall, Texas 75671-1059

Re: Longhorn Army Ammunition Plant
Agendas for Meetings

Dear Mr. Tolbert:

To prepare for the meetings and to better serve the Army, the Texas Natural Resource Conservation Commission (TNRCC) staff request that the Army provide an agenda for the Risk Assessment Scoping Meeting and for the Project Managers' Meeting a few weeks in advance of the meeting dates (October 25 and 26, 1995). Also, we request that the Army provide agendas for all future meetings at least two weeks prior to each meeting. If you have any questions or comments, please contact me at (512) 239-2483.

Sincerely yours,

Michael A. Moore (MC-143)
RI/FS II Unit
Superfund Investigation Section
Pollution Cleanup Division

cc: Jonna Polk, COE Tulsa District (CESWT-PP-EA)
Lisa Price, EPA Region 6 (6SF-AT)

DEPARTMENT OF THE ARMY
LONGHORN/LOUISIANA ARMY AMMUNITION PLANTS
MARSHALL, TEXAS 75671-1059

016228

REPLY TO
ATTENTION OF

October 5, 1995

SMCLO-EV

Subject: Transmission of Final Record of Decision and request for concurrence letter for the Longhorn Army Ammunition Plant, Sites 13 & 14 No Further Action

Executive Director (MC-143)
Texas Natural Resource Conservation Commission
Post Office Box 13087
Austin, Texas 78711-3087

Dear Sir:

The subject document is enclosed. The Record of Decision for this action has been developed in cooperation with your office. Longhorn's goal is to submit the document to Headquarters Army for approval by October 24, 1995. If possible, request the Texas Natural Resource Conservation Commission provide the letter of concurrence on or before that date to support the action.

Please refer any questions to either me or the Installation Restoration Program Manager, Mr. David Tolbert at 903-679-2728. The letter may be forwarded to this office.

Sincerely,

Darrell W. Chinn
Captain, U.S. Army
Executive Officer

Enclosures

DEPARTMENT OF THE ARMY
LONGHORN/LOUISIANA ARMY AMMUNITION PLANTS
MARSHALL, TEXAS 75671-1059

REPLY TO
ATTENTION OF

016229

October 5, 1995

SMCLO-EN

Ms. Lisa Price
Superfund Division
U.S. Environmental Protection Agency
1445 Ross Avenue
Dallas, Texas 75202

SUBJECT: Final Work Plan for the Preliminary Assessment Site Investigations Group Number 5 Sites at Longhorn Army Ammunition Plant in Karnack, Texas

Dear Ms. Price:

Enclosed are two copies of the subject document.

If you have any questions, please contact Mr. David Tolbert, at 903-679-2728.

Sincerely,

Darrell W. Chinn
Captain, U.S. Army
Executive Officer

Enclosures

DEPARTMENT OF THE ARMY
LONGHORN/LOUISIANA ARMY AMMUNITION PLANTS
MARSHALL, TEXAS 75671-1059

REPLY TO
ATTENTION OF

October 5, 1995

016230

SMCLO-EN

Mr. Michael Moore
Superfund Investigation Section
Texas Natural Resource Conservation Commission
Post Office Box 13087
Austin, Texas 78711-3087

SUBJECT: Final Work Plan for the Preliminary Assessment Site Investigations Group Number 5 Sites at Longhorn Army Ammunition Plant in Karnack, Texas

Dear Mr. Moore:

Enclosed are two copies of the subject document.

If you have any questions, please contact Mr. David Tolbert, at 903-679-2728.

Sincerely,

Darrell W. Chinn
Captain, U.S. Army
Executive Officer

Enclosures

DEPARTMENT OF THE ARMY
LONGHORN/LOUISIANA ARMY AMMUNITION PLANTS
MARSHALL, TEXAS 75671-1059

October 5, 1995

REPLY TO
ATTENTION OF
SMCLO-EN

016231

Mr. H.L. Jones
Texas Natural Resource Conservation Commission
2916 Teague Drive
Tyler, Texas 75701

SUBJECT: Final Work Plan for the Preliminary Assessment Site Investigations Group Number 5 Sites at Longhorn Army Ammunition Plant in Karnack, Texas

Dear Mr. Jones:

Enclosed is one copy of the subject document.

If you have any questions, please contact Mr. David Tolbert, at 903-679-2728.

Sincerely,

Darrell W. Chinn
Captain, U.S. Army
Executive Officer

Enclosure

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

016232

OCT 09 1995

CERTIFIED MAIL: RETURN RECEIPT REQUESTED

David Tolbert, Project Manager
Longhorn Army Ammunition Plant
Attn: SMCLO-EN
Marshall, Texas 75671-1059

Re: Interim Remedial Action at Landfill Sites 12 and 16
Draft Project Work Plan
Longhorn Army Ammunition Plant

Dear David:

In accordance with the Federal Facility Agreement for the Longhorn Army Ammunition Plant, EPA has reviewed the Draft Project Work Plan for the Interim Remedial Action for Landfill Sites 12 and 16 submitted to EPA September 22, 1995 and has no comments.

If you have any questions about this or any other matter, please contact me at (214) 665-6744.

Sincerely,

Lisa Marie Price
Remedial Project Manager
Superfund Division

cc: Captain Darrell W. Chinn
Executive Officer, U.S. Army
Longhorn Army Ammunition Plant
Marshall, Texas 75671-1059

Tulsa District Corps of Engineers
P.O. Box 61
Attn: Ms. Jonna Polk
CESWT-PP-E
Tulsa, OK 74121-0061

Mike Moore, Superfund
Texas Natural Resource Conservation Commission
P.O. Box 13087
Section MC143
Austin, TX 78711-3087

EPA's Comments 10/9/95
Responses to IRA

Response to GWP #4	Identify the specific area(s) in which this may be an acceptable design to; this will clarify where this design may affect ground water remediation.
Response to GWP #5	Intention of the monitoring wells/piezometers is still unclear given that contaminated ground water is beyond the locations planned; therefore, how data collected will be used to evaluate lateral containment is suspect.
Response to GWP #6	EPA and TNRCC must be notified of results of horizontal extraction well and should be included in the evaluation of its "irrelevancy" in the ground water collection system. The evaluation and use or abandonment of the well must be thoroughly documented for the record.
Response to GWP #19	Did not respond to what criteria would be used to determine excavation limits beyond what is specified in the ROD. Data collection is an acceptable response, but text of design work plan implies something beyond that.
Response to GWP #22	EPA spoke with TNRCC regarding the use of HDPE for placement of treated soil from the interim remedial action at the Burning Ground No. 3. According to TNRCC (and EPA agrees), HDPE is NOT required as a liner for the treated soil. If the soil from the interim remedial action is to remain uncovered in order that a release may occur (eg. heavy rainfall) before placement of cap over the landfill, a temporary cover should be used.
Response to GWP #23	The intention of EPA's comment was the identification and documentation of additional areas requiring action.
Response to CDAP #4	To what CDAP is the response referring? For all ongoing RI/FS work as well as all of the previous work conducted in conjunction with the interim remedial action at the Burning Ground No. 3, soil generated from invasive activities is assumed to be contaminated unless otherwise proven by analytical results. Delete the last sentence in section 4.3.3.
Response to AMP #1	To what "final work plan" does the response refer?

EPA's Comments 10/9/95
Responses to IRA

Response to AMP #2	EPA concurs with the response. A schedule for the conduct of the screening risk assessment should be discussed and agreed upon as soon as possible.
Response to AMP #3	To what "final work plan" does the response refer?
Response to AMP #5	EPA disagrees with the response. A full scan TO-14 is somewhat more expensive than some other methods (eg. TO-1, TO-2), however, the quality of the data is much better. Given that a full analysis of ALL of the source material that is to be treated in the thermal unit has NOT be conducted, to limit the scan to just a few parameters is inappropriate. A TO-14 scan should be used to characterize the nature and extent of the volatile emissions from the treatment unit.
Response to AMP #6	To what "final work plan" does the response refer? EPA still recommends analyses of daily downwind samples in order to assess emissions and any potential releases.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

016235

OCT 09 1995

CERTIFIED MAIL: RETURN RECEIPT REQUESTED

David Tolbert, Project Manager
Longhorn Army Ammunition Plant
Attn: SMCLO-EN
Marshall, Texas 75671-1059

Re: Response to EPA's Comments on
Interim Remedial Action at Burning Ground No. 3
Design Work Plan
Longhorn Army Ammunition Plant

Dear David:

In accordance with the Federal Facility Agreement for the Longhorn Army Ammunition Plant, EPA is submitting comments on the Army's responses to EPA's comments for the Interim Remedial Action at Burning Ground No. 3 design work plans in an enclosure to this letter.

EPA submitted its comments on the design work plans August 30, 1995. EPA received the response to comments on September 14, 1995. No date was given in the cover letter for the responses by which EPA was to submit any additional comments. I apologize for the delay in EPA's submission, however, given that the schedule allows for a thirty day acceptance review by EPA, I am willing to shorten my acceptance review in order to accommodate the delay.

If you have any questions about this or any other matter, please contact me at (214) 665-6744.

Sincerely,

Lisa Marie Price
Remedial Project Manager
Superfund Division

cc: Captain Darrell W. Chinn
Executive Officer, U.S. Army
Longhorn Army Ammunition Plant
Marshall, Texas 75671-1059

✓ Tulsa District Corps of Engineers
P.O. Box 61
Attn: Ms. Jonna Polk
CESWT-PP-E
Tulsa, OK 74121-0061

016236

Mike Moore, Superfund
Texas Natural Resource Conservation Commission
P.O. Box 13087
Section MC143
Austin, TX 78711-3087

EPA's Comments 10/9/95
Responses to IRA

Response to GWP #4	Identify the specific area(s) in which this may be an acceptable design to; this will clarify where this design may affect ground water remediation.
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EPA's Comments 10/9/95
Responses to IRA

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

016239

VIA FACSIMILE

OCT 09 1995

David Tolbert, Project Manager
Longhorn Army Ammunition Plant
Attn: SMCLO-EN
Marshall, Texas 75671-1059

Re: October 1995 Project Coordinators Meeting

Dear David:

It is my understanding that the meeting has been postponed until October 25, 1995 and that the meeting will be held at EPA's office in Dallas.

I would like to suggest that the following items be included for the agenda for the October 1995 Project Coordinators meeting:

- scheduled receipt of outstanding meeting minutes (May 1995, July 1995, and September 1995)
- monitoring well survey and results
- DERPMIS Resolution Document
- formal update to schedule
- administrative record update
- ~~Sept/June~~ 1995 background well sampling
- Landfill issues
- ~~Waste Management Plan, CDAP, etc. amendments for additional phases of investigation~~ Installation Management Plans

3rd OU 3 ROD status

If you have any questions about this or any other matter, please contact me at (214) 665-6744.

Sincerely,

Lisa Marie Price
Remedial Project Manager
Superfund Division

cc: Tulsa District Corps of Engineers via facsimile
Ms. Jonna Polk

Mike Moore, Superfund
Texas Natural Resource Conservation Commission via facsimile

016240

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

October 10, 1995

CERTIFIED MAIL
P 836 900 629
RETURN RECEIPT REQUESTED

David Tolbert, Project Manager
Longhorn Army Ammunition Plant
Attn: SIOLH-OR
Marshall, TX 75671-1059

Re: Longhorn Army Ammunition Plant
Interim Remedial Action at Burning Ground No. 3 - General Work Plan
Comments on Army's Responses to TNRCC Comments

Dear Mr. Tolbert:

The Texas Natural Resource Conservation Commission (TNRCC) staff has completed its review of the Army's responses regarding the referenced subject, which we received on September 15, 1995. We are unclear as to the rationale for the sampling strategy that has been proposed in the work plan. Moreover, we do not feel that the Army has adequately described it's data quality objectives. The Army should consult U.S. EPA, Sept 1994, "Guidance for the Data Quality Objectives Process", EPA/QA/G-4. We propose that a table (see Attachments 1 and 2 for examples of formats which may be used) be provided wherein a rationale is supplied for each sample that is proposed for collection. Our specific comments are enclosed. If you have any questions or comments, please contact me at (512) 239-2483.

Sincerely yours,

Michael A. Moore (MC 143)
RI/FS II Unit
Superfund Investigation Section
Pollution Cleanup Division

Enclosures

cc: Jonna Polk, COE Tulsa District (CESWT-PP-EA)
Lisa Price, EPA Region 6 (6SF-AT)

Superfund Investigation Section's Comments (Diane Poteet)

No.	Section/page	Comment to Army's Response
3	1.4/1-7	Please answer the questions. We have not questioned your accuracy nor your source, rather, we are interested in what is being said and simply require more information. The Record of Decision (ROD) is an administrative, public document, and thus, would not necessarily include all the information that a technical document such as this work plan would require. In addition, like the ROD, this work plan will be a public document, and if information is used from past reports, please properly reference that document, so that any reader can find out more information.
4	1.4/1-7	Please answer the question. Again, if you state that the IRA objectives include "reducing or preventing further migration of contaminants from source material and shallow ground water into deeper groundwater zones and surface bodies", then please inform us of how this will be accomplished? Please rewrite the objectives if this is not what is intended.
5	1.5/1-8	Please answer the questions. These are very important questions and the answers will give the reader a basic understanding what and why the work will be done.
6	1.5/1-12	See comment 3.
7	1.5/1-12	See comment 3.
8	1.5/1-12	See comment 3.
9	1.5/1-15	See comment 3.
10	1.5/1-16	See comment 3.
11	2.1/2-1	See comment 3.
12	2.1.1/2-1	The question was not completely answered. How will this migration of contaminants to deeper water bearing zones be known without samples being collected from deeper monitoring wells?
13	2.1.1/2-3	Surface geophysical methods, such as seismic, are not influenced by metal structures. Also, if resistivity or conductivity had been used, the survey transect lines could have been performed outside the Burning Ground area where the piezometers were installed. Geophysical methods can give a continuous stratigraphic picture of the subsurface which would have aided in the placement of the trenches and the wells.
15	2.1.3/2-7	The concentration contours for the plumes are drawn beyond the proposed locations of the trenches. The trenches will be upgradient from the direction of flow and the bayou will be downgradient from the trenches. What will happen to contaminants that are not captured by the trenches? What is the evidence that you base your statement?

No.	Section/page	Comment to Army's Response
17	2.2/2-8	See comment 13.
21	2.8.1/2-23	If the Report that you refer to in your response is the "Interim Remedial Action Burning Ground No. 3 and Unlined Evaporation Pond - Pilot Study Report - Phase II" that we received on 8/21/95, then we recommend that this report be properly referenced in the text and attached to the work plan because it has not been included in the administrative record and is not presently available to the public.
25	2.8.1.2a/2-26 and 3.1/02730a-4 through 6	I was unaware that other purging procedures have been agreed upon. However, the procedures I suggested are the ones that we use in the TNRCC Superfund program, and were given to you for your consideration (even though they are not ARARs). These procedures probably differ from those described in the draft work plan by taking into consideration the area disturbed by drilling (the bore hole) and not just the casing when calculating the well volume. We believe a more accurate well volume is calculated this way.
26	2.10/2-39	Your answer is incomplete. Please answer: "Was this determined through statistical methods?" If, so, which one(s)?

Superfund Engineering Section's Comments (Alvie Nichols)

No.	Section/page	TNRCC Comments to LHAAP response
3	Soil and Source Material	Check for typos and grammatical errors.
8	Monitoring of Groundwater Quality	When on-site results show water has passed cleanup requirements and off-site results show failure and water has already been discharged then the USACE must notify the TNRCC and EPA, as applicable. Recommend further discussion of this issue.
13	Monitoring of Groundwater Quality	Work Plan should state that the Army shall provide routine, monthly and /or yearly reports to the TNRCC, as requested. Same requirement shall apply to soils and source material remediation.
26	CDAP/8-1	Who is the technical manager that will make soil cleanup decisions?
27	CDAP/4-10	Response provided was inadequate. How did you determine that 4 grab samples are appropriate to measure soil contaminant levels? Given these 4 samples, what is the statistical confidence level that the soil is not contaminated? What is the risk of a false negative? Statistics used to arrive at these conclusions should be presented in the CDAP. When testing for VOCs, is it appropriate to composite samples? How can you justify resampling a different soil location if the first sample fails?
28	CDAP	Page 3-24, states that the soil remediation portion of this IRA will be completed once 50,000 cubic yards of soil have been treated. Does this volume also include the soil already collected from the Roll-Off Boxes? Also soil cleanup is based on a minimum 90% reduction in contaminant concentration. Does this reduction apply for all influent soil concentrations, (i.e.) is there a bottom line contaminant level where it is not feasible nor necessary to achieve 90% reduction? Please provide a table similar to Table 2.1 that lists contaminants and maximum allowable concentrations that meet ARARs. What is the milestone for completing the groundwater remediation portion of this IRA?

Table 2. Proposed Samples to be Collected 016244

Sample Matrix	Sample ID	Sample Location	Rationale
Surface Water	SW-1	Water from Pond A.	Document attribution for observed contamination in surface water pathway.
	SW-2	Water from Pond B.	Document attribution for observed contamination in surface water pathway.
	SW-3	QA/QC	Duplicate sample collected at same location as sample SW-2.
	SW-4	Water from Pond C.	Document attribution for observed contamination in surface water pathway.
	SW-5	QA/QC	Field Blank.
Sediment	SE-1	Sediment from Pond A	Document source characterization and overland migration route to the surface water pathway.
	SE-2	Sediment from Pond B	Document source characterization and overland migration route to the surface water pathway.
	SE-3	Sediment from Pond C	Document source characterization and overland migration route to the surface water pathway.
	SE-4	Sediment from unnamed drainage ditch upgradient from south edge of site and adjacent to railroad tracks.	Document background contaminant concentrations upstream from the site for the overland migration route to the surface water pathway.

Table 2 continued

Sample Matrix	Sample ID	Sample Location	Rationale
Sediment continued	SE-5	Sediment from unnamed drainage ditch down-gradient from south edge of site and adjacent to railroad tracks.	Document overland migration route to surface water pathway.
	SE-6	Sediment from unnamed drainage ditch at Highway 259.	Document overland migration route to surface water pathway.
	SE-7	Sediment from Bighead Creek, south of Sewage Disposal Plant out-fall and 50 feet upstream from PPE.	Document background contaminant concentrations upstream from the PPE in the surface water pathway.
	SE-8	QA/QC.	Duplicate sample collected at the same location as sample SE-5.
	SE-9	Sediment from Bighead at PPE.	Document release of contaminants from the site to the surface water pathway.
	SE-10	Sediment from Bighead at 50 feet downstream from PPE.	Document release of contaminants from the site to the surface water pathway.
Soil	SO-1	Background sample from north, upgradient of the site.	Background sample for attribution of contaminants to the site.
	SO-2	Soil sample adjacent and downgradient to the processing area.	Document source characterization and attribution for observed contamination in soil exposure pathway.
	SO-3	Soil sample from the oil seep area, which is east of processing area.	Document source characterization and attribution for observed contamination in soil exposure pathway.

Table 2, continued

Sample Matrix	Sample ID	Sample Location	Rationale
Soil continued	SO-4	Soil sample from area situated between API separator and shed with drums.	Document source characterization and attribution for observed contamination in soil exposure pathway.
	SO-5	QA/QC.	Duplicate sample collected at same location as sample SO-4.
	SO-6	Soil sample from run-off pathway, east of Pond A.	Document attribution for observed contamination in soil exposure pathway.
	SO-7	Soil sample from run-off pathway, east of Pond B.	Document attribution for observed contamination in soil exposure pathway.
	SO-8	Soil sample from area southeast and adjacent to Spill area.	Document source characterization and attribution for observed contamination in soil exposure pathway.
	S0-9	Soil sample from area southeast and adjacent to Stressed Vegetation area.	Document source characterization and attribution for observed contamination in soil exposure pathway.
	SO-10	Soil sample from Tar on the Ground area.	Document source characterizationa and attribution for observed contamination in soil exposure pathway.

Table 2-1. Summary of Data Quality Objectives for the Remedial Investigation.

01624

Problem	Decisions[1]	Decision Rule	Specified Limits on Decision Errors
1. Assess the nature and extent of contamination at ODA.	1A. Sufficient site data are available to fully characterize the nature and extent of contamination.	1A1. The horizontal and vertical extent of soil contamination has been defined. 1A2. The extent of groundwater contamination has been defined. 1A3. The extent of sediment and surface water contamination has been defined. 1A4. The interaction between groundwater and surface water has been defined. 1A5. Reference concentrations of analytes have been defined for each medium.	1a. Horizontal extent is defined by the outermost perimeter of surface soil samples having no detections of COCs above action levels. 1b. Vertical extent is defined by collecting soil samples at depths of 2 to 3 ft and 5 to 6 ft at locations having concentrations of COCs above action levels. If COCs are detected at 6 ft and COCs are present in the groundwater at that location, COCs are assumed to be present to the saturated zone. 2. The outermost perimeter of downgradient wells have no COCs detected above action levels. 3. The point at which sediment and surface water samples collected from Erika's, Kim and Christi's, and East Fork Elliott Creeks have no COCs detected above action levels has been defined. 4. The hydrologic interpretation of groundwater and surface water south of the ODA and stream volume calculations have been used to characterize the nature of interaction. 5. Soil reference locations are to be determined by the Army and approved by the EPA; groundwater reference locations are defined as hydraulically upgradient of or lateral to the ODA; surface water and sediment reference locations have been selected in areas unimpacted by the ODA, based on aquatic habitats similar to those in Erika's, Kim & Christi's, and East Fork Elliott Creeks.
	1B. Sufficient site data are not available to fully characterize the nature and extent of contamination.	1B1. The horizontal and vertical extent of soil contamination has not been defined. 1B2. The extent of groundwater contamination has not been defined. 1B3. The extent of sediment and surface water contamination has not been defined. 1B4. The interaction between groundwater and surface water has not been defined. 1B5. Reference concentrations of analytes have not been defined for each medium.	
2. Define contaminant fate and transport.	2A. Sufficient data are available to define contaminant fate and transport.	2A1. Physical and chemical parameters by medium are available as modeling inputs.	1. Parameters for TOC in soil and sediment, K_d, permeability, porosity, bulk density, K_{ow}, and water levels are available.
	2B. Sufficient data are not available to define contaminant fate and transport.	2B1. Physical and chemical parameters by medium are not available as modeling inputs.	

1 Decisions A and B are mutually exclusive for each problem. All of the decision rules for Decision A must be accomplished to select Decision A. If any of the decision rules for Decision B are accomplished, then select Decision B.

Army U.S. Army
COC Contaminant of Concern
EPA U.S. Environmental Protection Agency
ft foot or feet
K_d Distribution Coefficient
K_{ow} Octanol Water Partition Coefficient
ODA Old Demolition Area
TOC Total Organic Carbon

Table 2-2. Summary of Data Quality Objectives for the Human Health Risk Assessment.

016248

Problem	Decisions[1]	Decision Rule	Specified Limits on Decision Errors
1. Assess whether COCs associated with the ODA pose a potential for an adverse human health effect.	A. COCs associated with the ODA will not adversely affect human health.	A1. Noncarcinogenic analyte is not detected in any medium at ODA or is within the reference concentration range. A2. The exposure pathway is incomplete. A3. The HI for the specified receptor is less than 1 for a medium.	1. Noncarcinogenic COCs, as presented in the HHRA screening document, have been approved by EPA. 2. A complete exposure pathway must have a source, a release mechanism, transport medium, an exposure point, an exposure route, and a receptor. 3. The specified receptors include: off-site residents and on-site workers.
	B. COCs associated with the ODA pose a potential for adverse noncarcinogenic effects to human health.	B1. Noncarcinogenic analyte is detected in a medium at the ODA above the reference concentration. B2. The exposure pathway is complete. B3. The HI for the specified receptor is greater than 1 for a medium and the exposure point concentration exceeds the reference concentration.	
	C. COCs associated with the ODA do not pose an ELCR to human health.	C1. Carcinogenic analyte is not detected in a medium at the ODA above the reference concentration. C2. The exposure pathway is incomplete. C3. ELCR total[2] for the specified receptor is less than 10^{-6}.	1. COCs, as presented in the HHRA screening document, have been approved by EPA. 2. A complete exposure pathway must have a source, a release mechanism, transport medium, an exposure point, an exposure route, and a receptor. 3. The specified receptors include: off-site residents and on-site workers. 4. The resolution of Decision E requires an EPA-approved risk management decision.
	D. COCs associated with the ODA pose an unacceptable ELCR to human health.	D1. Carcinogenic analyte is detected in a medium at the ODA above the reference concentration. D2. The exposure pathway is complete. D3. ELCR total[2] for the specified receptor is greater than 10^{-4}.	
	E. COCs associated with the ODA may pose an unacceptable ELCR to human health.	E1. Carcinogenic analyte is detected in a medium at the ODA above the reference concentration. E2. The exposure pathway is complete. E3. ELCR total[2] for the specified receptor is greater than 10^{-6} and less than 10^{-4}.	

1 Decisions A and B are mutually exclusive. For Decision A to apply, decision rules A1, A2, or A3 must be met. For Decisions B, D, or E, all associated decision rules must be met. For example, decision rules B1, B2, and B3 must apply to select Decision B. Decisions C, D, and E are mutually exclusive, and Decision C requires that decision rule(s) C1, C2, or C3 be met.

2 Total is the sum of cancer risks associated with analytes within the same medium for the identified receptor.

COC	Contaminant of Concern
ELCR	Excess Lifetime Cancer Risk
EPA	U.S. Environmental Protection Agency
HHRA	Human Health Risk Assessment
HI	Hazard Index
ODA	Old Demolition Area

Table 2-3. Summary of Data Quality Objectives for the Ecological Risk Risk Assessment.

Problem	Decisions[1]	Decision Rule	Specified Limits on Decision Errors
1. Assess whether COCs associated with the ODA pose a potential risk to aquatic or terrestrial receptors.	A. COCs associated with the ODA will not adversely affect selected aquatic or terrestrial receptors.	A1. Analyte is not detected. A2. The exposure pathway is incomplete. A3. The HI for a specified aquatic or terrestrial receptor in a medium is less than 1.	1. The aquatic and terrestrial receptors are included in the EPA-approved ERA screening document. 2. The analytes examined for the receptors identified in A1 include COPECs as defined in the EPA-approved ERA screening document.
	B. COCs associated with the ODA pose an unacceptable potential for adverse effects to selected aquatic or terrestrial receptors.	B1. Analyte is detected. B2. The exposure pathway is complete. B3. The HI for a specified aquatic or terrestrial receptor in a medium is significantly greater than 1.	
	C. There is insufficient information to evaluate potential ecological risks at the ODA.	C1. Sufficient toxicity data are not available. C2. Criteria are below detection limits.	

1 The decisions shown are mutually exclusive. For Decision A to apply, decision rules A1, A2, or A3 must be met. Decision B requires that all decision rules for B be met. To select Decision C, decision rules C1 or C2 must apply.

COC	Contaminant of Concern
COPEC	Contaminant of Potential Ecological Concern
EPA	U.S. Environmental Protection Agency
	Ecological Risk Assessment
	Hazard Index
ODA	Old Demolition Area

Table 2-4. Summary of Data Quality Objectives for the Feasibility Study.

016250

Problem	Decisions[1,3]	Decision Rule	Specified Limits on Decision Errors
1. Evaluate Remedial Action Alternatives.	A. Retain Remedial Action Alternative.	A1. Alternative is protective of human health and the environment[2].	1. Definitions of protective will be defined in the HHRA and ERA.
		A2. Alternative complies with ARARs, PRGs, and/or site-specific risk-based clean-up goals.	2. Compliance indicates that COCs have been reduced to levels at or below the appropriate action levels as defined in the HHRA and ERA.
		A3. Alternative demonstrates long-term effectiveness and/or permanence.	3. Long term efficiency is defined as a 30 year source reduction of the concentration of COCs.
		A4. Alternative is technologically implementable.	4. Construction, operation, and maintenance of an alternative that provides site-specific reduction of COCs to appropriate risk-based levels is possible.
		A5. Cost is not prohibitive.	5. Capital costs, operating and maintenance costs, and present worth costs have been considered.
	B. Do not retain Remedial Action Alternative.	B1. Alternative is not protective of human health and the environment.	
		B2. Alternative does not comply with ARARs, PRGs, and/or site-specific risk-based clean-up goals and/or permanence.	
		B3. Alternative does not demonstrate long-term effectiveness.	
		B4. Alternative is not technologically implementable.	
		B5. Cost is prohibitive.	

1 The decisions shown are mutually exclusive. All decision rules for Decision A must be met to select Decision A. If any decision rule for Decision B is met, select Decision B.

2 Implies that human health risk assessment and ecological risk assessment data quality objectives have been met.

ARAR	Applicable or Relevant and Appropriate Requirement
COC	Contaminant of Concern
ERA	Ecological Risk Assessment
HHRA	Human Health Risk Assessment
PRG	Preliminary Remediation Goal

Table 2-5. Summary of Specific Data Inputs for Data Quality Objectives.

Input			Study Boundaries
Data	Data Sources	Sampling and Analytical Techniques	
Analytical soil, groundwater, sediment, and surface water samples collected from ODA site during the Phase IV Remedial Investigation List of contaminants of concern Chemical migration potential through soil, groundwater, sediment, and surface water Toxicity reference values Hazard quotients for detected chemicals Risk-based remediation goals (to be developed using EPA-approved toxicity criteria)	Collect ten soil samples for percent primary and secondary explosives by weight Collect up to 50 surface and subsurface soil samples outside the ODA and conduct field screening analysis for TNT Collect 20 surface soil samples inside ODA, ten subsurface soil samples inside ODA, and 20 surface soil samples outside ODA for explosives and metals Collect ten subsurface soil samples inside ODA for VOCs and SVOCs, and 20 surface soil samples inside ODA for SVOCs Collect four subsurface soil samples from two well borings inside ODA for TOC, permeability, and physical parameters; collect 12 soil samples from two deep soil borings inside ODA for TOC, soil moisture content, and physical soil testing Collect 12 subsurface soil samples from well borings outside ODA for physical parameters Collect two subsurface soil samples from two well borings inside the ODA for VOCs, SVOCs, explosives, and metals Collect and composite two surface soil and two subsurface soil samples inside ODA for waste characteristic analyses Collect eight subsurface soil samples from four shallow soil borings outside the ODA for explosives and metals Collect sediment samples from 14 locations during the dry season and 14 locations during the wet season from seven reaches (two samples per reach) for explosives and metals	**Sampling Techniques** Discrete noncomposite surface soil samples, analytical samples collected from 0 to 0.5 ft Discrete subsurface soil samples, hand-driven sampler, with stainless steel or brass liners, analytical samples collected from 2 to 3 ft and 5 to 6 ft Grab samples for sediment sample collection Grab samples for surface water sample collection Groundwater samples collected using low flow submersible pump **Soil Analyses** Explosives by Method LW12 Metals by Methods JS16, JD15, JD17, JD19, and JB01 VOCs by Method LM19 SVOCs by Method LM18 Total Organic Carbon by ASTM D-2974 Physical Soil Parameters USCS by ASTM D-421 Atterberg Limits by ASTM D-4318 Bulk Density by ASTM E-868-82 Sieve Analysis by ASTM B-422 Permeability by ASTM D-5084 Porosity by ASTM D-854 Soil Moisture by ASTM D-2216-71	Collect surface soil samples at depths of 0 to 0.5 ft at locations inside and outside ODA, as specified on Figure 3-1 Collect subsurface soil samples at depths of 2 to 3 ft and 5 to 6 ft at locations inside and outside ODA, as specified in Figure 3-2 Groundwater samples collected from wells inside ODA, downgradient of ODA, and upgradient of ODA Surface water and sediment samples collected from three streams downgradient of ODA and three reference streams (unimpacted by ODA)

Note An acronym list is provided on the last page of this table.

Table 2-5. Summary of Specific Data Inputs for Data Quality Objectives.

Input			
Data	Data Sources	Sampling and Analytical Techniques	Study Boundaries
	Collect sediment samples from six locations during the wet season and six locations during the dry season from Reaches 1, 2 and 7 for VOCs and SVOCs Collect one sediment sample from one location from Kim & Christi's Creek at the eastern boundary of the ODA for explosives and metals Collect six sediment samples in pools or stagnant pools from two locations in the three preliminarily identified reference streams unimpacted by the ODA during each of the wet and dry seasons for explosives, metals, VOCs, and SVOCs Collect four sediment samples along Kim and Christi's Creek near the ODA and conduct field screening analysis for TNT Collect surface water samples from 14 locations during the dry season and 14 locations during the wet season from seven reaches (two samples per reach) for explosives, metals, and water quality parameters Collect surface water samples from six locations during the wet season and six locations during the dry season from Reaches 1, 2, and 7 for VOCs and SVOCs Collect six surface water samples in pools or stagnant pools from two locations in the three preliminary identified reference streams unimpacted by the ODA during each of the wet and dry seasons for explosives, metals, VOCs, SVOCs, and water quality parameters Collect surface water samples from four seep locations during each of the wet and dry seasons for VOCs, SVOCs, explosives, metals, and water quality parameters	**Soil Analyses (Continued)** Waste Characterization TCLP by EPA Extraction Method 1311 Corrosivity by 9045 Ignitability by 1010 Reactivity by Chapter 7 in EPA SW-846 **Aqueous Analyses** Explosives by Methods UW32 and UW19 Metals by Methods SS18, SD20, SD21, SD22, SB01 VOCs by Method UM20 SVOCs by Method UM18 Water Quality Parameters Total Dissolved Solids by EPA Method 160.1 Total Suspended Solids by EPA Method 160.2 Alkalinity by EPA Method 310.1 Cations (Ammonium) by EPA Method 350.1 Anions (Chloride, Fluoride, Sulfate) by EPA Method 300.0 Nitrate/Nitrite by EPA Method 353.2 Salinity calculated value Turbidity by EPA Method 180.1 (also measured in the field) Bacterial Quality by SM9221 pH[1] Eh[1] Conductivity[1] Dissolved Oxygen[1] Temperature[1]	016252

Table 2-5. **Summary of Specific Data Inputs for Data Quality Objectives.**

Input			Study Boundaries
Data	Data Sources	Sampling and Analytical Techniques	
	Collect groundwater samples from four proposed wells inside the ODA, six proposed wells outside the ODA, and 13 existing wells outside the ODA during each of the wet and dry seasons for explosives (UF,F), metals (UF,F), and water quality parameters (UF,F) Collect groundwater samples from three reference wells quarterly for VOCs (UF), SVOCs (UF,F), explosives (UF,F), metals (UF,F), and water quality parameters (UF,F) Collect groundwater samples during each of the wet and dry seasons from four proposed wells inside the ODA for VOCs (UF) and SVOCs (UF,F) Collect groundwater samples from two proposed wells inside the ODA for SVOCs (D), explosives (D), and metals (D) to determine K_d values Conduct aquatic survey to determine species presence or absence Conduct terrestrial reconnaissance to determine species presence or absence Conduct a land survey Conduct a literature search for toxicity reference values and preliminary remediation goals Research the appropriate toxicity criteria and exposure assumptions to use for the risk assessment		

1 Measured in the field

D Dissolved
EPA U.S. Environmental Protection Agency
F Filtered
ft foot or feet
ODA Old Demolition Area
SVOC Semivolatile Organic Compound
TCLP Toxicity Characteristic Leaching Procedure
TNT 2,4,6-Trinitrotoluene
TOC Total Organic Carbon
TOX Total Organic Halide
UF Unfiltered
USCS Unified Soil Classification System
VOC Volatile Organic Compound

NOTE: Analyses are dependent on selection and concurrence of contaminants of concern.

Table 3-1. Soil Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
CHEMICAL				
Collect up to 50 surface and subsurface soil samples outside ODA for field screening for TNT	Define horizontal and vertical extent of contamination			Define volume of contaminated soil
Randomly collect 20 surface soil samples (0 to 0.5 ft) inside ODA for explosives and metals using a grid system Collect 20 surface soil samples (0 to 0.5 ft) outside ODA for explosives and metals; locations based on available data and best professional judgement	Define horizontal extent of contamination Confirm historic data Refine COC list Establish maximum concentrations and range of concentrations Confirm field screening soil sample results	Refine COC list Evaluate potential risk to human health Develop risk based PRGs Establish 95 percent upper confidence limit of the mean concentrations Establish mean concentrations	Refine COC list Evaluate potential risk to terrestrial ecological receptors	Define volume of contaminated soil Establish maximum concentrations for treatment Refine RAAs
Collect ten subsurface soil samples from one shallow soil boring, two deep soil borings, and two well borings inside ODA (2 to 3 ft; 5 to 6 ft) for explosives and metals	Define vertical extent of contamination Confirm historic data Refine COC list Establish maximum concentrations and range of concentrations	Refine COC list Evaluate potential risk to human health Develop risk based PRGs	Refine COC list Evaluate potential risk to terrestrial ecological receptors	Define volume of contaminated soil Establish maximum concentrations for treatment Refine RAAs
Randomly collect 20 surface soil samples (0 to 0.5 ft) from inside ODA for SVOCs using a grid system Collect ten subsurface soil samples from one shallow soil boring, two deep soil borings, and two well borings inside ODA (2 to 3 ft; 5 to 6 ft) for VOCs and SVOCs	Identify if VOC or SVOC contamination is present within the ODA Define potential horizontal and vertical extent of contamination Refine COC list	Refine COC list Develop risk based PRGs	Refine COC list	Establish maximum concentrations for treatment Refine RAAs

NOTE: An acronym list is provided on the last page of this table.

Table 3-1. Soil Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
Collect eight subsurface soil samples (2 to 3 ft, 5 to 6 ft) from four shallow soil borings outside ODA for explosives and metals	Define vertical extent of contamination, if present, outside ODA Confirm field screening soil sample results			Define volume of contaminated soil
Collect 12 soil samples from two deep soil borings inside ODA (0 to 0.5 ft; 2 to 3 ft; 5 to 6 ft; and up to three intervals below 6 ft based on changes in lithology) for TOC and soil moisture content Collect four subsurface soil samples from two well borings inside ODA (confining unit above aquifer, if present; screened interval) for TOC Collect two subsurface soil samples from two well borings inside ODA (screened interval) for VOCs, SVOCs, explosives, and metals	Evaluate contaminant fate and transport Calculate K_d values		Moisture content for dry/wet weight conversions for plant uptake and incidental ingestion Determine temporal variability in soil moisture	Refine RAAs Support groundwater modeling, if needed Evaluate pretreatment requirements for technologies
Collect two composite soil samples (0 to 0.5 ft; 2 to 3 ft) inside ODA for waste characterization (TCLP, corrosivity, ignitability, reactivity)	Characterize investigation derived waste			Evaluate soil disposal alternatives
Compile existing reference soil data	Establish reference concentrations for contaminants of concern	Evaluate potential risk to human health	Evaluate effects of ODA contaminants on potential terrestrial receptors	
GEOLOGIC				
Drill two deep soil borings inside ODA (5 ft into the competent Midway Group); archive soil cores	Define lithology Identify water bearing zones Confirm proposed well locations inside ODA			

NOTE: An acronym list is provided on the last page of this table.

Table 3-1. Soil Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
Log all soil/well borings and surface soil samples	Define lithology Classify soil types Define depth to confining layers, if present Identify presence of lignite			Identify presence of oversized materials Evaluate pretreatment requirements for technologies Refine RAAs
PHYSICAL				
Collect ten soil samples within ODA for percent primary and secondary explosives by weight (LSAAP laboratory analysis) prior to initiation of Phase IV RI field activities	Ensure safety of site workers during RI field efforts	Determine safety risk from explosives		Refine RAAs Evaluate implementability of technologies
Collect 12 soil samples from two deep soil borings (0 to 0.5 ft; 2 to 3 ft; 5 to 6 ft; and up to three intervals below 6 ft based on changes in lithology) inside ODA for physical soil testing (porosity, bulk density, Atterberg limits, sieve analysis, and USCS) Collect four subsurface soil samples from two well borings inside ODA (confining unit above aquifer, if present; screened interval) for physical soil testing (porosity, bulk density, Atterberg limits, sieve analysis, and USCS) and for physical soil testing (undisturbed sample for permeability (hydraulic conductivity)) Collect 12 soil samples from six well borings (depth intervals based on changes in lithology) outside of the ODA for physical soil testing (Atterberg limits, sieve analysis, and USCS)	Evaluate contaminant fate and transport Estimate contaminant retardation Classify soil types Evaluate potential for run-off Determine hydraulic conductivity			Refine RAAs Evaluate pretreatment requirements for technologies Evaluate implementability of technologies Determine percent fines Weight/volume calculations Support groundwater modeling, if needed

COC	Contaminant of Concern	RI	Remedial Investigation
ft	foot or feet	SVOC	Semivolatile Organic Compound
K_d	Distribution Coefficient	TCLP	Toxicity Characteristic Leaching Procedure
LSAAP	Lone Star Army Ammunition Plant	TNT	2,4,6-Trinitrotoluene
ODA	Old Demolition Area	TOC	Total Organic Carbon
PRG	Preliminary Remediation Goal	USCS	Unified Soil Classification System
RAA	Remedial Action Alternative	VOC	Volatile Organic Compound

NOTE: Analyses are dependent on selection and concurrence of COCs.

Table 3-2. Sediment Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
CHEMICAL				
Collect four sediment samples along Kim & Christi's Creek near the ODA for field screening for TNT	Define horizontal extent of contamination			Define volume of contaminated sediment
Collect a total of 14 sediment samples (two samples from each of seven reaches) during each of the wet and dry seasons from pools or stagnant pools in Erika's, Kim & Chnsti's, and East Fork Elliott Creeks for explosives and metals. (NOTE: If a reach is dry, sediment samples will not be collected from that particular reach. However, additional samples may be collected from one of the other reaches to obtain a total of 14 samples.)	Define nature and extent of contamination Confirm historic data Refine COC list Establish maximum concentrations and range of concentrations Characterize contaminant fate and transport	Refine COC list Evaluate potential risk to human health Develop risk based PRGs Establish 95 percent upper confidence limit of the mean concentrations Establish mean concentrations	Refine COC list Evaluate potential ecological impacts from sediment exposure	Define volume of contaminated sediment Establish maximum concentrations for treatment Refine RAAs
Collect up to six sediment samples (two samples from Reaches 1, 2, and 7) during each of the wet and dry seasons from pools or stagnant pools in Erika's Creek for VOCs and SVOCs. (NOTE: If a reach is dry, sediment samples will not be collected for these parameters.)	Identify if VOC or SVOC contamination is present within Erika's Creek Refine COC list	Refine COC list Develop risk based PRGs	Refine COC list	Establish maximum concentration for treatment Refine RAAs
Collect one sediment sample from Kim & Christi's Creek at the ODA eastern boundary for explosives and metals	Define nature and extent of contamination Confirm historic data Refine COC list Establish maximum concentrations and range of concentrations Characterize contaminant fate and transport			Define volume of contaminated sediment Establish maximum concentrations for treatment Refine RAAs

NOTE: An acronym list is provided on the last page of this table.

Table 3-2. Sediment Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
Collect up to six sediment samples (two samples from three sites) during each of the wet and dry seasons from pools or stagnant pools at non-ODA stream reference sites for VOCs, SVOCs, explosives, and metals	Establish reference concentrations for metals	Develop risk based PRGs Evaluate potential risk to human health	Evaluate incremental contribution of ODA to sediment concentrations	
GEOLOGIC				
Log all sediment samples	Classify sediment types			Identify presence of oversized materials Evaluate pretreatment requirements for technologies Refine RAAs

COC Contaminant of Concern
ODA Old Demolition Area
PRG Preliminary Remediation Goal
RAA Remedial Action Alternative
SVOC Semivolatile Organic Compound
TNT 2,4,6-Trinitrotoluene
VOC Volatile Organic Compound

NOTE: Analyses are dependent on selection and concurrence of COCs.

Table 3-3. Surface Water Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
CHEMICAL				
Collect a total of 14 surface water samples (two samples from each of seven reaches) during each of the wet and dry seasons from pools or stagnant pools in Erika's, Kim & Christi's, and East Fork Elliott Creeks for explosives and metals. (NOTE: If a reach is dry, surface water samples will not be collected from that particular reach. However, additional samples may be collected from one of the other reaches to obtain a total of 14 samples.)	Define nature and extent of contamination Characterize contaminant fate and transport Refine COC list Establish maximum concentrations and range of concentrations Confirm historic data	Refine COC list Evaluate potential risk to human health Develop risk based PRGs Establish 95 percent upper confidence limit of the mean concentrations Establish mean concentrations	Refine COC list Evaluate potential risk to aquatic receptors	Refine RAAs
Collect up to six surface water samples (two samples from Reaches 1, 2, and 7) during each of the wet and dry seasons from pools or stagnant pools in Enka's Creek for VOCs and SVOCs. (NOTE: If a reach is dry, surface water samples will not be collected for these parameters.)	Identify if VOC or SVOC contamination is present within Erika's Creek Refine COC list	Refine COC List Develop risk based PRGs	Refine COC list Evaluate potential risk to aquatic receptors	Establish maximum concentration for treatment Refine RAAs
Collect up to six surface water samples (two samples from three sites) during each of the wet and dry seasons from pools or stagnant pools at non-ODA stream reference sites for VOCs, SVOCs, explosives, and metals	Establish reference concentrations for metals	Develop risk based PRGs Evaluate potential risk to human health	Evaluate effects of ODA contaminants on surface water receptors	

NOTE: An acronym list is provided on the last page of this table.

Table 3-3. Surface Water Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
Collect one surface water sample at four seep locations south of the ODA during each of the wet and dry seasons for VOCs, SVOCs, explosives, and metals	Define nature and extent of contamination Refine COC list Establish maximum concentrations and range of concentrations Characterize contaminant fate and transport	Develop risk based PRGs	Demonstrate complete transport pathways for potential ecological receptors	
Field test all surface water samples for water quality parameters (dissolved oxygen, alkalinity, pH, Eh, hardness, temperature, conductivity, turbidity)	Characterize surface water quality		Assess aquatic habitat Determine whether other factors may be affecting water quality	
STREAM GAGING				
Install and monitor three stream gaging locations along Erika's Creek for a maximum of 1 year	Measure stream base flow on a daily basis Evaluate groundwater/surface water interaction Evaluate temporal variability in surface water flow	Support exposure assessment	Support aquatic risk evaluation Assess aquatic habitat	

COC Contaminant of Concern
ODA Old Demolition Area
PRG Preliminary Remediation Goal
RAA Remedial Action Alternative
SVOC Semivolatile Organic Compound
VOC Volatile Organic Compound

NOTE: Analyses are dependant on selection and concurrence of COCs.

Table 3-4. Groundwater Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
CHEMICAL				
Collect an initial round of groundwater samples from all proposed and existing wells inside and outside the ODA (a total of 26 wells) during either the wet or dry season for explosives and metals[1] Collect a second round of groundwater samples from four proposed wells inside the ODA, six proposed wells outside the ODA, and 13 existing wells outside the ODA for explosives and metals[1] during either the wet or dry season (excludes three reference wells selected during the first sampling event)	Define nature and extent of contamination Confirm historic data Refine COC list Establish maximum concentrations and range of concentrations Identify and define groundwater plume, if present	Refine COC list Evaluate potential risk to human health Develop risk based PRGs Establish mean concentrations Identify source aquifer where potential risk to human health is applicable Establish 95 percent upper confidence limit of the mean concentrations (with time)	Refine COC list based on complete transport pathways for potential ecological receptors	Define volume of contaminated groundwater Establish maximum concentrations for treatment Refine RAAs
Collect groundwater samples during the wet and dry seasons from the four proposed wells inside the ODA for VOCs and SVOCs[1]	Identify if VOC or SVOC contamination is present Refine COC list Identify analyte concentrations at source	Refine COC list Evaluate potential risk to human health Develop risk based PRGs Identify source aquifer where potential risk to human health is applicable Establish 95 percent upper confidence limit of the mean concentrations (with time)	Refine COC list Demonstrate complete transport pathways for potential ecological receptors	Define volume of contaminated groundwater Establish maximum concentrations for treatment Refine RAAs

NOTE: An acronym list is provided on the last page of this table.

Table 3-4. Groundwater Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
Collect groundwater samples during the first sampling round from three wells upgradient and north of the ODA (Wells ODA-11, ODA-30, and ODA-31) for reference determination; analyze samples for VOCs and SVOCs[1] Collect groundwater samples three times following the initial sampling of all proposed and existing wells (for a total of four quarterly sampling events) for reference determination. Sample three wells upgradient and north of the ODA; analyze samples for VOCs, SVOCs, explosives, and metals[1]. (NOTE: It is anticipated that Wells ODA-11, ODA-30, and ODA-31 will be sampled for reference determination).	Establish reference concentrations for metals/inorganics Determine if upgradient source of contamination exists	Develop risk based PRGs Determine risk if risk assessment indicates a problem from naturally occurring chemicals	Refine COC list	
Collect groundwater samples from two proposed Wells ODA-32 and ODA-35 inside the ODA for determination of site-specific K_d values. Analyze filtered samples (dissolved fraction) for SVOCs, explosives, and metals.	Determine site-specific K_d values Evaluate contaminant fate and transport			Refine RAAs Support groundwater modeling, if needed

NOTE: An acronym list is provided on the last page of this table.

Table 3-4. Groundwater Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
Field test or collect samples for water quality parameters from all wells sampled; analyze samples for TSS, TDS, salinity, Eh, pH, conductivity, turbidity (field and laboratory measurement), bacterial quality, dissolved oxygen, temperature, alkalinity, cations, and anions[1]	Characterize groundwater quality Classify Wilcox aquifer	Determine if groundwater is a drinking water source (pathway analysis)		Refine RAAs Evaluate pretreatment requirements for technologies Evaluate implementability of technologies
HYDROGEOLOGIC				
Collect water level data from all proposed and existing wells	Determine hydraulic gradient and evaluate direction of groundwater flow Evaluate groundwater/surface water interaction Determine groundwater flow rate			Support groundwater modeling, if needed
Conduct slug tests at all proposed and existing wells	Evaluate recharge rates and hydraulic conductivity Evaluate interconnectivity between water-bearing zones			Evaluate implementability of technologies Refine RAAs Support groundwater modeling, if needed
Interpret subsurface geology from well/soil borings	Evaluate groundwater and surface water interaction Complete geologic characterization Evaluate fracture flow potential Determine aquifer thickness	Evaluate groundwater discharge to surface water potential relative to human health risk	Evaluate groundwater discharge to surface water potential relative to ecological risk	Refine RAAs Support groundwater modeling, if needed

NOTE: An acronym list is provided on the last page of this table.

Table 3-4. Groundwater Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
Install four wells inside ODA (proposed Wells ODA-32, ODA-33, ODA-34, and ODA-35)	Define nature and extent of contamination Identify and define groundwater plume, if present Characterize site hydrogeology			
Install eight wells outside ODA (proposed Wells ODA-24 through ODA-31)	Define nature and extent of contamination Identify and define groundwater plume, if present Characterize hydrogeology upgradient and downgradient of ODA			

1 Filtered and unfiltered groundwater samples will be collected for all analyses except VOCs if the field measured turbidity exceeds 5 NTUs. It is assumed that all groundwater samples will require filtering. Samples will be filtered in the field until the 5 NTU standard is reached or a 1 micrometer filter is utilized.

COC Contaminant of Concern
K_d Distribution Coefficient
NTU Nephelometric Turbidity Unit
ODA Old Demolition Area
PRG Preliminary Remediation Goal
VOC Volatile Organic Compound
RAA Remedial Action Alternative
SVOC Semivolatile Organic Compound
TDS Total Dissolved Solids
TSS Total Suspended Solids

NOTE: Analyses are dependent on selection and concurrence of COCs.

Table 3-5. Sample Summary for All Media.

Sample Type	Number of Sample Locations (Samples per Location)	Number of Sampling Events	Total Number of Phase IV Samples	VOCs	SVOCs	Explosives	Total TAL Metals[1]	Water Quality Parameters[2]	Physical Soil Parameters[3]	Other
SOIL										
Percent Primary and Secondary Explosives by Weight inside ODA	10 (1)	1	10							LSAAP Lab - 10
Field Screening Surface and Subsurface Soil[7]	50 (1)	1	50			50				
Surface Soil inside ODA (0 to 0.5 ft)	20 (1)	1	20		20	20	20			Waste Char.[4] - 2
Surface Soil outside ODA (0 to 0.5 ft)	20 (1)	1	20			20	20			
1 Shallow Soil Boring/2 Deep Soil Borings/2 Well Borings inside ODA (2 to 3 ft; 5 to 6 ft)	5 (2)	1	10	10	10	10	10			Waste Char.[4] - 2
Shallow soil borings outside ODA (2 to 3 ft; 5 to 6 ft)	4 (2)	1	8			8	8			
2 Well Borings inside ODA - ODA-32 and ODA-35 (confining unit above aquifer, if present; screened interval)	2 (2)	1	4	2*	2*	2*	2*		4	TOC - 4 Permeability - 4
2 Deep Soil Borings inside ODA (0 to 0.5 ft; 2 to 3 ft; 5 to 6 ft; and up to three intervals below 6 ft based on changes in lithology)	2 (6)	1	12						12	TOC - 12 SMC - 12
Well Borings outside ODA	6 (2)	1	12						12*	
Total Soil Samples				12	32	110	60		28	LSAAP Lab - 10 Waste Char.[4] - 2 TOC - 16 SMC - 12 Permeability - 4

NOTE: An acronym list is provided on the last page of this table.

Table 3-5. Sample Summary for All Media.

Sample Type	Number of Sample Locations (Samples per Location)	Number of Sampling Events	Total Number of Phase IV Samples	VOCs	SVOCs	Explosives	Total TAL Metals[1]	Water Quality Parameters[2]	Physical Soil Parameters[2]	Other
SEDIMENT										
Field Screening Sediment	4 (1)	1	4			4				
Erika's Creek (4 Reaches), Kim & Christi's Creek (1 Reach), and East Fork Elliott Creek (2 Reaches) - samples collected in pools or stagnant pools[5]	7 (2)	2 (Wet/Dry)	28	12**	12**	28	28			
Three Non-ODA Stream Reference Sites (1 Reach each) - samples collected in pools or stagnant pools	3 (2)	2 (Wet/Dry)	12	12	12	12	12			
Kim & Christi's Creek at ODA Eastern Boundary	1 (1)	1	1			1	1			
Total Sediment Samples				24	24	45	41			
SURFACE WATER										
Erika's Creek (4 Reaches), Kim & Christi's Creek (1 Reach), and East Fork Elliott Creek (2 Reaches) - samples collected in pools or stagnant pools[5]	7 (2)	2 (Wet/Dry)	28	12**	12**	28	28	28		
Three Non-ODA Stream Reference Sites (1 Reach each) - samples collected in pools or stagnant pools	3 (2)	2 (Wet/Dry)	12	12	12	12	12	12		
Seeps south of the ODA	4 (1)	2 (Wet/Dry)	8	8	8	8	8	8		
Total Surface Water Samples				32	32	48	48	48		

NOTE: An acronym list is provided on the last page of this table.

Table 3-5. Sample Summary for All Media.

Sample Type	Number of Sample Locations (Samples per Location)	Number of Sampling Events	Total Number of Phase IV Samples	VOCs	SVOCs	Explosives	Total TAL Metals[1]	Water Quality Parameters[2]	Physical Soil Parameters[3]	Other
GROUNDWATER[4]										
Proposed Wells inside ODA (ODA-32, ODA-33, ODA-34, and ODA-35)	4 (1)	2	8	8 [UF]	8 [UF] 8 [F]	8 [UF] 8 [F]	8 [UF] 8 [F]	8 [UF] 8 [F]		
Proposed Wells outside ODA (Wells ODA-24 through ODA-29; excludes reference wells)	6 (1)	2	12			12 [UF] 12 [F]	12 [UF] 12 [F]	12 [UF] 12 [F]		
Wells upgradient and north of ODA for Reference Determination (Wells ODA-11, ODA-30, and ODA-31)	3 (1)	4	12	12 [UF]	12 [UF] 12 [F]	12 [UF] 12 [F]	12 [UF] 12 [F]	12 [UF] 12 [F]		
Existing Wells outside ODA (excluding reference Well ODA-11)	13 (1)	2	26			26 [UF] 26 [F]	26 [UF] 26 [F]	26 [UF] 26 [F]		
K_d Determination in Proposed ODA Wells (ODA-32 and ODA-35)	2 (1)	1	2		2*** [D]	2*** [D]	2*** [D]			
Total Groundwater Samples				20	42	118	118	116		

* Samples will be collected from screened interval only.

** Samples will be collected from Reaches 1, 2, and 7.

*** Samples will be filtered in the field using a 0.45 µm filter to obtain a dissolved fraction for site-specific K_d determination.

\+ Samples will be collected from the deep well of a well cluster.

1 TAL metals includes ICP metals, arsenic, selenium, lead, and mercury.

2 Water quality parameters for surface water samples include dissolved oxygen, alkalinity, pH, Eh, hardness, temperature, conductivity, and turbidity. Water quality parameters for groundwater samples include TSS, TDS, salinity, Eh, pH, conductivity, turbidity (field and laboratory measurement), bacterial quality, dissolved oxygen, temperature, alkalinity, cations, and anions.

3 Physical soil parameters include USCS, sieve analysis, Atterberg limits, porosity, and bulk density for interior ODA soil/well borings, and USCS, sieve analysis, and Atterberg limits for exterior ODA well borings.

4 Waste characterization parameters include analyses for TCLP, corrosivity, ignitability, and reactivity. A composite sample will be collected from the 0 to 0.5 ft and 2 to 3 ft depth intervals of a soil boring.

5 If a reach is dry during the dry season, sediment and surface water samples will not be collected from that particular reach. However, additional samples may be collected from one of the other reaches to obtain a total of 14 samples.

6 Filtered and unfiltered groundwater samples will be collected if the field measured turbidity exceeds 5 NTUs. It is assumed that all groundwater samples will require filtering. Samples will be filtered in the field until the 5 NTU standard is reached or a 1 µm filter is utilized.

7 Four laboratory samples will be collected at field screening locations that have no detected explosives, and up to 12 laboratory samples (0 to 0.5, 2 to 3, and 5 to 6 feet at up to four locations) will be collected to confirm field screening detected results.

D Dissolved
F Filtered
ft foot or feet
ICP Inductively Coupled Argon Plasma
LSAAP Lone Star Army Ammunition Plant
NTU Nephelometric Turbidity Unit
ODA Old Demolition Area
SMC Soil Moisture Content
SVOC Semivolatile Organic Compound
TAL Target Analyte List
TCLP Toxicity Characteristic Leaching Procedure
TDS Total Dissolved Solids
TOC Total Organic Carbon
TSS Total Suspended Solids
UF Unfiltered
µm micrometer(s)
USCS Unified Soil Classification System
VOC Volatile Organic Compound

NOTE: Analyses are dependent on selection and concurrence of COCs.

Table 3-6. Summary of Proposed Monitoring Well Locations at the Old Demolition Area. Page 1 of-1.

016268

Well Number	Location	Screened Interval
ODA-24	Approximately 100 ft northeast of soil boring SB8, nested with ODA-25	Alluvium and first sand interval (approximately 310 to 317 ft MSL)
ODA-25	Approximately 100 ft northeast of soil boring SB8, nested with ODA-24	Second sand interval (approximately 297 to 306 ft MSL)
ODA-26	Adjacent to Erika's Creek, southeast of the ODA, nested with ODA-27	Alluvial deposits of Erika's Creek, and/or shallowest Wilcox Formation
ODA-27	Adjacent to Erika's Creek, southeast of the ODA, nested with ODA-26	Deepest water-bearing zone in the Wilcox Group (lateral equivalent of lower sand immediately above the Midway Group, if present[1])
ODA-28	Approximately 250 ft south-southwest of Erika's Creek	Sand interval immediately above the Midway Group (approximately 267 to 277 ft MSL)
ODA-29	Near soil boring SB14, nested with ODA-17	Shallowest sand interval (above the upper sand interval at this location[1]) (approximately 287 to 295 ft MSL)
ODA-30*	Approximately 300 ft north of soil boring SB5	First silt/sand interval (approximately 305 to 310 ft MSL)
ODA-31*	Approximately 100 ft north of soil boring SB6	First sand interval in the Wilcox Aquifer (approximately 315 to 320 ft MSL)
ODA-32	Approximately 150 ft northwest of soil boring SB2, nested with ODA-33	Uppermost portion of the main sand interval in the Wilcox Group[2] (projected to be approximately 290 to 297 ft MSL)
ODA-33	Approximately 150 ft northwest of soil boring SB2, nested with ODA-32	Deepest portion of the main sand interval, immediately above the Midway Group[2] (approximately 267 to 275 ft MSL)
ODA-34	Approximately 200 ft northwest of ODA-7, nested with ODA-35	First water bearing interval in the Wilcox Group (if different from intended target interval of proposed Well ODA-35 [3]) (projected to be approximately 300 to 310 ft MSL)
ODA-35	Approximately 200 ft northwest of ODA-7, nested with ODA-34	Deepest sand interval (analogous to lower sand interval), immediately above the Midway Group (approximately 285 to 295 ft MSL)

* Background well

1 Upper/lower denotes approximate equivalency with requested U.S. Environmental Protection Agency terminology.

2 The main sand interval at this location may or may not be separated into two separate sands at this location (upper and lower sand units[1]).

3 If two different water bearing units are not present, only proposed Well ODA-35 will be installed.

ft foot or feet
MSL Mean Sea Level
ODA Old Demolition Area

Table 3-7. Other Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
TERRESTRIAL RECONNAISSANCE				
Conduct terrestrial reconnaissance of ODA and specific adjacent areas during the wet and dry seasons	Identify terrestrial community (small mammals) utilizing the ODA (forest/shrub) Identify terrestrial community (small mammals) utilizing the riparian areas along Kim & Christi's (limited to sediment deposition areas) and Erika's Creek (limited to the seep areas) Confirm historical information (1978 survey)		Identify habitats that may be affected Identify potential ecological receptors	
AQUATIC SURVEY				
Conduct stream survey of Erika's, Kim & Christi's, and East Fork Elliott Creek quarterly for 1 year	Characterize aquatic habitat Identify aquatic species Identify benthic community		Evaluate potential risk to the aquatic community Characterize benthic community	
AERIAL SURVEY				
Conduct LSAAP land use flyby to include 2 mile radius from installation boundary Meet with local government representatives to research local development plans	Determine present off-post land use Assess potential future off-post land use Prepare Land Use Report	Aid in selection of appropriate current and future receptors		
Conduct ODA flyby	Prepare site map			

NOTE: An acronym list is provided on the last page of this table.

Table 3-7. Other Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
SURVEYING				
Conduct topographic surveying**	Clarify site topography Prepare site topographic map			
Conduct location surveying to include all sample locations and well locations	Prepare accurate sample location maps and contaminant distribution maps			
LITERATURE SEARCH				
Contaminant mobility	Evaluate contaminant fate and transport in aerobic and anaerobic environments			Refine RAAs Support groundwater modeling, if necessary
Contaminant properties	Identify K_{ow} values, molecular weight, solubility, Henry's Law constant, and polarity to evaluate contaminant fate and transport	Toxicity data search Chemical degradation rates Bioavailability data Route to route extrapolations	Toxicity data search Chemical degradation rates Bioavailability data Route to route extrapolations	Refine RAAs Support groundwater modeling, if necessary
Collect precipitation and other meteorological data from nearby airport**	Determine wet and dry seasons Determine predominant wind direction Characterize potential surface water impact to watershed			Refine containment alternatives

* Two quarterly stream surveys have been completed to date.
** Activity has been completed.

K_{ow} Octanol water partition coefficient
LSAAP Lone Star Army Ammunition Plant
ODA Old Demolition Area
RAA Remedial Action Alternative

E007\DO3\MEMOS\TAB37DR.DOO
Rev. 08/02/95; 11:00 p.m.

DEPARTMENT OF THE ARMY
LONGHORN/LOUISIANA ARMY AMMUNITION PLANTS
MARSHALL, TEXAS 75671-1059

REPLY TO ATTENTION OF

October 16, 1995

016271

SMCLO-EN

Ms. Lisa Price
Superfund Division
U.S. Environmental Protection Agency
1445 Ross Avenue
Dallas, Texas 75202

SUBJECT: Draft Final Site Characterization Summary for Group 1 at Longhorn Army Ammunition Plant in Karnack, Texas

Dear Ms. Price:

Enclosed are two copies of the subject document.

Please review and provide written comments to this office by November 15, 1995.

If you have any questions, please contact Mr. David Tolbert, at 903-679-2728.

Sincerely,

Darrell W. Chinn
Captain, U.S. Army
Executive Officer

Enclosure

DEPARTMENT OF THE ARMY
LONGHORN/LOUISIANA ARMY AMMUNITION PLANTS
MARSHALL TEXAS 75671-1059

REPLY TO ATTENTION OF

016272

October 16, 1995

SMCLO-EN

Mr. Michael Moore
Superfund Investigation Section
Texas Natural Resource Conservation Commission
Post Office Box 13087
Austin, Texas 78711-3087

SUBJECT: Draft Final Site Characterization Summary for Group 1 at Longhorn Army Ammunition Plant in Karnack, Texas

Dear Mr. Moore:

Enclosed is one copy of the subject document.

Please review and provide written comments to this office by November 15, 1995.

If you have any questions, please contact Mr. David Tolbert, at 903-679-2728.

Sincerely,

Darrell W. Chinn
Captain, U.S. Army
Executive Officer

Enclosure

DEPARTMENT OF THE ARMY
LONGHORN/LOUISIANA ARMY AMMUNITION PLANTS
MARSHALL, TEXAS 75571-1059

October 16, 1995

REPLY TO ATTENTION OF
SMCLO-EN

016273

Mr. H.L. Jones
Texas Natural Resource Conservation Commission
2916 Teague Drive
Tyler, Texas 75701

SUBJECT: Draft Final Site Characterization Summary for Group 1 at Longhorn Army Ammunition Plant in Karnack, Texas

Dear Mr. Jones:

Enclosed is one copy of the subject document.

Please review and provide written comments to this office by November 15, 1995.

If you have any questions, please contact Mr. David Tolbert, at 903-679-2728.

Sincerely,

Darrell W. Chinn
Captain, U.S. Army
Executive Officer

Enclosure

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

October 17, 1995

CERTIFIED MAIL
P 836 901 713
RETURN RECEIPT REQUESTED

David Tolbert, Project Manager
Longhorn Army Ammunition Plant
Attn: SIOLH-OR
Marshall, Texas 75671-1059

Re: Longhorn Army Ammunition Plant
Interim Remedial Action at Landfill Sites 12 and 16
Draft Project Work Plan

Dear Mr. Tolbert:

The Texas Natural Resource Conservation Commission (TNRCC) staff has completed its review of the Draft Project Work Plan, which we received on September 22, 1995. Our comments are enclosed. If you have any questions or comments, please contact me at (512) 239-2483.

Sincerely yours,

Michael A. Moore (MC-143)
RI/FS II Unit
Superfund Investigation Section
Pollution Cleanup Division

Enclosure

cc: Jonna Polk, COE Tulsa District (CESWT-PP-EA)
Lisa Price, EPA Region 6 (6SF-AT)

Draft Project Work Plan
Interim Remedial Action - Landfills 12 & 16 Caps
Longhorn Army Ammunition Plant Superfund Site

TNRCC Superfund Investigation Section Comments (Diane Poteet)

No.	Section/page	Comment
1	6.4.1 Waste Management Plan - Solids/page 8	1. Please change first sentence to read: Contaminated soils will be treated and hauled to the Landfill 12 stockpile by others (see 3.5 Task 5 - Disposal/Placement of Treated Soil and Source Material in the Interim Remedial Action at Burning Ground No. 3 General Work Plan, Volume 1, page 3-34).
2	6.4.2 Waste Management Plan - Liquids/page 8	We recommend that decon water be tested prior to disposal. If contaminated, then treat and dispose of it properly. If not, then properly discharge it.
3	6.4.2 Waste Management Plan - Liquids/page 8	We recommend that no water be allowed to stand on the landfill, particularly, in the exclusion zone. Evaporation in east Texas does not seem to be a viable option in our opinion. Additionally, allowing water to stand on the landfill would cause increased infiltration through the landfill, which is what this project is trying to reduce.
4	General	We may have additional comments on the work plan after we receive and have the opportunity to review the design document/plans.

Draft Project Work Plan
Interim Remedial Action - Landfills 12 & 16 Caps
Longhorn Army Ammunition Plant Superfund Site

Superfund Engineering Section's Comments (Alvie Nichols)

No.	Section / Page	Comment
1	Introduction / Page 1	Project Summary mentions sampling of existing groundwater wells. Where are the details?
2	Decontamination Facility / Figure 7-2	Recommend installing a 6 foot splash guard w/ replaceable screen to contain decon water.
3	Haul Road at Landfills 12 and 16 / Figure 7-4 and 7-5	Please show footprint of the new landfill cap, location of temporary soil stockpile, limits of exclusion zone, berm locations, and dimensions.
4	Section 7.8.3 and 7.9.3 / Page 22 and 26	ROD states that liners will include a sodium bentonite geocomposite liner and a geosynthetic membrane liner. Explain difference from the GCL/FML mentioned in this Work Plan. Also provide cross-section drawing of landfill cap.

016277

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

October 17, 1995

CERTIFIED MAIL
P 836 901 714
RETURN RECEIPT REQUESTED

David Tolbert, Project Manager
Longhorn Army Ammunition Plant
Attn: SIOLH-OR
Marshall, Texas 75671-1059

Re: Longhorn Army Ammunition Plant
Landfill Sites 12 and 16
Army's Responses to TNRCC Comments on Interim Remedial Action Preliminary Design

Dear Mr. Tolbert:

The Texas Natural Resource Conservation Commission (TNRCC) staff has completed its review of the above referenced document, which we received on September 19, 1995. We concur with the U.S. Army's responses and have no further comments. If you have any questions or comments, please contact me at (512) 239-2483.

Sincerely yours,

Michael A. Moore (MC 143)
RI/FS II Unit
Superfund Investigation Section
Pollution Cleanup Division

cc: Jonna Polk, COE Tulsa District (CESWT-PP-EA)
Lisa Price, EPA Region 6 (6SF-AT)

Comments on Final Remedial Design Investigations Work Plan
Landfill Caps
Longhorn AAP

Reviewer: Diane Poteet, TNRCC, Superfund investigation Section

Respondent: Randel Mead, Tulsa District COE The soil gas sample collection method will not use a pump.

Comment #	Page/Section	Comment	Response	A or D
1	Part II - Field Exploration/Pg. 11	2. Borrow Source - Has borrow soil testing for contamination been performed? What were the results?	The borrow source has not been tested for contamination. No known source of contamination is located upgradient or within the limits of the borrow source. However, any borrow soil placed on the landfills will be tested for contamination during construction.	
2	Part II - Field Exploration/Pg. 11	3. Soil Gas Survey - Since low levels of methane gas were detected, will there be plans for control and treatment, monitoring and condensate removal?	No gas collection and treatment systems will be installed because the methane was detected at a very small number of sampling locations and the levels of methane detected were very low.	
3	Part III - Basis of Design/Pg. 15	1. Grading and Drainage - What about contaminated materials handling during regrading of refuse?	Only minimal regrading of contaminated materials, such as leveling small debris piles will be required during construction. Therefore handling of contaminated materials will not be necessary.	
4	Part III - Basis of Design/Pg. 15	1. Grading and Drainage - Will there be any air monitoring during refuse regrading and normal operation and maintenance?	Air monitoring for the protection of the workers will be required during construction of the landfill caps. No long term air monitoring will be required after completion of the caps.	
5	Part III - Basis of Design/Pg. 15	1. Grading and Drainage - Will there be contaminated surface runoff control during landfill regrading?	The landfill contents will not be exposed to rainfall during construction of the caps. Any small areas of waste exposed during construction will be covered before the end of the day. Therefore the surface runoff should not be contaminated. Runoff controls will be used to prevent soil sediment from entering surface drainage systems around the landfills.	

Comment #	Page/Section	Comment	Response	A or D
6	Part III - Basis of Design/Pg. 15	1. Grading and Drainage - What about treated soils from Burning Ground No. 3, will they be tested before using?	The treated soils from Burning Ground No. 3 will be tested during the Early Interim Remedial Action for Burning Ground No. 3. The treated soil must meet contamination limits described in the ROD for Burning Ground No.3.	
7	Part IV - Compliance with ARARS/Pg. 22	Since this is a preliminary design, it appears that the U.S. Army intends to comply with the ARARs listed on this page. Review of the next design stage will have to be performed before complete compliance can be ascertained.	The ARARs listed in the preliminary design and the ROD will be complied with during design and construction of the Early Interim Remedial Action. Future designs will be submitted for review.	

Superfund Investigation Section's Comments (Diane Poteet)

No.	Section/page	Comment to Army's Response
3	1.4/1-7	Please answer the questions. We have not questioned your accuracy nor your source, rather, we are interested in what is being said and simply require more information. The Record of Decision (ROD) is an administrative, public document, and thus, would not necessarily include all the information that a technical document such as this work plan would require. In addition, like the ROD, this work plan will be a public document, and if information is used from past reports, please properly reference that document, so that any reader can find out more information.
4	1.4/1-7	Please answer the question. Again, if you state that the IRA objectives include "reducing or preventing further migration of contaminants from source material and shallow ground water into deeper groundwater zones and surface bodies", then please inform us of how this will be accomplished? Please rewrite the objectives if this is not what is intended.
5	1.5/1-8	Please answer the questions. These are very important questions and the answers will give the reader a basic understanding what and why the work will be done.
6	1.5/1-12	See comment 3.
7	1.5/1-12	See comment 3.
8	1.5/1-12	See comment 3.
9	1.5/1-15	See comment 3.
10	1.5/1-16	See comment 3.
11	2.1/2-1	See comment 3.
12	2.1.1/2-1	The question was not completely answered. How will this migration of contaminants to deeper water bearing zones be known without samples being collected from deeper monitoring wells?
13	2.1.1/2-3	Surface geophysical methods, such as seismic, are not influenced by metal structures. Also, if resistivity or conductivity had been used, the survey transect lines could have been performed outside the Burning Ground area where the piezometers were installed. Geophysical methods can give a continuous stratigraphic picture of the subsurface which would have aided in the placement of the trenches and the wells.
15	2.1.3/2-7	The concentration contours for the plumes are drawn beyond the proposed locations of the trenches. The trenches will be upgradient from the direction of flow and the bayou will be downgradient from the trenches. What will happen to contaminants that are not captured by the trenches? What is the evidence that you base your statement?

No.	Section/page	Comment to Army's Response
17	2.2/2-8	See comment 13.
21	2.8.1/2-23	If the Report that you refer to in your response is the "Interim Remedial Action Burning Ground No. 3 and Unlined Evaporation Pond - Pilot Study Report - Phase II" that we received on 8/21/95, then we recommend that this report be properly referenced in the text and attached to the work plan because it has not been included in the administrative record and is not presently available to the public.
25	2.8.1.2a/2-26 and 3.1/02730a-4 through 6	I was unaware that other purging procedures have been agreed upon. However, the procedures I suggested are the ones that we use in the TNRCC Superfund program, and were given to you for your consideration (even though they are not ARARs). These procedures probably differ from those described in the draft work plan by taking into consideration the area disturbed by drilling (the bore hole) and not just the casing when calculating the well volume. We believe a more accurate well volume is calculated this way.
26	2.10/2-39	Your answer is incomplete. Please answer: "Was this determined through statistical methods?" If, so, which one(s)?

Superfund Engineering Section's Comments (Alvie Nichols)

No.	Section/page	TNRCC Comments to LHAAP response
3	Soil and Source Material	Check for typos and grammatical errors.
8	Monitoring of Groundwater Quality	When on-site results show water has passed cleanup requirements and off-site results show failure and water has already been discharged then the USACE must notify the TNRCC and EPA, as applicable. Recommend further discussion of this issue.
13	Monitoring of Groundwater Quality	Work Plan should state that the Army shall provide routine, monthly and /or yearly reports to the TNRCC, as requested. Same requirement shall apply to soils and source material remediation.
26	CDAP/8-1	Who is the technical manager that will make soil cleanup decisions?
27	CDAP/4-10	Response provided was inadequate. How did you determine that 4 grab samples are appropriate to measure soil contaminant levels? Given these 4 samples, what is the statistical confidence level that the soil is not contaminated? What is the risk of a false negative? Statistics used to arrive at these conclusions should be presented in the CDAP. When testing for VOCs, is it appropriate to composite samples? How can you justify resampling a different soil location if the first sample fails?
28	CDAP	Page 3-24, states that the soil remediation portion of this IRA will be completed once 50,000 cubic yards of soil have been treated. Does this volume also include the soil already collected from the Roll-Off Boxes? Also soil cleanup is based on a minimum 90% reduction in contaminant concentration. Does this reduction apply for all influent soil concentrations, (i.e.) is there a bottom line contaminant level where it is not feasible nor necessary to achieve 90% reduction? Please provide a table similar to Table 2.1 that lists contaminants and maximum allowable concentrations that meet ARARs. What is the milestone for completing the groundwater remediation portion of this IRA?

Table 2. Proposed Samples to be Collected

Sample Matrix	Sample ID	Sample Location	Rationale
Surface Water	SW-1	Water from Pond A.	Document attribution for observed contamination in surface water pathway.
	SW-2	Water from Pond B.	Document attribution for observed contamination in surface water pathway.
	SW-3	QA/QC	Duplicate sample collected at same location as sample SW-2.
	SW-4	Water from Pond C.	Document attribution for observed contamination in surface water pathway.
	SW-5	QA/QC	Field Blank.
Sediment	SE-1	Sediment from Pond A	Document source characterization and overland migration route to the surface water pathway.
	SE-2	Sediment from Pond B	Document source characterization and overland migration route to the surface water pathway.
	SE-3	Sediment from Pond C	Document source characterization and overland migration route to the surface water pathway.
	SE-4	Sediment from unnamed drainage ditch upgradient from south edge of site and adjacent to railroad tracks.	Document background contaminant concentrations upstream from the site for the overland migration route to the surface water pathway.

Table 2 continued

Sample Matrix	Sample ID	Sample Location	Rationale
Sediment continued	SE-5	Sediment from unnamed drainage ditch down-gradient from south edge of site and adjacent to railroad tracks.	Document overland migration route to surface water pathway.
	SE-6	Sediment from unnamed drainage ditch at Highway 259.	Document overland migration route to surface water pathway.
	SE-7	Sediment from Bighead Creek, south of Sewage Disposal Plant out-fall and 50 feet upstream from PPE.	Document background contaminant concentrations upstream from the PPE in the surface water pathway.
	SE-8	QA/QC.	Duplicate sample collected at the same location as sample SE-5.
	SE-9	Sediment from Bighead at PPE.	Document release of contaminants from the site to the surface water pathway.
	SE-10	Sediment from Bighead at 50 feet downstream from PPE.	Document release of contaminants from the site to the surface water pathway.
Soil	SO-1	Background sample from north, upgradient of the site.	Background sample for attribution of contaminants to the site.
	SO-2	Soil sample adjacent and downgradient to the processing area.	Document source characterization and attribution for observed contamination in soil exposure pathway.
	SO-3	Soil sample from the oil seep area, which is east of processing area.	Document source characterization and attribution for observed contamination in soil exposure pathway.

Table 2, continued

Sample Matrix	Sample ID	Sample Location	Rationale
Soil continued	SO-4	Soil sample from area situated between API separator and shed with drums.	Document source characterization and attribution for observed contamination in soil exposure pathway.
	SO-5	QA/QC.	Duplicate sample collected at same location as sample SO-4.
	SO-6	Soil sample from run-off pathway, east of Pond A.	Document attribution for observed contamination in soil exposure pathway.
	SO-7	Soil sample from run-off pathway, east of Pond B.	Document attribution for observed contamination in soil exposure pathway.
	SO-8	Soil sample from area southeast and adjacent to Spill area.	Document source characterization and attribution for observed contamination in soil exposure pathway.
	S0-9	Soil sample from area southeast and adjacent to Stressed Vegetation area.	Document source characterization and attribution for observed contamination in soil exposure pathway.
	SO-10	Soil sample from Tar on the Ground area.	Document source characterizationa and attribution for observed contamination in soil exposure pathway.

Table 2-2. Summary of Data Quality Objectives for the Human Health Risk Assessment.

Problem	Decisions[1]	Decision Rule	Specified Limits on Decision Errors
1. Assess whether COCs associated with the ODA pose a potential for an adverse human health effect.	A. COCs associated with the ODA will not adversely affect human health.	A1. Noncarcinogenic analyte is not detected in any medium at ODA or is within the reference concentration range. A2. The exposure pathway is incomplete. A3. The HI for the specified receptor is less than 1 for a medium.	1. Noncarcinogenic COCs, as presented in the HHRA screening document, have been approved by EPA. 2. A complete exposure pathway must have a source, a release mechanism, transport medium, an exposure point, an exposure route, and a receptor. 3. The specified receptors include: off-site residents and on-site workers.
	B. COCs associated with the ODA pose a potential for adverse noncarcinogenic effects to human health.	B1. Noncarcinogenic analyte is detected in a medium at the ODA above the reference concentration. B2. The exposure pathway is complete. B3. The HI for the specified receptor is greater than 1 for a medium and the exposure point concentration exceeds the reference concentration.	
	C. COCs associated with the ODA do not pose an ELCR to human health.	C1. Carcinogenic analyte is not detected in a medium at the ODA above the reference concentration. C2. The exposure pathway is incomplete. C3. ELCR total[2] for the specified receptor is less than 10^{-6}.	1. COCs, as presented in the HHRA screening document, have been approved by EPA. 2. A complete exposure pathway must have a source, a release mechanism, transport medium, an exposure point, an exposure route, and a receptor. 3. The specified receptors include: off-site residents and on-site workers. 4. The resolution of Decision E requires an EPA-approved risk management decision.
	D. COCs associated with the ODA pose an unacceptable ELCR to human health.	D1. Carcinogenic analyte is detected in a medium at the ODA above the reference concentration. D2. The exposure pathway is complete. D3. ELCR total[2] for the specified receptor is greater than 10^{-4}.	
	E. COCs associated with the ODA may pose an unacceptable ELCR to human health.	E1. Carcinogenic analyte is detected in a medium at the ODA above the reference concentration. E2. The exposure pathway is complete. E3. ELCR total[2] for the specified receptor is greater than 10^{-6} and less than 10^{-4}.	

1 Decisions A and B are mutually exclusive. For Decision A to apply, decision rules A1, A2, or A3 must be met. For Decisions B, D, or E, all associated decision rules must be met. For example, decision rules B1, B2, and B3 must apply to select Decision B. Decisions C, D, and E are mutually exclusive, and Decision C requires that decision rule(s) C1, C2, or C3 be met.

2 Total is the sum of cancer risks associated with analytes within the same medium for the identified receptor.

COC	Contaminant of Concern
ELCR	Excess Lifetime Cancer Risk
EPA	U.S. Environmental Protection Agency
HHRA	Human Health Risk Assessment
HI	Hazard Index
ODA	Old Demolition Area

ATTACHMENT 2
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Table 2-1. Summary of Data Quality Objectives for the Remedial Investigation.

Problem	Decisions[1]	Decision Rule	Specified Limits on Decision Errors
1. Assess the nature and extent of contamination at ODA.	1A. Sufficient site data are available to fully characterize the nature and extent of contamination.	1A1. The horizontal and vertical extent of soil contamination has been defined. 1A2. The extent of groundwater contamination has been defined. 1A3. The extent of sediment and surface water contamination has been defined. 1A4. The interaction between groundwater and surface water has been defined. 1A5. Reference concentrations of analytes have been defined for each medium.	1a. Horizontal extent is defined by the outermost perimeter of surface soil samples having no detections of COCs above action levels. 1b. Vertical extent is defined by collecting soil samples at depths of 2 to 3 ft and 5 to 6 ft at locations having concentrations of COCs above action levels. If COCs are detected at 6 ft and COCs are present in the groundwater at that location, COCs are assumed to be present to the saturated zone. 2. The outermost perimeter of downgradient wells have no COCs detected above action levels. 3. The point at which sediment and surface water samples collected from Erika's, Kim and Christi's, and East Fork Elliott Creeks have no COCs detected above action levels has been defined. 4. The hydrologic interpretation of groundwater and surface water south of the ODA and stream volume calculations have been used to characterize the nature of interaction. 5. Soil reference locations are to be determined by the Army and approved by the EPA; groundwater reference locations are defined as hydraulically upgradient of or lateral to the ODA; surface water and sediment reference locations have been selected in areas unimpacted by the ODA, based on aquatic habitats similar to those in Erika's, Kim & Christi's, and East Fork Elliott Creeks.
	1B. Sufficient site data are not available to fully characterize the nature and extent of contamination.	1B1. The horizontal and vertical extent of soil contamination has not been defined. 1B2. The extent of groundwater contamination has not been defined. 1B3. The extent of sediment and surface water contamination has not been defined. 1B4. The interaction between groundwater and surface water has not been defined. 1B5. Reference concentrations of analytes have not been defined for each medium.	
2. Define contaminant fate and transport.	2A. Sufficient data are available to define contaminant fate and transport.	2A1. Physical and chemical parameters by medium are available as modeling inputs.	1. Parameters for TOC in soil and sediment, K_d, permeability, porosity, bulk density, K_{ow}, and water levels are available.
	2B. Sufficient data are not available to define contaminant fate and transport.	2B1. Physical and chemical parameters by medium are not available as modeling inputs.	

1 Decisions A and B are mutually exclusive for each problem. All of the decision rules for Decision A must be accomplished to select Decision A. If any of the decision rules for Decision B are accomplished, then select Decision B.

Army	U.S. Army	K_d	Distribution Coefficient
COC	Contaminant of Concern	K_{ow}	Octanol Water Partition Coefficient
EPA	U.S. Environmental Protection Agency	ODA	Old Demolition Area
ft	foot or feet	TOC	Total Organic Carbon

Table 2-4. Summary of Data Quality Objectives for the Feasibility Study. 016288

Problem	Decisions[1,3]	Decision Rule	Specified Limits on Decision Errors
1. Evaluate Remedial Action Alternatives.	A. Retain Remedial Action Alternative.	A1. Alternative is protective of human health and the environment[2].	1. Definitions of protective will be defined in the HHRA and ERA.
		A2. Alternative complies with ARARs, PRGs, and/or site-specific risk-based clean-up goals.	2. Compliance indicates that COCs have been reduced to levels at or below the appropriate action levels as defined in the HHRA and ERA.
		A3. Alternative demonstrates long-term effectiveness and/or permanence.	3. Long term efficiency is defined as a 30 year source reduction of the concentration of COCs.
		A4. Alternative is technologically implementable.	4. Construction, operation, and maintenance of an alternative that provides site-specific reduction of COCs to appropriate risk-based levels is possible.
		A5. Cost is not prohibitive.	5. Capital costs, operating and maintenance costs, and present worth costs have been considered.
	B. Do not retain Remedial Action Alternative.	B1. Alternative is not protective of human health and the environment.	
		B2. Alternative does not comply with ARARs, PRGs, and/or site-specific risk-based clean-up goals and/or permanence.	
		B3. Alternative does not demonstrate long-term effectiveness.	
		B4. Alternative is not technologically implementable.	
		B5. Cost is prohibitive.	

1 The decisions shown are mutually exclusive. All decision rules for Decision A must be met to select Decision A. If any decision rule for Decision B is met, select Decision B.

2 Implies that human health risk assessment and ecological risk assessment data quality objectives have been met.

ARAR Applicable or Relevant and Appropriate Requirement
COC Contaminant of Concern
ERA Ecological Risk Assessment
HHRA Human Health Risk Assessment
PRG Preliminary Remediation Goal

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Table 2-3. Summary of Data Quality Objectives for the Ecological Risk Risk Assessment.

Problem	Decisions[1]	Decision Rule	Specified Limits on Decision Errors
1. Assess whether COCs associated with the ODA pose a potential risk to aquatic or terrestrial receptors.	A. COCs associated with the ODA will not adversely affect selected aquatic or terrestrial receptors.	A1. Analyte is not detected. A2. The exposure pathway is incomplete. A3. The HI for a specified aquatic or terrestrial receptor in a medium is less than 1.	1. The aquatic and terrestrial receptors are included in the EPA-approved ERA screening document. 2. The analytes examined for the receptors identified in A1 include COPECs as defined in the EPA-approved ERA screening document.
	B. COCs associated with the ODA pose an unacceptable potential for adverse effects to selected aquatic or terrestrial receptors.	B1. Analyte is detected. B2. The exposure pathway is complete. B3. The HI for a specified aquatic or terrestrial receptor in a medium is significantly greater than 1.	
	C. There is insufficient information to evaluate potential ecological risks at the ODA.	C1. Sufficient toxicity data are not available. C2. Criteria are below detection limits.	

1 The decisions shown are mutually exclusive. For Decision A to apply, decision rules A1, A2, or A3 must be met. Decision B requires that all decision rules for B be met. To select Decision C, decision rules C1 or C2 must apply.

COC	Contaminant of Concern
COPEC	Contaminant of Potential Ecological Concern
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
HI	Hazard Index
ODA	Old Demolition Area

Table 2-5. Summary of Specific Data Inputs for Data Quality Objectives.

Input			
Data	Data Sources	Sampling and Analytical Techniques	Study Boundaries
Analytical soil, groundwater, sediment, and surface water samples collected from ODA site during the Phase IV Remedial Investigation List of contaminants of concern Chemical migration potential through soil, groundwater, sediment, and surface water Toxicity reference values Hazard quotients for detected chemicals Risk-based remediation goals (to be developed using EPA-approved toxicity criteria)	Collect ten soil samples for percent primary and secondary explosives by weight Collect up to 50 surface and subsurface soil samples outside the ODA and conduct field screening analysis for TNT Collect 20 surface soil samples inside ODA, ten subsurface soil samples inside ODA, and 20 surface soil samples outside ODA for explosives and metals Collect ten subsurface soil samples inside ODA for VOCs and SVOCs, and 20 surface soil samples inside ODA for SVOCs Collect four subsurface soil samples from two well borings inside ODA for TOC, permeability, and physical parameters; collect 12 soil samples from two deep soil borings inside ODA for TOC, soil moisture content, and physical soil testing Collect 12 subsurface soil samples from well borings outside ODA for physical parameters Collect two subsurface soil samples from two well borings inside the ODA for VOCs, SVOCs, explosives, and metals Collect and composite two surface soil and two subsurface soil samples inside ODA for waste characteristic analyses Collect eight subsurface soil samples from four shallow soil borings outside the ODA for explosives and metals Collect sediment samples from 14 locations during the dry season and 14 locations during the wet season from seven reaches (two samples per reach) for explosives and metals	**Sampling Techniques** Discrete noncomposite surface soil samples, analytical samples collected from 0 to 0.5 ft Discrete subsurface soil samples, hand-driven sampler, with stainless steel or brass liners, analytical samples collected from 2 to 3 ft and 5 to 6 ft Grab samples for sediment sample collection Grab samples for surface water sample collection Groundwater samples collected using low flow submersible pump **Soil Analyses** Explosives by Method LW12 Metals by Methods JS16, JD15, JD17, JD19, and JB01 VOCs by Method LM19 SVOCs by Method LM18 Total Organic Carbon by ASTM D-2974 Physical Soil Parameters USCS by ASTM D-421 Atterberg Limits by ASTM D-4318 Bulk Density by ASTM E-868-82 Sieve Analysis by ASTM B-422 Permeability by ASTM D-5084 Porosity by ASTM D-854 Soil Moisture by ASTM D-2216-71	Collect surface soil samples at depths of 0 to 0.5 ft at locations inside and outside ODA, as specified on Figure 3-1 Collect subsurface soil samples at depths of 2 to 3 ft and 5 to 6 ft at locations inside and outside ODA, as specified in Figure 3-2 Groundwater samples collected from wells inside ODA, downgradient of ODA, and upgradient of ODA Surface water and sediment samples collected from three streams downgradient of ODA and three reference streams (unimpacted by ODA)

Note: An acronym list is provided on the last page of this table.

Table 2-5. Summary of Specific Data Inputs for Data Quality Objectives.

Input			
Data	Data Sources	Sampling and Analytical Techniques	Study Boundaries
	Collect sediment samples from six locations during the wet season and six locations during the dry season from Reaches 1, 2 and 7 for VOCs and SVOCs Collect one sediment sample from one location from Kim & Christi's Creek at the eastern boundary of the ODA for explosives and metals Collect six sediment samples in pools or stagnant pools from two locations in the three preliminarily identified reference streams unimpacted by the ODA during each of the wet and dry seasons for explosives, metals, VOCs, and SVOCs Collect four sediment samples along Kim and Christi's Creek near the ODA and conduct field screening analysis for TNT Collect surface water samples from 14 locations during the dry season and 14 locations during the wet season from seven reaches (two samples per reach) for explosives, metals, and water quality parameters Collect surface water samples from six locations during the wet season and six locations during the dry season from Reaches 1, 2, and 7 for VOCs and SVOCs Collect six surface water samples in pools or stagnant pools from two locations in the three preliminary identified reference streams unimpacted by the ODA during each of the wet and dry seasons for explosives, metals, VOCs, SVOCs, and water quality parameters Collect surface water samples from four seep locations during each of the wet and dry seasons for VOCs, SVOCs, explosives, metals, and water quality parameters	**Soil Analyses (Continued)** Waste Characterization TCLP by EPA Extraction Method 1311 Corrosivity by 9045 Ignitability by 1010 Reactivity by Chapter 7 in EPA SW-846 **Aqueous Analyses** Explosives by Methods UW32 and UW19 Metals by Methods SS18, SD20, SD21, SD22, SB01 VOCs by Method UM20 SVOCs by Method UM18 Water Quality Parameters Total Dissolved Solids by EPA Method 160.1 Total Suspended Solids by EPA Method 160.2 Alkalinity by EPA Method 310.1 Cations (Ammonium) by EPA Method 350.1 Anions (Chloride, Fluoride, Sulfate) by EPA Method 300.0 Nitrate/Nitrite by EPA Method 353.2 Salinity calculated value Turbidity by EPA Method 180.1 (also measured in the field) Bacterial Quality by SM9221 pH[1] Eh[1] Conductivity[1] Dissolved Oxygen[1] Temperature[1]	

Table 2-5. **Summary of Specific Data Inputs for Data Quality Objectives.**

Input			Study Boundaries
Data	**Data Sources**	**Sampling and Analytical Techniques**	
	Collect groundwater samples from four proposed wells inside the ODA, six proposed wells outside the ODA, and 13 existing wells outside the ODA during each of the wet and dry seasons for explosives (UF,F), metals (UF,F), and water quality parameters (UF,F) Collect groundwater samples from three reference wells quarterly for VOCs (UF), SVOCs (UF,F), explosives (UF,F), metals (UF,F), and water quality parameters (UF,F) Collect groundwater samples during each of the wet and dry seasons from four proposed wells inside the ODA for VOCs (UF) and SVOCs (UF,F) Collect groundwater samples from two proposed wells inside the ODA for SVOCs (D), explosives (D), and metals (D) to determine K_d values Conduct aquatic survey to determine species presence or absence Conduct terrestrial reconnaissance to determine species presence or absence Conduct a land survey Conduct a literature search for toxicity reference values and preliminary remediation goals Research the appropriate toxicity criteria and exposure assumptions to use for the risk assessment		

1 Measured in the field

D Dissolved
EPA U.S. Environmental Protection Agency
F Filtered
ft foot or feet
ODA Old Demolition Area
SVOC Semivolatile Organic Compound
TCLP Toxicity Characteristic Leaching Procedure
TNT 2,4,6-Trinitrotoluene
TOC Total Organic Carbon
TOX Total Organic Halide
UF Unfiltered
USCS Unified Soil Classification System
VOC Volatile Organic Compound

NOTE: Analyses are dependent on selection and concurrence of contaminants of concern.

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Table 3-1. Soil Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
CHEMICAL				
Collect up to 50 surface and subsurface soil samples outside ODA for field screening for TNT	Define horizontal and vertical extent of contamination			Define volume of contaminated soil
Randomly collect 20 surface soil samples (0 to 0.5 ft) inside ODA for explosives and metals using a grid system Collect 20 surface soil samples (0 to 0.5 ft) outside ODA for explosives and metals; locations based on available data and best professional judgement	Define horizontal extent of contamination Confirm historic data Refine COC list Establish maximum concentrations and range of concentrations Confirm field screening soil sample results	Refine COC list Evaluate potential risk to human health Develop risk based PRGs Establish 95 percent upper confidence limit of the mean concentrations Establish mean concentrations	Refine COC list Evaluate potential risk to terrestrial ecological receptors	Define volume of contaminated soil Establish maximum concentrations for treatment Refine RAAs
Collect ten subsurface soil samples from one shallow soil boring, two deep soil borings, and two well borings inside ODA (2 to 3 ft; 5 to 6 ft) for explosives and metals	Define vertical extent of contamination Confirm historic data Refine COC list Establish maximum concentrations and range of concentrations	Refine COC list Evaluate potential risk to human health Develop risk based PRGs	Refine COC list Evaluate potential risk to terrestrial ecological receptors	Define volume of contaminated soil Establish maximum concentrations for treatment Refine RAAs
Randomly collect 20 surface soil samples (0 to 0.5 ft) from inside ODA for SVOCs using a grid system Collect ten subsurface soil samples from one shallow soil boring, two deep soil borings, and two well borings inside ODA (2 to 3 ft; 5 to 6 ft) for VOCs and SVOCs	Identify if VOC or SVOC contamination is present within the ODA Define potential horizontal and vertical extent of contamination Refine COC list	Refine COC list Develop risk based PRGs	Refine COC list	Establish maximum concentrations for treatment Refine RAAs

NOTE: An acronym list is provided on the last page of this table.

Table 3-1. Soil Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
Collect eight subsurface soil samples (2 to 3 ft, 5 to 6 ft) from four shallow soil borings outside ODA for explosives and metals	Define vertical extent of contamination, if present, outside ODA Confirm field screening soil sample results			Define volume of contaminated soil
Collect 12 soil samples from two deep soil borings inside ODA (0 to 0.5 ft; 2 to 3 ft; 5 to 6 ft; and up to three intervals below 6 ft based on changes in lithology) for TOC and soil moisture content Collect four subsurface soil samples from two well borings inside ODA (confining unit above aquifer, if present; screened interval) for TOC Collect two subsurface soil samples from two well borings inside ODA (screened interval) for VOCs, SVOCs, explosives, and metals	Evaluate contaminant fate and transport Calculate K_d values		Moisture content for dry/wet weight conversions for plant uptake and incidental ingestion Determine temporal variability in soil moisture	Refine RAAs Support groundwater modeling, if needed Evaluate pretreatment requirements for technologies
Collect two composite soil samples (0 to 0.5 ft; 2 to 3 ft) inside ODA for waste characterization (TCLP, corrosivity, ignitability, reactivity)	Characterize investigation derived waste			Evaluate soil disposal alternatives
Compile existing reference soil data	Establish reference concentrations for contaminants of concern	Evaluate potential risk to human health	Evaluate effects of ODA contaminants on potential terrestrial receptors	
GEOLOGIC				
Drill two deep soil borings inside ODA (5 ft into the competent Midway Group); archive soil cores	Define lithology Identify water bearing zones Confirm proposed well locations inside ODA			

NOTE: An acronym list is provided on the last page of this table.

Table 3-1. Soil Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
Log all soil/well borings and surface soil samples	Define lithology Classify soil types Define depth to confining layers, if present Identify presence of lignite			Identify presence of oversized materials Evaluate pretreatment requirements for technologies Refine RAAs
PHYSICAL				
Collect ten soil samples within ODA for percent primary and secondary explosives by weight (LSAAP laboratory analysis) prior to initiation of Phase IV RI field activities	Ensure safety of site workers during RI field efforts	Determine safety risk from explosives		Refine RAAs Evaluate implementability of technologies
Collect 12 soil samples from two deep soil borings (0 to 0.5 ft; 2 to 3 ft; 5 to 6 ft; and up to three intervals below 6 ft based on changes in lithology) inside ODA for physical soil testing (porosity, bulk density, Atterberg limits, sieve analysis, and USCS) Collect four subsurface soil samples from two well borings inside ODA (confining unit above aquifer, if present; screened interval) for physical soil testing (porosity, bulk density, Atterberg limits, sieve analysis, and USCS) and for physical soil testing (undisturbed sample for permeability (hydraulic conductivity)) Collect 12 soil samples from six well borings (depth intervals based on changes in lithology) outside of the ODA for physical soil testing (Atterberg limits, sieve analysis, and USCS)	Evaluate contaminant fate and transport Estimate contaminant retardation Classify soil types Evaluate potential for run-off Determine hydraulic conductivity			Refine RAAs Evaluate pretreatment requirements for technologies Evaluate implementability of technologies Determine percent fines Weight/volume calculations Support groundwater modeling, if needed

COC	Contaminant of Concern	RI	Remedial Investigation
ft	foot or feet	SVOC	Semivolatile Organic Compound
K_d	Distribution Coefficient	TCLP	Toxicity Characteristic Leaching Procedure
LSAAP	Lone Star Army Ammunition Plant	TNT	2,4,6-Trinitrotoluene
ODA	Old Demolition Area	TOC	Total Organic Carbon
PRG	Preliminary Remediation Goal	USCS	Unified Soil Classification System
RAA	Remedial Action Alternative	VOC	Volatile Organic Compound

NOTE: Analyses are dependent on selection and concurrence of COCs.

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Rev. 08/03/95; 5:00 p.m.

Table 3-2. Sediment Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
CHEMICAL				
Collect four sediment samples along Kim & Christi's Creek near the ODA for field screening for TNT	Define horizontal extent of contamination			Define volume of contaminated sediment
Collect a total of 14 sediment samples (two samples from each of seven reaches) during each of the wet and dry seasons from pools or stagnant pools in Erika's, Kim & Christi's, and East Fork Elliott Creeks for explosives and metals. (NOTE: If a reach is dry, sediment samples will not be collected from that particular reach. However, additional samples may be collected from one of the other reaches to obtain a total of 14 samples.)	Define nature and extent of contamination Confirm historic data Refine COC list Establish maximum concentrations and range of concentrations Characterize contaminant fate and transport	Refine COC list Evaluate potential risk to human health Develop risk based PRGs Establish 95 percent upper confidence limit of the mean concentrations Establish mean concentrations	Refine COC list Evaluate potential ecological impacts from sediment exposure	Define volume of contaminated sediment Establish maximum concentrations for treatment Refine RAAs
Collect up to six sediment samples (two samples from Reaches 1, 2, and 7) during each of the wet and dry seasons from pools or stagnant pools in Erika's Creek for VOCs and SVOCs. (NOTE: If a reach is dry, sediment samples will not be collected for these parameters.)	Identify if VOC or SVOC contamination is present within Erika's Creek Refine COC list	Refine COC list Develop risk based PRGs	Refine COC list	Establish maximum concentration for treatment Refine RAAs
Collect one sediment sample from Kim & Christi's Creek at the ODA eastern boundary for explosives and metals	Define nature and extent of contamination Confirm historic data Refine COC list Establish maximum concentrations and range of concentrations Characterize contaminant fate and transport			Define volume of contaminated sediment Establish maximum concentrations for treatment Refine RAAs

NOTE: An acronym list is provided on the last page of this table.

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Rev. 08/02/95; 11:00 p.m.

Table 3-2. Sediment Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
Collect up to six sediment samples (two samples from three sites) during each of the wet and dry seasons from pools or stagnant pools at non-ODA stream reference sites for VOCs, SVOCs, explosives, and metals	Establish reference concentrations for metals	Develop risk based PRGs Evaluate potential risk to human health	Evaluate incremental contribution of ODA to sediment concentrations	
GEOLOGIC				
Log all sediment samples	Classify sediment types			Identify presence of oversized materials Evaluate pretreatment requirements for technologies Refine RAAs

COC Contaminant of Concern
ODA Old Demolition Area
PRG Preliminary Remediation Goal
RAA Remedial Action Alternative
SVOC Semivolatile Organic Compound
TNT 2,4,6-Trinitrotoluene
VOC Volatile Organic Compound

NOTE: Analyses are dependent on selection and concurrence of COCs.

Table 3-3. Surface Water Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
CHEMICAL				
Collect a total of 14 surface water samples (two samples from each of seven reaches) during each of the wet and dry seasons from pools or stagnant pools in Erika's, Kim & Christi's, and East Fork Elliott Creeks for explosives and metals. (NOTE: If a reach is dry, surface water samples will not be collected from that particular reach. However, additional samples may be collected from one of the other reaches to obtain a total of 14 samples.)	Define nature and extent of contamination Characterize contaminant fate and transport Refine COC list Establish maximum concentrations and range of concentrations Confirm historic data	Refine COC list Evaluate potential risk to human health Develop risk based PRGs Establish 95 percent upper confidence limit of the mean concentrations Establish mean concentrations	Refine COC list Evaluate potential risk to aquatic receptors	Refine RAAs
Collect up to six surface water samples (two samples from Reaches 1, 2, and 7) during each of the wet and dry seasons from pools or stagnant pools in Erika's Creek for VOCs and SVOCs. (NOTE: If a reach is dry, surface water samples will not be collected for these parameters.)	Identify if VOC or SVOC contamination is present within Erika's Creek Refine COC list	Refine COC List Develop risk based PRGs	Refine COC list Evaluate potential risk to aquatic receptors	Establish maximum concentration for treatment Refine RAAs
Collect up to six surface water samples (two samples from three sites) during each of the wet and dry seasons from pools or stagnant pools at non-ODA stream reference sites for VOCs, SVOCs, explosives, and metals	Establish reference concentrations for metals	Develop risk based PRGs Evaluate potential risk to human health	Evaluate effects of ODA contaminants on surface water receptors	

NOTE: An acronym list is provided on the last page of this table.

Table 3-3. Surface Water Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
Collect one surface water sample at four seep locations south of the ODA during each of the wet and dry seasons for VOCs, SVOCs, explosives, and metals	Define nature and extent of contamination Refine COC list Establish maximum concentrations and range of concentrations Characterize contaminant fate and transport	Develop risk based PRGs	Demonstrate complete transport pathways for potential ecological receptors	
Field test all surface water samples for water quality parameters (dissolved oxygen, alkalinity, pH, Eh, hardness, temperature, conductivity, turbidity)	Characterize surface water quality		Assess aquatic habitat Determine whether other factors may be affecting water quality	
STREAM GAGING				
Install and monitor three stream gaging locations along Erika's Creek for a maximum of 1 year	Measure stream base flow on a daily basis Evaluate groundwater/surface water interaction Evaluate temporal variability in surface water flow	Support exposure assessment	Support aquatic risk evaluation Assess aquatic habitat	

COC Contaminant of Concern
ODA Old Demolition Area
PRG Preliminary Remediation Goal
RAA Remedial Action Alternative
SVOC Semivolatile Organic Compound
VOC Volatile Organic Compound

NOTE: Analyses are dependant on selection and concurrence of COCs.

Table 3-4. Groundwater Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
CHEMICAL				
Collect an initial round of groundwater samples from all proposed and existing wells inside and outside the ODA (a total of 26 wells) during either the wet or dry season for explosives and metals[1] Collect a second round of groundwater samples from four proposed wells inside the ODA, six proposed wells outside the ODA, and 13 existing wells outside the ODA for explosives and metals[1] during either the wet or dry season (excludes three reference wells selected during the first sampling event)	Define nature and extent of contamination Confirm historic data Refine COC list Establish maximum concentrations and range of concentrations Identify and define groundwater plume, if present	Refine COC list Evaluate potential risk to human health Develop risk based PRGs Establish mean concentrations Identify source aquifer where potential risk to human health is applicable Establish 95 percent upper confidence limit of the mean concentrations (with time)	Refine COC list based on complete transport pathways for potential ecological receptors	Define volume of contaminated groundwater Establish maximum concentrations for treatment Refine RAAs
Collect groundwater samples during the wet and dry seasons from the four proposed wells inside the ODA for VOCs and SVOCs[1]	Identify if VOC or SVOC contamination is present Refine COC list Identify analyte concentrations at source	Refine COC list Evaluate potential risk to human health Develop risk based PRGs Identify source aquifer where potential risk to human health is applicable Establish 95 percent upper confidence limit of the mean concentrations (with time)	Refine COC list Demonstrate complete transport pathways for potential ecological receptors	Define volume of contaminated groundwater Establish maximum concentrations for treatment Refine RAAs

NOTE: An acronym list is provided on the last page of this table.

Table 3-4. Groundwater Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
Collect groundwater samples during the first sampling round from three wells upgradient and north of the ODA (Wells ODA-11, ODA-30, and ODA-31) for reference determination; analyze samples for VOCs and SVOCs[1] Collect groundwater samples three times following the initial sampling of all proposed and existing wells (for a total of four quarterly sampling events) for reference determination. Sample three wells upgradient and north of the ODA; analyze samples for VOCs, SVOCs, explosives, and metals[1]. (NOTE: It is anticipated that Wells ODA-11, ODA-30, and ODA-31 will be sampled for reference determination).	Establish reference concentrations for metals/inorganics Determine if upgradient source of contamination exists	Develop risk based PRGs Determine risk if risk assessment indicates a problem from naturally occurring chemicals	Refine COC list	
Collect groundwater samples from two proposed Wells ODA-32 and ODA-35 inside the ODA for determination of site-specific K_d values. Analyze filtered samples (dissolved fraction) for SVOCs, explosives, and metals.	Determine site-specific K_d values Evaluate contaminant fate and transport			Refine RAAs Support groundwater modeling, if needed

NOTE: An acronym list is provided on the last page of this table.

Table 3-4. Groundwater Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
Field test or collect samples for water quality parameters from all wells sampled; analyze samples for TSS, TDS, salinity, Eh, pH, conductivity, turbidity (field and laboratory measurement), bacterial quality, dissolved oxygen, temperature, alkalinity, cations, and anions[1]	Characterize groundwater quality Classify Wilcox aquifer	Determine if groundwater is a drinking water source (pathway analysis)		Refine RAAs Evaluate pretreatment requirements for technologies Evaluate implementability of technologies
HYDROGEOLOGIC				
Collect water level data from all proposed and existing wells	Determine hydraulic gradient and evaluate direction of groundwater flow Evaluate groundwater/surface water interaction Determine groundwater flow rate			Support groundwater modeling, if needed
Conduct slug tests at all proposed and existing wells	Evaluate recharge rates and hydraulic conductivity Evaluate interconnectivity between water-bearing zones			Evaluate implementability of technologies Refine RAAs Support groundwater modeling, if needed
Interpret subsurface geology from well/soil borings	Evaluate groundwater and surface water interaction Complete geologic characterization Evaluate fracture flow potential Determine aquifer thickness	Evaluate groundwater discharge to surface water potential relative to human health risk	Evaluate groundwater discharge to surface water potential relative to ecological risk	Refine RAAs Support groundwater modeling, if needed

NOTE: An acronym list is provided on the last page of this table.

Table 3-4. Groundwater Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
Install four wells inside ODA (proposed Wells ODA-32, ODA-33, ODA-34, and ODA-35)	Define nature and extent of contamination Identify and define groundwater plume, if present Characterize site hydrogeology			
Install eight wells outside ODA (proposed Wells ODA-24 through ODA-31)	Define nature and extent of contamination Identify and define groundwater plume, if present Characterize hydrogeology upgradient and downgradient of ODA			

1 Filtered and unfiltered groundwater samples will be collected for all analyses except VOCs if the field measured turbidity exceeds 5 NTUs. It is assumed that all groundwater samples will require filtering. Samples will be filtered in the field until the 5 NTU standard is reached or a 1 micrometer filter is utilized.

COC	Contaminant of Concern
K_d	Distribution Coefficient
NTU	Nephelometric Turbidity Unit
ODA	Old Demolition Area
PRG	Preliminary Remediation Goal
VOC	Volatile Organic Compound
RAA	Remedial Action Alternative
SVOC	Semivolatile Organic Compound
TDS	Total Dissolved Solids
TSS	Total Suspended Solids

NOTE: Analyses are dependent on selection and concurrence of COCs.

Table 3-5. Sample Summary for All Media.

Sample Type	Number of Sample Locations (Samples per Location)	Number of Sampling Events	Total Number of Phase IV Samples	VOCs	SVOCs	Explosives	Total TAL Metals[1]	Water Quality Parameters[2]	Physical Soil Parameters[2]	Other
SOIL										
Percent Primary and Secondary Explosives by Weight inside ODA	10 (1)	1	10							LSAAP Lab - 10
Field Screening Surface and Subsurface Soil[7]	50 (1)	1	50			50				
Surface Soil inside ODA (0 to 0.5 ft)	20 (1)	1	20		20	20	20			Waste Char.[4] - 2
Surface Soil outside ODA (0 to 0.5 ft)	20 (1)	1	20			20	20			
1 Shallow Soil Boring/2 Deep Soil Borings/2 Well Borings inside ODA (2 to 3 ft; 5 to 6 ft)	5 (2)	1	10	10	10	10	10			Waste Char.[4] - 2
Shallow soil borings outside ODA (2 to 3 ft; 5 to 6 ft)	4 (2)	1	8			8	8			
2 Well Borings inside ODA - ODA-32 and ODA-35 (confining unit above aquifer, if present; screened interval)	2 (2)	1	4	2*	2*	2*	2*		4	TOC - 4 Permeability - 4
2 Deep Soil Borings inside ODA (0 to 0.5 ft; 2 to 3 ft; 5 to 6 ft; and up to three intervals below 6 ft based on changes in lithology)	2 (6)	1	12						12	TOC - 12 SMC - 12
Well Borings outside ODA	6 (2)	1	12						12*	
Total Soil Samples				12	32	110	60		28	LSAAP Lab - 10 Waste Char.[4] - 2 TOC - 16 SMC - 12 Permeability - 4

NOTE: An acronym list is provided on the last page of this table.

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Rev. 08/02/95; 2:00 p.m.

Table 3-5. Sample Summary for All Media.

Sample Type	Number of Sample Locations (Samples per Location)	Number of Sampling Events	Total Number of Phase IV Samples	VOCs	SVOCs	Explosives	Total TAL Metals[1]	Water Quality Parameters[2]	Physical Soil Parameters[3]	Other
SEDIMENT										
Field Screening Sediment	4 (1)	1	4			4				
Erika's Creek (4 Reaches), Kim & Christi's Creek (1 Reach), and East Fork Elliott Creek (2 Reaches) - samples collected in pools or stagnant pools[5]	7 (2)	2 (Wet/Dry)	28	12**	12**	28	28			
Three Non-ODA Stream Reference Sites (1 Reach each) - samples collected in pools or stagnant pools	3 (2)	2 (Wet/Dry)	12	12	12	12	12			
Kim & Christi's Creek at ODA Eastern Boundary	1 (1)	1	1			1	1			
Total Sediment Samples				24	24	45	41			
SURFACE WATER										
Erika's Creek (4 Reaches), Kim & Christi's Creek (1 Reach), and East Fork Elliott Creek (2 Reaches) - samples collected in pools or stagnant pools[5]	7 (2)	2 (Wet/Dry)	28	12**	12**	28	28	28		
Three Non-ODA Stream Reference Sites (1 Reach each) - samples collected in pools or stagnant pools	3 (2)	2 (Wet/Dry)	12	12	12	12	12	12		
Seeps south of the ODA	4 (1)	2 (Wet/Dry)	8	8	8	8	8	8		
Total Surface Water Samples				32	32	48	48	48		

NOTE: An acronym list is provided on the last page of this table.

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Rev. 08/02/95; 2:00 p.m.

Table 3-5. Sample Summary for All Media.

Sample Type	Number of Sample Locations (Samples per Location)	Number of Sampling Events	Total Number of Phase IV Samples	VOCs	SVOCs	Explosives	Total TAL Metals[1]	Water Quality Parameters[2]	Physical Soil Parameters[3]	Other
GROUNDWATER[6]										
Proposed Wells inside ODA (ODA-32, ODA-33, ODA-34, and ODA-35)	4 (1)	2	8	8 [UF]	8 [UF] 8 [F]	8 [UF] 8 [F]	8 [UF] 8 [F]	8 [UF] 8 [F]		
Proposed Wells outside ODA (Wells ODA-24 through ODA-29; excludes reference wells)	6 (1)	2	12			12 [UF] 12 [F]	12 [UF] 12 [F]	12 [UF] 12 [F]		
Wells upgradient and north of ODA for Reference Determination (Wells ODA-11, ODA-30, and ODA-31)	3 (1)	4	12	12 [UF]	12 [UF] 12 [F]	12 [UF] 12 [F]	12 [UF] 12 [F]	12 [UF] 12 [F]		
Existing Wells outside ODA (excluding reference Well ODA-11)	13 (1)	2	26			26 [UF] 26 [F]	26 [UF] 26 [F]	26 [UF] 26 [F]		
K_d Determination in Proposed ODA Wells (ODA-32 and ODA-35)	2 (1)	1	2		2*** [D]	2*** [D]	2*** [D]			
Total Groundwater Samples				20	42	118	118	116		

* Samples will be collected from screened interval only.

** Samples will be collected from Reaches 1, 2, and 7.

*** Samples will be filtered in the field using a 0.45 µm filter to obtain a dissolved fraction for site-specific K_d determination.

\+ Samples will be collected from the deep well of a well cluster.

1 TAL metals includes ICP metals, arsenic, selenium, lead, and mercury.

2 Water quality parameters for surface water samples include dissolved oxygen, alkalinity, pH, Eh, hardness, temperature, conductivity, and turbidity. Water quality parameters for groundwater samples include TSS, TDS, salinity, Eh, pH, conductivity, turbidity (field and laboratory measurement), bacterial quality, dissolved oxygen, temperature, alkalinity, cations, and anions.

3 Physical soil parameters include USCS, sieve analysis, Atterberg limits, porosity, and bulk density for interior ODA soil/well borings, and USCS, sieve analysis, and Atterberg limits for exterior ODA well borings.

4 Waste characterization parameters include analyses for TCLP, corrosivity, ignitability, and reactivity. A composite sample will be collected from the 0 to 0.5 ft and 2 to 3 ft depth intervals of a soil boring.

5 If a reach is dry during the dry season, sediment and surface water samples will not be collected from that particular reach. However, additional samples may be collected from one of the other reaches to obtain a total of 14 samples.

6 Filtered and unfiltered groundwater samples will be collected if the field measured turbidity exceeds 5 NTUs. It is assumed that all groundwater samples will require filtering. Samples will be filtered in the field until the 5 NTU standard is reached or a 1 µm filter is utilized.

7 Four laboratory samples will be collected at field screening locations that have no detected explosives, and up to 12 laboratory samples (0 to 0.5, 2 to 3, and 5 to 6 feet at up to four locations) will be collected to confirm field screening detected results.

D Dissolved
F Filtered
ft foot or feet
ICP Inductively Coupled Argon Plasma
LSAAP Lone Star Army Ammunition Plant
NTU Nephelometric Turbidity Unit
ODA Old Demolition Area
SMC Soil Moisture Content
SVOC Semivolatile Organic Compound
TAL Target Analyte List
TCLP Toxicity Characteristic Leaching Procedure
TDS Total Dissolved Solids
TOC Total Organic Carbon
TSS Total Suspended Solids
UF Unfiltered
µm micrometer(s)
USCS Unified Soil Classification System
VOC Volatile Organic Compound

NOTE: Analyses are dependent on selection and concurrence of COCs.

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Rev. 08/02/95; 3:00 p.m.

Table 3-6. Summary of Proposed Monitoring Well Locations at the Old Demolition Area.

Well Number	Location	Screened Interval
ODA-24	Approximately 100 ft northeast of soil boring SB8, nested with ODA-25	Alluvium and first sand interval (approximately 310 to 317 ft MSL)
ODA-25	Approximately 100 ft northeast of soil boring SB8, nested with ODA-24	Second sand interval (approximately 297 to 306 ft MSL)
ODA-26	Adjacent to Erika's Creek, southeast of the ODA, nested with ODA-27	Alluvial deposits of Erika's Creek, and/or shallowest Wilcox Formation
ODA-27	Adjacent to Erika's Creek, southeast of the ODA, nested with ODA-26	Deepest water-bearing zone in the Wilcox Group (lateral equivalent of lower sand immediately above the Midway Group, if present[1])
ODA-28	Approximately 250 ft south-southwest of Erika's Creek	Sand interval immediately above the Midway Group (approximately 267 to 277 ft MSL)
ODA-29	Near soil boring SB14, nested with ODA-17	Shallowest sand interval (above the upper sand interval at this location[1]) (approximately 287 to 295 ft MSL)
ODA-30*	Approximately 300 ft north of soil boring SB5	First silt/sand interval (approximately 305 to 310 ft MSL)
ODA-31*	Approximately 100 ft north of soil boring SB6	First sand interval in the Wilcox Aquifer (approximately 315 to 320 ft MSL)
ODA-32	Approximately 150 ft northwest of soil boring SB2, nested with ODA-33	Uppermost portion of the main sand interval in the Wilcox Group[2] (projected to be approximately 290 to 297 ft MSL)
ODA-33	Approximately 150 ft northwest of soil boring SB2, nested with ODA-32	Deepest portion of the main sand interval, immediately above the Midway Group[2] (approximately 267 to 275 ft MSL)
ODA-34	Approximately 200 ft northwest of ODA-7, nested with ODA-35	First water bearing interval in the Wilcox Group (if different from intended target interval of proposed Well ODA-35 [3]) (projected to be approximately 300 to 310 ft MSL)
ODA-35	Approximately 200 ft northwest of ODA-7, nested with ODA-34	Deepest sand interval (analogous to lower sand interval), immediately above the Midway Group (approximately 285 to 295 ft MSL)

* Background well

1 Upper/lower denotes approximate equivalency with requested U.S. Environmental Protection Agency terminology.
2 The main sand interval at this location may or may not be separated into two separate sands at this location (upper and lower sand units[1]).
3 If two different water bearing units are not present, only proposed Well ODA-35 will be installed.

ft foot or feet
MSL Mean Sea Level
ODA Old Demolition Area

Table 3-7. Other Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
TERRESTRIAL RECONNAISSANCE				
Conduct terrestrial reconnaissance of ODA and specific adjacent areas during the wet and dry seasons	Identify terrestrial community (small mammals) utilizing the ODA (forest/shrub) Identify terrestrial community (small mammals) utilizing the riparian areas along Kim & Christi's (limited to sediment deposition areas) and Erika's Creek (limited to the seep areas) Confirm historical information (1978 survey)		Identify habitats that may be affected Identify potential ecological receptors	
AQUATIC SURVEY				
Conduct stream survey of Erika's, Kim & Christi's, and East Fork Elliott Creek quarterly for 1 year*	Characterize aquatic habitat Identify aquatic species Identify benthic community		Evaluate potential risk to the aquatic community Characterize benthic community	
AERIAL SURVEY				
Conduct LSAAP land use flyby to include 2 mile radius from installation boundary** Meet with local government representatives to research local development plans**	Determine present off-post land use Assess potential future off-post land use Prepare Land Use Report	Aid in selection of appropriate current and future receptors		
Conduct ODA flyby**	Prepare site map			

NOTE: An acronym list is provided on the last page of this table.

T. 3-7. Other Data Needs.

Activity	Remedial Investigation	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study
SURVEYING				
Conduct topographic surveying**	Clarify site topography Prepare site topographic map			
Conduct location surveying to include all sample locations and well locations	Prepare accurate sample location maps and contaminant distribution maps			
LITERATURE SEARCH				
Contaminant mobility	Evaluate contaminant fate and transport in aerobic and anaerobic environments			Refine RAAs Support groundwater modeling, if necessary
Contaminant properties	Identify K_{ow} values, molecular weight, solubility, Henry's Law constant, and polarity to evaluate contaminant fate and transport	Toxicity data search Chemical degradation rates Bioavailability data Route to route extrapolations	Toxicity data search Chemical degradation rates Bioavailability data Route to route extrapolations	Refine RAAs Support groundwater modeling, if necessary
Collect precipitation and other meteorological data from nearby airport**	Determine wet and dry seasons Determine predominant wind direction Characterize potential surface water impact to watershed			Refine containment alternatives

* Two quarterly stream surveys have been completed to date.
** Activity has been completed.

K_{ow} Octanol water partition coefficient
LSAAP Lone Star Army Ammunition Plant
ODA Old Demolition Area
RAA Remedial Action Alternative

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Rev. 08/02/95; 11:00 p.m.

DEPARTMENT OF THE ARMY
LONGHORN/LOUISIANA ARMY AMMUNITION PLANTS
MARSHALL, TEXAS 75671-1059

016310

REPLY TO ATTENTION OF

October 19, 1995

SMCLO-EN

Ms. Lisa Price
Superfund Division
U.S. Environmental Protection Agency
1445 Ross Avenue
Dallas, Texas 75202

SUBJECT: Draft Phase II Investigations of 125 Waste Process Sumps and 20 Waste Rack Sumps, forLonghorn Army Ammunition Plant in Karnack, Texas

Dear Ms. Price:

Enclosed are two copies of the subject document. Please review and provide written comments to this office by November 20, 1995.

If you have any questions, please contact Mr. David Tolbert, at 903-679-2728.

Sincerely,

Darrell W. Chinn
Captain, U.S. Army
Executive Officer

Enclosures

DEPARTMENT OF THE ARMY
LONGHORN/LOUISIANA ARMY AMMUNITION PLANTS
MARSHALL, TEXAS 75671-1059

REPLY TO ATTENTION OF

October 19, 1995

016311

SMCLO-EN

Mr. Michael Moore
Superfund Investigation Section
Texas Natural Resource Conservation Commission
Post Office Box 13087
Austin, Texas 78711-3087

SUBJECT: Draft Phase II Investigations of 125 Waste Process Sumps and 20 Waste Rack Sumps, forLonghorn Army Ammunition Plant in Karnack, Texas

Dear Mr. Moore:

Enclosed are two copies of the subject document. Please review and provide written comments to this office by November 20, 1995.

If you have any questions, please contact Mr. David Tolbert, at 903-679-2728.

Sincerely,

Darrell W. Chinn
Captain, U.S. Army
Executive Officer

Enclosures

DEPARTMENT OF THE ARMY
LONGHORN/LOUISIANA ARMY AMMUNITION PLANTS
MARSHALL, TEXAS 75671-1059

October 19, 1995

016312

REPLY TO ATTENTION OF
SMCLO-EN

Mr. H.L. Jones
Texas Natural Resource Conservation Commission
2916 Teague Drive
Tyler, Texas 75701

SUBJECT: Draft Phase II Investigations of 125 Waste Process Sumps and 20 Waste Rack Sumps, forLonghorn Army Ammunition Plant in Karnack, Texas

Dear Mr. Jones:

Enclosed is one copy of the subject document. Please review and provide written comments to this office by November 20, 1995.

If you have any questions, please contact Mr. David Tolbert, at 903-679-2728.

Sincerely,

Darrell W. Chinn
Captain, U.S. Army
Executive Officer

Enclosure

October 19, 1995

DEPARTMENT OF THE ARMY
TULSA DISTRICT, CORPS OF ENGINEERS
POST OFFICE BOX 61
TULSA, OKLAHOMA 74121-0061

REPLY TO
ATTENTION OF:

016315

Planning Division
Environmental Analysis and Support Branch

Mr. Curtis Tunnell
Executive Director
Texas Historical Commission
Department of Antiquities Protection
P.O. Box 12276
Austin, TX 78711-2276

Dear Mr. Tunnell:

This letter initiates consultation under Section 106 of the National Historic Preservation Act of 1966, as amended, on proposed geotechnical work at an old dump site at the Longhorn Army Ammunition Plant in Harrison County, Texas.

A cultural resources inventory was conducted by this office within the project area. No cultural resources were found. It is anticipated that the proposed action will not have an effect on historic properties. The enclosed documentation is provided pursuant to 36 CFR Part 800.4(d).

Sincerely,

for G. David Steele, P.E.
Chief, Planning Division

Enclosure

CULTURAL RESOURCES INVENTORY OF A SUSPECTED HIGH EXPLOSIVES DUMP SITE AT THE LONGHORN ARMY AMMUNITION PLANT, HARRISON COUNTY, TEXAS

PROJECT DESCRIPTION

The U.S. Army Corps of Engineers (USACE), Tulsa District, in conjunction with the USACE Waterways Experiment Station are in the process of investigating a 1950s dump site, Dump Site Number 63, at the Longhorn Army Ammunition Plant (LHAAP) where it is suspected that High Explosives (HE) were buried. The LHAAP is located in the northeastern portion of Harrison County and flanks the western shore of Caddo Lake. The project area is located in the southeastern portion of the base at the approximated UTM coordinate centrum of N6953300 E3317880 (Figures 1 and 2).

The investigation of the dump site will involve the use of a Site Characterization and Analysis Penetrometer System (SCAPS) vehicle. Since Dump Site Number 63 is presently covered with a 35 year old stand of loblolly pine and associated underbrush, two 30 foot east-west corridors will be cleared from an existing dirt road to allow free movement of the SCAPS vehicle (see Figure 2). On the dump site, the SCAPS vehicle will use a 2 inch diameter metal and ceramic probe to detect HE to a maximum depth of 70 feet below the surface. It is estimated that at least 34 probes will be placed across the dump site (see Figure 2). As a result of these investigations a remediation program may be operationalized at some point in the future which would result in the excavation and removal of sediments from the dump site.

As a result of these investigations, a cultural resources inventory was conducted within the dump site area.

AUTHORITY

The cultural resources inventory was performed in compliance with Section 106 and 110 of the National Historic Preservation Act of 1966, as amended and the Archeological Resources Protection Act of 1979, as amended.

PROJECT AREA

Overall, the LHAAP falls within the Gulf Coastal Plains region of northeastern Texas. The project area is situated in a poorly drained pine-oak flat (Peter and Stiles-Hanson 1990:3) above the southern side of the Big Cypress drainage system (now inundated by Caddo Lake). It is at an average elevation of 195 feet National Geodetic Vertical Datum and the upper-most sediments are composed principally of sands and sandy loams

related to the Wilcox Group (American Association of Petroleum Geologists 1975; Peter and Stiles-Hanson 1990:1). Prior to the construction of the LHAAP the project area was situated in a pine-oak forest zone composed of various species of pine and oak (Peter and Stiles-Hanson 1990:1-5). Since the middle nineteenth century the area in and around Dump Site Number 63 has been cleared and used for either grazing or cultivation until the lands were condemned in 1940-41 for the construction of the LHAAP. Prior to 1954, the area within the present vicinity of the dump site remained cleared and was grass-covered. Between 1954 and 1958, the top-most sediments appeared to have been stripped and east-west-running trenches were excavated within the cleared area (Figures 3 and 4). Since 1958, a second stand of trees, composed principally of loblolly pine, was allowed to grow over Dump Site Number 63. Today the project area is forested and covered with a thick underbrush of briar and other kinds of secondary plants.

As an area of research, the project area falls within the Gulf Coastal Plains archeological province. A culture-historic overview of the surrounding region is beyond the scope of this report; however, a detailed account is given in the USACE Southwestern Division's publication, "The Archeology and Bioarcheology of the Gulf Coastal Plain: Volume 1 and 2 (Story et al. 1990)." An overview on known cultural resources found within the last 60 years at the LHAAP is also available (Peter and Stiles-Hanson 1990).

INVESTIGATION

Previous cultural resources inventories within the present day boundaries of LHAAP were conducted as early as 1935 and resulted in the discovery of the prehistoric Caddo Harrison Bayou site, 41HS240 (Peter and Stiles-Hanson 1990:5). Other investigations involving this site were published by Ford (1936) and Webb (1948). A cultural resources inventory was conducted in 1968 along Caddo Lake which included some portions of the LHAAP (Gibson 1970). This inventory added two additional prehistoric sites within LHAAP and a reinvestigation of the Harrison Bayou site. In 1983, 360 acres within the LHAAP were intensively inventoried by Bennett (1984) and in 1985 a cultural resources overview and management plan was published (Dieste et al. 1985). Since 1988, archeologists with the USACE, Fort Worth District have conducted smaller intensive cultural resources inventories within the LHAAP (Peter and Stiles-Hanson 1990; Tim Dalbey, personal communication, 1995). A reconnaissance cultural resources inventory and overall assessment of cultural resources were conducted at the LHAAP in 1988 by Geo-Marine, Inc. (Peter and Stiles-Hanson 1990). Based on this investigation a historic

homestead site (Locality 37), consisting of a brick line well, bulldozed brick pile, and associated ornamental plants, were discovered near, but off-site from Dump Site No. 63 (see Figure 2)(Peter and Hanson 1990:37).

On September 11 and 27, 1995, Dr. Frank Winchell, archeologist with the USACE, Tulsa District, visually inspected the surface of Dump Site Number 63 by a series of north-south transects. Surface and subsurface sediments were also examined along the central north-south and south east-west road cut, in addition to a total of 28 screened shovel tests excavated within the dump site (see Figure 2). These shovel tests were excavated to depth between 40 and 60 cm below the surface. Since it was suspected that buried HE may exist somewhere within Dump Site No. 63, Dr. Winchell felt prudent not to excavate deeper soundings.

Locality 37 was also inspected in order to define the site limits. The site limits at this historic site were defined by observable features, such as the brick-lined well and brick pile, a few artifacts, and a cluster of oak trees. Ten shovel tests were also excavated at this site (see Figure 2).

FINDINGS

No cultural resources were found within the project area. Ground visibility was poor within the wooded areas, being less than 5 percent. Ground visibility along the roads and previously cleared Penetrometer corridors was excellent, being 100 percent. Sediments from the road, cleared transects, and shovel tests revealed a truncated, featureless B-Horizon consisting of brown/yellowish-brown to light brown and reddish brown sands and sandy loams. Very little pedogenic development was observed in the top-most sediments, indicating that the original A-Horizon had been stripped, probably as a result of clearing and other related activities involving the dumping and burying of materials at Dump Site Number 63 sometime between 1954 and 1958.

RECOMMENDATIONS

Based on the above findings, it is recommended that the above SCAPS investigations and possible future remediation activities at Dump Site Number 63 proceed.

REFERENCES CITED

American Association of Petroleum Geologists, *Geological Highway Map of the Southeastern Region* (1975), American Association of Petroleum Geologist, Tulsa.

Bennett, W. J., Jr., *Intensive Cultural Resources Survey of Selected Locations in the Longhorn Army Ammunition Plant, Karnack, Texas and Louisiana Army Ammunition Plant, Minden Louisiana* (1984), Archeological Assessment Report No. 42, submitted to the U.S. Army Corps of Engineers, Fort Worth District, Fort Worth.

Dieste, T., L. Heartfield, and G. Stringer, *An Archaeological Overview and Management Plan for the Longhorn Army Ammunition Plant, Harrison County, Texas* (1985), Final Report No. 22. National Park Service, U.S. Department of the Interior, Atlanta.

Ford, J. A., *Analysis of Indian Village Site Collections from Louisiana and Mississippi*, Anthropological Study No. 2. Department of Conservation, Louisiana Geological Survey, New Orleans.

Gibson, J. L. *Archaeological Survey at Caddo Lake, Louisiana and Texas* (1970), Contributions in Anthropology No. 6. Southern Methodist University, Dallas.

Peter, D. E. and C. Stiles-Hanson, *An Assessment of the Cultural Resources within the Longhorn Army Ammunition Plant, Harrison County, Texas* (1990), Miscellaneous Report of Investigations, Number 3. Geo-Marine, Inc., Plano, Texas.

Story, D. A., J. A. Guy, B. A. Burnett, M. D. Freeman, J. C. Rose, D. G. Steele, B. W. Olive, and K. J. Reinhard, *The Archeology and Bioarcheology of the Gulf Coastal Plain: Volume 1 and 2* (1990), Prepared by the Arkansas Archeological Survey. Final Report Submitted to the U.S. Army Corps of Engineers, Southwestern Division. Study Unit 2 of the Southwestern Division Archeological Overview. Arkansas Department of Corrections, Wrightsville.

Webb, C. H., Caddoan Prehistory: The Bossier Focus. *Bulletin of the Texas Archaeological and Paleontological Society* (1948) 19:100-147.

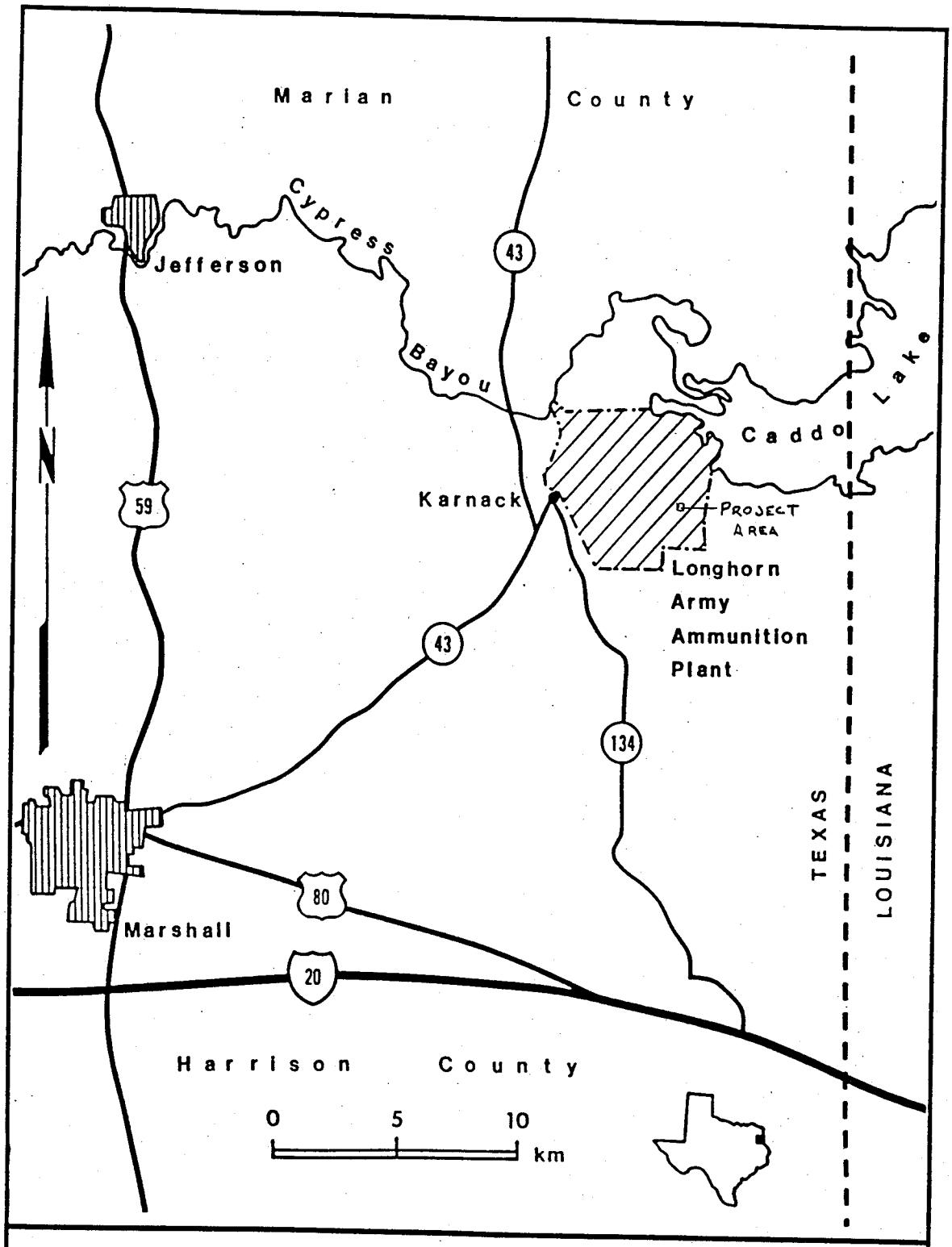


Figure 1. General location of the Longhorn Army Ammunition Plant in northeast Texas. AFTER PETER AND STILES-HANSON (1990)

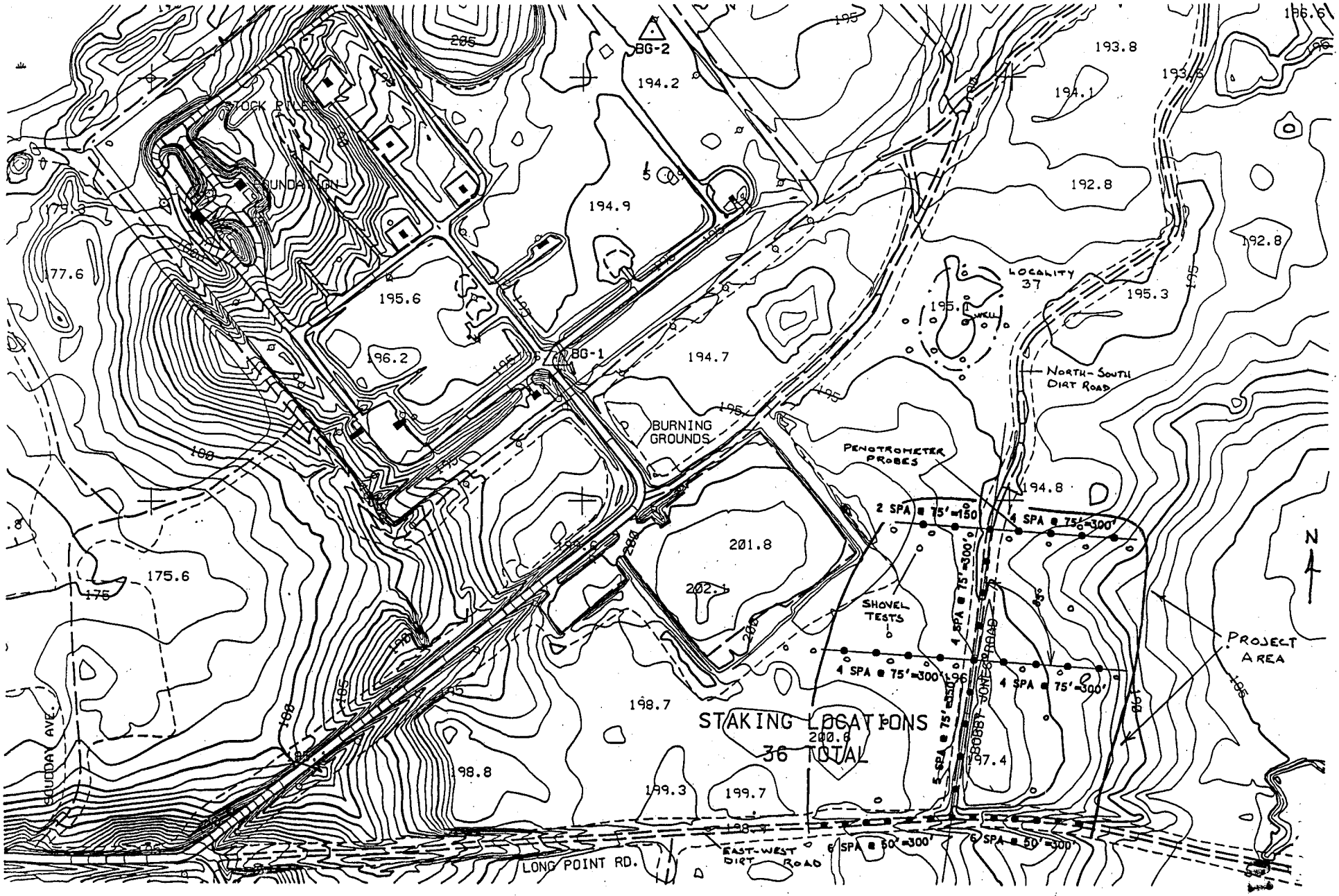
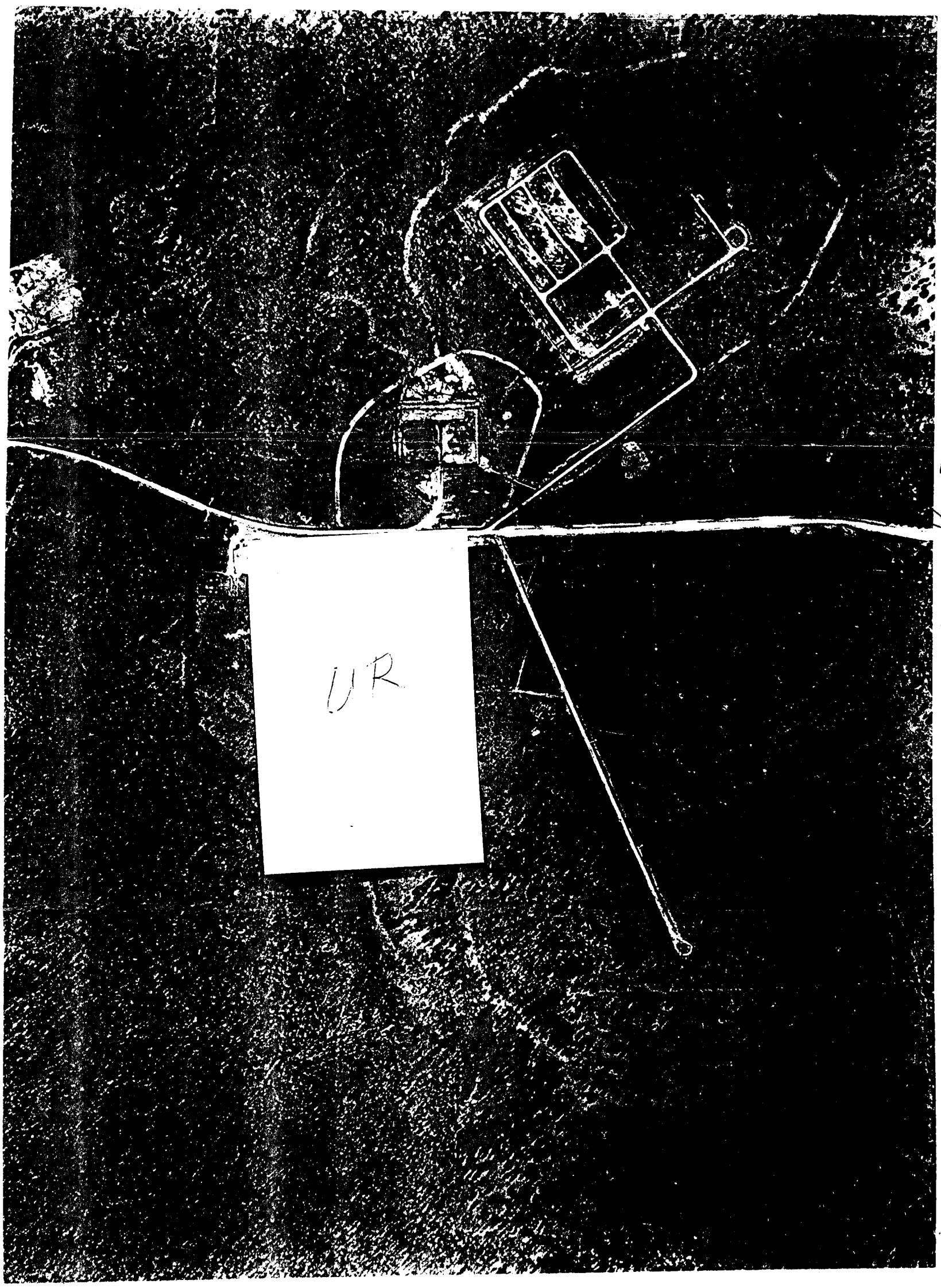

BG-2
BG-1
194.2
194.9
195.6
196.2
194.7
193.8
194.1
192.8
192.8
195.3
195.
LOCALITY 37
WELL
NORTH-SOUTH DIRT ROAD
BURNING GROUNDS
PENETROMETER PROBES
194.8
2 SPA @ 75'=150'
4 SPA @ 75'=300'
4 SPA @ 75'=300'
201.8
202.1
SHOVEL TESTS
4 SPA @ 75'=300'
4 SPA @ 75'=300'
5 SPA @ 75'=350'
JONES ROAD
PROJECT AREA
198.7
200.6
STAKING LOCATIONS
36 TOTAL
197.4
199.3
199.7
98.8
6 SPA @ 50'=300'
6 SPA @ 50'=300'
EAST-WEST DIRT ROAD
LONG POINT RD.
SUDDAY AVE.
175.6
177.6
N

FIGURE 2.

FIG. 4

1958



DUMP SITE No. 63 (1958)

TRENCHES

UR

FIGURE 3

1954

DEPARTMENT OF THE ARMY
U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
ABERDEEN PROVING GROUND, MARYLAND 21010-5422

016322

REPLY TO
ATTENTION OF

MCHB-DE-HR (40)

24 OCT 1995

MEMORANDUM FOR Commander, U.S. Army Corps of Engineers, Tulsa District, ATTN: CESWT-PP-EA/Ms. Jonna Polk, Post Office Box 61, Tulsa, Oklahoma 74121-0061

SUBJECT: Review of the Draft Site Work Plan for Interim Remedial Action at Landfills 12 and 16 Caps, Longhorn Army Ammunition Plant (LHAAP), Karnack, TX, prepared by OHM Remediation Services Corp., September 19, 1995

1. The U.S. Army Center for Health Promotion and Preventive Medicine reviewed the subject document on behalf of the Office of The Surgeon General. The description of the proposed work plan adequately addresses public health concerns; therefore, no comments are included.

2. The scientist reviewing the subject document and our point of contact is Mr. Mark A. Dossey, Health Risk Assessment and Risk Communication Program, DSN 584-2953 or commercial (410) 671-2953.

FOR THE COMMANDER:

JACK M. HELLER, Ph.D.
Acting Program Manager, Health Risk Assessment and Risk Communication

CF:
HQDA (DASG-HS-PE)
CDR, USAMEDCOM, ATTN: MCHO-CL-P
CDR, CEMRD, ATTN: CEMRD-ET-EH
CDR, USAEC, ATTN: SFIM-AEC-IRP
CDR, LHAAP, ATTN: SMCLO-EN

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

October 30, 1995

Mr. Myron O. Knudson, P.E., Director
Superfund Division
U. S. Environmental Protection Agency
Region 6
1445 Ross Avenue
Dallas, TX 75202-2733

RE: Record of Decision for Areas Referred to as Sites 13 and 14
Within the Longhorn Army Ammunition Plant

Dear Mr. Knudson:

We have reviewed the proposed Record of Decision (ROD) for the No Further Action at Sites 13 and 14 within the Longhorn Army Ammunition Plant (or "LHAAP"). We concur that the remedy described in the December 1995 ROD is the most appropriate for these sites.

Based on previous studies and surveys, no remedial action is warranted to protect human health and the environment at LHAAP Sites 13 and 14. This decision complies with Federal and State applicable or relevant and appropriate requirements and is cost effective.

Sincerely,

William L Caudell

for Dan Pearson
Executive Director

DP/MM/mm

cc: David Tolbert, LHAAP (SIOLH-OR)
Jonna Polk, COE Tulsa District (CESWT-PP-EA)
Lisa Price, EPA Region 6 (6SF-AT)

016324

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

October 30, 1995

Lisa Marie Price (6SF-AT)
U.S. Environmental Protection Agency
Region 6
1445 Ross Avenue
Dallas, TX 75202-2733

Re: Longhorn Army Ammunition Plant (LHAAP)
Record of Decision (ROD) for No Further Action at
LHAAP Sites 13 and 14

Dear Ms. Price:

Please find the enclosed referenced ROD with the original State of Texas Letter of Concurrence (Appendix A).

If you have any questions or comments, please contact me at (512) 239-2483.

Sincerely yours,

Michael A. Moore

Michael A. Moore (MC 143)
RI/FS II Unit
Superfund Investigation Section
Pollution Cleanup Division

Enclosure

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

CERTIFIED MAIL: RETURN RECEIPT REQUESTED

NOV 0 1 1995

016325

David Tolbert, Project Manager
Longhorn Army Ammunition Plant
Attn: SMCLO-EN
Marshall, Texas 75671-1059

Re: Site Characterization Summary Report
Remedial Investigation Sites 11, 1, XX, 27
Longhorn Army Ammunition Plant

Dear David:

In accordance with the Federal Facility Agreement for the Longhorn Army Ammunition Plant, EPA is submitting comments on the secondary document Site Characterization Summary Report Remedial Investigation Sites 11, 1, XX, 27 (Group #1) at Longhorn Army Ammunition Plant dated October 1995. EPA's comments are incorporated as an enclosure to this letter. Pursuant to the Federal Facility Agreement, EPA's comments should be addressed and changes incorporated when developing the Remedial Investigation Report.

If you have any questions about this or any other matter, please contact me at (214) 665-6744.

Sincerely,

Lisa Marie Price
Remedial Project Manager

Enclosure

cc: Captain Darrell W. Chinn
Executive Officer, U.S. Army
Longhorn Army Ammunition Plant
Marshall, Texas 75671-1059

Tulsa District Corps of Engineers
P.O. Box 61
Attn: Ms. Jonna Polk
CESWT-PP-E
Tulsa, OK 74121-0061

Mike Moore, Superfund
Texas Natural Resource Conservation Commission
P.O. Box 13087
Section MC143
Austin, TX 78711-3087

EPA's Comments 11/1/95
SCS Group #1 Sites

016326

General Comments:

#1 A table identifying the primary and secondary drinking water regulations proposed MCLs or MCLs as well as the Health Advisories for contaminants without proposed MCLs or MCLs should be provided in each of the sections for the sites under investigation. Discussion about concentrations of constituents above or below MCLs are useless without a frame of reference.

#2 For all tables and figures: specifically identify dates (i.e., years) for "previous" investigations or phases of investigations; clarify what "existing" means and give a date for the installation or collection of the sample (eg. Figure 3-1 indicates "existing" for the surface water/sediment sample location; Figure 4-1 indicates "existing" for a monitoring well).

#3 In the nature and extent of contamination sections for each of the sites under investigation, no conclusion is presented as to whether contamination related to site activities or suspected site activities has resulted in a release of contamination.

Specific Comments:

#4 Section 2.6, page 13 of 19, 1st para.: A draft 1990 USATHAMA document is the reference for Figure 2-4; what document is this? Given that a more current ground water elevation map (November 1994) was generated (See Hydrogeological Assessment, Volume I. May 1995, Figure 12) and ground water potentiometric information is presented for most of the sites under investigation, current data should be presented.

#5 Section 3.1.1, 1st sentence: The location is known but the activities are undocumented.

#6 Section 3.1.4: Delete the sentence *"The site-specific background level of 1,3,5-TNB was 30 µg/kg."*

#7 Sections 3.2.1, 4.2.1, 5.2.1, 6.2.1/Tables 3-2, 3-3, 3-4, 4-2, 5-2, 6-2: When discussing metal concentrations in reference to "background", use one value (i.e., UCL). The use of "maximum background concentrations...background ranges...[and] the background concentration" is very confusing. For purposes of comparing data (eg. tables illustrating maximum values detected during the investigation vs. background concentrations), UCL data should be included.

#8 Section 3.2.2, Table 3-5, Section 3.4, Section 4.2.2, Table 4-3, Section 5.2.2, Table 5-3, Section 5.4, Section 6.2.2, Table 6-5, Section 6.4: Qualify ground water grab information because the ground water grab sample should be used only as a screening tool, not as a definitive indicator of the nature and extent of ground water contamination.

#9 Section 3.2.3, 1st para., 4th sentence: To whose water quality standard are you referring?

#10 Section 3.3.2, 2nd para., 6th (last) sentence: *"This clay unit could act as an aquitard between this upper...transmissive unit and lower water-bearing units."* All the *"units"* within the Wilcox are hydraulically connected (Section 2.6, 1st para., 4th sentence).

#11 Section 4.2.1, page 9 of 26, 2nd para.: Identify PAH acronym and identify what constitutes a PAH contaminant.

#12 Section 4.4: To whose water quality health criteria are you referring? Is there a lab contamination problem with the data for the investigations for this site or are acetone, methylene chloride, and the phthalate contaminants possible site-related contaminants? What about the significant number and amount of semi-volatiles detected in soil boring SB26 and sediment sample SD-09?

#13 Section 5.4: See General Comment #3. Additionally, more explanation will have to be given regarding acetone concentrations detected during the Phase 1 investigation and the lack of detectable concentrations during the Phase 2 investigation.

#14 Section 6.1.4, 1st para., 3rd sentence: A concentration of 10.2 mg/kg is NOT a trace concentration! Is the unit reported incorrectly in the Table 6-1? The 2,4,6-TNT concentration for soil sample 0402 is not reported in Table 6-1.

#15 Section 6.4, 2nd para., 4th and 5th sentences: Is nickel suspected to be a contaminant at this site?