



The following documentation is an electronically-submitted vendor response to an advertised solicitation from the *West Virginia Purchasing Bulletin* within the Vendor Self-Service portal at ***wvOASIS.gov***. As part of the State of West Virginia's procurement process, and to maintain the transparency of the bid-opening process, this documentation submitted online is publicly posted by the West Virginia Purchasing Division at ***WVPurchasing.gov*** with any other vendor responses to this solicitation submitted to the Purchasing Division in hard copy format.

Header

List View

General Information

Contact

Default Values

Discount

Document Information

Procurement Folder: 202807

SO Doc Code: CRFQ

Procurement Type: Central Master Agreement

SO Dept: 0313

Vendor ID: 000000232671

SO Doc ID: DEP1700000002

Legal Name: TETRA TECH INC

Published Date: 9/1/16

Alias/DBA:

Close Date: 9/14/16

Total Bid: \$70,252.00

Close Time: 13:30

Response Date: 09/14/2016

Status: Closed

Response Time: 10:47

Solicitation Description: Addendum 1 - Environmental Risk Assessment

Total of Header Attachments: 0

Total of All Attachments: 0



Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Solicitation Response

Proc Folder : 202807

Solicitation Description : Addendum 1 - Environmental Risk Assessment

Proc Type : Central Master Agreement

Date issued	Solicitation Closes	Solicitation Response	Version
	2016-09-14 13:30:00	SR 0313 ESR09141600000001065	1

VENDOR

000000232671
TETRA TECH INC

Solicitation Number: CRFQ 0313 DEP1700000002

Total Bid : \$70,252.00

Response Date: 2016-09-14

Response Time: 10:47:07

Comments:

FOR INFORMATION CONTACT THE BUYER

Jessica S Chambers
(304) 558-0246
jessica.s.chambers@wv.gov

Signature on File

FEIN #

DATE

All offers subject to all terms and conditions contained in this solicitation

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
1	Risk or hazard assessment	700.00000	HOUR	\$100.360000	\$70,252.00

Comm Code	Manufacturer	Specification	Model #
77101501			

Extended Description :	Environmental Risk Assessor



September 13, 2016

West Virginia State Purchasing Division
2019 Washington Street, East
Charleston, West Virginia 25305
Jessica.s.chambers@wv.gov

SUBJECT: Solicitation No. CRFQ 0313 DEP1700000002

ATTN: Ms. Jessica S. Chambers, Buyer

Dear Ms. Chambers:

Tetra Tech, Inc. (Tetra Tech) appreciates the opportunity to submit our quotation for the open-end contract for an Environmental Risk Assessment to determine ecological and human health risks that may be associated with projects in the West Virginia Department of Environmental Protection Voluntary Remediation and Redevelopment Program. This quotation responds to Solicitation No. CRFQ 0313 DEP 1700000002.

Tetra Tech's risk assessment personnel meet the department's qualification by having relevant professional experience and educational background. The risk assessment staff is knowledgeable in the applicable disciplines of toxicology, biology, chemistry, and statistics and is familiar with applicable state and federal risk assessment guidance and environmental regulations. Enclosed are current resumes and diplomas or transcripts of qualified risk assessors. Also enclosed are a collection of project summaries displaying our breadth of risk assessment experience and an example risk assessment.

Tetra Tech's Contract Manager for this opportunity will be:

Ms. Leeann Sinagoga
412.921.8887 (Office)
412.921.4040 (Fax)
Leeann.sinagoga@tetrattech.com

As identified in your Request for Quotation, we also have attached the Unit Price form, the Purchasing Affidavit, and an Addendum Acknowledgement Form.

We look forward to working with the Department on this opportunity. If you have any questions, please contact Ms. Leeann Sinagoga at 412.921.8887.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Debra M. Humbert', written over a horizontal line.

Debra M. Humbert, PMP
Senior Vice President

DMH:lld

Attachments: Unit Price Form
Purchasing Affidavit
Addendum Acknowledgement Form
Staff Resumes
Certificate of Liability Insurance

Staff Diplomas or Transcripts
Project Summaries
Example Risk Assessment
Certification and Signature Page
Exhibit A

Tetra Tech, Inc.
661 Andersen Drive, Pittsburgh, PA 15220
Tel 412-921-7090 Fax 412-921-4040 tetrattech.com



Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Request for Quotation
10 – Consulting

Proc Folder: 202807

Doc Description: Addendum 1 - Environmental Risk Assessment

Proc Type: Central Master Agreement

Date Issued	Solicitation Closes	Solicitation No	Version
2016-09-01	2016-09-14 13:30:00	CRFQ 0313 DEP1700000002	2

BID RECEIVING LOCATION

BID CLERK

DEPARTMENT OF ADMINISTRATION

PURCHASING DIVISION

2019 WASHINGTON ST E

CHARLESTON

WV 25305

US

VENDOR

Vendor Name, Address and Telephone Number:

Tetra Tech, Inc.
Foster Plaza 7
661 Andersen Drive
Pittsburgh, PA 15220-2700

Contact: LeeAnn Sinagoga
Phone: 412.921.8887
leeann.sinagoga@tetrattech.com

FOR INFORMATION CONTACT THE BUYER

Jessica S Chambers
(304) 558-0246
jessica.s.chambers@wv.gov

Signature X

FEIN # 95-4148514

DATE September 13, 2016

All offers subject to all terms and conditions contained in this solicitation

ADDITIONAL INFORMATION:**Addendum**

Addendum No. 1 issued to publish and distribute the attached information to the vendor community.

The West Virginia Purchasing Division is soliciting bids on behalf of the West Virginia Department of Environmental Protection (WVDEP) to establish an open-end contract for an Environmental Risk Assessor to determine ecological and human health risks that may be associated with projects in the WVDEP Voluntary Remediation and Redevelopment Program.

INVOICE TO	SHIP TO
ENVIRONMENTAL PROTECTION OFFICE OF ENVIRONMENTAL REMEDIATION 601 57TH ST SE CHARLESTON WV25304 US	ENVIRONMENTAL PROTECTION 601 57TH ST CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
1	Risk or hazard assessment	700.00000	HOUR	\$100.36	\$70,252.00

Comm Code	Manufacturer	Specification	Model #
77101501			

Extended Description :

Environmental Risk Assessor

DEP1700000002	Document Phase Final	Document Description Addendum 1 - Environmental Risk Assessment	Page 3 of 3
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ADDITIONAL TERMS AND CONDITIONS

See attached document(s) for additional Terms and Conditions



Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Request for Quotation
10 — Consulting

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BID RECEIVING LOCATION

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

VENDOR

Vendor Name, Address and Telephone Number:

Tetra Tech, Inc.
Foster Plaza 7
661 Andersen Drive
Pittsburgh, PA 15220-2700

Contact: LeeAnn Sinagoga
Phone: 412.921.8887
leeann.signagoga@tetrattech.com

FOR INFORMATION CONTACT THE BUYER

Jessica S Chambers
(304) 558-0246
jessica.s.chambers@wv.gov

Signature X

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DATE September 13, 2016

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Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
1	Risk or hazard assessment	700.00000	HOURL	\$100.36	\$70,252.00

Comm Code	Manufacturer	Specification	Model #
77101501			

Extended Description :

Environmental Risk Assessor

SOLICITATION NUMBER: CRFQ DEP1700000002

Addendum Number: 01

The purpose of this addendum is to modify the solicitation identified as ("Solicitation") to reflect the change(s) identified and described below.

Applicable Addendum Category:

- ☐ | Modify bid opening date and time
- ☐ | Modify specifications of product or service being sought
- ☒ | Attachment of vendor questions and responses
- ☐ | Attachment of pre-bid sign-in sheet
- ☐ | Correction of error
- ☐ | Other

Description of Modification to Solicitation:

This addendum is issued to modify the solicitation per the attached documentation and the following:

1. To publish the vendor questions and agency answers.

No other changes.

Additional Documentation: Documentation related to this Addendum (if any) has been included herewith as Attachment A and is specifically incorporated herein by reference.

Terms and Conditions:

1. All provisions of the Solicitation and other addenda not modified herein shall remain in full force and effect.
2. Vendor should acknowledge receipt of all addenda issued for this Solicitation by completing an Addendum Acknowledgment, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

ATTACHMENT A

**Environmental Risk Assessment
CRFQ DEP1700000002
Vendor Questions and Agency Answers**

Q1.) Regarding the referenced RFQ; (VENDOR) is interested in submitting a bid, but would need to subcontract portions of the work (LRS, for example). Is this acceptable?

Also, is more (site/project-specific) information available?

A1.) Yes, subcontracting portions of the work is acceptable. No, site-specific information is not available as reports to be reviewed by the contracted risk assessor will be for varied projects across the state.

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.: CRFQ DEP1700000002

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:

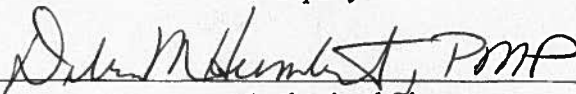
(Check the box next to each addendum received)

<input checked="" type="checkbox"/> Addendum No. 1	<input type="checkbox"/> Addendum No. 6
<input type="checkbox"/> Addendum No. 2	<input type="checkbox"/> Addendum No. 7
<input type="checkbox"/> Addendum No. 3	<input type="checkbox"/> Addendum No. 8
<input type="checkbox"/> Addendum No. 4	<input type="checkbox"/> Addendum No. 9
<input type="checkbox"/> Addendum No. 5	<input type="checkbox"/> Addendum No. 10

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

Tetra Tech, Inc.

Company



Authorized Signature

September 13, 2016

Date

NOTE: This addendum acknowledgment should be submitted with the bid to expedite document processing.

Revised 6/8/2012

**ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.:**

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:

(Check the box next to each addendum received)

- ☒ Addendum No. 1
- ☐ Addendum No. 2
- ☐ Addendum No. 3
- ☐ Addendum No. 4
- ☐ Addendum No. 5

- ☐ Addendum No. 6
- ☐ Addendum No. 7
- ☐ Addendum No. 8
- ☐ Addendum No. 9
- ☐ Addendum No. 10

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Tetra Tech, Inc.

Company


Authorized Signature

September 13, 2016

Date

NOTE: This addendum acknowledgment should be submitted with the bid to expedite document processing.

**REQUEST FOR QUOTATION
Environmental Risk Assessor**

11. MISCELLANEOUS:

11.1 Reports: Vendor shall provide quarterly reports and annual summaries to the Agency showing the Agency's items purchased, quantities of items purchased, and total dollar value of the items purchased. Vendor shall also provide reports, upon request, showing the items purchased during the term of this Contract, the quantity purchased for each of those items, and the total value of purchases for each of those items. Failure to supply such reports may be grounds for cancellation of this Contract.

11.2 Contract Manager: During its performance of this Contract, Vendor must designate and maintain a primary contract manager responsible for overseeing Vendor's responsibilities under this Contract. The Contract manager must be available during normal business hours to address any customer service or other issues related to this Contract. Vendor should list its Contract manager and his or her contact information below.

Contract Manager: LeeAnn Sinagoga

Telephone Number: 412.921.8887

Fax Number: 412.921.4040

Email Address: leeann.sinagoga@tetrattech.com

Exhibit A
Environmental Risk Assessor

Company Name: Tetra Tech, Inc.
 Address: Foster Plaza 7, 661 Andersen Drive
 City, State, Zip: Pittsburgh, PA 15220
 Phone & Fax No.: Phone: 412.921.8887 Fax: 412.921.4040

ITEM NO.	ESTIMATED QUANTITY	DESCRIPTION	UNIT PRICE PER HOUR	AMOUNT
1.0	700	Environmental Risk Assessor	\$ 100.36	\$72,252.00
		TOTAL BID AMOUNT		\$72,252.00

The DEP reserves the right to request additional information and supporting documentation regarding unit prices when the unit price appears to be unreasonable

DESIGNATED CONTACT: Vendor appoints the individual identified in this Section as the Contract Administrator and the initial point of contact for matters relating to this Contract.

 (Name, Title)
 LeeAnn Sinagoga, Contract Manager

 (Printed Name and Title)
 Foster Plaza 7, 661 Andersen Drive, Pittsburgh, PA 15220

 (Address)
 Phone: 412.921.8887 Fax: 412.921.4040

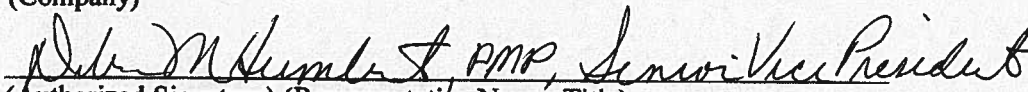
 (Phone Number) / (Fax Number)
 leeann.sinagoga@tetrattech.com

 (email address)

CERTIFICATION AND SIGNATURE: By signing below, or submitting documentation through wvOASIS, I certify that I have reviewed this Solicitation in its entirety; that I understand the requirements, terms and conditions, and other information contained herein; that this bid, offer or proposal constitutes an offer to the State that cannot be unilaterally withdrawn; that the product or service proposed meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise stated herein; that the Vendor accepts the terms and conditions contained in the Solicitation, unless otherwise stated herein; that I am submitting this bid, offer or proposal for review and consideration; that I am authorized by the vendor to execute and submit this bid, offer, or proposal, or any documents related thereto on vendor's behalf; that I am authorized to bind the vendor in a contractual relationship; and that to the best of my knowledge, the vendor has properly registered with any State agency that may require registration.

Tetra Tech, Inc.

 (Company)


 (Authorized Signature) (Representative Name, Title)

Debra M. Humbert, PMP, Senior Vice President

 (Printed Name and Title of Authorized Representative)

September 13, 2016

 (Date)

Phone: 412.921.8968 Fax: 412.921.4040

 (Phone Number) (Fax Number)

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

MANDATE: Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

EXCEPTION: The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

DEFINITIONS:

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Employer default" means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

"Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceeds five percent of the total contract amount.

AFFIRMATION: By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (W. Va. Code §61-5-3) that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

WITNESS THE FOLLOWING SIGNATURE:

Vendor's Name: Tetra Tech, Inc.

Authorized Signature: *Robert M. Humbert, PMP* Date: 9/13/16

State of Pennsylvania

County of Allegheny, to-wit:

Taken, subscribed, and sworn to before me this 13 day of September, 2016.

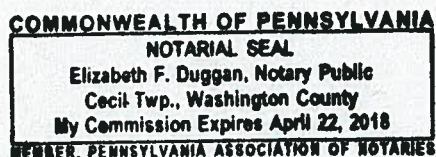
My Commission expires April 22, 2018.

AFFIX SEAL HERE

NOTARY PUBLIC

Elizabeth F. Duggan

Purchasing Affidavit (Revised 08/01/2015)





CERTIFICATE OF LIABILITY INSURANCE

DATE(MM/DD/YYYY)
11/03/2015

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Aon Risk Insurance Services West, Inc. Los Angeles CA Office 707 Wilshire Boulevard Suite 2600 Los Angeles CA 90017-0460 USA	CONTACT NAME:	
	PHONE (A/C. No. Ext): (866) 283-7122	FAX (A/C. No.): (800) 363-0105
INSURED Tetra Tech, Inc. 661 Andersen Drive Pittsburgh, PA 15220 USA	E-MAIL ADDRESS:	
	INSURER(S) AFFORDING COVERAGE	
	NAIC #	
	INSURER A: National Union Fire Ins Co of Pittsburgh	19445
	INSURER B: The Insurance Co of the State of PA	19429
	INSURER C: AIG Europe Limited	AA1120841
	INSURER D: Lexington Insurance Company	19437
	INSURER E:	
	INSURER F:	

COVERAGES**CERTIFICATE NUMBER:****REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS. Limits shown are as requested

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
A	<input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR <input checked="" type="checkbox"/> Contractual Liability <input checked="" type="checkbox"/> X,C,U GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input checked="" type="checkbox"/> PROJECT <input checked="" type="checkbox"/> LOC <input type="checkbox"/> OTHER			GL3372258	10/01/2015	10/01/2016	EACH OCCURRENCE \$2,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$1,000,000 MED EXP (Any one person) \$10,000 PERSONAL & ADV INJURY \$2,000,000 GENERAL AGGREGATE \$4,000,000 PRODUCTS - COMP/OP AGG \$4,000,000
A	AUTOMOBILE LIABILITY <input checked="" type="checkbox"/> ANY AUTO ALL OWNED AUTOS <input type="checkbox"/> SCHEDULED AUTOS <input checked="" type="checkbox"/> HIRED AUTOS <input checked="" type="checkbox"/> NON-OWNED AUTOS			CA3194397	10/01/2015	10/01/2016	COMBINED SINGLE LIMIT (Ea accident) \$2,000,000 BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)
C	<input checked="" type="checkbox"/> UMBRELLA LIAB <input checked="" type="checkbox"/> OCCUR EXCESS LIAB <input type="checkbox"/> CLAIMS-MADE DED RETENTION			TH1500079	10/01/2015	10/01/2016	EACH OCCURRENCE \$5,000,000 AGGREGATE \$5,000,000
B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR / PARTNER / EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y/N N	N/A	WC014267906 WC014267907 WC014267908 WC014267912	10/01/2015 10/01/2015 10/01/2015 10/01/2015	10/01/2016 10/01/2016 10/01/2016 10/01/2016	<input checked="" type="checkbox"/> PER STATUTE <input type="checkbox"/> OTHER E.L. EACH ACCIDENT \$1,000,000 E.L. DISEASE-EA EMPLOYEE \$1,000,000 E.L. DISEASE-POLICY LIMIT \$1,000,000
D	Professional Liability and Contractor's Pollution Liability			028182375	10/01/2015	10/01/2016	Each Claim Aggregate \$5,000,000 \$5,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required) Includes Stop Gap: OH, ND, WA, WY

CERTIFICATE HOLDER**CANCELLATION**

Tetra Tech, Inc. 661 Andersen Drive Pittsburgh, PA 15220 USA	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.
	AUTHORIZED REPRESENTATIVE <i>Aon Risk Insurance Services West, Inc.</i>

ENDORSEMENT

This endorsement, effective 12:01 A.M. 10/01/2015 forms a part of

policy No. GL3372258

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

CONTRACTOR'S COMMERCIAL PRIME ENDORSEMENT

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE FORM

Coverage afforded under this endorsement does not apply to any person or organization covered as an additional insured on any other endorsement now or hereafter attached to this Coverage Part.

I. ADDITIONAL INSURED

Section II - WHO IS AN INSURED, 1. is amended to include as an insured any person or organization described in paragraphs A through I below, whom you are required to add as an additional insured under a written contract or agreement. The written contract or agreement must be:

1. Currently in effect or becoming effective during the term of this policy; and
2. Executed prior to "bodily injury", "property damage," or "personal injury and advertising injury".

A. BY CONTRACT

Any person or organization to whom you become obligated to include as an additional insured under this policy, as a result of any contract or agreement you enter into which requires you to furnish insurance to that person or organization of the type provided by this policy, but only with respect to liability arising out of your operations or premises owned by or rented to you. However, the insurance provided will not exceed the lesser of:

1. The coverage and/or limits of this policy, or
2. The coverage and/or limits required by said contract or agreement.

B. CONTROLLING INTEREST

1. Any person or organization having a greater than a 50% interest in you, but only with respect to their liability arising out of:
 - a. Their financial control of you; or
 - b. Premises they own, maintain or control while you lease these premises.
2. The insurance afforded to these additional insureds under Paragraph I.B.1 does not apply to structural alterations, new construction or demolition operations performed by or for that person or organization.

C. CO-OWNER OR INSURED PREMISES

A Co-owner of insured premises co-owned by you and covered by this insurance but only with respect to their liability as co-owner of the premises.

D. LESSOR OF LEASED EQUIPMENT

1. Any person or organization from whom you lease equipment, but only with respect to liability for "bodily injury", "property damage" or "personal and advertising injury" caused, in whole or in part, by your maintenance, operation or use of such equipment leased to you by such person(s) or organization(s).
2. With respect to the insurance afforded to these additional insureds under Paragraph I.D.1, this insurance does not apply to any "occurrence" which takes place:
 - a) after the equipment lease expires, or
 - b) after the equipment is returned or no longer in your possession,whichever takes place later.

E. MANAGERS OR LESSORS OF PREMISES

Managers or Lessors of premises but only with respect to liability arising out of the ownership, maintenance or use of that part of the premises leased to you and subject to the following additional exclusions:

This insurance under this paragraph does not apply to:

1. Any "occurrence" which takes place after you cease to be a tenant in that premises.
2. Structural alterations, new construction or demolition operations performed by or on behalf of such Managers or Lessors.

F. MORTGAGEE, ASSIGNEE, OR RECEIVER

1. A mortgagee, assignee, or receiver but only with respect to their liability as mortgagee, assignee, or receiver and arising out of the ownership, maintenance, or use of the premises by you.
2. The insurance afforded to the additional insureds under Paragraph I.F.1 does not apply to structural alterations, new construction or demolition operations performed by or for that mortgagee, assignee, or receiver.

G. OWNERS, LESSEES, OR CONTRACTORS - COMPLETED OPERATIONS

- (1) Any Owner, Lessee or Contractor, but only with respect to liability arising out of "your work" performed for that additional insured and included in the "products-completed operations hazard".

H. OWNERS, LESSEES, OR CONTRACTORS - ONGOING OPERATIONS

Any Owners, Lessees, or Contractors, but only with respect to liability arising out of your ongoing operations performed for that additional insured.

This insurance does not apply to "bodily injury" or "property damage" occurring after:

- (1) all work, including materials, parts or equipment furnished in connection with such work, on the project (other than service, maintenance or repairs) to be performed by or on behalf of the additional insured(s) has been completed; or,
- (2) that portion of "your work" out of which the injury or damage arises has been put to its intended use by any person or organization other than another contractor or subcontractor engaged in performing operations for a principal as a part of the same project.

I. STATE OR POLITICAL SUBDIVISION - PERMITS

Any State or Political Subdivision, subject to the following provisions:

1. This insurance applies only with respect to operations performed by you or on your behalf for which the state or political subdivision has issued a permit.
2. This insurance does not apply to:
 - a. "Bodily injury," "property damage" or "personal and advertising injury" arising out of operations performed for the state or municipality; or
 - b. "Bodily injury" or "property damage" included within the "products-completed operations hazard".

II. PRIMARY INSURANCE - ADDITIONAL INSURED

Where persons or organizations have been added to your policy as additional insureds to comply with insurance requirements of written contracts mandating primary coverage for such additional insureds relative to:

- a) the performance of your ongoing operations for the additional insureds; or
- b) "your work" performed for the additional insureds and included in the "products-completed operations hazard,

then with respect to these additional insureds as defined above in this Section only,
SECTION IV - COMMERCIAL GENERAL LIABILITY CONDITIONS, Paragraph 4. - Other Insurance, a. - Primary Insurance, is deleted in its entirety and replaced with the following:

This insurance is primary over any similar insurance available to any person or organization we have added to this policy as an additional insured to comply with insurance requirements of written contracts mandating primary coverage for such additional insureds relative to (a) the performance of your ongoing operations for the additional insureds, or (b) "your work" performed for the additional insureds and included in the "products-completed operations hazard. However, this insurance is primary over any other similar insurance only if the additional insured is designated as a named insured of the other similar insurance. We will not require contribution of limits from the other similar insurance if the insurance afforded is primary.

III. INCIDENTAL MEDICAL MALPRACTICE LIABILITY COVERAGE

SECTION II - WHO IS AN INSURED, 2. a. (1) (d) is deleted in its entirety and replaced with the following:

- (d) Arising out of his or her providing or failing to provide professional health care services, except for "bodily injury" arising out of "Incidental Medical Malpractice Injury" by any physician, dentist, nurse or other medical practitioner employed or retained by you unless such "bodily injury" is covered by another primary policy. However, the insurance provided hereunder to such persons will not apply to liability arising out of services performed outside of the scope of their duties as your "employees." Any series of continuous, repeated or related acts will be treated as the occurrence of a single negligent professional healthcare service, which will be assignable to the same policy and policy year in which the originating act occurred.

SECTION V - DEFINITIONS - is amended to add:

"Incidental Medical Malpractice Injury" means "Bodily Injury" arising out of the rendering of or failure to render the following services:

- a. medical, surgical, dental, x-ray or nursing service or treatment or the furnishing of food or beverages in connection therewith; or
- b. the furnishing or dispensing of drugs or medical, dental or surgical supplies or appliances.

The Coverage provided by this endorsement does not apply to you or any insured if you are engaged in the business or occupation of providing any of the services described in the definition of "Incidental Medical Malpractice Injury".

IV. JOINT VENTURES / PARTNERSHIPS / LIMITED LIABILITY COMPANIES

The paragraph under **SECTION II - WHO IS AN INSURED** which states:

No person or organization is an insured with respect to the conduct of any current or past partnership, joint venture or limited liability company that is not shown as a Named Insured in the Declarations.

is hereby deleted and replaced with the following:

No person or organization, other than you, is an insured with respect to the conduct of any current or past partnership, joint venture or limited liability company that is not shown as a Named Insured in the Declarations.

Coverage under this policy, however, will not apply:

- a. Prior to the termination date of any joint venture, partnership or limited liability company; or
- b. If there is valid and collectible insurance purchased specifically to insure the partnership, joint venture or limited liability company.

V. SUPPLEMENTARY PAYMENTS

Under **SECTION I - SUPPLEMENTARY PAYMENTS - COVERAGES A AND B**, Paragraph 1.b., is deleted in its entirety and replaced with the following:

- b. Up to \$2,500 for cost of bail bonds required because of accidents or traffic law violations arising out of the use of any vehicle to which the Bodily Injury Liability Coverage applies. We do not have to furnish these bonds.

VI. LIBERALIZATION CLAUSE

If we revise or replace our standard policy form to provide more coverage, your policy will automatically provide the additional coverage as of the day the revision is effective in your state.

VII. UNINTENTIONAL ERRORS AND OMISSIONS

SECTION IV - COMMERCIAL GENERAL LIABILITY CONDITIONS, 6. - Representations is amended by adding:

- d. The unintentional failure by you or any Insured to provide accurate and complete nonmaterial representations as of the inception of the policy will not prejudice the coverages afforded by this policy.

VIII. AMENDMENT OF DUTIES IN THE EVENT OF OCCURRENCE, OFFENSE, CLAIM OR SUIT

SECTION IV - COMMERCIAL GENERAL LIABILITY CONDITIONS, 2. - Duties in the Event of Occurrence, Offense, Claim or Suit, a. is hereby deleted and replaced with the following:

- a. You must see to it that we are notified as soon as practicable of any "occurrence" or an offense, which may result in a claim. Knowledge of an "occurrence" or an offense by your agent, your servant, or your employee will not in itself constitute knowledge to you unless the Director of Risk Management (or one with similar or equivalent title) or his/her designee will have received such notice. To the extent possible notice should include:

- (1) How, when and where the "occurrence" or offense took place;
- (2) The names and addresses of any injured persons and witnesses; and
- (3) The nature and location of any injury or damage arising out of the "occurrence" or offense.

IX. AMENDMENT OF EXPECTED OR INTENDED INJURY EXCLUSION

SECTION I - COVERAGES, COVERAGE A - BODILY INJURY AND PROPERTY DAMAGE LIABILITY, 2. - Exclusions, a. - Expected or Intended Injury, is deleted and replaced by the following:

- a. "Bodily injury" or "property damage" expected or intended from the standpoint of the insured. This exclusion does not apply to "bodily injury" or "property damage" resulting from the use of reasonable force to protect persons or property.

X. CONTRACTUAL LIABILITY - RAILROADS

Only with respect to (i) operations performed within 50 feet of railroad property and (ii) for which a Railroad Protective Liability Policy in the name of the railroad has been provided, then

A. SECTION V - DEFINITIONS, Paragraph 9, is deleted in its entirety and replaced with the following:

9. "Insured Contract" means:

- a. A contract for a lease of premises. However, that portion of the contract for a lease of premises that indemnifies any person or organization for damage by fire to premises while rented to you or temporarily occupied by you with permission of the owner is not an "insured contract";
- b. A sidetrack agreement;
- c. Any easement or license agreement;
- d. An obligation, as required by ordinance, to indemnify a municipality, except in connection with work for a municipality;
- e. An elevator maintenance agreement;
- f. That part of any other contract or agreement pertaining to your business (including an indemnification of a municipality in connection with work performed for a municipality) under which you assume the tort liability of another party to pay for "bodily injury" or "property damage" to a third person or organization. Tort liability means a liability that would be imposed by law in the absence of any contract or agreement.

Paragraph f. does not include that part of any contract or agreement:

(1) That indemnifies an architect, engineer or surveyor for injury or damage arising out of:

- (a) Preparing, approving or failing to prepare or approve maps, shop drawings, opinions, reports, surveys, field orders, change orders or drawings and specifications; or

(b) Giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage; or

(2) Under which the insured, if an architect, engineer or surveyor, assumes liability for an injury or damage arising out of the insured's rendering or failure to render professional services, including those listed in Paragraph (1) above and supervisory, inspection, architectural or engineering activities; and

B. SECTION IV - COMMERCIAL GENERAL LIABILITY CONDITIONS, 4. - Other Insurance, b. Excess Insurance, (1) (a), is amended to include the following:

(v) That is a Railroad Protective Insurance Policy or similar coverage.

XI. COVERAGE FOR YOUR SUPERVISORY OR MANAGERIAL EMPLOYEES RELATING TO CO-EMPLOYEE INJURIES

SECTION II - WHO IS AN INSURED, 2.a. (1), (a) and (b) are clarified to hold that:

Your supervisory or managerial "employees" are insureds for "bodily injury" to "co-employees" while in the course of their employment or performing duties related to the conduct of your business if claims or suits arise out of liability assumed by an insured under an "insured contract" as provided by **SECTION I - COVERAGES, COVERAGE A BODILY INJURY AND PROPERTY DAMAGE LIABILITY, 2. Exclusions, e. Employer's Liability.**

XII. WAIVER OF TRANSFER OF RIGHTS OR RECOVERY AGAINST OTHERS TO US

SECTION IV - COMMERCIAL GENERAL LIABILITY CONDITIONS, 8. - Transfer of Rights of Recovery Against Others To Us, is amended by the addition of the following:

We waive any right of recovery we may have against any person or organization pursuant to applicable written contract or agreement you enter into because of payments we make for injury or damage arising out of your ongoing operations or "your work" done under a contract with that person or organization and included in the "products-completed operations hazard".

XIII. AMENDMENT OF OTHER INSURANCE

A. SECTION IV - COMMERCIAL GENERAL LIABILITY CONDITIONS, 4.- Other Insurance, b. - Excess Insurance, (1), is amended to include the following:

This insurance shall not be excess where (i) such other insurance is specifically purchased to apply as excess of this policy, or (ii) where you are obligated by contract to provide primary insurance to an additional insured, unless there is other additional insurance coverage available to that additional insured.

B. SECTION IV - COMMERCIAL GENERAL LIABILITY CONDITIONS, 4.- Other Insurance, b. - Excess Insurance, (2), is deleted in its entirety and replaced with the following:

When this insurance is excess, we will have no duty under Coverages A or B to defend any claim or "suit" that any other insurer has a duty to defend. If no other insurer defends, we will undertake to do so, but we will be entitled to the insured's rights against all those other insurers.

XIV. AMENDMENT AGGREGATE LIMITS PER PROJECT

A. For all sums which the insured becomes legally obligated to pay as damages caused by "occurrences" under COVERAGE A (SECTION I), offense under COVERAGE B (SECTION 1) and for all medical expenses caused by accidents under COVERAGE C (SECTION II), which can be attributed only to ongoing operations at a single designated construction project:

1. A separate Per Construction Project General Aggregate Limit applies to each construction project, and that limit is equal to the amount of the General Aggregate Limit shown in the Declarations.
 2. The Per Construction Project General Aggregate Limit is the most we will pay for the sum of (i) all damages under COVERAGE A, except damages because of "bodily injury" or "property damage" included in the "products-completed operations hazard", (ii) all damages under COVERAGE B and (iii) all medical expenses under COVERAGE C regardless of the number of:
 - a. Insureds;
 - b. Claims made or "suits" brought; or
 - c. Persons or organizations making claims or bringing "suits".
 3. Any payments made under COVERAGE A or B for damages or under COVERAGE C for medical expenses shall reduce the Per Construction Project General Aggregate Limit for that construction project. Such payments shall not reduce the General Aggregate Limit shown in the Declarations nor shall they reduce any other Per Construction Project General Aggregate Limit for any other construction project covered under this policy.
 4. The limits shown in the Declarations for Each Occurrence, Fire Damage and Medical Expense continue to apply. However, instead of being subject to the General Aggregate Limit shown in the Declarations, such limits will be subject to the applicable Per Construction Project General Aggregate Limit.
- B. For all sums which the insured becomes legally obligated to pay as damages caused by "occurrences" under COVERAGE A (SECTION I), offenses under COVERAGE B (SECTION 1) and for all medical expenses caused by accidents under COVERAGE C (SECTION I), which cannot be attributed only to ongoing operations at a single construction project:
1. Any payments made under COVERAGE A or B for damages or under COVERAGE C for medical expenses shall reduce the amount available under the General Aggregate Limit or the Products-Completed Operations Aggregate Limit, whichever is applicable; and
 2. Such payments shall not reduce any Construction Project General Aggregate Limit.
- C. When coverage for liability arising out of the "products-completed operations hazard" is provided, any payments for damages because of "bodily injury" or "property damage" included in the "products-completed operations hazard" will reduce the Products-Completed Operations Aggregate Limit, and not reduce the General Aggregate Limit nor the Construction Project General Aggregate Limit.
- D. If the applicable construction project has been abandoned, delayed, or abandoned and then restarted, or if the authorized contracting parties deviate from plans, blueprints, designs, specifications or timetables, the project will still be deemed to be the same construction project.
- E. The provisions of Limits of Insurance (SECTION III) not otherwise modified by this endorsement shall continue to apply as stipulated.

RESUMES



TETRA TECH

AARON M. BERNHARDT

Ecological Risk Assessor

EXPERIENCE SUMMARY

Mr. Bernhardt is an Ecological Risk Assessment Specialist and Project Manager with 24 years of experience, and is the ecological risk assessment Technical Focal Point for the U.S. Navy EFD SOUTH CLEAN Contracts. Currently, Mr. Bernhardt is a Senior Training Coordinator for the Emergency Response Training Program (ERTP) for the U.S. Environmental Protection Agency which is managed by Tetra Tech in Cincinnati, OH. He has managed and/or prepared numerous ecological risk assessments in several USEPA Regions for federal, state, and commercial clients, and presented the results to the regulators and at public meetings. In addition, as part of the tasks, he has interacted closely with federal and state regulators to plan investigations and to resolve comments. Mr. Bernhardt has also served as a Field Sampling Specialist, collecting various types of samples (i.e., chemical and biological) to support ecological risk assessments, to determine the extent of contamination, or as part of monitoring programs. He has also gained experience as a Water Quality Specialist responsible for conducting and managing many water quality related projects, including extensive experience regarding water quality issues relating to airports, along with experience evaluating NPDES permits.

RELEVANT EXPERIENCE

Ecological Risk Assessment

Senior Ecological Risk Assessor; Otterbein University, Westerville, OH; 2013 - Present. Conducted an Ecological Risk Assessment (ERA) in accordance with Ohio EPA guidance for the site, where metals were the primary contaminants of concern. The ERA consisted of Levels I through III of the Ohio EPA ERA guidance and was conducted for several areas of concern, including off-site areas. Media evaluated included surface soil, sediment, and surface water. The approach and results were discussed with the State ecological risk assessor, and all comments on the draft report were resolved.

Senior Ecological Risk Assessor; ALCOA, Lake Charles, LA; 2010 - Present. Assisted in preparing work plans to collect sediment samples for chemical analysis and whole-sediment toxicity tests. The results of the sediment chemistry and toxicity tests were evaluated to develop site-specific risk-based concentrations (for PAHs) for the protection of benthic invertebrates. Also, prepared a technical memorandum, which summarized

EDUCATION

M.S.; Chemical Hazard Assessment; University of Pittsburgh, 1990

B.A.; Biology; Case Western Reserve University; 1988

YEARS OF RELEVANT RISK ASSESSMENT EXPERIENCE

25

YEARS OF PROJECT MANAGEMENT EXPERIENCE

17

REGISTRATIONS/ AFFILIATIONS

Society of Environmental Toxicology and Chemistry

TRAINING/CERTIFICATIONS

OSHA 1910.120 8-Hour Annual and Refresher Training

OFFICE

Pittsburgh, PA

YEARS OF EXPERIENCE

26

YEARS WITH TETRA TECH

18

PCB cleanup levels in sediment at numerous sites across the United States. The memorandum will be used to help support a PCB cleanup level at the site. The data were presented to and discussed with the state regulators during meetings.

Senior Ecological Risk Assessor; Risk Assessment of Sediment Contamination; Private Client; Middle River, MD; 2008 - current. Prepared the ecological risk assessment for sediment contaminated with metals, PAHs, and PCBs. The risk assessment included an evaluation of the following: sediment chemistry, acid volatile sulfides/simultaneously extracted metals results, sediment pore water chemistry, benthic macroinvertebrate community data, and fish tissue analytical data. The results of the risk assessment were then used to develop clean-up levels that were used to develop remedial options for the site. The project is high profile in the local community; risk communication issues are significant.

Project Manager/Senior Ecological Risk Assessor; Naval Submarine Base New London, Groton, CT; 2007 - 2013. Conducted sediment sampling and toxicity testing to update the ecological risk assessment and further evaluate risks to sediment invertebrates. The data were used to develop site-specific cleanup goals for the site. An updated Remedial Investigation/Feasibility Study, Proposed Remedial Action Plan, and Record of Decision were prepared. Also, prior to the sediment being remediated, a Pre-Design Investigation was conducted to better refine the area that needed to be remediated. This allowed the remediation to be performed without needing to collect post-removal confirmation samples. The results of the various investigations/documents were presented technical and public meetings. There was also a lot of interaction with the federal and State regulators throughout the process to obtain consensus on various issues.

Senior Ecological Risk Assessor; Gould Island NSN Newport, Rhode Island; NUSC Disposal Area, Middletown, RI; NALF Cabaniss, Corpus Christi, TX, NSWC Indianapolis, IN; NSWC White Oak, MD; NWS Crane, IN; and MCB Quantico, VA; 1998 - Present. Prepared several ecological risk assessments as part of RI/FS programs at DOD bases in Indiana, Maryland, Texas, and Virginia. The state and federal agencies reviewed and approved the procedures for conducting the risk assessments. Risk assessments included evaluation of surface water, sediment, and soil data. Some of the risk assessments involved the preparation of a baseline risk assessment and involved the collection of biological samples for chemical analysis and the collection of soil and sediment samples for toxicity tests. Met with the regulators to discuss the results of the risk assessments and to begin planning for the next phase of data collection. In some cases, developed site-specific cleanup levels for soil and sediment by collecting fish tissue samples and conducting sediment and earthworm toxicity and bioaccumulation tests.

Senior Ecological Risk Assessor; PPG, Jersey City, NJ; 2011. Prepared ecological evaluations (EEs) in accordance with the requirements of New Jersey Administrative Code (N.J.A.C.) 7:26E in addition to the New Jersey Department of Environmental Protection (NJDEP) Ecological Evaluation Technical Guidance. The EEs were conducted to assess actual or potential adverse ecological effects on wildlife and plants resulting from site-related contamination.

Senior Ecological Risk Assessor; Lower Darby Creek NPL Site, Philadelphia and Delaware Counties, PA; 2009 - present. Updated ecological risk assessment portion of the Remedial Investigation report based on EPA comments and developed surface soil and sediment preliminary cleanup goals (PRGs) based on risks to ecological receptors. The PRGs were developed using chemical data from soil and sediment samples along with data from co-located toxicity test samples. Site-specific bioaccumulation data were also used to develop the PRGs. The PRGs were developed in close coordination with EPA Region 3 ecological risk assessors.

Senior Ecological Risk Assessor; U.S. Department of Agriculture Beltsville Agricultural Research Center, Beltsville, MD; 2007 - present. Conducted to determine the bioavailability of pesticides in soil to invertebrates and small mammals in areas where pesticides were stored, mixed, and/or applied to the soil. The purpose of this study was to collect additional site-specific data and refine and reduce the uncertainties in the ecological cleanup goals. As part of this study, the following were done: (1) invertebrate tissue samples and co-located soil samples were collected for chemical analysis, (2) a laboratory earthworm bioaccumulation study was conducted, and (3) small mammal samples were collected for chemical analysis. The data were used to determine the bioavailability of pesticides to earthworms, field-collected invertebrates, and small mammals, to determine whether pesticides were causing an unacceptable risk to mammals and birds, and to develop preliminary remediation goals to protect the receptors at risk.

Senior Ecological Risk Assessor; Ryeland Road Arsenic NPL Site, Womelsdorf, PA; 2005. Prepared both screening-level and baseline ecological risk assessments (BERA) according to EPA's 8-step process/guidance. Ecological tests were performed as part of the BERA study design to evaluate earthworm, minnow, and amphipod growth and/or mortality rates, and generate site-specific bioaccumulation factors for terrestrial organisms. Developed site-specific, ecological, risk-based criteria for several metals. Created plots to determine whether relationships existed between chemical concentrations and toxicity/bioaccumulation data, used exposure equations to estimate daily doses to ecological receptors, ran various food chain models. Also developed cleanup goals to protect various receptors using the site-specific toxicity test data. Achieved significant cost savings by developing food chain models that supported not having to collect small mammals for tissue analysis. The final BERA will serve as a template for other EPA Region 3 ERAs.

Senior Ecological Risk Assessor/Technical Support; U.S. Army; Iowa Army Ammunition Plant (IAAAP); Middletown IA; January 2005 - present. Senior ecological risk assessor responsible for developing ecological-based cleanup values to protect the Indiana bat. Reviewed an existing BERA for the site and prepared alternate soil to insect bioaccumulation factors and an alternate approach for implementing the cleanup number, both of which were accepted by the USEPA and U.S. Fish and Wildlife Service (FWS). The alternate bioaccumulation factors resulted in higher cleanup values for most chemicals and the revised approach for implementing the cleanup number resulted in less soil needing to be removed while still posing acceptable risks to the Indiana bat.

Senior Ecological Risk Assessment Reviewer; U.S. Army; Ravenna Army Ammunition Plant (RVAAP); Ravenna, OH; 2001 - 2008. Senior ecological risk assessor responsible for design and quality assurance of screening-level ecological risk assessments on-going at five sites at RVAAP: Load Lines 6/9/11, Central Burn Pits, and Cobb's Pond. USEPA Region 5, Ohio EPA, U.S. Army, U.S. Army Corp of Engineers, and facility-specific risk assessment guidelines used to prepare risk assessments. Risk assessments were used to support a "no further action" recommendation in some cases.

Assistant Project Manager/Project Ecologist; Ecological Risk Assessment; NTC Great Lakes, IL; 2000 - Present. Conducted ecological risk assessments for two sites at the Base and participated in several Data Quality Objective (DQO) meetings as part of the planning process, and met with the Navy and regulators to discuss the work plan. Presented the results of the ecological risk assessments to the Navy and regulators.

Senior Ecological Risk Assessor; Naval Station, Annapolis, MD; 2001 - 2008. Conducted a baseline ecological risk assessment for a site contaminated with lead paint from radio towers. The risk assessment consisted of implementing and evaluating an earthworm toxicity and bioaccumulation test to evaluate risks to soil invertebrates and small mammals and birds that consume earthworms. The risk assessment included the development of ecological PRGs for the site.

Senior Ecological Risk Assessor; Industrial Lumber Yard, PA; 2004. Prepared a screening level ecological risk assessment for a lumber yard in Southwestern Pennsylvania, in accordance with Act II, the Pennsylvania Land Recycling Program. The risk assessment was approved by the Pennsylvania Department of Environmental Protection.

Technical Support; U.S. Navy; NAS Cecil Field; 2001 - 2003. Assisted in development of preliminary remediation goals (PRGs) at a closed skeet range. Tasks involved providing technical support in developing the work plan and responding to comments from the regulators, attending a meeting with regulators to discuss the PRGs, and addressing issues raised by the regulators at the meeting. The PRGs were developed using site-specific biological data that were collected from the site.

Senior Ecological Risk Assessment Reviewer; USEPA Region I RAC; Central Landfill, Johnston, RI; and Solvents Recovery Service of New England, Inc., Southington, CT; 1999 - 2000. Assisted USEPA in reviewing ecological risk assessments that were submitted by Potentially Responsible Parties (PRPs). The risk assessments were reviewed to determine if they complied with USEPA guidance and the reports were also checked to ensure that screening criteria and calculations were correct. The comments were then submitted to the USEPA for distribution to the PRPs. The comments were resolved with the PRP during technical meetings/conference calls.

Training

Senior Training Coordinator; EPA Environmental Response Training Program; Cincinnati, OH; 2007 - Present. Course Lead Instructor for Introduction to Risk Assessment Guidance (IRAG) and Ecological Risk Assessment Guidance (ERAG) courses. Responsible for presenting the courses, overseeing ongoing revisions and updates of the courses, and assigning tasks to other instructors. Update course module presentation files (i.e., PowerPoint) and instructor guides, as new information and USEPA risk assessment guidance becomes available. Work closely with instructors and client to ensure the successful completion of all courses. The ERAG course is taught jointly with an USEPA Ecological Risk Assessor. Both courses are 2.5-day in length and are presented to various Federal, State, and local regulators to help them become familiar and better understand the risk assessment process. Monitor courses through the periodic review of Student Evaluations, Course Wrap-up Reports, and Course Director Summaries. Identify problems involving the course and provide alternatives for correcting the problem. Submit monthly progress reports.

Project Management

Project Manager, U.S. Navy, Naval Facilities Engineering Command (NAVFAC) Atlantic; 2013 - Present. Assessed the existing inventory of environmental geospatial data (for all EV media, including the Natural Resources, Cultural Resources Compliance, and Restoration Product Lines) within the Commander Navy Region Mid-Atlantic area of responsibility and converted environmental geospatial data (for all EV media, except Restoration) into the new Spatial Data Standard for Facilities, Infrastructure, and Environment v3.0 data standard, per the Defense Installation Spatial Data Infrastructure- approved Navy Data Model. Managed the staff that assessed the data and conducted the conversion, and reviewed the deliverables and reports prior to submittal.

Project Manager; Portsmouth Naval Shipyard, Kittery, ME; 2003 - 2008. Served as project manager for preparing a Post-Remedial Operation, Maintenance, and Monitoring Plan (OM&M Plan) for landfill at a Naval Shipyard (PNS) in USEPA Region I. Task consisted of preparing detailed data quality objectives and preparation

of the OM&M Plan. The OM&M plan included the groundwater monitoring program as well as the landfill inspection and maintenance program. Several reports presenting the results of the sampling rounds and modifications to the monitoring program have been prepared.

Project Ecologist/Sampling Investigations

Project Manager/Project Ecologist; Pre-Removal Sediment Confirmation Sampling; Portsmouth Naval Shipyard, Kittery, ME; 2013 - present. Conducted an investigation to better refine offshore areas that needed to be remediated with the goal of allowing the remediation to be conducted without the need for post-removal confirmation samples. The investigation was conducted in a phased approach where all of the samples were collected during the same field event, but certain samples were held for chemical analysis until the results of adjacent samples were obtained and evaluated. This resulted in cost savings of several thousand dollars.

Project Manager/Project Ecologist; Interim Monitoring Program, Portsmouth Naval Shipyard, Kittery, ME; 1999 - present. Serves as field operations leader and project manager for an Interim Monitoring Program for a Naval Shipyard (PNS) in USEPA Region I. Tasks associated with the monitoring program include oversight of subcontractor collecting sediment, mussel, and lobster samples, preparation of the monitoring plan, and preparing data reports for each sampling round and various data evaluation reports. The results of the data evaluation reports were used to optimize the monitoring program, and determine that additional scrutiny was needed at select monitoring stations. Based on those needs, two Additional Scrutiny Investigations were implemented in 2005 and 2007, and reports were prepared to present the results of the investigations. Routinely provides technical support for various projects at PNS that may not be specifically related to the monitoring program. Presented the results of the various investigations at technical and public meetings.

Project Ecologist; Fish Consumption Human Health Risk Assessment; MCAS Cherry Point, NC; 1998 - 1999. Prepared a human health risk assessment as part of an RI/FS program. As part of the risk assessment, obtained information on fish advisory levels for certain contaminants in North Carolina and other states to determine if the contaminant levels detected in the fish warranted a fish advisory. The task also included collection of the fish samples from several stations (including reference locations) and submitting them to the laboratory for chemical analysis. The sampling program and data evaluation procedures were developed in coordination with the state and USEPA Region 4 who reviewed and approved the procedures for conducting the work. Presented the results of the risk assessment to the regulators at a meeting for their comments and subsequent approval.

Project Ecologist; Sampling Investigations; MCAS Cherry Point, NC; 1998 - 1999. Managed two field efforts that included the collection of fish samples in large creeks. Collected fish samples using electroshockers, gill nets, hoop nets, trot lines, and hook and line. Managed the processing of the fish samples for chemical analysis.

Ecological Risk Assessment

Ecological Risk Assessments Review; PPG Industries, General Electric, USX Corporation, and Hamilton Standard; Connecticut, Indiana, Missouri, Pennsylvania, and West Virginia; 1990 - 1998. Conducted screening level and baseline ecological risk assessments as part of CERCLA remedial investigations, or RCRA Corrective Action Programs at several large industrial facilities. Work involved reviewing applicable state and federal regulations and guidance documents, contacting the appropriate regulators, updating chemical toxicity data, and conducting literature reviews.

Ecological Risk Assessor; North Carolina (Camp Lejeune) and Virginia (NRTF Driver, NWS Yorktown, Camp Perry); 1991 - 1998. Prepared more than 20 ecological risk assessments as part of RI/FS programs at DoD bases in North Carolina and Virginia. The state and federal agencies reviewed and approved the procedures for conducting the risk assessments. The risk assessments included the evaluation of aquatic biosurveys and body-burden assessments in freshwaters and estuaries; aquatic and terrestrial bioaccumulation studies, and/or chemical sampling of surface water, sediment, soil, and groundwater. Presented results of the risk assessments to the regulators for their comments and subsequent approval.

Ecological Risk Assessor; USACE Omaha District; Kimball, NE and Chugwater, WY; 1997 - 1998. Prepared ecological risk assessments at two former Atlas "E" Missile sites in Nebraska and Wyoming. Met with state regulators to review the results of the risk assessment and to discuss and address their comments.

Project Ecologist/Sampling Investigations

Project Ecologist; Brownfield Environmental Assessments; Miscellaneous Industrial Clients in Pennsylvania and Indiana, 1991 - 1998. Prepared several ecological assessments in accordance with Voluntary Remediation Programs (Brownfields). These assessments consisted of desktop reviews of available information that were obtained from federal or state agencies (i.e., National Inventory Wetland Maps, endangered species and critical habitat surveys), along with reviews of existing studies for the sites. In addition, ecological risk assessments were conducted at several of the sites when warranted by site conditions (i.e., significant habitat, complete exposure pathways, etc.). The ecological risk assessments were conducted in accordance with state and USEPA guidance and included biological surveys at some of the sites.

Project Ecologist; Aquatic Assessment; PPG Industries; Kokomo, IN; 1997. Task manager for an aquatic assessment of a creek in Indiana following the USEPA Rapid Bioassessment Protocol for PPG. Conducted a habitat assessment, collected benthic macroinvertebrates for population statistics, and collected sediment samples for chemical analysis. Conducted assessment to determine if the state cleanup levels were protective of the benthic community.

Project Ecologist; Long-Term Monitoring Program; Driver, VA; 1995 - 1998. Conducted a long-term sediment and fish tissue monitoring program for a BRAC facility in Virginia to determine the effectiveness of site remediation of PCBs. Collected 40 sediment and four mummichog samples for chemical analysis on a bi-annual basis. The monitoring program was initiated after the ecological risk assessment determined that there was not a significant risk to ecological receptors. Negotiated the program after several meetings with representatives from federal and state agencies.

Project Ecologist; Clam Live Box Study; Driver, VA; 1994. Conducted a clam live box study in an estuary. Selected appropriate clam species, constructed live boxes, deployed boxes, and managed study. Used data to determine if PCBs were bioaccumulating in the clams.

Project Ecologist; Earthworm Bioaccumulation Study; Camp Lejeune, NC; 1995. Task manager for an in-situ earthworm bioaccumulation study. Constructed earthworm containers, determined most appropriate earthworm species to use in the study, obtained worms, and managed study. Used data to support the conclusions of a baseline risk assessment.

Project Ecologist; Aquatic Assessment; Pittsburgh International Airport; Pittsburgh, PA; 1997. Task manager for an aquatic assessment of a creek following the USEPA Rapid Bioassessment Protocol for the airport.

Conducted a habitat assessment and collected benthic macroinvertebrates for population statistics. The work was conducted to determine if runoff from the airport was impacting the aquatic community.

Project Scientist; Long-Term Wetlands Monitoring Program; Hamilton Standard; Windsor Locks, CT; 1997 - 1998. Managed a long-term wetlands monitoring program. Conducted work to determine the impact of a seep collection system on existing wetlands downgradient of the seeps.

Project Scientist; Environmental Literature Reviews; Several Industrial Clients; Pennsylvania, Ohio, and Indiana; 1995 - 1998. Conducted environmental literature reviews for several industrial facilities in several states to determine current environmental conditions. Work involved contacting the appropriate agencies for information on threatened and endangered species, scenic rivers, and other sensitive environments. National Wetland Inventory Maps, and USGS Topographic maps also were reviewed for the sites.

Project Ecologist; Various Sampling Investigations; North Carolina (Camp Lejeune) and Virginia (NRTF Driver, NWS Yorktown, Camp Perry); 1991 - 1998. Task manager for many large field efforts that included the collection of chemical (surface water and sediment) and biological (fish, benthic macroinvertebrates and crabs) samples in both freshwater and/or saltwater streams, ponds, rivers, and bays. Collected sediment samples with corers and grab samplers. Collected the fish samples using electroshockers, haul seines, gill nets, hoop nets, minnow traps and catfish traps while the benthic macroinvertebrate samples were collected using Ponar grabs and kick nets. Collected crabs using crab pots. Managed the processing of the fish and crab samples for chemical analysis and the benthic macroinvertebrate samples for sorting and taxonomic identification.

Project Scientist; Sediment/Surface Water Sampling Investigation, FMC Corporation; Charleston, WV; 1994 - 1997. Conducted an extensive sediment sampling investigation to define the horizontal extent of contamination in a large river in West Virginia. Work involved collecting over 100 sediment samples along pre-determined transects, as well as collecting additional sediment samples based on field measurements and observations. Investigation also included collecting surface water and well point data to determine if contaminated groundwater was discharging to the river.

Project Scientist; Bioassays; U.S. Navy, LANTDIV/CLEAN and USX Corporation; Camp Lejeune, North Carolina (U.S. Navy), and Gary, Indiana (USX); 1995 (U.S. Navy) and 1991 (USX). Collected sediment and surface water samples to conduct bioassay studies to determine the toxic response to fish and invertebrates from exposure to site-related contaminants. Selected appropriate tests and test organisms to meet the site conditions and ecological endpoints.

Task Leader; Stream Sampling Investigations; Pittsburgh International Airport; Pittsburgh, PA; 1990 - 1998. Prepared stream sampling plans and summary reports to determine concentrations of deicing agents in streams adjacent to the airport. Other water quality incidents investigated at the airport included reported fish kills, foaming problems in the streams, and odor problems.

Task Leader; Air Sampling Investigation; Pittsburgh International Airport; Pittsburgh, PA; 1997. Collected air samples for chemical analysis of deicing agents in response to odor complaints. Collected samples using air pumps and adsorbent tubes. Calculated risk-based concentrations to determine if the air concentrations were posing an adverse human health risk.

Task Leader; Stream Sampling Investigations; Pittsburgh International Airport; Pittsburgh, PA; 1990 - 1998. Member of technical committee tasked with identifying and evaluating the handling and disposal of spent

deicing fluids. Identified and assessed potential alternatives for current deicing practices and/or deicing fluids including recycling, land application, and biological treatment.

Task Leader; Baseline Sampling and Testing Program; Harrisburg International Airport; Harrisburg, PA; 1995 - 1997. Prepared a Baseline Sampling and Testing Program to monitor storm water runoff of spent deicing fluids. Set up the program, purchased automatic sampling equipment, and collected the samples. Presented the results to the state and discussed the proposed NPDES permit requirements for stormwater discharges.

Water Quality Issues

Project Scientist; Water Quality Management Plan; Pittsburgh International Airport; Pittsburgh, PA; 1991 - 1992. Developed a Water Quality Management Plan and conducted studies evaluating the potential impacts on waters receiving deicing runoff from the airport. Worked with a local municipal treatment plant to determine the appropriate loading of spent deicing fluid that their plant could handle.

Project Scientist; NPDES Permit Review; Zinc Corporation of America; PA; 1993. Investigated discharge limits set by the state for an NPDES permit for this metals works facility. Examined waste load allocation model and assumptions used by the state to determine how they arrived at their discharge limits. In addition, used and investigated USEPA models to determine appropriate discharge limits.

Project Scientist; NPDES Permit Review; Steel Company; IN; 1994. Reviewed an existing NPDES permit for a large steel mill to determine what the effects of adding leachate from a proposed landfill would have on the discharge limits contained in the existing permit.

Project Scientist; Water Quality Monitoring Program; Pittsburgh Water and Sewer Authority; Pittsburgh, PA; 1993 - 1994. Prepared Water Quality Monitoring Outline Reports for two proposed hydroelectric power plants on the Allegheny and Ohio Rivers. Reviewed past water quality sampling reports and participated in an interagency coordination meeting.

PUBLICATIONS / PRESENTATIONS

Bernhardt, A., N., L. Ganser, D. O'Connor, V. Jurka, J. Wright, M. Hammond. 2012. "Mercury Investigation at Site 1 - Dodge Pond, East Lyme, Connecticut." Presented at the Society of Environmental Toxicology and Chemistry's 33rd Annual Meeting, 11-15 November 2012, Long Beach, California.

Bernhardt, A., Prevar, D., Smith, P., Bowersox, M., Roberts, J., Pluta, B, Davis, K., Tuttle, J., 2008. "Invertebrate and Small Mammal Bioavailability Study at the USDA Beltsville Agricultural Research Center." Presented at the Society of Environmental Toxicology and Chemistry's 29th Annual Meeting, 16 - 20 November 2008, Tampa, Florida.

Bernhardt, A., N. Teamerson, C. Corbett, B. Pluta, and K. Patnode. 2006. "Baseline Ecological Risk Assessment at an Arsenic Site." Presented at the Society of Environmental Toxicology and Chemistry's 26th Annual Meeting, 5 - 9 November 2006, Montreal, Canada.

Bernhardt, A.M., T.M. Biksey, A.C. Schultz, and B. Marion. Literature Review: Ecological and Human Health Risk Assessment. Water Environment Research. 2006. 78(10).

Bernhardt, A.M., T.M. Biksey, and A.C. Schultz. Literature Review: Ecological and Human Health Risk Assessment. *Water Environment Research*. 2005. 77(6).

Bernhardt, A, R. Young, D. Cohen, F. Evans, J. Speicher, and M. Raymond, 2004. "Comparison of NOAA and USEPA Analytical Methods for Metals." Presented at the Society of Environmental Toxicology and Chemistry's 25th Annual Meeting, 14 - 18 November 2004, Portland, Oregon.

Young, R., and A. Bernhardt, Development of Site Specific, Ecological PRGs for PCBs and Mercury. Presented at the Society of Environmental Toxicology and Chemistry's 25th Annual Meeting, 14 - 18 November 2004, in Portland, Oregon.

Bernhardt, A.M., T.M. Biksey, and A.C. Schultz. Literature Review: Ecological and Human Health Risk Assessment. *Water Environment Research*. 2004. 76(6).

Bernhardt, A.M., T.M. Biksey, W.H. Phillips, A.M. Romano, and A.C. Schultz. Literature Review: Ecological and Human Health Risk Assessment. *Water Environment Research*. 2003. 75(5).

Bernhardt, A.M, R. Haynie, M. Martin, and N. Parker. "Development of Ecological Risk-Based Levels in Soil Contaminated with Lead Paint." Presented at the Society of Environmental Toxicology and Chemistry's 23rd Annual Meeting, 16 - 20 November 2002, in Salt Lake City, Utah.

Bernhardt, A, J.E. Hinck, D. Cohen, F. Evans, J. Speicher, and M. Raymond, 2002. "Interim Offshore Monitoring Program at Portsmouth Naval Shipyard." International Conference on Soils, Sediment and Water, 17th Annual Inter. Conference on Contaminated Soils, Sediments, and Water, Univ. of Mass. at Amherst, Oct. 22-25.

Bernhardt, A.M., and T.M. Biksey, 2000. "The Right Tool for the Job" (Ecological Risk Assessment) *Water Environment and Technology*. Vol. 12(3): 30-35.

Bernhardt, A, D. Cohen, F. Evans, and M. Raymond, 2000. "Using the DQO Process to Develop an Interim Offshore Monitoring Program for Portsmouth Naval Shipyard." Presented at the Society of Environmental Toxicology and Chemistry's 21st Annual Meeting, 12 - 16 November 2000, in Nashville, TN.

Biksey, T.M., and A.M. Bernhardt, 2000. "Environmental Baseline Assessment of Oil Fields in the Arabian Gulf." Presented at the Society of Environmental Toxicology and Chemistry's 21st Annual Meeting, 12 - 16 November 2000, in Nashville, TN.

Biksey, T.M., M.E. Kimes, A.M. Bernhardt, M.A. Suminski, and C. Penny. 1999. "Long-Term Aquatic Monitoring Program at a Naval BRAC Site". Presented at the Society of Environmental Toxicology and Chemistry's 20th Annual Meeting on November 14 - 18, 1999, Philadelphia, Pennsylvania.

Cohen, D, Bernhardt, A, F. Evans, and M. Raymond, 1999. "Using the DQO Process to Develop the Interim Offshore Monitoring Program for Portsmouth Naval Shipyard." Presented at Navy Ecological Risk Assessment and Management Forum, August 31 - September 1, 1999, in Philadelphia, PA.

Biksey, T.M., A.M. Bernhardt, M.E. Kimes, M.A. Suminski, and C. Penny. 1996 "Assessment of Ecological Risks Prior to a Naval Base Closure." Presented at the Society of Environmental Toxicology and Chemistry's 17th Annual Meeting on November 17-21, 1996, Washington, D.C.



TETRA TECH

LEIGH A. CIOFANI

Risk Assessment Specialist/Environmental Scientist

EXPERIENCE SUMMARY

Ms. Ciofani is a risk assessor with more than nine years of professional experience. As a risk assessment specialist, she develops conceptual site models, analyzes site data, performs statistical analysis of data, calculates human health risk, prepares risk assessment report text and tables, and calculates PRGs. She has supported public health risk assessments for more than 40 hazardous waste sites, assessing risk associated with water ingestion, inhalation of volatiles, dermal contact, fugitive dust emissions, fish ingestion, volatile emissions, and soil ingestion.

RELEVANT EXPERIENCE

Risk Assessment

Risk Assessor; U.S. Coast Guard; 2015 - Present. Assisted with data tables including relevant project criteria for water data sets. Develop conceptual site model and relevant exposure assumptions for human health risk assessment.

Risk Assessor; Lockheed Martin Corporation; Middle River, MD; 2014 - Present. Assist with data analysis and report writing for human health risk assessments incorporating soil vapor and indoor air results.

Risk Assessor; U.S. Army Corps of Engineers; Stockton, UT; 2016. Assisted with human health risk assessment model runs incorporating air modeling results.

Risk Assessor; Naval Research Laboratory - Chesapeake Bay Detachment; Chesapeake Beach, MD; 2012 -2016. Prepared human health risk estimates in RAGS Part D table format for several media and receptors with associated report text. Also prepared fate and transport analysis text.

Risk Assessor; Safety Light Corporation; Bloomsburg, PA; 2016. Prepared human health risk estimates in risk ratio format for soil and associated technical memorandum text for one survey unit. Data included radionuclides and non-radionuclide parameters.

Risk Assessor; Anacostia River Sediment Project; Washington, DC; 2016. Calculated 95% upper confidence limits and general statistics for several data sets using ProUCL software.

EDUCATION

M.S. Earth System Science & Policy, University of North Dakota, 2007

B.S. Environmental Science, Allegheny College, 2005

YEARS OF RELEVANT RISK ASSESSMENT EXPERIENCE

8

REGISTRATIONS/ AFFILIATIONS

NA

TRAINING/CERTIFICATIONS

NA

OFFICE

Pittsburgh, PA

YEARS OF EXPERIENCE

9

YEARS WITH TETRA TECH

8

Risk Assessor; Naval Weapons Industrial Reserve Plant (NWIRP); Bedford, MA; 2015 - 2016. Prepared human health risk estimates in RAGS Part D table format for soil at three sites and associated technical memorandum text.

Risk Assessor; Lockheed Martin Corporation; Middle River, MD; 2015 - 2016. Assisted with data tables including relevant project criteria for soil data sets at several sites. Assisted with post-remedial risk analysis document preparation.

Risk Assessor; Ft. Mifflin; 2015. Assisted with calculating statistics for statistical comparisons using ProUCL software.

Risk Assessor; Former Tronox Pigment Site; Savannah, GA; 2015. Prepared RAGS Part D Table 2s and 3s for several soil and sediment data sets including both discrete and incremental sampling method (ISM) samples.

Risk Assessor; Lockheed Martin Corporation; Middle River, MD; 2015. Updated sample lists and human health risk estimates in RAGS Part D table format for several media and receptors.

Risk Assessor; Naval Station Newport; Portsmouth, RI; 2014 - 2015. Prepared human health risk estimates in RAGS Part D table format for several media and receptors with associated report text for multiple sites.

Risk Assessor; Former Naval Construction Battalion Center (NCBC) Davisville; North Kingstown, RI; 2013 - 2014. Created chemicals of potential concern selection tables and risk-ratio tables for human health risk assessment for sediment and shellfish data. Prepared human health risk assessment report.

Risk Assessor; Naval Air Station Brunswick; Brunswick, ME; 2012 - 2013. Prepared human health risk estimates in RAGS Part D table format for several media, receptors, and exposure units with associated report text.

Risk Assessor; Naval Support Activity Crane; Crane, IN; 2012 - 2013. Prepared human health risk estimates in RAGS Part D table format for several media and receptors with associated report text.

Risk Assessor; Naval Activity Puerto Rico: Ceiba, Puerto Rico; 2012. Prepared human health risk estimates in RAGS Part D table format for several media and receptors with associated report text.

Risk Assessor; Marine Corps Air Station (MCAS) Beaufort, SC; 2012 - 2013. Prepared human health risk estimates in RAGS Part D table format for several media and receptors with associated report text for multiple sites. Also prepared fate and transport and nature and extent of contamination text sections and assisted with report compilation.

Risk Assessor; Marine Corps Recruit Depot (MCRD) Parris Island; SC; 2010 - 2012. Updated RAGS Part D tables for human health risk assessment for various receptors and multiple sites.

Risk Assessor; NAS South Weymouth; Weymouth, MA; 2009 - 2012. Performed human health risk assessments for multiple sites; created risk-ratio analysis tables as well as risk assessment tables in RAGS Part D format for various receptors and exposure pathways. Prepared several corresponding human health risk assessment reports. Calculated preliminary remediation goals as part of feasibility study support.

Risk Assessor; Joint Base Charleston; Charleston, SC; 2011 - 2012. Prepared a risk ratio report for human health receptors and associated report text at one site. Prepared human health risk estimates in RAGS Part D table format for several media and receptors with associated report text at two other sites.

Assistant Risk Assessor; Lockheed Martin Corporation; Middle River, MD; 2012. Prepared human health risk estimates in RAGS Part D table format for several media and receptors. Prepared associated sample calculations and risk estimate figures. Assisted with data analysis and report writing for human health risk assessment incorporating several site media.

Risk Assessor; Portsmouth Naval Shipyard; Kittery, ME; 2011 - 2012. Performed updates to human health risk assessments for various receptors and exposure pathways and associated tables in RAGS Part D format.

Risk Assessor; Lockheed Martin Corporation; Middle River, MD; 2011. Created human health risk assessment tables in RAGS Part D format for soil and groundwater at several exposure units. Prepared the corresponding human health risk assessment report.

Risk Assessor; U.S. Army; Fort Belvoir, VA; 2010 - 2011. Created human health risk assessment tables in RAGS Part D format for several site media in three exposure units. Prepared corresponding human health risk assessment report.

Risk Assessor; United States Coast Guard; Former Atwater Facility; Detroit, MI; 2011. Created human health risk assessment tables in RAGS Part D format for site media for several receptors. Prepared corresponding human health risk assessment report.

Risk Assessor; Otterbein College; Westerville, OH; 2010 - 2011. Prepared work plan for a human health risk assessment considering United States Environmental Protection Agency and Ohio Environmental Protection Agency guidance.

Risk Assessor; Former Naval Construction Battalion Center (NCBC) Davisville; North Kingstown, RI; 2009 - 2011. Verified database completion and prepared sample list for inclusion in risk assessment. Created chemicals of potential concern selection tables and risk-ratio tables for human health risk assessment for four individual sites. Prepared human health risk assessment report and associated nature and extent text.

Risk Assessor; Portsmouth Naval Shipyard; Kittery, ME; 2011. Prepared human health risk estimates in RAGS Part D table format and associated report text and figures for a remedial investigation.

Risk Assessor; Lockheed Martin Corporation; Middle River, MD; 2010 -2011. Created chemicals of potential concern selection tables and risk-ratio tables for assessment of human health risks for recreational users exposed to sediment via direct contact and fish consumption. Assisted with the preparation of the nature and extent of contamination section.

Risk Assessor; Naval Computer and Telecommunications Area Master Station – Atlantic Detachment Cutler (NCTAMSLANT); Cutler, ME; 2010. Prepared human health chemicals of potential concern selection tables and risk-ratio tables and associated text for one site. Updated previous risk assessment chemicals of potential concern selection tables and risk-ratio tables to incorporate new data for a second site.

Risk Assessor; NAS Brunswick: Brunswick, ME; 2009 - 2010. Performed human health risk assessments for several sites, receptors, and exposure pathways; created risk ratio tables and risk assessment tables in RAGS Part D format.

Risk Assessor; Portsmouth Naval Shipyard: Kittery, ME; 2009 - 2010. Performed human health risk assessments for various receptors and exposure pathways; created assessment tables in RAGS Part D format. Assisted with site-specific screening level calculation using published toxicity data and site-specific exposure assumptions. Aided in preparing the human health risk assessment report for the remedial investigation.

Risk Assessor; UNCBC Gulfport, Gulfport, MS; 2009. Performed human health risk assessments for various receptors and exposure pathways; created assessment tables in RAGS Part D format. Prepared the human health risk assessment report.

Risk Assessor; NSA Annapolis: Annapolis, MD; 2008 - 2009. Created chemicals of potential concern selection tables and RAGS Part D tables and calculated exposure point concentrations for the human health risk assessment.

Risk Assessor; Naval Weapons Station (NWS) Charleston; Charleston, SC; 2008. Created chemicals of potential concern selection tables; prepared draft human health risk assessment reports for two sites.

Risk Assessor; Former Melville Water Tower Site; Portsmouth, RI; 2008. Interpreted site data and prepared a human health risk assessment report incorporating several land use scenarios and potential human receptors.

RI/FS

Technical Support; Otterbein College: Westerville, OH; 2013. Prepared nature and extent of contamination text and associated tables. Prepared fate and transport analysis text.

Risk Assessor; Portsmouth Naval Shipyard; Kittery, ME; 2011 - 2012. Calculated preliminary remediation goals and post-remedial risk estimates. Assisted with associated report writing for the feasibility study and the remedial alternatives analysis. Responsibilities also included preparing site background information sections of these reports.



TETRA TECH

LEANNE M. GANSER

Risk Assessment Specialist/Environmental Scientist

EXPERIENCE SUMMARY

Ms. Ganser has over 10 years of environmental experience. She writes human health and ecological risk assessments and has performed data validation. As a risk assessment specialist, she develops conceptual site models, analyzes site data, performs statistical analysis of data, calculates human health risk, prepares risk assessment report text and tables, and calculates PRGs. She has supported public health risk assessments for more than 40 hazardous waste sites, assessing risk associated with water ingestion, inhalation of volatiles, dermal contact, fugitive dust emissions, fish ingestion, volatile emissions, and soil ingestion. She has reviewed and interpreted data from technical studies on the fate and transport of pesticides, and developed experiments to evaluate the potential for doormats to reduce pesticides residues in the home and to trace the presence of an herbicide in a local watershed.

RELEVANT EXPERIENCE

Risk Assessment

Risk Assessor; NASA, Wallops Island, VA; 2015 - Present. Assisted in development of protocol for ecological risk assessment for Opening Burning Area. Reviewed Human Health and Ecological Risk Assessment Protocol for Open Burning Area for grammatical accuracy, logical organization, and clarity.

Risk Assessor; Tooele Army Depot, UT; 2015 - Present. Evaluated ecological risks in support of a RCRA Part B application for a facility that conducts open burn and open detonation of energetic production wastes. Followed USEPA Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities using EcoRisk View™ software.

Risk Assessor; Suffolk County Department of Health Services, NY; 2015 - Present. Evaluate human health risks for Grand Canal Area. Evaluate water quality data including chemicals and nutrients. Calculate cancer and non-cancer risk estimates using risk-ratio approach.

Environmental Scientist/ Risk Assessor; MCAS Beaufort, SC; 2011 - 2015. Developed watershed contaminated source document. Prepared ecological risk assessment for SWMU 86, SWMU 87, and AOC P.

EDUCATION

M.S.; Marine, Estuarine, and Environmental Science; University of Maryland; 2006

B.S.; Environmental Science; Chatham University; 2004

YEARS OF RELEVANT RISK ASSESSMENT EXPERIENCE

8

REGISTRATIONS/ AFFILIATIONS

Qualified Environmental Professional, 2015

TRAINING/CERTIFICATIONS

Chemistry for Environmental Professionals Fundamentals; USEPA, 2012

Chemistry for Environmental Professionals Applied; USEPA, 2012

OFFICE

Pittsburgh, PA

YEARS OF EXPERIENCE

10

YEARS WITH TETRA TECH

8

Risk Assessor; Otterbein University, Westerville, OH; 2013 - 2015. Conducted an Ecological Risk Assessment (ERA) in accordance with Ohio EPA guidance for the site, where metals were the primary contaminants of concern. The ERA consisted of Levels I through III of the Ohio EPA ERA guidance and was conducted for several areas of concern, including off-site areas. Media evaluated included surface soil, sediment, and surface water.

Risk Assessor; NAS Brunswick, ME; 2008 - 2015. Prepared methodology for ecological risk assessment for Skeet Range, Site 9, Site 17, and Quarry. Wrote ecological risk assessment for Skeet Range, Site 9, Site 17 and Quarry. Performed food chain modeling for ecological risk assessment. Assisted in developed of human health and ecological risk assessment text for site screening of Picnic Pond area. Performed risk-ratio evaluation and human health risk screening assessment for Machine Gun Site and Skeet Range.

Risk Assessor/Environmental Scientist; MCRD Parris Island, SC; 2011 - 2015. Developed watershed contaminated source document. Performed human health risk assessment for various receptors and exposure pathways; created assessment tables in RAGS Part D format. Prepared the human health risk assessment report for Site 9/16. Wrote sections on nature and extent and fate and transport for OU12 RI report.

Risk Assessor; Naval Station Newport, RI; 2011 - 2014. Performed food chain modeling for ecological risk assessment. Prepared ecological risk assessment for Tank Farms 1, 2, and 3.

Risk Assessor; NAS Crane, IN; 2011 - 2013. Prepared human health and ecological risk assessment for Resource Conservation and Recovery Act Facility Investigation (RFI) report for SWMU 11. Prepared ecological risk assessment for SWMUs 18, 21, 28, and 35. Performed human health risk assessment for various receptors and exposure pathways; created assessment tables in RAGS Part D format. Performed food chain modeling for ecological risk assessment. Wrote sections on nature and extent and fate and transport of chemicals for SWMU 28 RFI report.

Risk Assessor; NALF Cabaniss, TX; 2012. Performed food chain modeling for ecological risk assessment for former Incinerator Disposal Site and Skeet Range.

Risk Assessor; Charleston AFB, SC; 2011. Performed human health risk assessment for various receptors and exposure pathways; created assessment tables in RAGS Part D format. Prepared the human health risk assessment report for SWMU 28.

Risk Assessor; Private Client, Middle River, MD; 2011. Performed food chain modeling for ecological risk assessment. Prepared ecological risk assessment for Strawberry Point. Addressed comments and revised fish tissue data report.

Risk Assessor; CNC Charleston, SC; 2011. Performed human health risk assessment for various receptors and exposure pathways; created assessment tables in RAGS Part D format. Prepared the human health risk assessment report for AOC 721.

Risk Assessor; NAS Whiting Field, FL; 2011 - 2011. Performed risk-ratio evaluation of groundwater plumes for Site 40. Prepared human health risk screening assessment.

Risk Assessor; NWS Earle, NJ; 2011. Performed food chain modeling for ecological risk assessment for Site 9. Prepared ecological risk assessment.

Risk Assessor; Fort Belvoir, VA; 2010 - 2011. Coordinated completion of human health risk assessment report for SWMU 27. Performed human health risk assessment for various receptors and exposure pathways; created assessment tables in RAGS Part D format. Prepared the human health risk assessment report.

Risk Assessor; Naval Submarine Base (NSB) New London, Groton, CT; 2008 - 2011. Assisted in the development of text and tables for a draft sampling and analysis plan addendum for Phase IV Remedial Investigation for Area A Wetland- Site 2B. Assist in developing of text and tables for Completion Report for Area A Wetland- Site 2B. Updated analytical methods and human health and ecological screening criteria as part of an update of the monitoring program for Area A Landfill, DRMO and Goss Cove at New London. Evaluated groundwater and soil data from Lower Subbase from the 2010 PDI for Data Quality Reviews. Prepared Nature and Extent section for 2010 PDI.

Risk Assessor; Indian Head, MD; 2011 - 2012. Performed human health risk assessment for various receptors and exposure pathways; created assessment tables in RAGS Part D format. Prepared the human health risk assessment report for UXO 32.

Risk Assessor; Marine Corps Base Quantico, VA; 2010. Evaluated data from UXO 001, 006, 012, and 13CD for Data Quality Reviews. Assisted in preparation of site investigation report for UXO 001, 006, and 012. Performed food chain modeling for ecological risk evaluation.

Risk Assessor; NSF Indian Head, MD; 2009. Prepared text and tables of ecological risk assessment for Site Inspection Report.

Risk Assessor; Carr Point Naval Station Newport, Portsmouth, RI; 2009. Performed food chain modeling for ecological risk assessment. Assisted in development of ecological risk assessment text.

Risk Assessor; Naval Shipyard (NSY) Portsmouth, Kittery, ME; 2009. Assisted text corrections for Rounds 1 through 10 Data Evaluation Report. Evaluated data from Rounds 8 to 10 and Additional Scrutiny Studies for Data Quality Reviews.

Risk Assessor; U.S. Coast Guard; Baltimore Yard, MD; 2009. Prepared discussion of the fate and transport of contaminants present in the environmental media at Site 08 to support a human health risk assessment.

Risk Assessor; NUSC Newport, RI; 2008 - 2009. Prepared chemical concentration plots based on toxicity tests using survival and growth of organisms as endpoints.

Risk Assessor; NASA Langley Research Center (LaRC), Hampton, VA; 2008. Identified chemicals of potential concern and characterized potential noncarcinogenic and carcinogenic risks resultant from exposure to soil. Wrote methodology and results sections for human health risk assessment. Wrote technical memorandum presenting a human health risk screening evaluation of subsurface soil.

Risk Assessor; Naval Shipyard (NSY) Portsmouth, Kittery, ME; 2008. Assisted in preparation of tables and text for Round 5 data package for OU 3 Post-Remedial Operation. Maintenance. and Monitoring Program

(OM&M). Assisted in making corrections to text for Rounds 1 through 4 Data Evaluation Report for OU 3 prepared as part of the Post-Remedial OM&M program.

Risk Assessor; Marine Corps Air Station (MCAS) Cherry Point, NC; 2008. Updated database with screening criteria to be used in ecological and human health risk assessments.

Risk Assessor; Naval Base Kitsap (NBK), Bangor, WA; 2008. Researched State of Washington screening criteria for use in human health risk assessments.

Risk Assessor; Solomons Complex, Solomons, MD; 2008. Identified chemicals of potential concerns and characterized potential noncarcinogenic and carcinogenic risks resultant from exposure to soil, groundwater, surface water, and sediment. Wrote text for ecological and human health site screening risk assessment to support site characterization report.

Risk Assessor; Health Canada; 2013. Summarized toxicological studies on phthalates using International Uniform Chemical Information Database (IUCLID).

Risk Assessor; NWIRP Calverton, NY; 2012 - 2013. Assisted in development of ecological acute and chronic toxicity values for aquatic organisms for the Peconic River.

Risk Assessor; NAS Crane, IN; 2011. Assisted in development of technical memorandum developing preliminary remediation goals for dyes.

Risk Assessor; Private Client; Middle River, MD; 2011. Developed technical memorandum evaluating background concentrations of chemicals in sediment in the Chesapeake Bay.

Risk Assessor; Former Naval Construction Battalion Center (NCBC) Davisville, North Kingstown, RI; 2009 - 2011. Researched Comprehensive State Groundwater Protection Program for Technical Memorandum on Preliminary Remediation Goals for Groundwater Underlying Site 16 at NCBC Davisville. Contacted federal and state protection agencies to determine implementation and current status of program. Prepared white paper on radon concentrations in groundwater to proposed standards. Prepared white paper on quality and quantity of groundwater for drinking water use.

Risk Assessor; Private Client; Industrial Gasification Plant, Beaumont, TX; 2008 - 2009. Researched county and state health statistics, locations of sensitive populations, area water supply, and emissions of nearby industries. Prepared discussion on air emission and water discharges compared to screening criteria.

Risk Assessor; Private Client; Middle River, MD; 2008. Researched regional anthropogenic chemical concentration in sediments near Middle River, Maryland. Determined specifics regarding the development of fish advisories. Identified State of Maryland screening levels for surface water, soil, sediment and fish tissue.

Risk Assessor; NS Great Lakes, IL; 2013 - Present. Prepared record of decision, proposed plan, and public notices for several sites including sites 5, 9, 12, 17, and 21. Communicate with newspapers for publication of public notices. Updated Site 12 RI report based on response to comments document including writing an ecological risk assessment for Site 12 and updating the Site 12 human health risk assessment.

Risk Assessor; MCRD Parris Island, SC; 2012 - 2012. Prepared sections for RI report on nature and extent and fate and transport of chemicals present at Site 5.

Risk Assessor; New London, CT; 2009 - 2009. Prepared chemical concentration plots based on toxicity tests using survival and growth of organisms as endpoints. Assist in development of ecological risk assessment for Area A Wetland Remedial Investigation and Feasibility Study.

Risk Assessor; MCB Camp Lejeune, NC; 2008 - 2009. Identified regional human health and ecological screening criteria for soil, sediment, groundwater, and surface water for select metals and perchlorate.

Risk Assessor; NSA Mid-South, TN; 2008 - 2009. Identified regional human health and ecological screening criteria for soil for PAHs, select metals and nitroglycerin. Prepared chemistry-related QAPP worksheets.

Statistical Analyses

Environmental Scientist; NAS Jacksonville, FL; 2012. Calculated upper confidence limits for Site 45 using FL Pro software.

Environmental Scientist; Private Client; 2012. Provided statistical support by providing upper tolerance limits for groundwater monitoring program.

Environmental Scientist; NAS Crane, IN; 2012. Provided statistical support by providing background comparisons for soil from SWMU 11 using graphical techniques (box plots, normal probability plots, scatter plots, etc.) and formal statistical comparison tests (Wilcoxon Rank Sum test, Gehan test, etc.).

SCIENTIFIC/TECHNICAL PUBLICATIONS

Bernhardt, A., L. Ganer, T. Brent. 2014. "Effect of Soil pH on Plant Toxicity Tests." Presented at the Society of Environmental Toxicology and Chemistry's 35th Annual Meeting, 9-13 November 2014, Vancouver, British Columbia.

Bernhardt, A., N., L. Ganer, D. O'Connor, V. Jurka, J. Wright, M. Hammond. 2012. "Mercury Investigation at Site 1 - Dodge Pond, East Lyme, Connecticut." Presented at the Society of Environmental Toxicology and Chemistry's 33rd Annual Meeting, 11-15 November 2012, Long Beach, California.



TETRA TECH

ROBERT J. JUPIN

Risk Assessment Specialist/Environmental Scientist

EXPERIENCE SUMMARY

Mr. Jupin is a risk assessment specialist/environmental scientist with 37 years of experience in the environmental field. Mr. Jupin has prepared risk assessments and provided technical review in accordance with CERCLA, RCRA, American Society for Testing and Materials (ASTM) Risk-Based Corrective Action (RBCA) guidance, and various other state-driven programs, cost-recovery actions, and voluntary remediation projects for a broad spectrum of clients, including chemical plants, steel plants, paint plants, wood-treating sites, coal tar refineries, former manufactured gas plants, and Federal facilities. His work experience includes Monte Carlo analysis, statistical analysis, and technical review of proposed regulations. He has performed computer and analytical modeling to determine environmental fate and transport of constituents in soil, groundwater, surface water, and air for a variety of projects. Experience includes modeling groundwater impacts on surface water, groundwater modeling to demonstrate natural attenuation of contaminant plumes, and air dispersion modeling to determine air concentrations for risk assessments.

RELEVANT EXPERIENCE

Risk Assessment Specialist; NASA; Kennedy Space Center, FL; 2015 - Present. Assisting in the preparation of a probabilistic risk assessment (PRA) that is being prepared to derive an Alternate Soil Cleanup Target Level (A-SCTL) for residential exposures to total polychlorinated biphenyls (PCBs) at an IR site at the Kennedy Space Center. Traditional cleanup levels are derived using exposure parameters based on high-end or maximum values. The PRA accounts for variability within populations by allowing the exposure parameters to be defined as statistical distributions.

Risk Assessment Specialist; Support of RCRA Part B

Application; Tooele Army Depot, Tooele, UT; 2006 - present. Prepared a human health risk assessment in support of a RCRA Part B application for a facility that conducts open burn and open detonation of energetic production wastes and specialty items. Principal site contaminants were energetics and metals. The risk assessment was conducted per the guidelines established in the U.S.EPA guidance document titled, Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (U.S.EPA, September 2005). Risk estimates were produced using commercially available software provided by Lakes Environmental, Industrial Risk Assessment Program – Human Health for the U.S.EPA OSW Human Health Risk Assessment Protocol (HHRAP) (IRAP-h View). Air dispersion modeling results from the Open Burn/Demolition Model (OBDM) were used as

EDUCATION

M.S., Environmental Engineering, University of Pittsburgh, 1991

B.S., Meteorology, Pennsylvania State University, 1976

YEARS OF RELEVANT RISK ASSESSMENT EXPERIENCE

29

TRAINING/CERTIFICATIONS

8-hour Hazardous Waste Refresher Training, 1997

40-hour OSHA Hazardous Waste Training, 1993

Total Quality Management Training, 1992

OFFICE

Pittsburgh, PA

YEARS OF EXPERIENCE

37

YEARS WITH TETRA TECH

19

inputs to IRAP-h View. Traditional USEPA risk assessment methodology was used to evaluate risks to soils using soil sample results that were collected as part of the investigation.

Risk Assessment Specialist; RI/FS; Naval Surface Warfare Center, Indian Head, MD; 1997 - Present. Acts as lead risk assessment specialist for a team conducting a Remedial Investigation/Feasibility Study (RI/FS) for several operable units at the Naval Surface Warfare Center, Indian Head, Maryland. Volatile organic compounds, semivolatile organic compounds, perchlorate, and metals were the principle site contaminants. Used USEPA's IEUBK Model to evaluate lead exposures by children and EPA's biokinetic slope factor approach to evaluate lead exposures by adults (USEPA's Adult Lead Model). Primary responsibilities include preparation of baseline risk assessment documents. Unacceptable risks were identified for exposures to perchlorate in fish tissue. After a review of the chemical and physical characteristics of perchlorate, concentrations in other site media, concentrations in background media, and analytical methods it was determined that the detected concentrations of perchlorate in fish tissue were most likely a false positive caused by analytical matrix interferences.

Risk Assessment Specialist, NAS Pensacola, Pensacola, FL, 2014 - 2015. Acted as lead risk assessment specialist for a team conducting a series of RIs for five MRP sites at the facility. Principal site contaminants were PAHs, arsenic, and lead. Used Florida Department of Environmental Protection Global Risk-Based Correction Actions (RBCA) to determine risks and determine which Risk Management Option (RMO) was appropriate.

Risk Assessment Specialist; RF/CMS; Naval Surface Warfare Center, Crane, IN; 2012 - 2015. Acted as lead risk assessment specialist for a team conducting a RCRA Facility Investigations/Corrective Measures Studies for two trap ranges at the Naval Air Warfare Center in Crane, Indiana. Principal site contaminants are PAHs and lead. Used USEPA's Integrated Exposure Uptake Biokinetic Model (IEUBK) Model to evaluate lead exposures by children and USEPA biokinetic slope factor approach to evaluate lead exposures by adults (USEPA's Adult Lead Model). Primary responsibilities include preparation of baseline risk assessment documents and development of cleanup goals.

Risk Assessment Specialist; RI/FS; Marine Corp Recruit Depot, Parris Island, SC; 2011 - 2014. Acted as lead risk assessment specialist for a team preparing a series of Remedial Investigation/Feasibility Studies for a number of unexploded ordnance sites (UXO) sites at the Marine Corp Recruit Depot in Parris Island, South Carolina. Principal site contaminants were munitions components and metals (primarily arsenic, hexavalent chromium, and lead). Media of concern were soils, groundwater, and sediment. Primary responsibilities include preparation of baseline risk assessment documents and development of cleanup goals following USEPA Region IV guidance.

Risk Assessment Specialist; CERCLA Investigation for Site 16 at the Naval Construction Battalion Center Davisville; North Kingstown, RI; 2005 -2014. A significant trichloroethene plume underlies Site 16 which is being investigated under a Federal Facilities Agreement. Groundwater is the primary media of concern; approximately 200 monitoring wells were installed to evaluate the vertical and lateral extent of contamination at the site. Initial work involved the evaluation of existing data to identify data gaps for the completion of the remedial investigation for the site as well as the preparation of quality assurance project plan (QAPP) for the resolution of those data gaps. Assisted in the preparation of a human health risk assessment which was prepared as part of a Remedial Investigation/Feasibility Study. Used USEPA's version of the Johnson-Ettinger vapor intrusion model along with groundwater sampling results and soil gas measurements to evaluate risks associated with the migration of chemicals from groundwater to indoor air. Used the results of the risk assessment to develop cleanup goals for soil and groundwater. Also insisted in the development of the Proposed Plan and Record of Decision for the site.

Risk Assessor Specialist; U.S. Navy, NAVFAC Atlantic/CLEAN; Naval Station, Newport, RI; 2008 to October 2015. Acted as lead risk assessment specialist for a team a series of Remedial Investigation/Feasibility Studies for a number of sites at the Naval Station in Newport RI. Principal site contaminants were PAHs, PCBs, and metals in soils and sediments; and VOCs and metals in groundwater. Used USEPA's IEUBK Model to evaluate lead exposures by children and USEPA biokinetic slope factor approach to evaluate lead exposures by adults (USEPA's Adult Lead Model). Used USEPA's version of the Johnson-Ettinger vapor intrusion model along with groundwater sampling results to evaluate risks associated with the migration of chemicals from groundwater to indoor air. Primary responsibilities include preparation of baseline risk assessment documents, and development of remedial goal objectives.

Risk Assessment Specialist; Support of RCRA Part B Application; Thiokol Propulsion, Brigham City, UT; 2002 - 2014. Prepared a human health risk assessment in support of a RCRA Part B application for a facility that conducts open burn and open detonation of energetic production wastes and specialty items at two separate treatment locations. Principal site contaminants were energetics and dioxins. The risk assessment was conducted per the guidelines established in the U.S.EPA guidance document titled, Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (U.S.EPA, September 2005). Risk estimates were produced using commercially available software provided by Lakes Environmental, Industrial Risk Assessment Program – Human Health for the U.S.EPA OSW Human Health Risk Assessment Protocol (HHRAP) (IRAP-h View). Air dispersion modeling results from the Open Burn/Demolition Model (OBDM) were used as inputs to IRAP-h View. Risks for industrial workers, which are not included in the combustion guidance, were evaluated using traditional USEPA risk assessment methodology.

Risk Assessment Specialist; RFI/CMS; Naval Surface Warfare Center, Crane, IN; 2001 - 2015. Acted as lead risk assessment specialist for a team conducting a series of RCRA Facility Investigations/Corrective Measures Studies for a number of sites at the Naval Air Warfare Center in Crane, Indiana. Principal site contaminants are military dyes, VOCs, PAHs, PCBs, explosives, dioxins, and metals. Used USEPA's Integrated Exposure Uptake Biokinetic Model (IEUBK) Model to evaluate lead exposures by children and USEPA biokinetic slope factor approach to evaluate lead exposures by adults USEPA's Adult Lead Model). EPA's Johnson and Ettinger (J&E) vapor intrusion model was used to evaluate risks associated with the migration of chemicals from groundwater to indoor air. Primary responsibilities include preparation of baseline risk assessment documents and development of cleanup goals.

Risk Assessment Specialist; RFI/CMS; Joint Base Charleston Weapons, Charleston, SC; 2008 - 2015. Acted as lead risk assessment specialist for a team conducting a series of RCRA Facility Investigations/Corrective Measures Studies for a number of sites at the Base. Principal site contaminants are VOCs and metals in soil and groundwater. Primary responsibilities include preparation of baseline risk assessment documents.

Risk Assessment Specialist; RIFS; Marine Corp Recruit Depot, Parris Island, SC; 1998 - Present. Acts as lead risk assessment specialist for a team conducting a series of Remedial Investigations/Feasibility Studies for several sites at the Marine Corp Recruit Depot in Parris Island, South Carolina. Principal site contaminants are PAHs, pesticides, and metals. Used USEPA's IEUBK Model to evaluate lead exposures by children and USEPA biokinetic slope factor approach to evaluate lead exposures by adults (USEPA's Adult Lead Model). EPA's Johnson and Ettinger (J&E) vapor intrusion model was used to evaluate risks associated with the migration of chemicals from groundwater to indoor air. Primary responsibilities include preparation of baseline risk assessment documents and development of remedial goal objectives.

Risk Assessment Specialist; CERCLA Investigation for Engineer Proving Ground (EPG), Fort Belvoir, VA; 2010 - 2014. Acts as a risk assessment specialist for a team preparing human health risks in support of the Proposed Plans and Record of Decision for five sites at the Engineer Proving Ground in Fort Belvoir, Virginia. Principal contaminants were VOCs and metals. Used USEPA's IEUBK Model to evaluate lead exposures by children and USEPA biokinetic slope factor approach to evaluate lead exposures by adults (USEPA's Adult Lead Model). Primary responsibilities include preparation of baseline risk assessment documents and development of remedial goal objectives.

Risk Assessment Specialist; RI/FS; Naval Submarine Base - New London, Groton, CT; 2000- 2012. Acted as lead risk assessment specialist for a team conducting several Remedial Investigation/Feasibility Studies (RI/FS) for the groundwater Operable Unit at the Naval Submarine Base - New London, Groton, Connecticut. The principle site contaminants were halogenated VOCs, PAHs, and lead. Used USEPA's IEUBK Model to evaluate lead exposures by children and USEPA biokinetic slope factor approach to evaluate lead exposures by adults (USEPA's Adult Lead Model). Used USEPA's version of the Johnson-Ettinger vapor intrusion model along with groundwater sampling results to evaluate risks associated with the migration of chemicals from groundwater to indoor air. Primary responsibilities included preparation of baseline risk assessment documents, development of remedial goal objectives, and support of the development of the proposed plans and records of decision.

Risk Assessment Specialist; Environmental Health Assessment; NSA Naples; Naples, Italy; 2008 - 2012. Acted as a risk assessment specialist for a team conducting investigations to address public health issues for civilian and military personnel. Assisted in the preparation of human health risk assessments for exposures to tap water, soil, soil gas, and particulates in air.

Risk Assessment Specialist; Support of RCRA Part B Application; Aberdeen Proving Ground, Aberdeen, MD; 2005 - 2009. Acted as a risk assessment specialist for a team preparing a human health risk assessment in support of a RCRA Part B application for a facility that conducts open burn and open detonation of energetic production wastes and specialty items at three separate treatment locations. Principal site contaminants were VOCs, SVOCs, energetics, and dioxins. The risk assessment was conducted per the guidelines established in the U.S.EPA guidance document titled, Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (U.S.EPA, September 20058). Risk estimates were produced using commercially available software provided by Lakes Environmental, Industrial Risk Assessment Program - Human Health for the U.S.EPA OSW Human Health Risk Assessment Protocol (HHRAP) (IRAP-h View). Air dispersion modeling results from the Open Burn/Demolition Model (OBDM) were used as inputs to IRAP-h View. Risks for industrial workers, which are not included in the combustion guidance, were evaluated using traditional USEPA risk assessment methodology. In addition, as part of the project the results of the site characterization study were used to prepare a RAGS Part D risk assessment for exposures to soil and groundwater.

Risk Assessment Specialist; NASA Kennedy Space Center, FL; 2005 - 2009. Acted as a risk assessment specialist for a team conducting a series of RCRA Facility Investigations for several sites at the John F. Kennedy Space Center in Florida. Primary responsibilities include preparation of risk evaluations. Principal site contaminants are PAHs, PCBs, and metals. All work was conducted under the Florida HSWA program and facility-specific risk assessment guidelines.

Senior Risk Assessment Specialist; Ravenna Army Ammunition Plant (RVAAP); Ravenna, Ohio; September 2001 to 2008. Assisted in the preparations of human health risk assessments on-going at five sites at RVAAP: Load Lines 6/9/11, Central Burn Pits, and Cobb's Pond. USEPA Region 5, Ohio EPA, U.S. Army,

U.S. Army Corp of Engineers, and facility-specific risk assessment guidelines were used to prepare risk assessments. Risk assessment will be used to support a "no further action" recommendation in some cases.

Risk Assessment Specialist; Superfund-Related Investigations; NAS Cecil Field; Jacksonville, FL; 2005. Provided technical support for a team conducting investigations at the facility. Used the Spatial Analysis and Decision Assistance (SADA) model to delineate lead contamination in soil. The model results were used to identify soil sampling locations that would be collected to bind the extent of lead contamination.

Risk Assessment Specialist; RF/CMS; Naval Surface Warfare Center White Oak; Silver Spring, MD; 2001 - 2007. Acted as a risk assessment specialist for a team conducting a series of RCRA Facility Investigations for several sites at the Naval Surface Warfare Center in Silver Spring, Maryland. Principal site contaminants are PAHs, explosives, and metals. Primary responsibilities include preparation of baseline risk assessment documents.

Senior Risk Assessment Specialist; Risk Assessment of Building Materials for Private Client; Cleveland, OH; 2003 - 2005. Assisted in the evaluation of a human health risk evaluation of polychlorinated biphenyl (PCB) contamination of building materials (e.g., painted walls and structural beams, concrete) within a large industrial building previously used to repair electrical equipment and selected for sale by private client. The risk assessment was used as the basis of the private client's request to USEPA Region 5 to allow "high occupancy" use of the building under the USEPA's PCB Mega Rule (promulgated under the Toxic Substances Control Act [TSCA]). The project included a statistically-based design of a sampling and analytical program to acquire data adequate for human health risk assessment and the data validation of the PCB data collected. The EPA approved "high occupancy" use and the building was sold.

Risk Assessment Specialist; RI/FS; Naval Air Warfare Center, Indianapolis, IN; 1997 - 2004. Acted as lead risk assessment specialist for a team conducting a Remedial Investigation/Feasibility Study (RI/FS) for the Naval Air Warfare Center (NAWC), Indianapolis, Indiana. As a result of the BRAC, NAWC Indianapolis and its associated properties are being disestablished as DOD installations. The principal site contaminants were halogenated VOCs, PAHs, and metals. Primary responsibilities include preparation of baseline risk assessment documents, development of risk-based preliminary remediation goals, support for risk assessment activities associated with BRAC Cleanup Team Meetings, and risk evaluation of residual contaminant levels that remain at the site after remediation of groundwater.

Risk Assessment Specialist; RI/FS; Naval Industrial Reserve Ordnance Plant (NIROP) Toledo, OH; 2002 - 2003. Acted as lead risk assessment specialist for a team conducting a Remedial Investigation/Feasibility Study for a naval facility in Toledo, Ohio. Principal site contaminants included trichloroethene and vinyl chloride. Used USEPA's version of the Johnson-Ettinger vapor intrusion model along with groundwater sampling results, soil gas measurements, and indoor air samples to evaluate risks associated with the migration of chemicals from groundwater to indoor air. Primary responsibilities include preparation of baseline risk assessment documents and development of remedial goal objectives. The results of the risk assessment were used to support the early transfer of the property.

Risk Assessment Specialist; RI/FS; Marine Corp Air Station Cherry Point NC; 1999 - 2002. Acted as lead risk assessment specialist for a team conducting a series of Remedial Investigations/Feasibility Studies for several sites at the Marine Corp Air Station in Cherry Point, North Carolina. Principal site contaminants are PAHs, dioxins, pesticides, and metals. Used USEPA's Integrated Exposure Uptake Biokinetic Model (IEUBK) Model to evaluate lead exposures by children and USEPA biokinetic slope factor approach to evaluate lead

exposures by adults (USEPA's Adult Lead Model). Also used USEPA's version of the Johnson-Ettinger vapor intrusion model to evaluate risks associated with the migration of chemicals from groundwater to indoor air. Primary responsibilities include preparation of baseline risk assessment documents and development of remedial goal objectives.

Risk Assessment Specialist; RI/FS, EBST/FOST; Naval Industrial Reserve Ordnance Plant, Fridley, MN; 1997 - 2003. Risk Assessment Specialist for environmental baseline survey and RI/FS. As a result of the BRAC, NIROP Fridley and its associated properties are being disestablished as DOD installations. An EBST, FOST, and RI were prepared to fulfill BRAC requirements and to support the transfer of the NIROP Fridley facilities to a private contractor. The principal site contaminants were VOCs. Primary responsibilities include preparation of EBST/FOST and baseline risk assessment documents.

Risk Assessment Specialist; RFI/CMS; Naval Surface Warfare Center, Louisville, KY; 2000 - 2002. Acted as lead risk assessment specialist for a team conducting a RCRA Facility Investigation/Corrective Measures Study (RFI/CMS) for the Naval Surface Warfare Center (NSWC), Louisville, Kentucky. As a result of the BRAC, NSWC Louisville and its associated properties are being disestablished as DOD installations. The principal site contaminants were halogenated VOCs, PAHs, PCBs, dioxins, and metals. Primary responsibilities include preparation of baseline risk assessment documents, development of risk-based preliminary remediation goals, and support for risk assessment activities associated with BRAC Cleanup Team Meetings.

Risk Assessment Specialist; RI/FS; Marine Corps Combat Development Command, Quantico, VA; 1997 - 2000. Acted as lead risk assessment specialist for a team conducting a Remedial Investigation/Feasibility Study (RI/FS) for the Marine Corps Combat Development Command, Quantico, Virginia. Pesticides and metals were the principle site contaminants. Used USEPA's IEUBK Model to evaluate lead exposures by children.

Risk Assessment Specialist; RI/FS - Melville North Landfill; Naval Education Training Center, Newport, RI; 1997 - 1997. Provided support as a risk assessment specialist for a team conducting an RI for a landfill containing spent acids, waste paints, solvents, waste oils, and PCBs. The risk assessment was performed because the site was being developed into a marina. The results of the baseline risk assessment indicated that future construction workers are likely to experience adverse health effects as a result of exposure to soil.

Risk Assessment Specialist; Wood-Treating Plant RI/FS; Virginia. Prepared a risk assessment as part of an RI/FS investigation for an active wood-treating facility in Virginia. Summarized data for Site Environmental Conditions section of RI Report. Principal site contaminants were PAHs and metals. Modeled the environmental fate and transport of site-related constituents via the air and surface water migration routes to determine the potential impact on offsite receptors. Used results of the risk assessment to derive cleanup goals for soil and groundwater.

Risk Assessment Specialist; Steel Company RFI/CMS; Pennsylvania. Conducted preliminary risk assessments for a steel facility in Pennsylvania as part of a RCRA Facility Investigation. Evaluated various plant processes and identified those which could potentially have adverse impacts on the environment and which would require further investigation. Participated in seminar for client which outlined the RFI/CMS (RCRA Facility Investigation/Corrective Measures Study) process.

Risk Assessment Specialist; Generic Work Plan, Major Natural Gas Distributor; Pennsylvania. Prepared a preliminary risk assessment template for inclusion in a master work plan that would be used to investigate 20 former manufactured gas plant sites in Pennsylvania. Developed soil and groundwater action levels for use in

screening data collected at the sites and determining whether additional investigations would be required. Prepared site conceptual model, as part of site work plans, that was used to focus the site investigations. Principal contaminants of concern at sites included VOCs, PAHs, and metals. Prepared preliminary risk assessment for sites.

Risk Assessment Specialist, Former Manufactured Gas Plant RI/FS; Virginia. Prepared a risk assessment for a former manufactured gas plant in Virginia using the Virginia Department of Environmental Quality Risk Exposure Assessment Model (REAMs). Potential receptors were future residents exposed to groundwater and recreational users exposed to surface water in a river located adjacent to the site. Principal site contaminants were volatile organic compounds and polynuclear aromatic hydrocarbons.

Risk Assessment Specialist; Landfill RI/FS; New York. Performed a human health risk assessment as part of an RI/FS investigation for the groundwater operating unit at a Superfund site located in New York. As part of the risk assessment, modeled the migration of chemicals from sludge in onsite lagoons to demonstrate that the onsite groundwater plume had stabilized and that site-related chemicals were not migrating to adjacent wetlands or to offsite drinking water supply wells. Used the results of the risk assessment to develop remedial goals for groundwater at the site.

Risk Assessment Specialist; Former Chemical Refinery RI/FS; Kansas. Prepared risk assessment for a former refinery site in Kansas that was being developed as a public park. Principal site contaminants were semivolatile organics and metals. Evaluated human health risks to child and adult receptors based on reasonable maximum and central tendency exposures. Used EPA's IEUBK lead model to evaluate lead exposures by children. The results of the risk assessment were used to justify the selection of the final remedial alternative, which consisted of stabilization of waste areas and surface cover.

Risk Assessment Specialist; Former Wood-Treating Plant RI/FS; Massachusetts. Conducted two separate risk assessments for a former wood-treating Superfund site in Massachusetts that was divided into two areas for investigation purposes. Principal site contaminants were polynuclear aromatic hydrocarbons (PAHs). Evaluated potential exposures relating to recreational use of pond and to ingestion of fish. Developed cleanup goals for site soils and for a neighboring pond whereby, instead of the entire site, only a small section of the site and pond required remediation. Reviewed and commented on USEPA's Executive Decision Document for the site, which set final cleanup levels for areas requiring remediation.

Risk Assessment Specialist; Former Tar and Coke Plant RI/FS; New Jersey. Prepared three risk assessments as part of an RI/FS for a former coke and by-products plant in New Jersey. Compared site constituent levels with proposed New Jersey soil, groundwater, and surface water criteria. Used Monte Carlo analysis to develop Alternate Cleanup Standards (ACSS) for soils and Alternate Concentration Limits (ACLs) for groundwater.

Risk Assessment Specialist; Wood-Treating Plant RI/FS; California. Reviewed risk assessment conducted for an active wood-treating site as part of an RI/FS prepared by another consultant. The principal site contaminants were arsenic, pentachlorophenol, and dioxins. Identified several areas in which the original report overestimated the potential health and environmental impacts of the site on the surrounding area. Conducted air dispersion modeling for the site as part of a review of a separate report prepared by another consultant.

Risk Assessment Specialist; Former Wood-Treating Plant RI/FS; New Hampshire. Prepared a risk assessment as part of an RI for a former wood-treating site in New Hampshire. Correlated total petroleum

hydrocarbons with total PAH concentrations to enlarge the site database for use in the risk assessment. Evaluated groundwater flow to demonstrate that site groundwater was not affecting a neighboring river.

Risk Assessment Specialist; Former Manufactured Gas Plant RI/FS; Vancouver, British Columbia, Canada. Prepared a risk assessment for a former manufactured gas plant site in British Columbia that was being developed as a residential development and public park. Principal site contaminants were PAHs. Used the results of the risk assessment to develop cleanup goals for soil.

Risk Assessment Specialist; Former Manufactured Gas Plant/Former Railroad Fueling Facility RI/FS; New Brunswick, Canada. Prepared a risk assessment for a former manufactured gas plant/ railroad facility in New Brunswick. Planned future uses of the site included industrial, public park, and tourist center. Principal site contaminants were benzene and total petroleum hydrocarbons (TPH). Evaluated potential risks resulting from exposures to TPH using a modification of the Massachusetts TPH method. Used results of the risk assessment to derive cleanup goals for soil and groundwater.

SCIENTIFIC/TECHNICAL PUBLICATIONS

Sinagoga, Lee Ann, and Robert Jupin, "Risk Evaluation of Volatile Organic Chemical Contamination of Groundwater/Soils in Support of Property Transfers," Presented at the Annual International Conference on Soils, Sediments, and Surface Water, Amherst, Massachusetts, October 2003.

Stang, K., and R. Jupin, "How Accurate and Precise Are Our Analytical Data," Presented at the Hazardous Materials Control Resources Institute Superfund Conference, Washington, D.C., December 1993.

Kotun, Ronald J., Ph.D., Robert J. Jupin, et al., "Innovative Approaches for Cleanup Level Development." Chapter in: Process Engineering for Pollution Control and Waste Minimization, Eds.: Wise, D.L. and D.J. Trantolo, Marcel Dekker, Inc., 1993.

Jupin, Robert J., and Diane McCausland, "Statistical Methods to Derive Cleanup Goals for a Multi-Chemical Impacted Site," Proceedings of HMC/Superfund '92, Washington, D.C., December 1, 1992.

Kotun, Ronald J., Ph.D., and Robert J. Jupin, "An Innovative Approach to Derive Risk-Based Cleanup Levels for Carcinogenic PAHS," Proceedings of National R&D Conference on the Control of Hazardous Materials, San Francisco, California, February 5, 1992.

Jupin, Robert J., and Ronald D. Neufeld, Ph.D., "Evaluation of the January 2, 1988 Diesel Oil Spill into the Monongahela River with the WASP4 Water Quality Model," Proceedings of Twenty-Third Mid-Atlantic Industrial Waste Conference, Pittsburgh, Pennsylvania, June 4, 1991.

Kotun, Ronald J., Ph.D., Robert J. Jupin, et al., "Critical Issues and Influential Parameters Determined from Assessing Risks Posed by PAHs in Soil/Sediment for Over 30 Sites," presented at the International Specialty Conference on Managing Environmental Risks, Quebec, Canada, November, 1989.

Jupin, Robert J., and Richard T. DeCesar, Ph.D., "The Role of Risk Assessment in Redeveloping Industrial/Commercial Properties," presented at Pacific Northwest International Sections 25th Annual Meeting, Whistler, British Columbia, Canada. November 10, 1988.



TETRA TECH

RONALD J. KOTUN, Ph.D.
Senior Risk Assessment Specialist/Toxicologist

EXPERIENCE SUMMARY

Dr. Kotun is a risk assessment specialist, vapor intrusion specialist, and technical lead for the Risk/Toxicology Group with over 31 years of environmental experience. Dr. Kotun has prepared risk assessments and provided technical review for CERCLA- and RCRA-driven sites, state-driven RBCA programs, cost-recovery actions, property transfers, and voluntary remediation projects for a broad spectrum of clients including the Department of Defense (DOD) and wood-treating, steel, utilities, automobile manufacturing, chemical, and retail petroleum industries. His use of risk assessment has also been instrumental in establishing site-specific remedial objectives. He has completed public health risk assessments and developed cleanup levels for more than 100 sites. He has used site-specific exposure assessments, statistical analysis, Monte Carlo probabilistic analysis, geostatistics, and appropriate scientific information to arrive at realistic risk estimates and cleanup levels. Has worked with a variety of chemicals including polycyclic aromatic hydrocarbons (PAH), pentachlorophenol, dioxins, polychlorinated biphenyls (PCBs), pesticides, metals, and emerging contaminants such as perfluorinated compounds and 1,4-dioxane. His work experience includes environmental fate and transport analysis, vapor intrusion modeling, technical review of proposed regulations, and statistical analysis. Dr. Kotun has managed projects relating to remedial investigations, feasibility studies, and risk assessments for public and private sector clients. These projects ranged in duration from a few months to several years and ranged in cost from thousands to millions of dollars. Worked as an advocate for the client to ensure that projects were conducted in a timely manner and budgeted dollars were spent wisely. He also participated in the activities of the Risk Assessment Subcommittee supporting Pennsylvania's Cleanup Standards Science Advisory Board to develop the state's Act 2 regulations.

RELEVANT EXPERIENCE

Risk Assessment

Vapor Intrusion Specialist; Confidential Client; Baltimore, MD; 2011 - Present. Technical lead for an extensive vapor intrusion investigation at an active facility. Using groundwater, soil gas, and indoor air data to gain a better understanding of the potential for vapor intrusion and evaluating the potential health risks to workers.

EDUCATION

Ph.D., Pharmacology/
Toxicology, University of
Pittsburgh, 1985

B.S., Chemistry, Carnegie
Mellon University, 1980

YEARS OF RELEVANT RISK ASSESSMENT EXPERIENCE

31

YEARS OF PROJECT MANAGEMENT EXPERIENCE

25

REGISTRATIONS/ AFFILIATIONS

Society for Risk Analysis
Society of Toxicology

TRAINING/CERTIFICATIONS

OSHA 1910.120 8-Hour Annual
and Refresher Training

OFFICE

Pittsburgh, PA

YEARS OF EXPERIENCE

31

YEARS WITH TETRA TECH

19

Have used portable GC/MS technology to better define the location of potential sources of contaminants. Work with a multidisciplinary team to interpret data and convey this information to workers at the facility. Also have interaction with Maryland Department of the Environment (MDE) to gain acceptance for sampling strategy and determining appropriate mitigation actions.

Senior Risk Assessment Specialist; Environmental Health Assessment; NSA Naples; Naples, Italy; 2008 - 2014. Acted as lead risk assessment specialist for a team conducting investigations to address public health issues for civilian and military personnel. Addressed issues associated with public burning of trash and potential risks associated with exposure to tap water, soil, soil gas, and particulates in air. Entailed the preparation of investigation work plans and a human health risk assessment, served as a project liaison in Italy between Navy personnel and Tetra Tech staff, and presented to military leadership and at public meetings.

Risk Assessment Specialist; Superfund-Related Investigations; Marine Corp Recruit Depot, Parris Island, SC; 2012 - Present. Acts as a lead risk assessment specialist for a team conducting investigations at various sites across the base. Sites have been contaminated with volatile organic compounds, polynuclear aromatic hydrocarbons, pesticides, metals, and PCBs. Using site-specific characteristics and statistical analysis to demonstrate attainment of protection of public health and the environment and to minimize the extent of remediation. Vapor intrusion evaluations have also been conducted. Assisted in the development of Remedial Investigations, Feasibility Studies, and Proposed Plans.

Senior Risk Assessment Specialist; NASA Kennedy Space Center, FL; 2015 - Present. Using probabilistic risk analysis (Monte Carlo simulation) and site-specific exposure assumptions to derive alternate soil cleanup target levels.

Senior Risk Assessment Specialist; RCRA Facility Investigations (RFI); NAS Pensacola, FL; 2006 - 2011. Acted as lead risk assessment specialist for a team conducting investigations at the facility. Used Florida Department of the Environment Global Risk-Based Correction Actions (RBCA) to determine risks and determine which Risk Management Option (RMO) was appropriate.

Senior Risk Assessment Specialist; Superfund-Related Investigations; NAS Jacksonville, FL; 1999 - Present. Acts as lead risk assessment specialist for a team conducting investigations at the facility. Using site-specific characteristics and statistical analysis to demonstrate attainment of protection of public health and the environment and to minimize the extent of remediation. Also using FDEP Global RBCA regulations to determine which Risk Management Option (RMO) is appropriate and consequently determine which sites can achieve No-Further Action status. Evaluating potential health issues associated with vapor intrusion.

Senior Risk Assessment Specialist; Human Health and Ecological Risk Assessment and Supplemental Remedial Investigation; NAVSTA Newport, Newport, RI; 2008 - 2010. Acted as lead risk assessment specialist for a team conducting investigations to update existing data and to redefine the nature and extent of contamination that reflects where removal actions were implemented. Prepared a work plan using the UFP-SAP format. Used results of the investigation to prepare a human health and ecological risk assessment.

Senior Risk Assessment Specialist; Remedial Action Plans; Confidential Client; Baltimore, MD; 2006 - 2010. Evaluated data collected for a Site Characterization Report to establish site-specific remedial goals to attain clean closure under the Maryland Department of the Environment (MDE) Voluntary Cleanup Program (VCP) while minimizing the extent of remediation. The facility is located on valuable waterfront property resulting

in the financial decision to sell the property for redevelopment for residential and office use. Successful negotiation with MDE has already resulted in scaling down the remedial effort to focus only on source control.

Senior Risk Assessment Specialist; RCRA Part B Permit Application; Aberdeen Proving Ground; Aberdeen, MD; 2005 - 2008. Prepared a risk assessment in accordance with EPA's "Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities" for Open Burn/Open Detonation units to be included in a RCRA Part B permit application. Presented the results to regulatory officials.

Senior Risk Assessment Specialist; United States Coast Guard; USCG Integrated Support Command (ISC); Portsmouth, VA; 2005 - 2008. Prepared a risk assessment to demonstrate that the presence of diesel range organics did not pose a significant risk to human health and the environment and that no further action was needed at the site.

Senior Risk Assessment Specialist; Superfund-Related Investigations; NAS Cecil Field; Jacksonville, Florida; 1999 - 2010. Acted as lead risk assessment specialist for a team conducting investigations at the facility. Used site-specific characteristics, statistical analysis, and geostatistics to demonstrate attainment of protection of public health and the environment and to minimize the extent of remediation. Also used FDEP Global RBCA regulations to determine which Risk Management Option (RMO) was appropriate and consequently determined which sites could achieve No-Further Action status. Received a letter of commendation from the Florida Environmental Partnering Alliance. Received the Chief of Naval Operations (CNO) FY 2007 Environmental Award for the Environmental Restoration Category—Team Category as a participant in the activities of the Cecil Field BRAC Cleanup Team

Senior Risk Assessment Specialist; NASA Kennedy Space Center, FL; 2003 - 2010. Provided technical human health risk assessment support for all environmental programs at NASA for Tetra Tech NUS. All work was conducted under the Florida HSWA program. Addressed lead contamination issues at a firing range.

Senior Risk Assessment Specialist; Portsmouth Naval Shipyard, Kittery, ME; 2004 - 2010. Evaluated risk assessment data and used statistical applications to establish site-specific remedial goals and minimize the extent of remediation. The approach being presented was new for Maine and EPA Region 1.

Senior Risk Assessment Specialist; Basewide Environmental Screening Assessment for BRAC Closure; Naval Research Laboratory, Orlando, FL; 1999 - 2008. The objective of this project was to determine the impact historical operations may have had on the site at two Naval Research Laboratory (NRL) Underwater Sound Reference Detachments. The facilities are part of the approved 1995 Base Realignment and Closure (BRAC) IV Act and are being investigated under the Navy's Installation Restoration Program to determine their actual environmental conditions. Addressed human health risk issues associated with groundwater contamination. Engaged in fate and transport analysis to demonstrate that there were no significant impacts to the human health of potential offsite receptors. The site is located in a highly populated area, which resulted in the preparation and distribution of Fact Sheets and presentations and interactions with the community, county representatives and the FDEP.

Senior Risk Assessment Specialist; Charleston Air Force Base; Charleston, SC; 1999 - 2007. Provided technical support for human health risk assessment issues associated with the investigation and remediation of numerous solid waste management units. The sites included pesticide management units, dump sites, landfills, hardfills, and fire training areas.

Senior Risk Assessment Specialist; Engineering Evaluation/Cost Analysis; Annapolis, MD; 2000 - 2005. Evaluated potential human health risk in support of an Engineering Evaluation/Cost Analysis (EE/CA) for a site in Maryland contaminated with lead paint. Sixteen now-dismantled radio towers were historically sandblasted during routine maintenance and painting. Sand blasting resulted in significant release of lead-based paint to the surrounding area. Objective was to minimize the amount of remediation that would be required to attain the remedial objective of protecting public health and the environment.

Senior Risk Assessment Specialist; Remedial Investigation (RI), and Community Relations Program; Nebraska Avenue Complex, Washington, DC; 2001 - 2003. Provided technical support for human health risk assessment issues. The site was contaminated due to past transformer draining activities. The investigation covered areas where PCB transformer oil was released to the ground and where a removal action was completed. Areas that were affected included soils and sediment that covered a one-acre area within a park adjacent to a stream. Community relations activities included public interaction through Restoration Advisory Board meetings, development of a fact sheet, and updating a community relations plan.

Risk Assessment Specialist and Toxicologist; Human Health Risk Evaluation of Air Emissions; Plaskolite Industries, Inc.; Columbus, OH; 2001 - 2002. Acted as lead risk assessment specialist and toxicologist for a team evaluating the potential impacts of air emissions from a plastics manufacturing plant to neighboring residents. Used air monitoring samples to evaluate risk; determined that risks were insignificant to neighbors despite the presence of odors from the emissions. Data and results used in cooperation with company to assist in implementing engineering controls for odors. Worked directly with the public to define the sampling plan and define how the data would be evaluated. Presented the results at a public meeting.

Senior Risk Assessment Specialist; RFI; Naval Ordnance Station; Louisville, KY; 1997 - 2003. Acted as lead risk assessment specialist for a team conducting an RFI. Developed a Risk Assessment Work Plan that established the protocol to be used in evaluating risk. Negotiated with regulatory agencies to arrive at approach that used "best-science" and practicality.

Senior Risk Assessment Specialist; RFI; NAS Key West, FL; 1997 - 2003. Acted as lead risk assessment specialist for a team conducting an RFI. Various metals, volatile organic compounds and semivolatile organic compounds are distributed across the site. The risk assessment results were used to determine which SWMUs would require remediation or further assessment in the CMS.

Risk Assessment Specialist; Development of Risk-Based Cleanup Levels; Wood Treating Site; VA; 1990 - 1996. Developed site-specific risk-based cleanup levels for pentachlorophenol, arsenic, and carcinogenic polyaromatic hydrocarbons (PAHs) for a wood treating site. Used probabilistic risk assessment to arrive at the risk-based cleanup values.

Risk Assessment Specialist; Risk Assessment Review for Cost Recovery Litigation; Various Sites. Reviewed risk assessment for consistency with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) for sites in EPA Regions III, IV, and V in anticipation of cost recovery litigation.

Risk Assessment Specialist; PA Act 2 Closure; Retail Petroleum Site; PA; 1995 - 1997. Prepared a risk assessment in accordance with Pennsylvania's Act 2 regulations (Land Recycling Act) to demonstrate that soil remediation would not be required.

Risk Assessment Specialist; Remedial Investigations; Major Natural Gas Distributor; PA; 1992 - 1996. Prepared a template preliminary risk assessment for inclusion in a generic work plan that would be used to investigate 20 former manufactured gas plant sites. Developed soil and groundwater action levels for use in screening data collected at the sites and determining whether additional investigations would be required. Prepared site conceptual model, as part of site work plans, that was used to focus the site investigations. Principal contaminants of concern included PAHs, VOCs, and metals. Negotiated site-specific cleanup levels with regulators on behalf of client.

Risk Assessment Specialist; Superfund Risk Assessments; Chemical Manufacturing Site and Waste Disposal Site; PA; 1993 - 1997. Prepared streamlined risk evaluations for two sites in Pennsylvania to demonstrate that Removal Actions would not be required.

Risk Assessment Specialist and Project Manager; Remedial Investigation; Manufactured Gas Plant; MD; 1991 - 1993. Conducted an investigation at a former manufactured gas plant, prepared a risk assessment and assessed remedial alternatives to achieve protection of human health and the environment.

Risk Assessment Specialist; RCRA Clean Closure; Wood Treating Facilities; PA, WV; 1989 - 1991. Prepared risk assessments for remediated surface impoundments at wood treating facilities to obtain "Clean-Closure" status. "Clean" was defined by showing that remaining contaminants posed negligible risks.

Senior Risk Assessment Specialist; RI/FS - Melville North Landfill; Naval Education Training Center, Newport, RI; 1997. Acted as lead risk assessment specialist for a team conducting an RI for a landfill containing spent acids, waste paints, solvents, waste oils and PCBs. The risk assessment was performed in light of the site being developed into a marina. Future construction workers are likely to experience adverse health effects as a result of exposure to soil.

Risk Assessment Specialist; Development of Risk-Based Cleanup Levels; Wood-Treating Site; CO; 1993 - 1997. Conducted a risk assessment, developed site-specific risk-based cleanup levels and a level protective of groundwater. Constituents of interest were pentachlorophenol, PAHs, dioxins and arsenic. The soil level protective of groundwater was developed using the Summers Model.

Risk Assessment Specialist; Implementation of Groundwater Treatment System (Interim Remedial Measures); Wood-Treating Site; CO; 1995. Prepared a risk assessment to demonstrate that emissions from a groundwater treatment process would not adversely affect human health and the environment. Emissions were modeled from groundwater concentrations, and the Point Source Gaussian Diffusion Model (PTPLU model) was used to estimate downwind concentrations.

Risk Assessment Specialist; Alternate Concentration Limits Standards; Coke and Byproducts Facility; NJ; 1990 - 1995. Established Alternate Concentration Limits (ACLs) for groundwater at a former coke and byproducts plant that are protective of the adjacent river. Also established Alternate Cleanup Standards (ACS) for soil in accordance with the State's Industrial Site Recovery Act (ISRA) and proposed N.J.A.C. 7:26D that were site specific and risk-based.

Risk Assessment Specialist; Remedial Investigation; Former Manufactured Gas Plant; Vancouver, British Columbia; 1989 - 1990. Prepared a risk assessment for a former manufactured gas plant site in British Columbia that was being developed as a residential development and public park. Principal site contaminants were PAHs. Developed site-specific cleanup goals.

Risk Assessment Specialist; Regulatory Negotiation; Wood Treater; IL; 1992 - 1994. Negotiated with the Illinois EPA on behalf of our client to demonstrate that dioxins/furans were not an issue of concern in streams adjacent to a wood-treating facility. Used the bioavailability index to illustrate this issue.

Risk Assessment Specialist; Risk Assessments for Property Transfer; Automotive Manufacturers; Wisconsin, MI; 1990 - 1993. Conducted risk assessments for automotive manufacturers to define the nature and extent of contamination for purposes of property transfer. Demonstrated that properties posed "negligible" risks and were clean under a "no action" alternative. Also reviewed risk assessments prepared by the buyer to ensure that risks were assessed in accordance with future land use.

Risk Assessment Specialist; Application for Removal Credits; Steel Manufacturer; IL; 1994 - 1996. Prepared a risk assessment to derive sewage pollutant loading limits for phenolic compounds in accordance with 40 CFR Part 503 (Sewage regulations). Measured loading rates were less than the derived limits that correspond to the exposure pathways associated with known sludge applications. Removal credits were granted by EPA to the steel manufacturers for phenolic compounds.

Risk Assessment Specialist; Scoping Document for Risk Assessment; Wood-Treating Site; MT; 1990 - 1992. Prepared a "scoping document" for the EPA presenting the client's position on how risks should be assessed at a site in Montana. Demonstrated a proactive approach that may counter EPA's technical policy, but represented best science.

Risk Assessment Specialist; Hazardous Waste Delisting; Steel Manufacturer; NY; 1990. Assisted a steel manufacturer petition for a hazardous waste delisting. Provided the technical support and comments to demonstrate that the proposed health-based standard for benzo(a)pyrene was of dubious technical merit. Demonstrated that the technical data did not support the unilateral use of this standard as a basis for the proposed denial of the manufacturer's petition when compared with listing criteria.

Risk Assessment Specialist; Remedial Objective Development; Window-Treating Facility; WI; 1989 - 1991. Developed risk-based remedial objectives for pentachlorophenol and dioxins in groundwater for a window-treating facility in Wisconsin.

Risk Assessment Specialist; RFI; Wood Treating Site; SC; 1991 - 1994. Prepared a risk assessment as part of a RCRA Facility Investigation (RFI) for a RCRA site. Site was primarily impacted with PAHs. Regulatory agency was performing the official risk assessment; therefore a parallel risk assessment was prepared using appropriate assumptions in order to expeditiously prepare public comments on the agency's risk assessment.

Data Reviewer; Liability Data Review; Superfund Waste Disposal Site; NJ; 1992. Reviewed data from a Superfund waste disposal site on behalf of a potentially responsible party (PRP) (automobile manufacturer) to prepare an affidavit that reduced an apportionment of liability.

Statistical Analyst; RCRA Groundwater Monitoring Program; Multiple Facilities; Various States; 1990 - 1997. Groundwater data collected as part of RCRA Groundwater Monitoring Programs were reviewed and statistically analyzed. Results of the analysis provided the technical support necessary for negotiating reductions in monitoring programs. This translated into significant savings in field and analytical costs.

Statistical Analyst; Compliance with PA Residual Waste Regulations; Utility Company; PA; 1994 - 1995. Groundwater data were reviewed in accordance with Pennsylvania's Residual Waste Regulations to determine whether groundwater quality had "degraded." With the advent of Pennsylvania's Act 2 legislation, regulatory and technical oversight has been provided to explore options that demonstrate that ash disposal sites and other areas were not adversely affecting groundwater quality.

Project Manager and Senior Risk Assessment Specialist; Risk Assessment and Air Transport Modeling; Urban Redevelopment Authority; Ninemile Run Slag Site; Pittsburgh, PA; 1997 - 1999. Conducted a risk assessment in accordance with Pennsylvania Act Two regulations to demonstrate that the slag site can be developed into a residential community. Risks associated with metals and PAHs present in the slag pose insignificant risks to future construction workers and adjacent offsite residents. Air transport modeling associated with known future construction activities was conducted to demonstrate air concentrations of contaminants would not impact human health. Partnered with PADEP to facilitate development of this "brownfield."

Vapor Intrusion

Vapor Intrusion and Risk Assessment Specialist; Superfund-Related Investigations; Marine Corp Recruit Depot, Parris Island, SC; 2011 - Present. Acts a lead risk assessment and vapor intrusion specialist for a team conducting vapor intrusion investigations to on-base public health issues. Reviewing results of an investigation conducted at a former dry cleaning facility and using the results of a human health risk assessment to assist with remedy selection.

Vapor Intrusion and Risk Assessment Specialist; Superfund-Related Investigations; MCLB Albany; Albany, GA; 2011 - 2014. Acted as lead risk assessment and vapor intrusion specialist. Used building characteristics, exposure assumptions, groundwater characterization, and Johnson and Ettinger mode as multiple lines of evidence to demonstrate that vapor intrusion investigation was not warranted.

Vapor Intrusion and Risk Assessment Specialist; Environmental Health Assessment; NSA Naples, Italy; 2008 - 2014. Acted as lead risk assessment and vapor intrusion specialist for a team conducting vapor intrusion investigations to address public health issues for civilian and military personnel. Investigated individual residences "on the economy" (off-base) and on-base buildings. Entailed the preparation of a UFP-SAP for the vapor intrusion investigation, evaluating the results of the investigation with regards to potential risks to human health, and presenting the results to Navy officers and the public.

Vapor Intrusion Specialist; RFI; Joint Base McGuire-Dix-Lakehurst, NJ; 2011 - Present. Prepared a work plan to address the vapor intrusion investigation of 12 sites. The sites have been the locations of past operations involving the storage (e.g., USTs and ASTs), handling (e.g., associated piping) or use of various petroleum products and (in some cases) other potentially hazardous substances. Records indicate that leaks and spills of these materials are known or are suspected to have occurred that may have impacted the soil and groundwater at these sites. A site-specific NJDEP Vapor Intrusion (VI) Report will be prepared in accordance with established regulatory requirements

Vapor Intrusion and Risk Assessment Specialist; RI/FS for Flash Dry Cleaning Facilities, West Palm Beach, FL; 2008 - 2011. Developed the work plan for the vapor intrusion investigation and conducted the risk assessment at a dry cleaning facility where a tetrachloroethylene plume was migrating from the dry cleaning facility. Evaluated risks associated with the tetrachloroethylene plume for on-site and off-site receptors and reviewed the data to evaluate the impacts associated with vapor intrusion.

Vapor Intrusion and Risk Assessment Specialist; Vapor Intrusion Investigation; Anniston Army Depot (ANAD); Anniston, AL; 2008 - 2013. Assisted in the development of the work plan for the vapor intrusion investigation.

Consultant for Vapor Intrusion Decision Tool; NAVFAC; 2009 - 2013. Assisted in development of a vapor intrusion resource to support Navy RPMs addressing vapor intrusion. Offered technical input into the development of a Vapor Intrusion Web Tool.

Training

Instructor and Program Developer; EPA Environmental Resources Training Program (ERTP); 2004 - Present. Serving as an instructor for the ERTP course, Introductory Risk Assessment Guidance for Superfund (IRAGS). Also provides technical support for developing and modifying the course based on suggestions and comments from students and EPA staff.

Technical Reviews

- Prepared technical comments on the proposed RCRA CMS regulations on behalf of our client to ascertain that technical integrity was maintained.
- Prepared technical comments on the proposed Land Disposal Restriction (LDR) regulations to demonstrate that site-specific risk-based standards are more appropriate than action levels.
- Prepared technical comments to dissuade the proposed use of results from Method 1312, the Synthetic Precipitation Leaching Procedure, as a means for direct comparison to action levels and assessment of mobility.
- Summarized a Technology Support Document on Methodologies for Human Health Criteria and Values as part of the Great Lakes Initiative (GLI) for a consortium of Great Lakes industries.

SCIENTIFIC/TECHNICAL PUBLICATIONS

Kotun, Ronald J., "Calculating a More Refined and Representative Risk Estimate," Joint Services Environmental Management Training Conference and Exposition, Denver, CO, May 2008.

Kotun, Ronald J., "Using Geostatistics and Risk Assessment to Minimize Remediation," Joint Services Environmental Management Training Conference and Exposition, Columbus, OH, May 2007.

Kotun, Ronald J., "Using Geostatistics and Risk Assessment to Minimize Remediation," presented at the Air Force 2006 Environmental Training Symposium, Pittsburgh, PA, March 2006.

Kotun, Ronald J., "Establishing a Cleanup Level for Lead at a Former Firing Range," presented at the Region 3 EPA DOD Environmental Colloquium, Williamsburg, VA, September 2003.

Kotun, Ronald J., "From Slag Dump to Residential Development: Risk Assessment's Role," presented at Brownfields 2002: Investing in the Future, Charlotte, NC, November 2002.

Kotun, Ronald J., Speranza, M.P., Jonnet, M., "Using Geostatistics and Risk Assessment to Minimize Remediation," presented at the Society for Risk Analysis Annual Meeting, Seattle, WA, December 2001.

Kotun, Ronald J., "Using Geostatistics and Risk Assessment to Minimize Remediation," presented at the 18th Annual International Conference on Contaminated Soils, Sediments and Water, Amherst, MA, October 2001.

Gromicko, G. J., R. J. Kotun, and J. J. Mahfood, "Remediation Strategy Using Intrinsic Bioremediation for a Former MGP Site," presented at the In Situ and On-site Bioremediation Symposium, New Orleans, LA, May 1997.

Kotun, R. J., "Using Monte Carlo Simulation to Derive Risk-Based Cleanup Levels," presented at the Superfund XVII Conference and Exhibition, Washington, D.C., October 1996.

Kotun, R. J. et al., "Innovative Approaches for Cleanup Level Development." In: Process Engineering for Pollution Control and Waste Minimization, Marcel Dekker, Inc., Eds.: Wise, D.L. and Trantolo, D.J., 1994.

Kotun, R. J. and J. J. Mahfood, "Deriving a Practical and Cost-Effective Soil Remedial Goal for Carcinogenic PAHs," presented at the Superfund XV Conference and Exhibition, Washington, DC, December 1994.

Kotun, R. J., et al., "A Decision Flow Chart for Cleanup of Multiple Manufactured Gas Plant Sites," presented at the Federal Environmental Restoration III and Waste Minimization II Conference and Exhibition, New Orleans, LA, April 1994.

Kotun, R. J., "Comparison of Site-Specific Cleanup Goals to Proposed Uniform Cleanup Standards," presented at the Superfund XIV Conference and Exhibition, Washington, DC, December 1993.

Kotun, R. J., and R. J. Jupin, "An Innovative Approach to Derive Risk-Based Cleanup Levels for Carcinogenic PAHs", presented at the National R&D Conference on the Control of Hazardous Materials, San Francisco, CA, February 1992.

Kotun, R. J., et al., "Critical Issues and Influential Parameters Determined from Assessing Risks Posed by PAHs in Soil/Sediment for Over 30 Sites," presented at the International Specialty Conference on Managing Environmental Risks, Quebec City, Quebec, November 1989.



TETRA TECH

LEE ANN SINAGOGA

Risk Assessment Specialist/Project Manager

EXPERIENCE SUMMARY

Ms. Sinagoga has 35 years of professional experience. She is an environmental health scientist/risk assessment specialist and project manager, and she manages the Chemistry/Toxicology Department in the Pittsburgh office. Technical responsibilities include public health and environmental risk assessment, research and review of chemical and toxicological data and environmental regulations, and environmental fate and transport analysis. She has completed or reviewed public health risk assessments for more than 100 hazardous waste sites, assessing public health impacts through water ingestion, inhalation of volatiles during showering, dermal contact, fugitive dust emissions, fish ingestion, volatile emissions, soil ingestion, etc. Work experience includes planning document preparation, risk assessment, cleanup goal/action level development, preparation of environmental baseline survey documents to support property lease and transfer, site investigation/remedial investigation report preparation, environmental assessment/ environmental impact statement preparation. Her training experience includes risk assessment presentations to EPA contractors, EPA and state regulators under EPA's Environmental Response Team Program (ERTP). Her project management experience includes CERCLA RI/FS projects, environmental baseline survey projects, RCRA Facility Investigation (RFI)/Verification Investigation (VI) projects, risk assessment projects, NEPA Environmental Assessments, air modeling/permitting and public health assessments. As a Department Manager, her responsibilities include workload allocation, training, and oversight of technical/administrative staff assigned to the Chemistry/Toxicology Department in the Pittsburgh office.

RELEVANT EXPERIENCE

Risk Assessments

Senior Risk Assessment Specialist; Risk Assessment for Residential Areas Adjoining Safety Light Corporation CERCLA Site, Bloomsburg, PA; 2015 - current. Performed risk assessment of radionuclide contamination (e.g., radium 226, 228)

in surface soils of residential lots adjoining Safety Light Corporation facility. The risk assessment being conducted using the USEPA's Preliminary Remediation Goal (PRGs) User's Guide and calculator. The accurate evaluation of the contribution of background radionuclide levels is a critical component of this on-going evaluation.

EDUCATION

M.S.; Environmental Chemical Hazard Assessment; Univ. of Pittsburgh, 1983

B.S.; Biological Science; University of Pittsburgh, 1978

YEARS OF RELEVANT RISK ASSESSMENT EXPERIENCE

28

YEARS OF PROJECT MANAGEMENT EXPERIENCE

25

REGISTRATIONS/ AFFILIATIONS

Member of Society for Risk Analysis (National and Local Organizations)

TRAINING/CERTIFICATIONS

OSHA 1910.120 8-Hour Annual and Refresher Training

Shipping Hazardous Materials, 2009
Hazardous Waste Operations, 1988

OFFICE

Pittsburgh, PA

YEARS OF EXPERIENCE

37

YEARS WITH TETRA TECH

28

Senior Risk Assessment Specialist; Risk Assessment Support for Development of Risk-Based Perchlorate Discharge Limit; NASA Wallops Island Facility, VA; 2015 - current. Prepared technical memorandum (TM) providing the rationale for proposed perchlorate discharge limit in the proposed VPDES permit modification. The discharge limit (1.4 mg/L) to the receiving surface waters is a conservative risk-based value developed based on currently available toxicity information, the potential for human and ecological receptor exposure, and the nature of the discharge and the surface water body receiving the discharge. The regulatory agency involved is the Virginia Department of Environmental Quality.

Senior Risk Assessment Specialist; Risk Assessment of Hexavalent Chromium Concentrations in Air Emissions from Test Burns; Bechtel/ATK/U.S. Department of Energy; 2016 - current. Evaluated potential health impacts to workers hypothetically exposed to hexavalent chromium concentrations in air resulting from burn events. The assessment was performed based on: 1) comparisons of predicted (modeled) concentrations to USEPA, OSHA, and NIOSH standards and criteria and 2) the using the USEPA's Regional Screening Level (RSL) calculator. Thus far, no adverse health effects have been predicted.

Senior Risk Assessment Specialist; Risk Assessment of Multiple Environmental Media Contamination; Former Kilgore Manufacturing Company Property; Westerville, OH; 2008 - current. Responsible for design and quality assurance of the risk assessment prepared for groundwater, soils, surface water, and sediments at this former ordnance manufacturing facility. The risk assessment included a risk evaluation of asbestos air samples collected via "activity based sampling" techniques. The asbestos risk analysis was conducted according to the USEPA's Framework for Investigating Asbestos-Contaminated Superfund Sites. The project is high profile in the local community; residential areas adjoin the study area. Risk communication issues are significant; informational facts sheets were prepared for individual residential lots communicating the risk assessment results based on soils/surface waters/sediments collected within each lot.

Project Manager; Phthalate Hazard Assessment for Dicyclohexyl Phthalate (DCHP); Health Canada; 2013. Responsible for the project management of a human health hazard evaluation of DCHP. The evaluation requires a literature search of available toxicity data for DCHP, and the summarization and quality assurance review of such data. The final deliverable will be the preparation of a narrative providing an evaluation of the available toxicity studies for DCHP. Additionally, the toxicity data garnered during the literature search will be entered into the Health Canada IUCLID database.

Senior Risk Assessment Specialist; Risk Assessment of Surface Water, Sediment, Pore Water, and Shellfish Contamination; Post ROD Investigations for Sites 07/09 at the Naval Construction Battalion Center Davisville; North Kingstown, RI; 2005 - Current. Responsible for design and quality assurance of risk assessments prepared for sediment/surface water/pore water fish tissue contamination adjoining commercially/recreationally valuable area. The primary concern is the potential discharge of groundwater plumes (e.g., trichloroethene) to the adjoining surface water bodies. The risk assessments are being conducted in support of the long-term monitoring plans for Sites 07 and 09.

Senior Risk Assessment Specialist; Risk Assessment of Sediment Contamination; Private Client; Middle River, MD; 2008 - current. Responsible for design and quality assurance of the risk assessment prepared for sediment/fish tissue contamination adjoining commercially valuable area. Sediments contaminated with metals, PAHs, and PCBs will be dredged based on the out-come and clean-up levels established by the risk assessment. The project is high profile in the local community; risk communication issues are significant.

Senior Risk Assessment Specialist; Risk Assessment of Groundwater, Soils, Surface Water, and Sediment Contamination; Private Client; Middle River, MD; 2009 - current. Responsible for design and quality assurance of the risk assessment prepared for sediment multi-media contamination at a dump site within an airport facility and adjoining commercially valuable area. Remedial decisions will be based on a risk evaluation of solvent and petroleum contamination of the environmental media.

Senior Risk Assessment Specialist; Risk Assessment of Vapor Intrusion Pathway; Private Client; Middle River, MD; 2013 - current. Responsible for vapor intrusion data evaluation/risk analysis for a large commercial building adjoining a groundwater contaminant plume (trichloroethene). The evaluation is complicated by the fact that both background and contaminant sources inside the building are contributing to the detected indoor air concentrations. The building is currently occupied; thus, accurate and effective risk communications is an important aspect of the work.

Senior Risk Assessment Specialist; RI/FS, Site 1 – Disposal Area, Naval Station Annapolis, MD; 2008 - 2010. Responsible for design and quality assurance of the risk assessment prepared for disposal area and adjoining areas at Site 1 at Naval Station Annapolis (NAS). Soils and sediments contaminated with PAHs, PCB, and metals were the environmental media of concern. The disposal area abuts and has impacted adjoining surface water bodies. The risk assessment is the basis of the proposed remedial action (i.e., the landfill capping) of the disposal area.

Senior Risk Assessment Specialist; Environmental Health Assessment; NSA Naples; Naples, Italy; 2008 - 2014. Risk assessment specialist for a supporting Navy team conducting investigations to address public health issues for civilian and military personnel. Addressing issues associated with public burning of trash and potential risks associated with exposure to tap water, soil, soil gas, and particulates in air.

Senior Risk Assessment Specialist; Human Health Risk Assessment for Camp Ground Site; NAVSTA Newport, Newport, RI; 2009 - 2012. Acted as lead risk assessment specialist for a team conducting risk evaluation of soils at a Navy recreational area previously used as a skeet range. The primary contaminants of concern are the PAHs. The evaluation of the PAH contamination at this MRP site was complicated by the fact that the residual PAH is likely strongly bound to the clay pigeon matrix of the skeet targets. Thus, non-standard relative absorption factors (RAFs) were used to calculate contaminant intake.

Project Manager and Senior Risk Assessment Specialist; Risk Assessment of Vapor Intrusion Pathway; Private Client Commercial Building; Milwaukee, WI 2008 - 2010. Responsible for the project management of a human health risk evaluation of vapor intrusion pathway for a private, commercial building in Milwaukee, Wisconsin. Trichloroethene is present in soils and groundwater adjoining the building. Resolution of the issue is needed to allow property transfer.

Senior Risk Assessment Specialist; RI/FS - NWIRP Toledo – Site 11, Trichloroethene plume; Toledo, Ohio; 2002 - 2005. Responsible for design and quality assurance of the risk assessment prepared for Site 11 at NWIRP Toledo. Groundwater and soils contaminated with trichloroethene were the environmental media of concern. The risk assessment included an evaluation of the potential for vapor intrusion into buildings using the USEPA guidance for Evaluating the Vapor Intrusion into Indoor Air (November, 2002). The results of the human health risk assessment were presented at the University of Massachusetts Amherst, Contaminated Soils and Sediments Conference in October of 2002. The results of the risk assessment also supported the successful property transfer conducted at this facility.

Senior Risk Assessment Specialist; RI/FS - Naval Computer and Telecommunications Area, Master Station Atlantic Detachment; Cutler, ME; 2004 - 2014. Responsible for the design of risk assessments for two sites at NCTS Cutler, Maine. Prepared work plan sections presenting human health risk assessment protocol for the Salvage Yard (SY) site. Performing screening level risk assessment based on soil data available for the Construction Debris Area (CDA). Primary contaminants of concern include polychlorinated biphenyls (PCBs), including the dioxin-like PCBs. Sampling/analytical protocols and risk assessment protocols for PCBs and dioxin-like PCBs were established for the project.

Senior Risk Assessment Specialist; RFI/CMS – Marine Corps Air Station (MCAS) Beaufort; Multiple Sites; Beaufort, SC; 2003 - 2009. Responsible for design of risk assessments for multiple sites at MCAS Beaufort. Prepared work plan sections detailing human health risk assessment protocol and assisted in the preparation of work plan sections presenting protocol for the background study for the facility.

Senior Risk Assessment Specialist; RI/FS – Portsmouth Naval Shipyard; Multiple Sites; Portsmouth, ME; 1997 - 2012. Responsible for the design and quality assurance of risk assessments for multiple, complex sites at the Portsmouth Naval Shipyard in Portsmouth, Maine. The environmental media evaluated included soils, groundwater, surface waters, sediments, air, and biota (e.g., lobsters, mussels). Also, developed screening levels for surface waters and sediments assuming recreational land scenario. In one case, the USEPA's lead models (i.e., the Integrated Exposure Uptake Biokinetic Model [IEUBK]) and the Adult Lead Model [ALM]) were adapted to develop screening levels for the recreational land use scenario.

Project Manager and Senior Risk Assessment Specialist; Risk Assessment of Building Materials for Private Client; Cleveland, Ohio; 2003 - 2004. Responsible for the project management of a human health risk evaluation of polychlorinated biphenyl (PCB) contamination of building materials (e.g., painted walls and structural beams, concrete) within a large industrial building previously used to repair electrical equipment and selected for sale by a private client. The risk assessment was the basis of the private client's request to USEPA Region 5 to allow "high occupancy" use of the building under the USEPA's PCB Mega Rule (promulgated under the Toxic Substances Control Act [TSCA]). The project included a statistically-based design of a sampling and analytical program to acquire data adequate for human health risk assessment and the validation of the PCB data collected. The USEPA granted the client's request for the "high occupancy" use of the building. The USEPA approval allowed the property to be sold as planned by the client.

Senior Risk Assessment Specialist; Private Client Seeking RCRA Subpart X Permit for Open Burning/Open Detonation Units; 2001 - 2012. Responsible for review and quality assurance of the risk assessment prepared based on air emissions from units. The risk assessment is being conducted per guidelines established in the USEPA guidance titled, Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (July, 1998).

Senior Risk Assessment Specialist; NCBC Gulfport; Gulfport, Mississippi; 2002 - 2009. Responsible for design and quality assurance of the risk assessment prepared for Site 8 at NCBC Gulfport. Groundwater and soils contaminated with dioxins/furans were the environmental media of concern. The risk assessment included an evaluation of the contamination per both USEPA and State of Mississippi requirements and guidelines.

Risk Assessment Specialist; Fernald Environmental Management Project – RI/FS - Operable Unit 5; Department of Energy/ERMC; Fernald, Ohio; 1993 - 1996. Served as task manager and senior risk assessment specialist for risk assessment activities for a Remedial Investigation/Feasibility Study (RI/FS) for Operable Unit (OU) 5 of the Fernald Environmental Management Project (FEMP), Fernald, Ohio. OU 5 included

all environmental media potentially contaminated by past manufacturing activities at the site. The principal contaminants were uranium, radium 226/228, thorium, and other radionuclides. Additional potential chemicals of concern for the site were chlorinated hydrocarbons, metals, pesticides, and PCBs. The task management of the risk assessment for OU 5 included database management of more than 8,000 environmental samples, risk assessment (chemical and radiological) of multiple exposure pathways assuming current and future land use scenarios, and the development of preliminary remediation goals for the OU 5 feasibility study. Risk assessment support of the extensive modeling activities (air, surface water/sediment, and groundwater) conducted for the OU 5 RI/FS and communication with other Fernald operable units were critical components of the risk assessment task.

Senior Risk Assessment Specialist; RFI - NSWC Crane - Mustard Burial Ground; Crane, Indiana; 2000 - 2009. Responsible for risk assessment protocol sections of planning documents supporting the RCRA Facility Investigation of Mustard Burial Ground Site at NSWC Crane. Contaminants of concern include mustard gas and radioactive thorium. Consequently, the sampling plan and risk protocol considered chemical and radiological contaminants. Groundwater, soils, surface waters and sediments are the environmental media of concern.

Senior Risk Assessment Specialist; RFI for Chemical Production Facility; Major Chemical Company; Hopewell, Virginia; 1993 - 1997. Lead risk assessment specialist for a team conducting an RFI for a chemical facility in Virginia. Under an agreement with EPA Region III, the industrial client is investigating several Solid Waste Management Units (SWMUs) to determine the presence/extent of environmental contamination. Chemical concentrations detected in Phase I environmental media samples were compared to risk based action levels for human exposure and site specific soil cleanup goals based on groundwater protection to determine the need for further investigation or corrective action. The results of risk assessment activities conducted during the Phase I RFI focused the list of chemicals of concern and the sites and environmental media that were investigated further during the Phase II RFI.

Senior Risk Assessment Specialist; Remedial Investigations at four U.S. Air Force bases; 1987 to 1998. Prepared Risk Assessments for Remedial Investigations at four U.S. Air Force bases (Eaker AFB; Randolph AFB; Sheppard AFB; Kelly AFB) investigated as part of the Air Forces' Installation Restoration Program (IRP). The remedial investigation included data evaluation and presentation, contaminant fate and transport modeling, exposure assessment, and qualitative/quantitative risk assessment of contaminant concentrations detected in environmental media. The principal site contaminants were solvents and fuel related organics.

Senior Risk Assessment Specialist; RI/FS for Six Sites at Fairchild AFB; Spokane, Washington; 1991 - 1993. Lead risk assessment investigator for Remedial Investigation/Feasibility Study at a large Air Force base located in Washington State. The base is listed as an NPL site. The principal site contaminants are trichloroethene and petroleum waste. Seven operable units were investigated. The risk assessment results were used to demonstrate that remediation of soils was not necessary.

Senior Risk Assessment Specialist; RI/FS Endangerment Assessment Report for King of Prussia Site; King of Prussia, Pennsylvania; 1989. Prepared an Endangerment Assessment report for a 10 acre abandoned hazardous waste site in New Jersey. The Endangerment Assessment included data presentation, nature, and extent of contamination reporting, exposure assessment, and risk assessment. The site was located in the environmentally sensitive Pinelands Protection Area and consisted of lagoons, buried drums, sludge deposits, contaminated groundwater, rusted tankers, and buried plastic containers. The buried drums contained percentage levels of organics and the buried plastic containers held liquids with extremely high inorganic concentrations and a pH of 2 to 3. Other media exhibited elevated concentrations of inorganics and moderate

levels of organics. Also participated in several meetings with potentially responsible party representatives, state representatives, and USEPA representatives.

Risk Assessment Specialist; RCRA Tank System Variance Demonstration Project; Major Chemical Company; Charleston, West Virginia; 1987 - 1988. Prepared risk assessment for a RCRA Tank System Variance Demonstration report to support a request for a risk-based variance from West Virginia regulations requiring secondary containment for existing industrial waste tanks. The risk analysis presented in the report evaluated the impact of tank releases on the groundwater and an adjoining surface water body. The State of West Virginia granted a variance for the majority of the tanks included in the variance request. The industrial client estimates that several million dollars were saved as a result of the variances granted.

Senior Risk Assessment Specialist; RI/FS Endangerment Assessment Report for Fibers Public Supply Wells Site; Puerto Rico; 1990. Conducted public and environmental health risk assessment for an organically contaminated Superfund site located in Puerto Rico. The Endangerment Assessment report prepared for the site reported on the present or future potential health threats posed by contaminants in environmental media. The assessment included data presentation, nature and extent of contamination reporting, exposure assessment, and risk assessment.

Risk Assessment Specialist; CERCLA RI/FS; USEPA Region I; 1987 through 2005. Served as a lead risk assessment investigator or reviewer for Remedial Investigation/Feasibility Studies completed or ongoing at several NPL sites in EPA Region I. Four of the sites were industrial facilities (Groveland Wells, Raymark, Solvents Recovery, and New Hampshire Plating); the fifth site is an Air Force base (Pease AFB). Contaminated groundwater, surface water, sediments, and/or soils are the environmental media evaluated in the risk assessments. Volatile organics, metals, polychlorinated biphenyls, dioxins, lead and/or petroleum hydrocarbons are the principal contaminants of concern at the sites. Has functioned in an oversight capacity for EPA Region I at one Air Force base contaminated with radiologicals.

Senior Risk Assessment Specialist; Risk Assessment Methodology Paper; Major Chemical Company; Charleston, West Virginia; 1989. Was part of a team that prepared a risk assessment methodology paper for an industrial client. The paper, presented at a Third World Conference on risk assessment and management of toxic chemicals, discussed the basic concepts and applications of risk assessment for industrial facilities.

Senior Risk Assessment Specialist; RIFS for Whitmoyer Pharmaceutical Site; USEPA; PA; 1988 - 1989. Prepared an Exposure Assessment and Risk Assessment for a 22 acre site in Pennsylvania. Arsenic and organic contamination were of primary concern. Media of concern included contaminated groundwater, concentrated waste, and contaminated soil, as well as structures.

RI/FS/Risk Assessment

Project Manager and Lead Human Health Risk Assessment Specialist; Human Health and Ecological Risk Assessments for Worst Case Incident Scenario Project; United States Coast Guard Office of Standards Evaluation and Development (CG-REG); 2015 - current. Serves as project manager for a human health and ecological risk assessment project being conducted to evaluate the impact of a hypothetical, reasonable "worst case" spill of shale gas extraction waste water (SGEWW) from a commercial barge transporting the material along navigable rivers within Pennsylvania, Ohio, and West Virginia. SGEWW, also known as "frack water," is a by-product of drilling for natural gas using unconventional hydraulic fracturing (or "fracking") technology, which involves the injection of water, sand, and chemical additives. The sand remains in the gas well but a substantial

portion of the injected fluid re-surfaces after drilling and must be handled as SGEWW. The project involves extensive research of the chemicals of potential concern (COPC) in the SGEWW, the development of a conceptual spill model scenario (CSMS), fate and transport modeling to determine COPC concentrations in surface waters and sediments, and risk assessment to determine potential adverse impacts to human and ecological receptors exposed to COPC concentrations in the river environment. The assessments are being completed to: 1) Support the estimation of conservative bounds for safe transport of SGEWW via barge, 2) Allow the USCG to more completely evaluate the efficacy of proposed policies and rules regarding the transport of SGEWW via barge, and 3) Allow the USCG to better communicate risks related to barge transport of SGEWW to the regulatory community and the public.

Project Manager and Lead Human Health Risk Assessment Specialist; Public Health Problem Evaluation; Grand Canal, Oakdale, Suffolk County, NY; 2015 - current. Serves as project manager for public health evaluation (PHE) of the physical, chemical, and microbiological data collected from the Grand Canal area and adjacent wetlands. The PHE considers data (including vector data) provided by the Suffolk County Department of Health Services (SCDHS) and data readily available as a result of internet web searches. The primary objective of the PHE is to determine if such data indicate a potential for adverse human health impacts resulting from direct human contact with surface waters and sediments, consumption of biota taken from the study area, and/or exposure to mosquitos (or other biological agents (e.g., bacterial) within the Grand Canal study area. For a number of years, the Grand Canal has been the subject of complaints by area residents, reportedly concerned with progressive shoaling and reduction in tidal flushing. Residential areas do adjoin the Grand Canal and residents do use the Canal for recreational purposes (e.g., boating). Issues raised by the residents include the potential for mosquito breeding, potential West Nile virus and other epizootic activity, the possible contamination of Grand Canal surface waters and sediments, and general water quality deterioration.

Project Manager and Human Health Risk Assessment Specialist; Human Health and Ecological Risk Assessment Project for Open Burning Area Permitting Project, NASA Goddard Space Flight Center (GSFC), Wallops Flight Facility, Wallops Island, VA; 2015 - current. Serves as project manager for fate and transport modeling and risk assessments being performed in support of the NASA Permit Renewal Application for the Open Burning (OB) Area at the Goddard Flight Center Wallops Flight Facility (WFF) in Wallops Island, Virginia. The unit is used treat (dispose of) rocket motor propellants and ignitors deemed hazardous waste. AERMOD, a steady-state plume air model, is being used to predict air concentrations at receptor locations in the vicinity and downgradient of the unit during and after a burning event. The HHRA will be prepared in accordance with the USEPA guidance titled, Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (HHRAP) (USEPA, 2005), using commercially available software provided by Lakes Environmental, Industrial Risk Assessment Program – Human Health for the USEPA OSW Human Health Risk Assessment Protocol (HHRAP), referred to as IRAP-h View™. The assessment will include the evaluation of both direct and indirect risks. Direct risks address exposure to constituents emitted from the OB sources through inhalation. Indirect risks address exposure to constituents emitted from OB sources resulting from contact with soil, plants, or water bodies. Indirect exposure also includes ingestion of homegrown above-ground fruits, homegrown produce, homegrown beef and milk, homegrown chicken and eggs, homegrown pork, and freshwater fish. The Lakes Environmental Eco Risk View software program is being used to conduct the ecological risk assessment for the project designed to evaluate risks from emission sources per the USEPA OSW Screening Level Ecological Risk Assessment Protocol (SLERAP).

Project Manager and Lead Human Health Risk Assessment Specialist; CERCLA Investigation for Site 16 at the Naval Construction Battalion Center Davisville; North Kingstown, RI; 2005 - 2016. Served as project manager for task orders contracted with the Navy for Site 16 at the Naval Construction Battalion Center at Davisville. A significant trichloroethene plume underlies Site 16 which is being investigated under a Federal Facilities Agreement. Groundwater is the primary media of concern; approximately 225 monitoring wells were installed to evaluate the vertical and lateral extent of contamination at the site. The current task orders involve the completion of the remedial investigation, feasibility study, proposed plan, and record of decision (ROD). The

field investigation conducted in support of the remedial investigation was conducted using a TRIAD-type of investigative approach, an environmental forensics evaluation to determine the source of sediment contamination (polycyclic aromatic hydrocarbons (PAHS), and innovative screening technologies for chlorinated volatile organic chemicals (CVOCs). The assessments also included an evaluation of the results of the perfluorooctanoic acid (PFOA)/perfluorooctane sulfonate (PFOS) groundwater sampling program at Site 16 in 2011/2012. The CVOc investigation results were presented at the 2008 SETAC Conference. The final ROD for Site 16 was published in June 2014.

Project Manager and Senior Risk Assessment Specialist; Risk Assessment of Soil Contamination; Private Client; Middle River, MD; 2010 - current. Responsible for design and quality assurance of the risk assessment prepared for five soils units in a commercially valuable area. PAHs, and PCBs are the primary contaminants of concern. The soils will be remediated based on the out-come and clean-up levels established by the risk assessment. The State of Maryland is the primary regulatory agency. The project is high profile in the local community; risk communication issues are significant.

Project Manager and Lead Risk Assessment Specialist; Risk Assessment for Six Sites at Fort Belvoir Engineering Proving Ground; Fort Belvoir, VA; 2009 - 2012. Serves as project manager and lead human health risk assessor providing fate and transport analysis and risk assessment services for six environmental sites at Fort Belvoir. VOCs and metals are among the primary COCs evaluated. To date, EPA Region 3 has approved (without comment) the risk assessment prepared for one of the sites.

Project Manager and Senior Risk Assessment Specialist; Ravenna Army Ammunition Plant (RVAAP); Ravenna, OH; 2001 - 2007. Senior human health risk assessment specialist responsible for design and quality assurance of risk assessments at five sites at RVAAP: Load Lines 6/9/11, Central Burn Pits, and Cobb's Pond. USEPA Region 5, Ohio EPA, U.S. Army, U.S. Army Corp of Engineers, and facility-specific risk assessment guidelines used to prepare risk assessments. Risk assessment results are presented in RAGS Part D format. It is anticipated that risk assessment will be used to support a "no further action" recommendation in some cases.

Project Manager and Lead Risk Assessment Specialist; Site Investigation/Risk Assessment for the Site 1 Landfill and Small Arms Range at the Naval Support Facility at Thurmont, Maryland; 2006 - 2007. Served as project manager and lead risk assessor under subcontract to JM Waller Associates under a task order contracted with the Navy for the Site 1 Landfill and Small Arms Range at the Naval Support Facility in Thurmont Maryland. Lead and polychlorinated biphenyls (PCBs) in soils are the primary contaminants of concern.

Project Manager and Lead Risk Assessment Specialist; RCRA Facility Investigation/Verification Investigation at Naval Surface Warfare Center, Stump Neck Annex; Indian Head, MD; 1995 - 1998. Served as project manager for two RCRA Facility Investigation/(RFI)/Verification Investigation (VI) task orders contracted by the Navy for the Naval Surface Warfare Center, Stump Neck Annex, Indian Head, Maryland. Some of the sites under investigation are subject to requirements stipulated by a Resource Conservation and Recovery Act (RCRA) Corrective Action Permit issued to the facility by EPA Region III. The primary constituents of concern are explosives (e.g., trinitrotoluene). Environmental media (groundwater, soils, surface waters, sediments) were sampled during two field sampling events and analyzed in accordance with protocol established in planning documents approved by EPA Region III. EPA Region III approved the draft version of RFI/VI report documents submitted for four of the nine sites under investigation.

Project Manager; Background Study for Naval Surface Warfare Center Indian Head, MD; 2001 - 2002. Conducted background study for environmental media in support of remedial investigations and other

investigations on-going at Naval Surface Warfare Center, Indian Head. Statistical analysis of the data (basic descriptive statistics, box and whisker plots, Kruskal-Wallis Non-Parametric ANOVA, normal probability plots) and an evaluation of the geological data were used to segregate soil data into appropriate sub-populations for purposes of conducting site versus background comparisons.

Project Manager; RI/FS for Six Sites at Fairchild AFB; Spokane, WA; 1991 - 1993. Project manager for an analytical and data validation project. The base is listed as an EPA National Priorities List (NPL) site and was under a Consent Order and Decree with USEPA Region X and the State of Washington. The scope of work included laboratory analysis of several hundred environmental samples. Validation of the analytical results was performed by chemists and the results of the validation of several hundred environmental samples were presented in four Informal Technical Information Reports, which were prepared using EPA and Air Force guidelines. Work tasks were completed under budget; excess funds were diverted to Feasibility Study/Remedial Design activities for the site. The validated analytical data were determined to be RI/FS quality data by EPA Region X.

Training/Guidance Documents

Guest Lecturer for Carnegie Mellon University (CMU), Remediation Engineering Class; Pittsburgh, PA; 2014 - ongoing. Presents (annually) *Risk Assessment Overview* lecture to students attending remediation engineering class. The one-session lecture provides the students with an overview of the fundamentals of human health and ecological risk assessment and how risk assessment tools support risk management decision making.

Senior Risk Assessment Specialist/Trainer; USEPA Environmental Response Team Program (ERTP) Contract; Cincinnati, OH; 2003 - current. Provides human health risk assessment training to SEPA personnel and state personnel who are often responsible for risk management decisions at environmental sites, particularly CERCLA sites. The training course covers all elements of human health risk assessment and is typically 3 ½ days in duration. The risk assessment training focuses on the methodologies presented in the Risk Assessment Guidance (RAGS) for Superfund Parts A, B, C, and D and the guidance presented in OSWER directives related to human health risk assessment. Also provides technical support for developing and modifying the course based on suggestions and comments from students and EPA staff.

Risk Assessment Specialist (Trainer); Various Clients; Nationwide; Training. Prepared and presented risk assessment training as part of the company's Laboratory Services Group "Solving the Mysteries" seminar. The 2-day seminar was presented annually in several major U.S. cities (Pittsburgh, Houston, San Francisco, Orlando, etc.). Four to eight seminars were presented each year. The typical audience included RI/FS project managers and other professionals required to contract for and utilize analytical data. The risk assessment training presented at the seminar focused on the fundamental risk assessment steps and risk assessment applications.

Risk Assessment Specialist (Trainer); USEPA Region I; 1989. Prepared and presented risk assessment training to EPA contractors in USEPA Region I. The objective of the training was to communicate USEPA Region I risk assessment protocol and expectations to contractors performing work for the agency. The training session lasted 2 days. Approximately 30 risk assessment professionals attended the training.

Task Manager; Quality Improvement Forum – Risk Compendium Guidance Document Project; Charleston, SC; 2000 - 2001. Prepared sections of a Risk Assessment Compendium document that serves as a risk assessment guidance document for Navy project managers and risk assessors. Responsible for the

oversight, final organization, and production of the document. The guidance document was published in September 2001.

Environmental Baseline Surveys

Project Manager and Lead Risk Assessment Specialist; Base Realignment and Closure (BRAC) Documents for Naval Air Warfare Center Indianapolis, IN; 1996 - 2005. Project manager for environmental baseline survey task orders contracted by the Navy for the Naval Air Warfare Center (NAWC) Indianapolis, Indiana. As a result of the Base Closure and Realignment Act (BRAC), NAWC Indianapolis and its associated properties have been disestablished as DOD installations. An Environmental Baseline Survey (EBS), Environmental Baseline Survey for Lease (EBSL), and Finding of Suitability to Lease (FOSL) were prepared to fulfill BRAC requirements and to support the lease of the NAWC Indianapolis facilities to the City of Indianapolis. These documents were reviewed and approved by the Navy and the regulatory agencies in 1996. The Environmental Baseline Survey for Transfer (EBST) and Finding of Suitability to Transfer (FOST) for Parcel No. 1A were approved and signed in February 2000. Consequently, Parcel 1A was successfully transferred from the Navy to the City of Indianapolis. EBST and FOST documents were also prepared for Parcel No. 2A. On April 25, 2001, a deed covering Parcel 2A was executed and forwarded to the City of Indianapolis. EBST and FOST documents for Parcel No. 1B were prepared/finalized in 2002/2003. Deeds covering the transfer of Parcel 1B and Parcel No. 2B were signed in November 2003 and September 2004, respectively.

National Environmental Policy Act (NEPA)

Lead Risk Assessment Specialist; Environmental Impact Statement (EIS) for Private Client Gasification Facility; Beaumont, TX; 2008 - 2012. Responsible for preparation of human health risk assessment sections of Environmental Impact Statement (EIS) report being prepared for a major, proposed gasification facility. The EIS is being prepared in accordance with requirements established under the National Environmental Policy Act (NEPA), the United States Department of Energy, and the State of Texas.

Project Manager and Lead Risk Assessment Specialist; Environmental Assessment for US Coast Guard Station, Marblehead, OH; 2007 - 2008. Managed preparation of Environmental Assessment and Finding of No Significant Impact for the Dredging of Port Facilities at the USCG Station, Marblehead, Ohio. The Environmental Assessment was prepared in accordance with Coast Guard guidance and requirements established under the National Environmental Policy Act (NEPA). The document was reviewed by both the State of Ohio and Federal oversight agencies (e.g., State of Ohio Historic Preservation Office, the United States Department of the Interior Fish and Wildlife Service, the Ohio Department of Natural Resources.)

SCIENTIFIC/TECHNICAL PUBLICATIONS / PRESENTATIONS

Shah, S. I., R. J. Hubbard, J. D. Chiou, and L. Sinagoga, "Risk Assessment - An Industrial Perspective," presented at the International Workshop on Risk Assessment and Management of Toxic Chemicals: Principles and Applications, Chulabhorn Research Institute, Bangkok, Thailand. (1989)

U.S. Navy, Pei-Fung L. Hurst, PhD, (ENSAFE), and L. Sinagoga, Guidance on Risk-Based Decision Making. (Final guidance document, September 2001)

Sinagoga, L. and R. Jupin, "Risk Evaluation of Volatile Organic Chemical Contamination of Groundwater/Soils in Support of Property Transfers," Presented at the Annual International Conference on Soils, Sediments, and Surface Water, Amherst, Massachusetts, October 2003.

Sinagoga, L, "Comparison of Human Health Risk Assessment/Risk Management Requirements – Federal versus State", Presented at the Air Force 2006 Environmental Training Symposium, Pittsburgh, PA.

Sinagoga, L. "Update on the Human Health Risk Assessment of Trichloroethene" Presented at the Air Force 2007 Environmental Training Symposium, Pittsburgh, PA.

Anderson, S.A., J. Wright, L.A. Sinagoga, C.A. Frye, and D. Barney. "Vertical Profiling Using the Color-Tec® Method to Identify Source Releases and Delineate CVOC Soil and Groundwater Plumes at the Former Naval Construction Battalion Center Davisville in North Kingstown, Rhode Island." Presented to: The International Conference and Training – Triad Investigations – New Approaches and Innovative Strategies, Amherst, Massachusetts, (June, 2008).

Dale, J., D. Barney, S.A. Anderson, and L.A. Sinagoga. "Vertical Soil Profiling Using Color-Tec® Method at Former NCBC Davisville." Environmental Restoration News, NAVFAC, Base Realignment and Closure Corner, April 2012.

Sinagoga, L.A., R. Kotun. Revised Health Risk Assessment for Trichloroethylene. Presented to Navy NAVFAC. February 2012.

Sinagoga, L.A., Risk Assessment Overview Class Session, Carnegie Mellon University (CMU): Remediation Engineering Class, 2014 through 2016.

ADDITIONAL PROFESSIONAL AFFILIATIONS

Member of Women in Energy Network (Pittsburgh Regional Area)

Secretary of the Greater Pittsburgh Chapter of the Society for Risk Analysis (2001).

President-elect of the Greater Pittsburgh Chapter of the Society for Risk Analysis (2002).



TETRA TECH

KATHERINE SUORSA SUPER

Senior Toxicologist

EXPERIENCE SUMMARY

Katherine Super, DABT is a toxicologist and risk assessment manager with 20+ years of experience in both human health and ecological risk assessment and toxicology. She has managed the preparation of risk assessments and risk management plans for many private and Department of Defense clients under various regulatory programs. These risk assessments include a number of RCRA Facility Investigations/Corrective Measure Studies (RFI/CMS), Remedial Investigation/Feasibility Studies (RI/FS) and EE/CA under CERCLA, and in USEPA Regions 3, 4, 5, 7, 9, and 10. Ms. Super has conducted risk assessments under many state environmental agencies (e.g., Indiana, Pennsylvania, Ohio, California, Illinois, Montana, Utah, Washington, Arkansas, Louisiana, Texas, Michigan). She has also conducted risk assessments and supported risk-based remediation efforts under UST as well as State Superfund regulatory programs. A board-certified toxicologist, she utilizes her toxicology training to evaluate the strengths and weaknesses of toxicology studies upon which USEPA-derived toxicity criteria are based. She has extensive risk assessment experience with: 1) metals risk assessment (including arsenic, lead, and chromium) 2) 2,3,7,8-TCDD and PCB regulatory, toxicity, and bioaccumulative considerations; 3) methodologies for toxicity evaluation of complex mixtures, such as total petroleum hydrocarbons (TPH) and PAHs; and 4) volatile organic compounds (including petroleum product components and chlorinated solvents) and relevant exposure pathways such as vapor intrusion.

RELEVANT EXPERIENCE

Site Investigation Risk Assessment:

- ***Risk Assessment of Arsenic in Fill Soil, Confidential Client. Kokomo, IN.*** Developed site-specific risk assessments of school and park properties, residential and industrial areas of areas with fill from historical glass manufacturing operations. Supporting client in on-going negotiations with Indiana Department of Environmental Management on risk assessment approach, incorporation of site-specific relative bioavailability, and site risk-based remedies and closure.

EDUCATION

M.S.; Environmental Biology (emphasis Toxicology); Ohio State University; 1985

B.S.; Biology; Westminster College; 1981

REGISTRATIONS

N/A

TRAINING/CERTIFICATIONS

Diplomate of the American Board of Toxicology (DABT; 1997)

OFFICE

Pittsburgh, Pennsylvania

YEARS OF EXPERIENCE

25

YEARS WITH TETRA TECH

15

- ***Risk Assessment of Air Monitoring Systems for Hydrogen Sulfide from Bayou Come-Area Sinkhole, Louisiana***. Provided risk assessment and toxicological expertise as part of Tetra Tech team in evaluating health protectiveness of an air monitoring network of gases emitted from a catastrophic sinkhole near Bayou Come, Louisiana.
- ***Human Health Risk Assessment Work Plan, Confidential Mining Client***. Grass Valley, California. Prepared site-specific risk assessment work plan and risk assessment for former gold mining site in northern California. COPCs include arsenic and lead primarily from waste rock. Provided client support in negotiations with the California EPA's Department of Toxic Substances Control (DTSC).
- ***RI/FS Baseline Human Health Risk Assessment of Arsenic in Mine Tailings, Talache Mine Tailings Site, Atlanta, Idaho***. Negotiated with USEPA Region X and fine-tuned details of human health risk assessment of mine-tailings site with arsenic in environmental media. Exposure media included soil, sediment, fish tissue, surface water. Recreational use and fish ingestion exposures to arsenic were shown to be associated with acceptable risk.
- ***RI/FS Baseline Risk Assessment for Former Alumina Production Facility, Illinois***. Have been participating in long-term negotiations on risk-based strategies for RI/FS process of this historical bauxite residue and gypsum waste disposal Site. Developed DQOs and collaborated in developing risk-based investigation strategy for this Site. Prepared BLRA work plan, approved by EPA Region V, and prepared human health risk assessments for soil, surface water, and sediment. Human health COPCs include metals such as arsenic and lead, PAHs, and Naturally Occurring Radioactive Materials (NORM).
- ***Risk Assessment of Arsenic and Petroleum Hydrocarbons on Former Rail Yard Property, CA***. Prepared a risk assessment for a private client of residual chemicals in soil at a former rail yard. This effort was in support of divestiture of the property and included proposed risk management elements to control exposure of development workers.
- ***Expert Opinion Report and Deposition on Human Health Risk of Tetrachloroethylene in Environmental Media, Confidential Client, Southern California Former Dry Cleaner Site***. Prepared an Expert Opinion Report on the potential baseline human health risks of residual dry cleaning solvents, particularly tetrachloroethylene (PCE), in soil vapor. Provided responses to opposing counsel's questions on the Expert Opinion Report in a deposition.
- ***Vapor Intrusion Risk Assessment, Confidential Client, Bay Area, California***. Providing on-going technical support to Potentially Responsible Party (PRP) in negotiations with other PRPs and the San Francisco Bay Regional Water Quality Control Board. Responsibilities include reviewing site-specific Human Health Risk Assessment for vapor intrusion pathway of PCE and chlorinated degradation products with soil vapor data, and preparing a vapor intrusion risk assessment using groundwater VOC data.

- ***Vapor Intrusion Risk Assessments and Risk-Based Remedial Strategy Development for Multiple Dry Cleaning Sites, Central Valley and Southern California.*** Prepared site-specific risk assessments for confidential client to support remedial decision-making for multiple dry cleaning sites.
- ***Health Risk Assessments (HRAs) Supportive of RCRA Part B Permit Application of Hazardous Waste Disposal Facility, Los Angeles, California.*** Revised an out-of-date HRA to support the renewal of one southern California Hazardous Waste Storage and Treatment Facility's RCRA Part B Permit and developed an HRA for another facility. Negotiated with the California Environmental Protection Agency's Department of Toxic Substances Control (DTSC) and the South Coast Air Quality Management District to what elements would be included in the HRAs. This allowed a large cost savings to the client by leveraging a significant amount of analysis that was included in the original HRA.
- ***Site-specific Risk Assessment of Proposed Dredged Sediments for Harbor Maintenance, Humboldt Bay, Eureka, California.*** Prepared a risk assessment of potential contact of surfers to dioxins/furans in ocean-disposed harbor sediments to support an essential maintenance dredging project by the Cooperative Eureka Waterfront Facilities. Responded to public comments and provided testimony to the California Coastal Commission in a public hearing to gain approval of the proposed dredging and disposal project in the face of environmental group opposition.
- ***Coplanar PCB and Lead in Sediments Risk Assessment of Former Scrap Metal Recycling Operation, California.*** Successfully negotiated on behalf of a confidential client with the Regional Water Quality Control Board (RWQCB) and California Environmental Protection Agency's (CalEPA's) Office of Environmental Health Hazard Assessment (OEHHA) on cost-saving modifications to methods for finalizing a human health risk assessment of the property. Prepared the final human health risk assessment with primary COPCs of PCBs (including dioxin-like coplanar congeners) and lead in soil and marine sediments. Provided technical oversight and review of ecological risk assessment, primarily of sediment exposures and potential food chain transfers.
- ***R/FS Baseline Risk Assessment for Dioxins/Furans and Pentachlorophenol of Former Sawmill and Wood Treatment Facility, Montana.*** Prepared detailed "RAGS D-type" baseline risk assessment work plan and conducted human health risk assessment for confidential client following State specifications, at the client's request. Primary chemicals of potential concern (COPCs) were pentachlorophenol and dioxins/furans. Pathways evaluated included future, hypothetical residential exposure to soil, garden produce, and uptake to breast milk for nursing infant. Incorporated elements of the draft National Academy of Sciences review (July 2006) of EPA's Dioxin Reassessment into uncertainty analysis of baseline risk assessment.
- ***RFI Risk Assessment of Dioxins in Groundwater and Miscellaneous Chemicals in Soil, Former Dye Production Facility, Virginia.*** Prepared a risk assessment for this RFI that supported client's preferred remedy for a former dye production facility. First, the risk assessment evaluated hot spots separately from site-wide conditions resulting in acceptable risks for all areas besides hot spots. Second, the inclusion of site-specific data was successfully argued in negotiations with EPA Region

III. Most significantly, site-specific lead solubility data were applied in the Integrated Exposure and Uptake Biokinetic (IEUBK) Model in the RFI Report in order to provide a more realistic risk evaluation for lead exposure.

- **USEPA Region V RFI and UST Closure - Wisconsin Chemical Plant.** Developed a site risk management strategy for the plant that will satisfy the regulatory requirements of both EPA Region V and Wisconsin Department of Natural Resources (WDNR). Prepared RFI risk assessment that focused subsequent investigation on the only area of potential concern with regard to risk issues.
- **RFI Chemical Plant, West Virginia.** Involved in preparation of 30+ SWMU risk assessment for RFI Report submitted to EPA Region III. Used a screening risk assessment approach to eliminate consideration of large number of SWMUs to focus later phases of RFI on few potentially problem areas and environmental media.
- **RFI Coke By-Products Plant, Follansbee, West Virginia.** Prepared a risk assessment and negotiated with USEPA Region III on behalf of the client. Constituents of concern included PAHs and benzene in soil, and dissolved phase from DNAPL in groundwater. Advocated the position that only realistic land use assumptions and complete exposure pathways should be addressed quantitatively in the risk assessment.
- **West Virginia Chemical RCRA Facility Dioxin Risk Assessment.** Prepared a risk assessment on dioxin in ground water that was basis for agency's dismissal of dioxin as a ground water COPC. Risk assessment was a component of a technical report prepared for the client that supported the client's position that ppq levels of dioxin in ground water, while likely reflecting ambient levels and not attributable to the facility, would not result in unacceptable risks to local residents. Ms. Super also wrote the sections on dioxin toxicity, fate and transport, and critiqued EPA's highly conservative cancer slope factor for 2,3,7,8-TCDD as a key part of the technical report.
- **RI/FS Wurtsmith Air Force Base, Michigan.** Managed the preparation of human health and ecological risk assessments for various operable units in the remedial investigation of Wurtsmith AFB and the fashioning of these documents into feasibility studies and decision documents with EPA Region V and Michigan Department of Environmental Quality (MDEQ). Risk-based remedies for chlorinated VOCs in ground water were implemented.
- **RI/FS Andersen AFB, Guam.** Prepared detailed work plans for human health and ecological risk assessment for 40 sites on the base, which encompasses the northern half of the island of Guam. Assisted in negotiations on behalf of the Air Force with EPA Region IX and Guam EPA. Assisted with Section VII consultations on potential impacts of site investigations and remediation on endangered species with the Natural Resources Trustees, consisting of the U.S. Fish and Wildlife Service and NOAA.

Performed a risk assessment for exposure to chlorinated VOCs in ground water in support of the Air Force client's preferred remedy. Argued that current and likely future exposure conditions should be emphasized over hypothetical exposure scenarios.

- **RI/FS Multiple PRP Group Superfund Site, Nitro, West Virginia.** Prepared a site-specific risk assessment for high profile Superfund site with many organic COPCs. Strategy for risk assessment included applying best science (in toxicology and fate and transport) and site-specific exposure assumptions to support no further action for soils.
- **RI/FS Scippo Creek, Ohio - No Action Decision for PCBs in Stream Sediments.** Prepared risk assessment that achieved a No Action Decision by Ohio EPA for PCBs in a small Ohio stream adjacent to a chemical plant. Site-specific fish ingestion pathway using fish tissue data for exposure assessment was a key element in the human health risk assessment that supported the remedial decision.
- **RI/FS Aluminum Manufacturing Facility along Mississippi River, Iowa.** Managed preparation of CERCLA risk assessment documents for active manufacturing facility along the Mississippi River with PCBs and carcinogenic PAHs as primary COPCs. Participated in a team with client and other consultants for EPA Region VII RI/FS; involved in strategy development, technical review, and report preparation.
- **Risk Assessment of Sawmill with Historical Pentachlorophenol Wood Treatment, California.** Prepared a risk assessment of on-site conditions with chlorophenols and dioxins/furans in soil and shallow groundwater. This risk assessment was intended for submittal to the North Coast RWQCB and CalEPA's OEHHA. The focus of the assessment was on realistic exposure of workers to COPCs (primarily PCP and dioxins/furans) in subgrade soil and shallow groundwater.
- **Remedial Investigation Report Review of Former Wood Treatment Facility, Northern California.** Provided technical review of remedial investigation report with respect to study quality for application to human health and ecological risk assessment. Principle chemicals of concern were pentachlorophenol (PCP) and dioxins/furans.
- **Willamette River Fish Tissue Data Evaluation for Ingestion in Human Health Risk, Oregon.** Provided confidential client with an evaluation of the significance of chemical fish tissue data with respect to human health risk. Constituents included dioxins/furans and pesticides. The evaluation included comparison of data with FDA limits, identification of data quality issues that contributed uncertainty to a risk evaluation, and an estimation of theoretical excess lifetime cancer risks and non-cancer hazards following standard USEPA risk assessment methods. Participated as part of Potentially Responsible Party (PRP) technical team in development of human health fish ingestion risk assessment for various receptors, including subsistence-type fishermen.
- **Human Health Risk Assessment for an Aircraft Components Manufacturing Facility, Windsor Locks, Connecticut.** Managed the preparation of a multi-source area human health risk assessment. COPCs included dioxin-like PCBs, chromium VI, and chlorinated solvents and their byproducts. Exposure and migration media included soil, groundwater, sediment, and surface water.
- **Risk-Management During Brownfields Redevelopment, San Jose, California.** Conducted the redevelopment-specific risk assessment of the Lenzen Yard, in San Jose, California, and incorporated this into the risk management plan for redevelopment of the property. The California

Regional Water Quality Control Board (RWQCB) has approved the risk-management plan for the Lenzen Yard (18 acres), which is currently being redeveloped as an administrative and maintenance facility for Caltrain, a local commuter railroad. The primary constituents of interest at the site included TPH and arsenic.

- ***Preliminary Endangerment Assessment (PEA) of Former Metal-Plating Facility.*** Prepared a PEA risk assessment for a former metal-plating facility that was redeveloped as a storage facility in Southern California. The client's schedule required that redevelopment proceed prior to closure approval from the California DTSC, so Ms. Super developed a risk-based decision tree that guided soil remediation with the goal that post-remediation levels would be acceptable to DTSC. After redevelopment of the property was completed, the PEA risk assessment was prepared according to published DTSC guidance and guidance provided in a phone conference with DTSC, and then submitted to DTSC. This included evaluation of vapor intrusion to indoor air using the DTSC's Johnson & Ettinger model.
- ***Risk Assessment and Risk Management Plan for Redevelopment.*** Prepared a risk assessment following San Francisco RWQCB and USEPA Risk Assessment Guidance for Superfund (RAGS) guidance that supported risk management during redevelopment and the risk-based closure of a brownfields property in San Francisco for redevelopment as a storage facility. The San Francisco RWQCB approved the risk-based closure, which allowed PAHs to remain in soil at concentrations greater than industrial soil Environmental Screening Levels (ESLs).
- ***Screening-Level Risk Assessment.*** Conducted a screening-level risk assessment of a Southern California property used formerly for fiberglass boat and shower manufacturing operations. Volatile organic constituents in soil and groundwater were shown to be at acceptable risk-based levels based on comparison with RWQCB ESLs and drinking water standards.
- ***Post-remediation Risk Assessment.*** Ms. Super is providing technical support to a SVE remediation project of a former dry cleaning operation in Southern California. She will conduct a risk assessment of post-remediation levels of perchloroethylene (PCE) with respect to the potential for vapor intrusion to indoor air and direct contact exposures.
- ***Vapor Intrusion Risk Assessment of School, Los Angeles, California.*** Performed a risk assessment of soil chlorinated VOCs that migrated off-site from an industrial facility to a Southern California public school property. The risk assessment showed that off-site soil vapor concentrations associated with on-going remedial activities were acceptable, and that indoor air analytical data were consistent with ambient urban conditions rather than with intrusion from soil vapor. She also evaluated the risks associated with emissions from the SVE system itself.
- ***Risk Evaluation of Potential Worker Exposure to PCBs on Concrete.*** Prepared a risk assessment of potential exposure of workers to PCBs on concrete at a California industrial facility. Applied a state-of-the-art exposure model. Showed that potential risk levels were below California Proposition 65 risk targets.

- ***Risk Assessment and Risk Management Plan Development, San Francisco Bay Area, California.*** Developed a risk assessment for inclusion in a risk management plan for the on-going operations and future construction plans of a can-making facility in the San Francisco Bay area. The San Francisco RWQCB and local Water District reviewed and approved the risk management plan. Therefore, residual levels of chlorinated solvents in soil and groundwater were left in place on the basis of management of current and future exposure through implementation of the risk management plan.
- ***PCB and Vapor Intrusion Risk Assessments, California.*** Conducted a risk assessment of PCBs on concrete surfaces and of chlorinated VOCs in subsurface soil at a Southern California former casting facility. The PCB risk assessment used USEPA exposure assessment methods, and showed both acceptable potential risk for current workers and that levels would not trigger Proposition 65 requirements. The VOC analysis included evaluation of potential vapor intrusion exposure, and showed this to be acceptable.
- ***Ohio Superfund Site.*** Prepared risk assessment that achieved a No Action Decision by Ohio EPA for PCBs in a small Ohio stream adjacent to a chemical plant.
- ***Risk-Based TSCA PCB Clean-up Levels.*** Managed preparation of risk assessments supporting risk-based clean-up levels for PCBs under the new TSCA PCB disposal rules. Risk assessments include those for PCBs in soils and for PCBs on surfaces. These were prepared for submittal to regulatory agencies or as part of due diligence for real-estate transfers.
- ***Former Coke Facility Superfund Site, West Virginia.*** Negotiating on behalf of client on risk issues regarding first Superfund site placed in EPA's XL Program. EPA's goal with XL is to expedite the investigation and decision-making process through stakeholder buy-in and innovative remedies that especially benefit the community. Therefore, a unique approach to the remedial investigation based on presumptive remedies and risk assessment is being developed through negotiations with EPA Region III.
- ***Pennsylvania Chemical Plant.*** For one of the largest and most complex sites closed under Pennsylvania's Act 2, prepared human health and ecological risk assessments as part of an RI/FS for an active chemical plant along the Ohio River. The primary constituents of potential concern for this site were volatile organic chemicals in ground water (principally BTEX). Five of six investigation areas were closed according to the Site-specific standards, which are based on risk assessment. The sixth was closed under the State-wide Health Standard for mercury.
- ***Active Aluminum Smelting Facility and Former Chlor-Alkali Plant.*** Contributed in a team effort by client and other consultants to produce a complicated risk assessment for submittal to EPA Region VI and TNRCC. Key COPC was mercury and methyl mercury. Wrote the toxicity assessment section of the human health risk assessment and managed the production of approximately 20 toxicity profiles for COPCs that supported the approaches used in the toxicity assessment.
- ***Former Coke Works, Toledo, Ohio.*** Developed risk assessment approach and prepared work plan for Phase II investigation under Ohio EPA's Voluntary Action Program (VAP).

- **New York State Former Paint Manufacturing Facility.** Reviewed and revised a risk assessment of an inactive industrial site prepared for submission to Voluntary Cleanup Program under NYDEC. NYDEC Recommended Soil Cleanup Objectives were used as screening criteria for identifying constituents of interest for a site-specific risk assessment.
- **Shallow Radiologic Waste Disposal Facility.** Provided toxicology expertise and conducted a baseline risk assessment and risk assessments of remedial alternatives of nonradiological chemicals for a shallow waste disposal facility for radiological and nonradiological wastes. This site has a complex hydrogeology, and a team of scientists of various disciplines addressed the environmental fate and transport of constituents from trenches on this site. Ms. Super also coordinated the work of hydrogeologists and engineers to determine exposure point concentrations of constituents under four remedial alternatives.

Toxicology

- **Toxicity Evaluations of Phthalate and Flame Retardant Compounds.** Researched primary toxicity literature and prepared a comprehensive health hazard evaluations of dicyclohexyl phthalate, as well as updating the IUCLID database entry of this chemical. The IUCLID database will subsequently be used by Health Canada in consideration of a cumulative risk assessment and will support public access of toxicological information for human health risk assessment on this chemical.
- **Regulatory Toxicity Database preparation.** Researched primary toxicity literature, compiled data, and prepared toxicity database entries of various phthalate esters (di-n-octyl phthalate, dibutyl phthalate, and monobenzyl phthalate) and flame retardant compounds (ethylene bis-tetrabromophthalimide and tris[1,3-dichloro-2-propyl]phosphate) for Health Canada's IUCLID toxicity database.
- **Toxicological Evaluation Preparation for Pharmaceutical Company.** Prepared and reviewed toxicological evaluations of products and their components for a major pharmaceutical company. The client required the evaluation of 50 of its product mixtures as potential occupational hazards for its workers. Preparation of the toxicological reviews of product components entailed searching the literature and assessing the potential adverse effects most germane to occupational exposure.
- **MSDS Development for Industrial Manufacturing Client.** Developed Material Safety Data Sheets (MSDS) on products for industrial manufacturing client. MSDS summarized data from the primary scientific literature and information from toxicity databases and references for potential adverse health effect associated with occupational exposure.

CHRONOLOGICAL HISTORY

Senior Toxicologist and Risk Assessment Specialist; Tetra Tech, Inc.; Pittsburgh, PA; November 2007 to Present

Senior Toxicologist and Risk Assessment Specialist; Tetra Tech MFG, Inc.; Pittsburgh, PA; October 1999 to October 2007. Prepared and managed the preparation of RI/FS and RCRA RFI/CMS

risk assessments for private sector clients. Conducted risk assessments under many state environmental agencies (e.g., Pennsylvania, Ohio, California, Illinois, Montana, Utah, Washington, Arkansas, Louisiana, Texas, Michigan), and also conducted risk assessments and supported risk-based remediation efforts under UST as well as State Superfund regulatory programs. With client-advocacy perspective, developed site-specific cleanup levels and negotiated with regulatory agencies and other Potentially Responsible Parties (PRP) on behalf of our clients. The goals of these regulatory agency negotiations are to achieve cost-effective remediation or engineering/institutional controls that attain protection of public health and the environment. Negotiations with other PRPs are for the purpose of cost allocation and minimization of our client's economic liability.

Risk Assessor and Risk Assessment Manager; IT Corporation (formerly ICF Kaiser Engineers); November 1992 to October 1999. Prepared and managed the preparation of human health risk assessments as part of CERCLA Remedial Investigation/Feasibility Studies and RCRA Facility Investigations/Corrective Measure Studies for various private industrial and DOD clients.

Researcher in Aquatic Toxicology; Oregon State University; November 1988 to November 1991. Conducted toxicity experiments to support objectives of grant funding. Primary research projects included analysis of effects of temperature modulation of carcinogen metabolism in rainbow trout (benzo(a)pyrene and aflatoxins), and evaluation of hardness as a modifying factor in aluminum toxicity to daphnia species.

SCIENTIFIC/TECHNICAL PUBLICATIONS

Griffith, M.B., K.S.Super, W.Lynch, and B.E.Fishman. (2001) Accumulation of Metals in Vegetation from an Alkaline Artificial Soil. *Journal of Environmental Science and Health*. 36(1):49-61.

Zhang, Q., K. Suorsa-Super, and L. Curtis. "Temperature-Modulated Aflatoxin B1 Hepatic Disposition, and Formation and Persistence of DNA Adducts in Rainbow Trout." *Toxicology and Applied Pharmacology*, 113:253-259, 1992.

Suorsa, K.E. and S.W. Fisher. "Effects of pH on the Environmental Fate of 14C-Aldicarb in an Aquatic Microcosm." *Ecotoxicology and Environmental Safety*, 11:81-90, 1986.

MEMBERSHIPS

Society of Toxicology

AWARDS

N/A

DIPLOMAS AND TRANSCRIPTS

University of Pittsburgh

To all persons to whom these presents may come, Greeting

Be it known that

Anton M. Bernhardt

having satisfied the requirements for the degree of

Master of Science in Hygiene

and having been recommended by the Graduate Faculty in

The Graduate School of Public Health

is now admitted to that degree with all the rights, privileges and immunities thereto appertaining.

In Witness Whereof we the Officers of the University have caused our corporate seal and the proper signatures to be hereunto affixed.

Given at Pittsburgh, Pennsylvania on the twenty-seventh day of April, in the year of our Lord one thousand nine hundred and thirty.

James M. Smith
President of University

Donald H. Madison
Dean of Graduate School



Wesley L. Palmer
Vice-Chancellor

John W. Bell
Dean of Graduate School

Western Reserve University



On the recommendation of the Dean and the General Faculty of
Western Reserve College and Case Institute of Technology

The Trustees of the University have admitted

Aaron Milton Bernhardt

to the Degree of

Bachelor of Arts

Western Reserve College

Given at Cleveland Ohio May sixteenth Nineteen Hundred Eighty Eight

[Signature]

Philip A. Fogg
Secretary of the Board of Trustees

Alena K. Brown

The University of North Dakota

Leigh Ann Ciofani

has completed the Curriculum prescribed in the

Graduate School

and is admitted through the authority vested by law in the

State Board of Higher Education, the President, and the Faculties of the

University of North Dakota to the Degree of

Master of Science

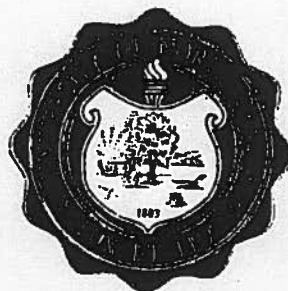
with all the rights and privileges pertaining thereto.

Given at the University, Grand Forks, North Dakota, on

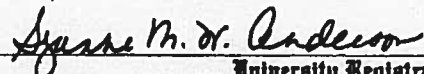
this fourteenth day of December, 2007.

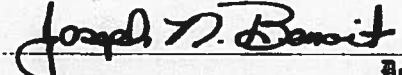

President, State Board of Higher Education


Chancellor, North Dakota University System




President of the University


University Registrar


Dean

The Board of Regents of the University System of Maryland

University of Maryland

*In recognition of the successful completion of the
requisite course of study and on nomination of the Faculty of the
Graduate School*

*by virtue of authority granted by charter of the State of Maryland
hereby confers upon*

Leanne Marie Ganser
the degree of

Master of Science
Marine, Estuarine, and Environmental Sciences

with all the honors, rights, and privileges thereunto appertaining.

*In witness whereof this Diploma, signed by the authorized officers
of the University and sealed with the corporate seal of the University, is granted.*

*Given at College Park, Maryland, on the twenty-first day of
May in the year two thousand six.*



David M. Norris
*Chairperson of the Board of Regents
of the University System of Maryland*

S. M. A. N.
President

W. E. C. C. C.
Chancellor

Ann B. Wylie
Interim Dean of the Graduate School

University of Pittsburgh

To all persons to whom these presents may come, Greeting

Be it known that

Robert James Jupin

having satisfied the requirements for the degree of

Master of Science in Civil Engineering

and having been recommended by the Graduate Faculty in

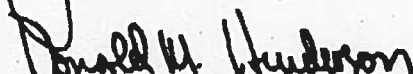
The School of Engineering

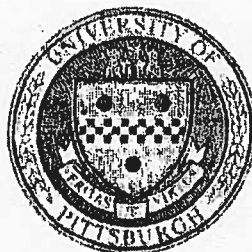
is now admitted to that degree with all the rights, privileges and immunities thereunto appertaining.

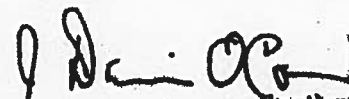
In Witness Whereof, we the Trustees of the University have caused our corporate seal and the proper signatures to be hereunto affixed.

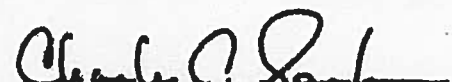
Given at Pittsburgh, Pennsylvania on the fourteenth day of December in the year of our Lord one thousand nine hundred and ninety-one.


Chairman, Board of Trustees


Provost




President


Dean, The School of Engineering

GRADUATE ACADEMIC RECORD

PHARM 794
KOTUN, DONALD, J 81-1PAGE 1 OF 2
UNIVERSITY OF PITTSBURGH
OFFICE OF THE REGISTRAR
PITTSBURGH, PA. 15261

SCHOOL/CAMPUS THE SCHOOL OF PHARMACY

ACADEMIC DEGREE CONFERRED BY THE UNIVERSITY OF PITTSBURGH
PHD APRIL 1985 PHARMACOLOGYSTATUS OF STUDENT
PS PHL FULL FALL 80-81ADMITTED FROM:
CARNEGIE MELLON UNIVERSITY
B.S., 1980

FALL 80-81

DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS
PS PHL	136	PHYSIO-ANAT I	4		16.00
PS PHL	146	PHCOL I	3		15.00

WINTER 80-81

DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS
PHCEUT	304	ADV PHARMCOGKIN	3		9.75
PS PHL	137	PHYSIO & ANAT 2	4		16.00
PS PHL	147	PHCOL 2	3		16.25
PS PHL	326	PHCOL SEM 2	1		4.00

SPRING TERM 80-81

DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS
PS PHL	310	PHD RES DIS	2		8.00
PS PHL	310	PHD RES DIS	3		12.00
PS PHL	315	ADV PHCOL I	4		15.00

FALL 81-82

DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS
PS PHL	323	BIOSTATISTICS	3		11.25
PS PHL	325	PHCOL SEM 1	1		4.00
PS PHL	310	PHD RES DIS	1		4.00
PS PHL	316	ADV PHCOL II	4		12.00

WINTER 81-82

DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS
PS PHL	310	PHD RES DIS	2		8.00
PS PHL	326	PHCOL SEM 2	1		4.00
MS PSY	240	PRIN MAMM PHY	6		12.00

SPRING TERM 81-82

DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS
PS PHU	310	PHD RES DIS	3		12.00
PS PHL	310	PHD RES DIS	3		12.00
PS PHL	314	BIONULLEONICS	3		12.00

FALL 82-83

DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS
PS PHU	310	PHD RES DIS	3		12.00
PS PHL	310	PHD RES DIS	3		12.00
PS PHL	310	PHD RES DIS	3		12.00
PS PHL	325	PHCOL SEM 1	1		4.00

WINTER 82-83

DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS
PS PHL	310	PHD RES DIS	3		12.00
PS PHL	310	PHD RES DIS	3		12.00
PS PHL	310	PHD RES DIS	3		12.00

SPRING TERM 82-83

DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS
PS PHU	310	PHD RES DIS	3		12.00
PS PHL	310	PHD RES DIS	3		12.00
PS PHL	310	PHD RES DIS	3		12.00

FALL 83-84

DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS
PS PHL	310	PHD RES DIS	3		12.00
PS PHL	310	PHD RES DIS	3		12.00
PS PHL	310	PHD RES DIS	3		12.00

WINTER 83-84

DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS
PS PHL	310	PHD RES DIS	3		12.00
PS PHL	310	PHD RES DIS	3		12.00

WINTER 83-84

DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS
PS PHL	310	PHD RES DIS	3		12.00

SPRING TERM 83-84

DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS
PS PHU	310	PHD RES DIS	3		12.00
PS PHL	310	PHD RES DIS	3		12.00
PS PHL	310	PHD RES DIS	3		12.00

FALL 84-85

DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS
PS PHL	310	PHD RES DIS	3		12.00
PS PHL	310	PHD RES DIS	3		12.00

NOTES

GRADUATE

ACADEMIC RECORD



UNIVERSITY OF PITTSBURGH
OFFICE OF THE REGISTRAR
PITTSBURGH, PA 15260

SCHOOL/CAMPUS THE SCHOOL OF PHARMACY

PHARM 794
KOTUN, RONALD, J

ACADEMIC DEGREE CONFERRED BY THE UNIVERSITY OF PITTSBURGH
PHD APRIL 1985 PHARMACOLOGY

STATUS OF STUDENT

WINTER 84-85

DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDIT	GRADE	QUALITY POINTS
PS	PHL310	PHD RES DISS	3		12.00
PS	PHL310	PHD RES DISS	3		12.00

PRIMARY EXAMINATION FOR DOCTORATE - DATE

COMPREHENSIVE EXAM DATE FINAL EXAM DATE

PASSED OCTOBER 1982 PASSED 4/1/85

ADMISSION TO CANDIDACY FOR

DEFENSE AND DATE
OCTOBER 1982

NOTES

UNIVERSITY OF PITTSBURGH

Transcript Information

GRADING SYSTEM

LEVEL OF ATTAINMENT:

		UNDERGRADUATE	GRADUATE	FIRST PROFESSIONAL
A+	4.00			
A	4.00	Superior	Superior	Exceptional
A-	3.75			
B+	3.25			
B	3.00	Meritorious	Adequate	Superior
B-	2.75			
C+	2.25			Meritorious
C	2.00	Adequate	Minimal	Adequate
C-	1.75			Minimal
D+	1.25			
D	1.00	Minimal		
D-	0.75			
F	0.00	Failure	Failure	Failure

THE FOLLOWING GRADES CARRY NO QUALITY POINTS:

G	Unfinished Course Work
H	Honors
I	Incomplete
N	Audit - Non-credit
R	Resignation - Student resigned from the University.
S	Satisfactory - Satisfactory completion of course requirements.
U	Unsatisfactory - Unsatisfactory completion of course requirements.
W	Withdrawal
Z	Invalid Grade - Invalid grade reported
**	No Grade - No grade reported.

NOTE: Course work taken prior to the Winter Term 1953-54 reflects a 3.00 grade point system in effect at that time.

DISCONTINUED GRADES:

K	Competent Attainment
P	Pass
Q	Satisfactory completion of an independent study, directed study, teaching of courses, individual research, and thesis or dissertation research.
WF	Qualified
	Withdrawal/Failing

PLUS AND MINUS GRADES:

Plus and minus grades were added to the University's grading system in the Winter term 1975-76.

SPECIAL TRANSCRIPT NOTATIONS

UHP or *UHC* preceding a Course Title indicates that the course was offered by the University Honors College.

PCHE in the Notes or Remarks area of the transcript indicates that the course was taken by the student in cooperation with the Pittsburgh Council on Higher Education cross-registration program at the college or university indicated.

Joseph M. Katz Graduate School of Business - The Master of Business Administration (MBA) full time day program adopted a modular format for its courses, including 1/2 credits, which is not reflected on the official University transcript. Details of each student's program can be obtained directly from The Joseph M. Katz Graduate School of Business.

Certificate Programs which were completed by a student are identified in the Notes, Faculty Action or Academic Degrees area of the transcript.

Official Transcripts have the seal of the Office of the University Registrar.

THREE-TERM CALENDAR

The University of Pittsburgh utilizes a three-term academic calendar that is equivalent to the semester hour system. The first professional programs operate on the semester calendar.

ACCREDITATION

The University of Pittsburgh is accredited by the Middle States Association of Colleges and Schools, Commission on Higher Education. Individual school or program accreditation may be verified by contacting the Dean's Office of the school identified on the student's record.

COURSE NUMBERING SYSTEM

- 001-099 - Lower Level Undergraduate
- 100-199 - Upper Level Undergraduate
- 700-799 - Lower Level (General Studies) Undergraduate
- 800-899 - Upper Level (General Studies) Undergraduate
- 500-599 - First Professional Programs - Medicine and Dental Medicine
- 200-299 - Master Level Graduate
- 300-399 - Doctoral Level Graduate
- 900-999 - Other (Includes Occupational/Vocational and Special Workshops)

DEGREE ABBREVIATIONS

AA	Associate of Arts	MSMFSE	Master of Science in Manufacturing Systems Engineering
AS	Associate of Science	MSPE	Master of Science in Petroleum Engineering
BA	Bachelor of Arts	MST	Master of Science in Telecommunications
BS	Bachelor of Science	MER	Master of Energy Resources
BPHIL	Bachelor of Philosophy	MSMINE	Master of Science in Mining Engineering
BASW	Bachelor of Arts in Social Work	MPW	Master of Public Works
BSE	Bachelor of Science in Engineering	MLS	Master of Library Science
BSN	Bachelor of Science in Nursing	MSIS	Master of Science in Information Science
BSHRP	Bachelor of Science in Health Related Professions	MBA	Master of Business Administration
BSPHR	Bachelor of Science in Pharmacy	MSW	Master of Social Work
MA	Master of Arts	MURP	Master of Urban & Regional Planning
MFA	Master of Fine Arts	MPA	Master of Public Administration
MS	Master of Science	MPIA	Master of Public & International Affairs
MAT	Master of Arts in Teaching	MN	Master of Nursing
MED	Master of Education	MSN	Master of Science in Nursing
MPT	Master of Physical Therapy	MNED	Master of Nursing Education
MSBENG	Master of Science in Bioengineering	MPH	Master of Public Health
MSCHE	Master of Science in Chemical Engineering	MHA	Master of Health Administration
MSCE	Master of Science in Civil Engineering	MSHYG	Master of Science in Hygiene
MSEE	Master of Science in Electrical Engineering	MDS	Master of Dental Science
MSER	Master of Science in Energy Resources	JD	Juris Doctor
MSIE	Master of Science in Industrial Engineering	PHD	Doctor of Philosophy
MSME	Master of Science in Mechanical Engineering	DPH	Doctor of Public Health
MSMETE	Master of Science in Metallurgical Engineering	SCDHYG	Doctor of Science in Hygiene
MSMATE	Master of Science in Materials Engineering	EDD	Doctor of Education
MSMSE	Master of Science in Materials Science and Engineering	DMD	Doctor of Dental Medicine
		MD	Doctor of Medicine
		PSYD	Doctor of Psychology

TO TEST FOR AUTHENTICITY: Translucent globe icons *MUST* be visible from both sides when held toward a light source. The face of this transcript is printed on blue SCRIP-SAFE® paper. When photocopied, a latent security statement containing the institutional name and the words COPY COPY COPY appear over the face of the entire document. When this paper is touched by fresh liquid bleach, an authentic document will stain brown. A black and white or color copy of this document is not an original and should not be accepted as an official institutional document. If you have any questions about this document, please contact our office. ALTERATION OF THIS DOCUMENT MAY BE A CRIMINAL OFFENSE!

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In compliance with the Family Educational Rights and Privacy Act of 1974, as amended, this document has been released on the condition that the recipient will not permit any other party or agency to have access to this record without the written consent of the student.

RAISED SEAL NOT REQUIRED

Patricia J. Mathay
University Registrar

21-Jul-2015



This document cannot be released to a third party without the written consent of the student. This is in accordance with the Family Educational Rights and Privacy Act of 1974.

Official Transcripts

ADMITTED TO THE COLLEGE

FROM

ENTRANCE UNITS FROM West Allegheny H.S.

833-500 Y

UNIVERSITY OF PITTSBURGH

COURSE CONFERRED		DATE	HONORS	MAJOR	POINTS PER CREDIT HOUR	A SUPERIOR ATTAINMENT 4 POINTS	B ATTAINMENT ABOVE AVG 3 POINTS	C AVERAGE ATTAINMENT 2 POINTS	D TWO-THIRD AVERAGE 1 POINT	E TWO-THIRD AVERAGE 1 POINT	F TWO-THIRD AVERAGE 1 POINT	G TWO-THIRD AVERAGE 1 POINT	H TWO-THIRD AVERAGE 1 POINT	I TWO-THIRD AVERAGE 1 POINT	J TWO-THIRD AVERAGE 1 POINT	K TWO-THIRD AVERAGE 1 POINT	L TWO-THIRD AVERAGE 1 POINT	M TWO-THIRD AVERAGE 1 POINT	N TWO-THIRD AVERAGE 1 POINT
BS		4/26/78	MAGNA CUM LAUDE	BIOLOGICAL SCIENCES															
WINTER 79-76		FALL 77-78																	
COURSE	NO.	DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS	DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS	DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS
BIDL	138			ECOSYSTEM MAN	3		12.00	CMP SC	1	INT COMP PRO B	3		12.00						
CHEM	32			ORGANIC	3		9.00	GEOG	41	ENVIRON PROBS	3		12.00						
CHEM	34			ORGANIC LAB	1		4.00	LIF SC115		ENVIRONMENTAL	4		16.0						
ENG LT	82			INTR TO POETRY	3		12.00	LIF SC170		INDEP STUDIES	7		6.0						
MATH	23			ANAL GEO CAL 2	4		12.00	SP	118	PRESID RHET	3		12.00						
PED C	33			BALLET I	1		4.00												
WINTER 77-78		FALL 76-77																	
COURSE	NO.	DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS	DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS	DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS
CMP SC	41			INTERMED PROG	3		12.00	LIF SC108		GENETICS	3		12.00						
LIF SC109				GENETICS LAB	2		8.00	LIF SC112		DATA ANALYSIS	3		11.25						
PED C	6			CANOEING	1		4.00	SOC	5	SOCIETIES	3		12.00						
FALL 75-76		WINTER 76-77																	
COURSE	NO.	DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS	DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS	DEPARTMENT	COURSE NUMBER	COURSE TITLE	CREDITS	GRADE	QUALITY POINTS
ECON	10			INTRO ECON THY	3		12.00	LIF SC 22		CELL DEV LAB	4		12.00						
LIF SC125				PHYSIOLOGY	4		12.00	PHYS	11	INTRODUCT II B	3		9.00						
PHYS	12			PHYS LAB LEC A	2		8.00												

REMARKS

REMARKS

UNIVERSITY OF PITTSBURGH

Transcript Information

GRADING SYSTEM

LEVEL OF ATTAINMENT

	UNDERGRADUATE	GRADUATE	FIRST PROFESSIONAL
A+	4.00		
A	4.00	Superior	Superior
A-	3.75		Exceptional
B+	3.25		
B	3.00	Meritorious	Adequate
B-	2.75		Superior
C+	2.25		Meritorious
C	2.00	Adequate	Minimal
C-	1.75		Adequate
D+	1.25		Minimal
D	1.00	Minimal	
D-	0.75		
F	0.00	Failure	Failure

THE FOLLOWING GRADES CARRY NO QUALITY POINTS:

G	Unfinished Course Work
	Course work unfinished because of extenuating personal circumstances.
H	Honors
	Honors (exceptional) completion of course requirements.
I	Incomplete
	Incomplete course work, due to the nature of the course, clinical work, or incomplete research work in individual guidance courses or seminars.
N	Audit - Non-credit
R	Resignation - Student resigned from the University.
S	Satisfactory - Satisfactory completion of course requirements.
U	Unsatisfactory - Unsatisfactory completion of course requirements.
W	Withdrawal
Z	Invalid Grade - Invalid grade reported
**	No Grade - No grade reported.

NOTE: Course work taken prior to the Winter Term 1953-54 reflects a 3.00 grade point system in effect at that time.

DISCONTINUED GRADES:

K	Competent Attainment
P	Pass
	Satisfactory completion of an independent study, directed study, teaching of courses, individual research, and thesis or dissertation research.
Q	Qualified
WF	Withdrawal/Failing

PLUS AND MINUS GRADES:

Plus and minus grades were added to the University's grading system in the Winter term 1975-76.

SPECIAL TRANSCRIPT NOTATIONS

UHP or *UHC* preceding a Course Title indicates that the course was offered by the University Honors College.

PCHE in the Notes or Remarks area of the transcript indicates that the course was taken by the student in cooperation with the Pittsburgh Council on Higher Education cross-registration program at the college or university indicated.

Joseph M. Katz Graduate School of Business - The Master of Business Administration (MBA) full time day program adopted a modular format for its courses, including 1/2 credits, which is not reflected on the official University transcript. Details of each student's program can be obtained directly from The Joseph M. Katz Graduate School of Business.

Certificate Programs which were completed by a student are identified in the Notes, Faculty Action or Academic Degrees area of the transcript.

Official Transcripts have the seal of the Office of the University Registrar.

THREE-TERM CALENDAR

The University of Pittsburgh utilizes a three-term academic calendar that is equivalent to the semester hour system. The first professional programs operate on the semester calendar.

ACCREDITATION

The University of Pittsburgh is accredited by the Middle States Association of Colleges and Schools, Commission on Higher Education. Individual school or program accreditation may be verified by contacting the Dean's Office of the school identified on the student's record.

COURSE NUMBERING SYSTEM

001-099	- Lower Level Undergraduate
100-199	- Upper Level Undergraduate
700-799	- Lower Level (General Studies) Undergraduate
800-899	- Upper Level (General Studies) Undergraduate
500-599	- First Professional Programs - Medicine and Dental Medicine
200-299	- Master Level Graduate
300-399	- Doctoral Level Graduate
900-999	- Other (Includes Occupational/Vocational and Special Workshops)

DEGREE ABBREVIATIONS

AA	Associate of Arts	MSMFSE	Master of Science in Manufacturing Systems Engineering
AS	Associate of Science	MSPE	Master of Science in Petroleum Engineering
BA	Bachelor of Arts	MST	Master of Science in Telecommunications
BS	Bachelor of Science	MER	Master of Energy Resources
BPHIL	Bachelor of Philosophy	MSMINE	Master of Science in Mining Engineering
BASW	Bachelor of Arts in Social Work	MPW	Master of Public Works
BSE	Bachelor of Science in Engineering	MLS	Master of Library Science
BSN	Bachelor of Science in Nursing	MSIS	Master of Science in Information Science
BSHRP	Bachelor of Science in Health Related Professions	MBA	Master of Business Administration
BSPHR	Bachelor of Science in Pharmacy	MSW	Master of Social Work
MA	Master of Arts	MURP	Master of Urban & Regional Planning
MFA	Master of Fine Arts	MPA	Master of Public Administration
MS	Master of Science	MPIA	Master of Public & International Affairs
MAT	Master of Arts in Teaching	MN	Master of Nursing
MED	Master of Education	MSN	Master of Science in Nursing
MPT	Master of Physical Therapy	MNED	Master of Nursing Education
MSBENG	Master of Science in Bioengineering	MPH	Master of Public Health
MSCHE	Master of Science in Chemical Engineering	MHA	Master of Health Administration
MSCE	Master of Science in Civil Engineering	MSHYG	Master of Science in Hygiene
MSEE	Master of Science in Electrical Engineering	MDS	Master of Dental Science
MSER	Master of Science in Energy Resources	JD	Juris Doctor
MSIE	Master of Science in Industrial Engineering	PHD	Doctor of Philosophy
MSME	Master of Science in Mechanical Engineering	DPH	Doctor of Public Health
MSMETE	Master of Science in Metallurgical Engineering	SCDHYG	Doctor of Science in Hygiene
MSMATE	Master of Science in Materials Engineering	EDD	Doctor of Education
MSMSE	Master of Science in Materials Science and Engineering	DMD	Doctor of Dental Medicine
		MD	Doctor of Medicine
		PSYD	Doctor of Psychology

TO TEST FOR AUTHENTICITY: Translucent globe icons *MUST* be visible from both sides when held toward a light source. The face of this transcript is printed on blue SCRIP-SAFE® paper. When photocopied, a latent security statement containing the institutional name and the words COPY COPY COPY appear over the face of the entire document. When this paper is touched by fresh liquid bleach, an authentic document will stain brown. A black and white or color copy of this document is not an original and should not be accepted as an official institutional document. If you have any questions about this document, please contact our office. ALTERATION OF THIS DOCUMENT MAY BE A CRIMINAL OFFENSE!

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Patricia J. Mathay
University Registrar

20-Jul-2015



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Official Transcripts

Leeann Sinagoga

STUDENT ID
NUMBER
[REDACTED]

UNIVERSITY OF PITTSBURGH DEGREE(S)/CERTIFICATE(S) AWARDED

DEGREE Bachelor of Science; April 1978

DEGREE Master of Science in Hygiene; August 1983

MAJOR Environmental Health

ACAD CNTR Graduate Sch of Public Health

CAMPUS Pittsburgh

ACADEMIC GOAL(S) AT DATE OF LAST ATTENDANCE

MAJOR Not Candidate for Degree

ACAD CNTR Graduate Sch of Public Health

CAMPUS Pittsburgh

UNIVERSITY OF PITTSBURGH CREDITS

COURSE TITLE COURSE CREDIT GRADE SPECIAL NOTATION

Fall Term 1981-1982

COURSE TITLE	COURSE	CREDIT	GRADE	SPECIAL NOTATION
INT STAT MTH I	BIOST	0241	2.0	
PRIN OF EPID	EPID	0211	3.0	
APP WAT CHEM	IEHS	0233	2.0	
WAT CHEM MEAS	IEHS	0256	2.0	
HUMAN BIOLOGY	PH	0201	3.0	

Winter Term 1981-1982

COURSE TITLE	COURSE	CREDIT	GRADE	SPECIAL NOTATION
MUT MAM CHROM	BIOST	0230	3.0	
INTRASTMTH 2	BIOST	0242	2.0	
INTRO WAT QUAL	IEHS	0231	2.0	
ENVTRACEHEMAN	IEHS	0257	3.0	
IND TOX	IEHS	0268	3.0	
SURVEY RAD H	RAD H	0230	2.0	

CONTINUED ON NEXT COLUMN

UNIVERSITY OF PITTSBURGH CREDITS

COURSE TITLE COURSE CREDIT GRADE SPECIAL NOTATION

Spring Session 1981-1982

COURSE TITLE	COURSE	CREDIT	GRADE	SPECIAL NOTATION
ENVIR EPID	EPID	0218	2.0	
FIELD TRIP	IEHS	0210	1.0	
SOLID WASTE MG	IEHS	0243	2.0	
PRIN AIR RES	IEHS	0284	2.0	

Spring Term 1981-1982

COURSE TITLE	COURSE	CREDIT	GRADE	SPECIAL NOTATION
SPEC STUDIES	IEHS	0221	1.0	

Fall Term 1982-1983

COURSE TITLE	COURSE	CREDIT	GRADE	SPECIAL NOTATION
BIOMED STAT	BIOST	0248	2.0	
OCC HTLH HAZ	IEHS	0204	2.0	
SPEC STUD IEHS	IEHS	0221	3.0	
SAN OF NAT WAT	IEHS	0236	3.0	
ANAL AIR CONT	IEHS	0281	2.0	
BAS CONC OCCHL	IEHS	0285	3.0	

Winter Term 1982-1983

COURSE TITLE	COURSE	CREDIT	GRADE	SPECIAL NOTATION
ENVCHEMHAZASSM	IEHS	0215	3.0	
SPEC IND ENV	IEHS	0221	3.0	
SPEC TOPICS	IEHS	0222	1.0	
COLL ENVI HLTH	IEHS	0227	1.0	
INDUSWASTEWAT	IEHS	0239	2.0	
ENVI HLTH LAW	IEHS	0244	2.0	

Spring Session 1982-1983

COURSE TITLE	COURSE	CREDIT	GRADE	SPECIAL NOTATION
SPECIAL STUDY	IEHS	0221	3.0	

Winter Term 1988-1989

COURSE TITLE	COURSE	CREDIT	GRADE	SPECIAL NOTATION
IMMUNOTOXICOL	IEHS	0279	2.0	

END OF DOCUMENT. NO ENTRIES BELOW THIS LINE

UNIVERSITY OF PITTSBURGH

Transcript Guide

In September 2005, the University implemented a new student administration computer system resulting in the change to some historic terminology. Depending on the status of the student at the time the transcript is produced, the transcript labels may contain either current or historic terminology. These wording changes follow with the historic terminology in parentheses: Career (Level); Program (Academic Center); Plan (Major/Minor); Subplan (Area of Concentration); GPA (QPA).

GRADING POLICY

The following are grades and grade/quality points associated with each grade:

A+ 4.00	C+ 2.25
A 4.00	C 2.00
A- 3.75	C- 1.75
B+ 3.25	D+ 1.25
B 3.00	D 1.00
B- 2.75	D- 0.75
	F 0.00

The following grades carry no grade/quality points:

G	Unfinished Course Work
H	Honors
HS	High Satisfactory
I	Incomplete
LS	Low Satisfactory
N	Audit
NC	No Credit
R	Resignation
S	Satisfactory
U	Unsatisfactory
W	Withdrawal

The following are discontinued grades:

K	Competent Attainment
P	Pass
Q	Qualified
WF	Withdrawal/Failing
Z	Invalid Grade
**	No grade Reported

Note: Plus and minus grades were added to the University's grading system in the Winter Term 1975-1976. For additional grade information please see the University grading policy on line at <http://www.bc.pitt.edu/policies/policy/09/09-01-01.html>

SPECIAL NOTATIONS (Applies only to students who attended prior to Fall Term 2005-2006).

1. Indicates that the course was repeated. The credits and quality points earned in this course are not used in the calculation of the QPA.
2. Indicates that the course was offered through the University Honors College
3. Indicates that the course was taken at one or more of the institutions participating in the University of Pittsburgh cross-registration program.

Decode for the abbreviations are:

CAR	Carlow University (formerly Carlow College)
CMU	Carnegie-Mellon University
CHA	Chatham University (formerly Chatham College)
CCA	Community College of Allegheny County
DUQ	Duquesne University
LAR	La Roche College
PTS	Pittsburgh Theological Seminary
PPU	Point Park University (formerly Point Park College)
RMU	Robert Morris University (formerly RMC Robert Morris College)
SE	Seton Hill University (formerly Seton Hill College)
WC	Westmoreland County Community College

GPA/QPA POLICY: Prior to the Fall Term 2005-2006, the University cumulative Quality Point Average (QPA) was calculated based on all University of Pittsburgh courses relevant to the student's degree goal(s). Effective with the Fall Term 2005-2006, the cumulative Grade Point Average (GPA) is associated with credits completed at the Career Level. For additional QPA/GPA information, please see the University GPA/QPA policy on line at <http://www.bc.pitt.edu/policies/policy/09/09-01-02.html>

THREE-TERM CALENDAR: The University of Pittsburgh utilizes a three-term academic calendar which is equivalent to the semester-hour system. The first professional programs operate on the semester calendar.

ACCREDITATION: The University of Pittsburgh is accredited by the Middle States Association of Colleges and Schools, Commission on Higher Education. Individual school or program accreditation may be verified by contacting the Dean's Office of the Academic Center/Program identified on the student's record.

DEGREES AWARDED FROM OTHER INSTITUTIONS: Any information displayed reflecting degrees awarded by other institutions should be verified with the awarding institution for accuracy.

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COURSE NUMBERING SYSTEM Effective Fall Term 1990-1991

0001-0999 and 7000-7999	Lower Level Undergraduate
1000-1999 and 8000-8999	Upper Level Undergraduate
2000-2999	Master Level Graduate
3000-3999	Doctoral Level Graduate
4000-4999	Noncredit
5000-5999	First Professional Programs (Medicine, Dental Medicine, Law)
6000-6999	Career Development Undergraduate
9000-9999	Career Development Graduate

Prior to Fall Term 1990-1991

0001-0099	Lower Level Undergraduate
0010-0099	First Year Sectioned Courses (Law)
0100-0199	Upper Level Undergraduate
0100-0399	Upper Level Electives (Law)
0200-0299	Master Level Graduate
0300-0399	Doctoral Level Graduate
0400-0499	Third Year Limited Enrollment Courses (Law)
0500-0599	First Professional Programs (Medicine and Dental Medicine)
0500-0699	Upper Division Seminars (Law)
0700-0799	Lower Level (General Studies)
0800-0899	Upper Level (General Studies)
0900-0999	Other
0900-0999	Activities for Credit (Law)

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Patricia J. Mathay



Patricia J. Mathay
University Registrar

20-Jul-2015

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Official Transcripts

PROJECT SUMMARIES



**Human Health Risk Assessment of Shoreline Surface Waters, Sediments and Groundwater
NCBC Davisville
Davisville, Rhode Island**

Tetra Tech conducted a Remedial Investigation of a groundwater plume contaminated with volatile organic chemicals (VOCs) that discharged at a shoreline along a recreational area in Rhode Island. The shoreline is downgradient of an area once used for disposal of DANC (Decontaminating Agent, Non-Corrosive). The shoreline area, located along Narragansett Bay and Allen Harbor, is used extensively by the surrounding community for recreational purposes. For example, a yacht club is located in the immediate vicinity of the discharge area and there is evidence that shell-fishing is occurring along the shoreline.

As part of this Remedial Investigation, Tetra Tech prepared a human health risk assessment for exposure to a volatile organic chemical (VOC) plume. The risk assessment was conducted in accordance with USEPA and Rhode Island Department of Environmental Management risk assessment guidance established under the Comprehensive Environmental Response Compensation and Liability Act [CERCLA]. The risk assessment addressed the migration of VOCs in groundwater from the source area to the shoreline and the magnitude of the concentrations discharging to the shoreline. Through an extensive hydrogeological investigation and environmental sampling program, Tetra Tech determined where the discharges of VOCs occurred. Based on the tidal cycle, Tetra Tech determined when discharge was maximized. VOCs concentrations varied significantly within the water column above the sediment. Consequently, recreators wading along the shoreline at low tide, when the groundwater discharge was maximized, were exposed to higher VOC concentrations in the shoreline surface water than recreators swimming along the shoreline at high tide. The assessment considered both surface water and sediment exposures occurring during wading or swimming (incidental ingestion, dermal contact). Additionally, because shell-fishing was evident along the shoreline, the assessment also considered shell-fishermen's exposures to the shallow groundwater plume (incidental ingestion and dermal contact with the shallow groundwater and sediments and consumption of shellfish). The results of the risk assessment were used, in part, to determine whether the posted "No Wading/No Swimming" signs used to alert the local community of a potential public health threat were warranted. The results of on-going risk assessment and risk management activities were routinely communicated to the local township authorities and to the community through periodic public meetings and through the posting of fact sheets in recreational areas along the shoreline.



TETRA TECH

Vapor Intrusion Monitoring and Sub-Slab Depressurization System Operations
Confidential Client
Baltimore, MD

Tetra Tech investigated chlorinated volatile organic compound (VOC) contamination in sub-slab vapor to evaluate potential sub-slab VOC migration into workspace air at an industrial facility in Baltimore, MD. Locations for the initial air sampling inside the facility were focused where VOC contamination was observed in underlying groundwater. Over time, monitoring has expanded across the buildings' footprints delineating the nature and extent of sub-slab contamination. Additionally, Tetra Tech conducted an indoor air survey using a HAPSITE field-portable gas chromatogram/mass spectrometer (GC/MS) to locate indoor sources of VOCs and identify sub-slab conduits for vapor intrusion.

Tetra Tech designed and installed two sub-slab depressurization systems (SSDSs) at locations where data indicated elevated concentrations of VOCs in sub-slab vapor and the presence of vapor intrusion. The SSDSs were later expanded based on the findings of the on-going investigation to capture locations that had shown persistently high concentrations of chlorinated VOCs. The complete SSD systems were installed and operational within six weeks of project authorization. Tetra Tech currently performs the operation, monitoring, and maintenance (OMM) of these systems.

Tetra Tech developed a Vapor Intrusion Management Plan to assist in managing potential risks associated with vapor intrusion. Moreover, as vapor intrusion guidance and sampling and analytical methodologies have evolved, Tetra Tech has stayed abreast of these developments and has modified the investigation accordingly. Tetra Tech has worked closely with the client to develop presentations and fact sheets so they can effectively communicate investigation results to the employees. Tetra Tech and the client have also worked closely with the Maryland Department of the Environment to keep them aware of the findings.



**Public Health Evaluation
Naval Support Activity Naples
Naples, Italy**

For more than a decade, Naples and the Campania Region of Italy have experienced numerous challenges with garbage collection, dumping of illegal waste, and open burning of trash. The Italian government has been unable to resolve the situation due to political and legal challenges. Although various Italian health agencies have conducted environmental health studies, they are considered incomplete because they did not meet acceptable scientific protocols.

Tetra Tech was retained to complete a Public Health Evaluation (PHE) to identify and characterize the Navy-occupied areas in the Naples region most affected by improper refuse and hazardous waste disposal practices. The PHE evaluated ambient air, soil gas, surface soil, and drinking water at various sites in the Naples Region. Nine air monitoring stations and a meteorological tower across a 400 square mile area within the Province of Naples were employed during the investigation. The presence of chlorinated hydrocarbons in irrigation well samples, tap water samples, and passive soil gas samples collected during the first phase of the investigation triggered the need to collect active soil gas samples at government buildings and residential properties during the second phase of the investigation.

The government building investigation entailed collecting active soil gas, indoor air, and ambient air to assess the potential for vapor intrusion. Indoor air samples were collected from a variety of buildings, including an on-base high school and an on-base child development center. The indoor air quality investigations indicated that the child development center was the only location where chlorinated hydrocarbons in indoor air could potentially be attributable to vapor intrusion. Although human health risks associated with exposure to the concentrations that were detected in indoor air would be considered acceptable, the Navy elected to take precautionary measures, including installation of a sub-slab depressurization system.

Soil gas samples were also collected at approximately 300 residential properties during this investigation. The scheduling and sampling of residential properties required coordination among various commands within the Navy to ensure that residents were present during sampling. The investigation also required attaining approval from Italian landlords to enter their homes for active soil gas sampling. Bilingual staff was hired to support and coordinate this sampling effort. In addition, contract requirements mandated that sample analysis be conducted outside of Italy and be conducted using US EPA methods. Tetra Tech coordinated with a laboratory in Germany to meet these requirements.

A Screening Level Human Health Risk Assessment was conducted for the individual residential properties using the active soil gas results and the regional ambient air data. In some instances, the results suggested that some residents should consider relocation. Site-specific risk assessment assumptions were employed in concert with sound risk management principles to determine appropriate actions and future enduring processes for the base.



TETRA TECH

Ecological Risk Assessment and Development of Site-Specific Ecological Cleanup Goals

**United States Department of Agriculture, Beltsville Agricultural Research Center
Beltsville, Maryland (2007 – 2008)**

Tetra Tech conducted a study to determine the ecological risks to invertebrates and small mammals resulting from exposure to DDD, DDE, DDT, and dieldrin in soil in areas where pesticides were stored, mixed, and/or applied to the soil. The general tasks included preparing a work plan, collecting data, calculating ecological risks, and developing site-specific ecological cleanup levels. The study included collection of: 1) soil invertebrates and small mammals for tissue analysis; 2) soil samples for chemical analysis; and, 3) soil samples for the conduct of earthworm bioaccumulation tests.

The data from the study were first used to calculate risks to mammals and birds. Based on the results of the data evaluation, it was determined that risks were greatest to small mammals and birds that consume soil invertebrates; risks to higher trophic level receptors such as hawks and fox were acceptable. Therefore, site-specific cleanup levels were developed for the protection of small insectivorous birds and mammals. This was done by first calculating soil to invertebrate bioaccumulation factors (BAFs), and then using the BAFs to back-calculate soil concentrations that were protective of the small mammals and birds. Having site-specific cleanup levels ensures that the cleanup would be protective of ecological receptors, which is not necessarily the case when only conservative screening levels are used. The study was conducted in close coordination with Region 3 EPA's risk assessors to meet an expedited schedule. To do this, Tetra Tech worked closely with EPA to verbally agree on scope and methodology while simultaneously preparing a written work plan for the field sampling.



TETRA TECH

**Radiological CERCLA Human Health Risk Assessment
Safety Light Corporation
Bloomsburg, Pennsylvania**

Safety Light Corporation manufactured self-illuminated watches and instrument dials, smoke detectors, exit signs, and other merchandise containing radioactive materials. Wastes generated at the site included solid and liquid waste streams contaminated with radioactive materials such as radium-226, strontium-90, cesium-137, and tritium. The USEPA added the Safety Light Corporation site to the National Priorities List in 2005.

Tetra Tech prepared a risk assessment associated with the exposure to offsite surface soil from areas adjoining the Safety Light Corporation site. Eleven different exposure units, including several residential lots, were evaluated. Risks associated with residential exposure to soil through ingestion, inhalation, and external radiation exposure were quantified. In addition, risks associated with the consumption of produce grown in these soils were also quantified. The risk assessment was conducted using a risk ratio technique in conjunction with preliminary remediation goals published by the USEPA for radionuclides based upon exposure for a future hypothetical resident and exposure point concentrations of radionuclides derived using USEPA ProUCL software and guidance. Background data collected by the US Army Corps of Engineers in 2015 and background data collected for the site's Remedial Investigation were used to help distinguish site-related risks.

EXAMPLE RISK ASSESSMENT

TECHNICAL MEMORANDUM

TO: Andy Frebowitz
FROM: Lee Ann Sinagoga
RE: Human Health Risk Assessment of Radionuclide Results for
Surface Soil Samples Collected from Areas/Residential Lots Adjoining
[REDACTED] Corporation CERCLA Site

Section 1 Introduction

This technical memorandum provides the results of a human health risk assessment (HHRA) of radionuclide data for soil samples collected from areas adjoining the [REDACTED] Corporation (SLC) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site in [REDACTED], [REDACTED]. The soil samples were collected from 0 to 6 inches below ground surface (bgs) in April 2015 and analyzed using the methods specified below. Analytical results, reported for the following target radionuclides (**Table A**), were validated per United States Environmental Protection Agency (USEPA) protocol and are summarized in **Table B**:

Table A
Target Analyte List Radionuclides

Radionuclide	Is the radionuclide site-related based on site history? ¹	Analytical Method
• Actinium-228 (Ac-228)	Ra-228 decay progeny.	LANL ER-130 Modified
• Bismuth-214 (Bi-214)	Ra-226 decay progeny.	LANL ER-130 Modified
• Carbon-14 (C-14)	Yes	EPA 520.0 Modified
• Cesium-137 (Cs-137)	Yes	LANL ER-130 Modified
• Hydrogen-3 (H-3)	Yes	LANL ER-210 Modified
• Potassium-40 (K-40)	No	LANL ER-130 Modified
• Nickel-63 (Ni-63)	Yes	ASTM 3500-Ni Modified
• Lead-210,-212,-214 (Pb-210, -212, -214)	Pb-210 (Yes) Pb-210 is also a Ra-226 decay progeny. Pb-212 is Ra-228 decay progeny. PB-214 is Ra-226 decay progeny.	LANL ER-130 Modified EML Pb-01 Modified
• Radium-226,-228 (Ra-226, -228)	Ra-226 (Yes)	LANL ER-130 Modified
• Strontium-90 (Sr-90)	Yes	EiChroM SRW01 Modified

• Thorium-234 (Th-234)	No (Present because uranium, a naturally occurring radionuclide, is likely present.)	LANL ER-130 Modified
• Thallium-208 (Tl-208)	Th-232 decay progeny. Th-232 is not site related.	LANL ER-130 Modified

1: Section 1.3 of the Remedial Investigation report discusses radiological isotopes of concern attributable to site activities. Site records and NRC licenses were reviewed to determine which isotopes were used at the site. Since 1969, SLC was authorized to possess only H-3. Therefore, using the rule of thumb that after 10 half-lives the element is no longer radioactive, any radionuclide other than H-3 with a half-life shorter than 3.6 years (and which, therefore will have undergone 10 half-lives since 1969) would have decayed away. All isotopes which were used at the site and have not undergone decay of 10 half-lives were considered site-related.

The sampled locations are depicted on **Figure A** and briefly described in the following table along with the results of the gamma radiation walk over survey conducted in June 2015:

Table C
Sample Locations

Sample Location Identifier(s) on Figure A	Address or Descriptions of Sample Location(s) on Figure A	Gamma Radiation Survey Results (recorded as counts per minute)
RS-01 and RS-02	VWP lot, East of site	12,000 to 15,000
RS-03 and RS-04	4188 Old Berwick Road (OBR), East of site	10,000 to 12,000
RS-05	1231 River Lane, East of site	10,000 to 12,000
RS-06	4051 OBR, North of site	12,000 to 15,000
RS-07	4061 OBR, North of site	10,000 to 12,000
RS-08	4065 OBR, North of site	Not available.
RS-09	4071 OBR, North of site	10,000 to 12,000
RS-10 and RS-11	4119 OBR, North of site	12,000 to 15,000
RS-12	4159 OBR, North of site	12,000 to 15,000
RS-A1 through RS-A13	4050 OBR, Samples from 13 locations immediately west of the locations RS-B1 through RS-B13.	10,000 to 12,000
RS-B1 through RS-B13	4050 OBR, Samples from 13 locations from strip of property immediately west of site.	Some locations with >15,000 counts.

Section 2 Risk Estimation Methodology

The HHRA was conducted using the following risk ratio technique, preliminary remediation goals (PRGs) published by the USEPA for radionuclides, and exposure point concentrations (EPCs) calculated for the radionuclides detected in soil samples collected from areas adjoining the SLC Site:

$$\frac{\text{USEPA PRG}}{\text{EPC}} = \frac{\text{Cancer Risk Estimate of } 1 \times 10^{-6}}{\text{?? Cancer risk Estimate}}$$

Using this simple technique, a cancer risk estimate may be calculated by multiplying the EPC for a radionuclide by 1×10^{-6} and then dividing that product by the PRG for that radionuclide. A cumulative cancer risk estimate may be calculated by summing the risk estimates determined for each radionuclide. This technique is referred to as the "sum of ratios" approach for calculating risk (Section 5.15.2 of the *USEPA Regional Screening Level Table User's Guide* [USEPA, June 2015]).

The PRGs used in the HHRA are those published by the USEPA at: <http://epa-prgs.oem.gov/radionuclides/> (*Preliminary Remediation Goals for Radionuclides*) (**Attachment A**). PRGs are isotope concentrations that correspond to the one-in-one million chance or probability of developing cancer as a consequence of exposure. The values used in this HHRA were calculated by the USEPA assuming that a resident may be exposed to radionuclides in soils via the following pathways:

- Incidental ingestion of soils (e.g., soils adhering to the hand of a resident after yard work).
- Inhalation of soil particulates entrained in the air as a consequence dispersion via the wind.
- External radiation from radionuclides emitting gamma rays.
- Ingestion of produce grown in soils.

PRGs used in this HHRA are those listed in the PRG table with a '+D' designation (when available) indicating that they consider the contributions of short-lived decay chain products. The use of such PRGs assumes that the isotopes are in secular equilibrium. Per the guidance in the *User's Guide for Preliminary Remediation Goals for Radionuclides*, in the absence of empirical data otherwise, the PRG values with the '+D' designation "should be used unless there are compelling reasons not to." Therefore, the cancer risk estimates presented in this HHRA were calculated using the following PRGs and decay chain assumptions:

Table D
PRGs Used in HHRA

Parent Radionuclide (Used for PRG Calculation)	Relevant Decay Chain Assumptions	PRG (All Exposure Pathways)	PRG (All Exposure Pathways Except Ingestion of Produce)	Is the external radiation exposure pathway significant to the PRG (minus the consumption of vegetation pathway)?
Ra-228+D	Ac-228 is in the associated decay chain for Ra-228.	1.22E-02	8.82E-02	Yes
C-14	C-14	1.47E-01	3.17E+02	No
Cs-137+D	Cs-137	4.7E-02	6.05E-02	Yes
H-3	H-3	2.25E-01	2.37E-01	No
K-40	K-40	3.97E-02	1.44E-01	Yes

Ni-63	Ni-63	6.66E+00	5.72E+02	No
Pb-210	Pb-210	7.72E-03	7.54E-01	No
Ra-226+D	Bi-214 and Pb-214 are in the associated decay chain for Ra-226.	6.43E-03	1.38E-02	Yes
Sr- 90+D	Sr-90	6.36E-02	4.20E+00	Yes
U238-D	Th-234 is in the associated decay chain for U-238.	4.96E-02	7.98E-01	Yes
Th-232+D	Pb-212 and Tl-208 are in the associated decay chain.	3.59E-03	2.68E-02	Yes
U-234 (Activity Concentration = U-238)	Th-234 is in the associated decay chain for U-238. U-234 is the terminal radionuclide for the U-238 decay chain.	6.61E-02	5.83E+00	No

PRGs presented as picocuries per gram (pCi/gm).

While **Table B** presents analytical results for Ac-228, Bi-214, Pb-212, Pb-214, Th-234, and Tl-208, separate cancer risk estimates are not calculated for these radionuclides because they are accounted for in the decay chains of the parent radionuclides listed above. Uranium-238 (U-238), a naturally occurring radionuclide, is included above because Th-234 was detected in the soil samples, an indication that U-238 is present (i.e., Th-234 is in the associated decay chain for U-238). U-234, another naturally occurring radionuclide, is included above because it is the terminal radionuclide in the U-238 decay chain and, assuming secular equilibrium, should be present in the soils at radionuclide concentrations equal to those estimated for U-238. The exposure assumptions (e.g., days per years of exposure) used to calculate the PRGs are those specified in the Users' Guide.

The EPCs evaluated in this HHRA (**Attachment B**) were calculated using USEPA ProUCL software (Version 5.0.00) except that the maximum detected concentration was selected as the EPC if less than 4 positive detections were reported for a radionuclide for an exposure unit (e.g., a single residential lot) being evaluated. In that case, the maximum detected concentration was selected as the EPC.

The HHRA was conducted in a step-wise manner (Case 1 through Case 4 described below) to provide an understanding of the risks associated with site-related radionuclides versus those most likely reflective of background conditions, the impact of elevated detection limits, and the impact of the inclusion of the ingestion of produce grown in soils exposure pathway on HHRA results:

- **Case 1:** Risk estimates were calculated for *all radionuclides* presented in **Table D**. The EPCs for radionuclides not detected were set equal to one-half the minimum detected activity (MDA). Risk estimates were based on PRGs developed assuming exposure via *all* four exposure pathways listed above.
- **Case 2:** Risk estimates were calculated for **Table D radionuclides identified as site-related** in Section 1 of the RI report (see **Table A**). The EPCs and PRGs used to calculate risk estimates for Step 1 were also used to calculate risk estimates for Step 2.
- **Case 3A:** Risk estimates were calculated for **Table D radionuclides identified as site-related and detected at concentrations exceeding background concentrations or where one-half the MDA value for a non-detect results exceeded background concentrations**. The EPCs and PRGs used to calculate risk estimates for Step 1 were also used to calculate risk estimates for Step 3.
- **Case 3B:** Risk estimates were calculated for **Table D positively detected radionuclides identified as site-related and detected at concentrations exceeding background concentrations**. The EPCs and PRGs used to calculate risk estimates for Step 1 were also used to calculate risk estimates for Step 3.
- **Case 4:** Risk estimates were calculated for *radionuclides identified as site-related and detected at concentrations exceeding background concentrations or where one-half the MDA value for a non-detect results exceeded background concentrations*. The EPCs used to calculate risk estimates for Step 1 were also used to calculate risk estimates for Step 4. However, risk estimates were based on the USEPA PRGs adjusted to assume that exposure only occurs via three of the four exposure pathways listed above; the adjusted PRGs did not consider exposure via the ingestion of produce grown in soils.

A radionuclide was considered to be present at concentrations exceeding background if the maximum detected concentration exceeded the upper prediction limit (UPL) calculated for one of two background data sets available for the SLC site (**Attachment C**):

- Sixty background soil samples collected by the United States Army Corps of Engineers (USACE)-Baltimore District in 2015 (USACE, June 2015). USEPA ProUCL software (Version 5.0.00) was used calculate UPLs for the following radionuclides reported for that dataset: Ra-226, Bi-212, Pb-212, Ra-228, Tl-208, Th-234, U-235, and K-40.
- Seven background soil samples collected in 2008 during the remedial investigation field event. USEPA ProUCL software (Version 5.0.00) was used to calculate UPLs for the following radionuclides reported for that dataset: Ac-227, C-14, Cs-137, Pb-210, neptunium (Np)-237, Ra-226, Sr-90, Tl-204, tritium (H3) and U-238. Data available for 20 additional background soil samples collected in 2008 were rejected during data validation were not used in the calculation of the UPL.

Section 3 Results

The results of the HHRA are summarized in **Table E** and **Figure B**, and detailed in the spreadsheets in **Attachment D (Spreadsheets D-1 through D-11)**. As points of reference, the cancer risk estimates calculated assuming a receptor is exposed to *all* of the radionuclides in **Table D** at the UPL and arithmetic mean background concentrations are 2×10^{-3} and 1×10^{-3} , respectively. The cancer risk estimates calculated assuming a receptor is exposed only to the site-related radionuclides in **Table D** at the UPL and arithmetic mean background concentrations are 6×10^{-4} and 3×10^{-4} , respectively.

Risk estimates for *all* radionuclides (Case 1) and only those identified as *site-related* radionuclides (Case 2) exceed the USEPA target cancer risk range (1×10^{-4} to 1×10^{-6}) for all exposure units evaluated. However, as noted above, so do the risk estimates calculated for background concentrations. The risk estimates calculated for all radionuclides (Case 1) for the Group B and VWP exposure units exceed the risk estimate based on the background UPL values; risk estimates for the other exposure units do not. The risk estimates calculated for the site-related radionuclides only (Case 2) for the Group A, Group B, 4119 OBR, 4188 OBR, and VWP exposure units exceed the risk estimate based on the background UPL values; risk estimates for the other exposure units do not.

Risk estimates calculated only for the site-related radionuclides detected above background UPLs (Case 3) for the following six exposure units do not exceed the target risk range: 1231-River Rd, 4051-OBR, 4061-OBR, 4065-OBR, 4071-OBR, and 4159-OBR. The 1231-River Rd exposure unit is a residential lot to the east of the Site; it does not directly border the site. The five referenced exposure units along Old Berwick Road (OBR) are to the north of the site.

The risk estimate calculated only for site-related radionuclides exceeding background UPLs (Case 3: 7×10^{-4}) for the Group A samples does exceed the target risk range. Ra-226, Pb-210, and H-3 are the primary site-related radionuclides contributing to the risk. Several site-related radionuclides were detected at maximum concentrations exceeding the background UPL, where available:

Table F

Group A Versus Background

Radionuclide	Maximum Detected Concentration	EPC	Background UPL	Background Maximum
C-14	3.82	3.62	0.194	0.194
CS-137	0.89	0.61	0.515	0.444
H-3	31.6 (one detection only)	31.6	5.851	5.6
Pb-210	2.47	1.58	2.084	1.92

Ra-226	2.45	1.65	1.52	1.95
Sr-90	2.32	1.07	0.728	0.698

All concentrations presented as pCi/gm.

However, the background exceedances appear to be marginal in most cases. For example, as detailed in **Attachment D**, the maximum Ra-226 concentration is within the background range reported for the United States. Additionally, H-3 was detected in one sample only and at a concentration marginally exceeding the method detection limit. H-3 is a very volatile radionuclide and is expected to dissipate rapidly once released to the environment. Therefore, in the absence of continuing contamination from a source, its presence in the Group A surface soil samples is somewhat suspect. The risk estimate for the Group A samples does not exceed the risk range if the PRG does not consider the ingestion-of-produce grown in soils exposure pathway (Case 4). The Group A samples were collected from a strip of land immediately west of the Group B samples locations. None of the Gamma Radiation Survey readings in that area exceeded 12,000 counts per minute.

The risk estimates for the Group B samples exceed the target risk range regardless of the case evaluated. Ra-226 and Pb-210 are the primary site-related radionuclides contributing to the risk. Several of the site-related radionuclides exceed the background UPL values:

Table G
Group B Versus Background

Radionuclide	Maximum Detected Concentration	EPC	Background UPL
C-14	3.2	3.2	0.194
CS-137	0.99	0.99	0.515
Pb-210	9.22	3.81	2.084
Ra-226	12.31	7.22	1.52
Sr-90	1.98	1.06	0.728

All concentrations presented as pCi/gm.

In contrast to Group A, the Ra-226 and Pb-210 results for this dataset clearly exceed background. Group B samples were collected from a strip of land immediately west of the site and immediately east of the Group A samples. Several of the Gamma Radiation Survey readings in this area exceeded 15,000 counts per minute.

The risk estimates for the 4119-OB, VWP, and 4188-OB exposure units exceed the target risk range regardless of the case evaluated. One or more of the site-related radionuclides exceed the background UPL values:

Table H

4119-OBR, VWP, 4188-OBR Versus Background

Radionuclide	Maximum Detected Concentration 4119-OBR	Maximum Detected Concentration VWP	Maximum Detected Concentration 4188-OBR	Background UPL	Maximum Detected Background Concentration
CS-137	3.4	27.19	1.4	0.515	0.444
H-3	ND	ND	33.69	5.851	5.6
Pb-210	2.07	10.29	2.36	2.084	1.92
Ra-226	1.76	4.68	1.16	1.52	1.95
Sr-90	0.86	1.59	0.66	0.728	0.698

All concentrations presented as pCi/gm.

The risk estimates are driven primarily by Ra-226, Sr-90, Pb-210, and H-3. However, the maximum detected Ra-226 and Sr-90 concentrations reported for the 4119-OBR lot do not exceed or marginally exceed, respectively, the maximum detected site background concentrations. As detailed in **Attachment D**, the maximum Ra-226 concentration reported for lot 4119-OBR is also within the background range reported for the United States. (The cancer risk estimate for detected site related radionuclides exceeding background for the 4119-OBR lot does not exceed the target risk range if Ra-226 and Sr-90 are eliminated from the risk calculations.) The background exceedance reported for Pb-210 for the 4188-OBR lot is also marginal. Additionally, H-3 is a volatile radionuclide expected to dissipate rapidly once released to the environment. Therefore, in the absence of continuing contamination from a source, its presence in the surface soil samples from the 4188-OBR lot is somewhat suspect. (The cancer risk estimate for detected site related radionuclides exceeding background for the 4118-OBR lot does not exceed the target risk range if H-3 and Pb-210 are eliminated from the risk calculations.) In contrast, the maximum Cs-137 concentration for the 4119-OBR lot clearly exceeds background as do several radionuclides detected in the surface soil samples collected from the VWP lot. The 4119-OBR lot is located immediately north of the Site. The other two lots are located immediately east of the Site.

Section 4 Summary and Conclusions

This technical memorandum provides a HHRA of the radionuclide data for surface soil samples collected in 2015 from areas adjoining the **██████████** CERCLA site in **██████████**. Eleven different exposure units (including several residential lots) were evaluated.

The HHRA was conducted using a simple risk ratio technique, PRGs published by the USEPA for radionuclides assuming that a hypothetical future resident may be exposed to the soils (<http://epa-prgs.ornl.gov/radionuclides/>), and EPCs calculated for (or selected for) each exposure using USEPA ProUCL guidance and software. The USEPA PRGs represent the one-in-one million cancer risk level.

Thus, the cancer risk estimate for an individual radionuclide was calculated by multiplying the EPC for a radionuclide by 1×10^{-6} and then dividing that product by the PRG for that radionuclide. The cumulative cancer risk estimate for an exposure unit was calculated by summing the risk estimates determined for each radionuclide. This technique is referred to as the “sum of ratios” approach for calculating risk (Section 5.15.2 of the *USEPA Regional Screening Level Table User's Guide* [USEPA, June 2015]).

The HHRA was conducted in a step-wise manner to provide an understanding of the risks associated with site-related radionuclides versus those most likely reflective of background conditions, the impact of elevated detection limits, and the impact of the inclusion of the ingestion of produce grown in soils exposure pathway on HHRA results. The results of the HHRA are provided in **Table E** and **Figure B**, and summarized below:

- The total cancer risk estimates developed for each of the exposure units (assuming exposure to both naturally occurring and site-related radionuclide concentrations) exceed the USEPA target cancer risk range. However, several naturally occurring radionuclides (e.g., U-238, U-234, and K-40, detected or assumed to be present based on the available data) and site-related radionuclides detected at background concentrations (in some cases) contribute significantly to those estimates.
- Risk estimates developed for the following exposure units (residential lots) assuming receptor exposure only to those site-related radionuclides present at concentrations exceeding background concentrations do not exceed the risk range: 1231-River Rd, 4051-OBR, 4061-OBR, 4065-OBR, 4071-OBR, and 4159-OBR.
- Risk estimates developed for the Group A and Group B areas (to the west of the site) assuming receptor exposure only to those site-related radionuclide present at concentrations exceeding background concentrations exceed the risk range. However, the risk estimate calculated for Group A area using USEPA PRGs adjusted so the PRGs do not consider the ingestion of home-grown produce pathway does not. Several site-related radionuclides were detected in these areas at concentrations exceeding background concentrations. The risk estimates developed for the following site-related radionuclides (detected at concentrations exceeding background) exceed 1×10^{-4} : H-3, Pb-210, Ra-226. However, the Ra-266 results are most noteworthy in terms of background exceedances, particularly when the data for Group B samples are evaluated.
- Risk estimates developed for the 4119-OBR, VWP, and 4188-OBR exposure units, assuming receptor exposure only to those site-related radionuclides detected at concentrations exceeding background, exceed the risk range. The risk estimates developed for the following site-related radionuclides (detected at concentrations exceeding background) for one or more of these lots exceed 1×10^{-4} : H-3, Pb-210, Cs-137, Ra-226, Sr-90. However, the Ra-226 and Cs-137 results are most noteworthy in terms of background exceedances, particularly when the data for the VWP exposure unit are evaluated. The background exceedances reported for most of the risk drivers of

the risk estimates developed for the 4119-OBR and 4188-OBR exposure units (Pb-210, Ra-226, and Sr-90) are marginal.

TABLE B
RESIDENTIAL SAMPLE RESULTS
PAGE 1 OF 7

Radionuclide	SLC-RS-042115-01/VWP	SLC-RS-042115-02/VWP	SLC-RS-042115-03/4188 OBR	SLC-RS-042115-04/4188 OBR	SLC-RS-042215-05/1231 River Ln
Ac-228	1.72	2.33	2.23	1.48	1.99
Bi-214	7.47	1.96	1.96	1.47	1.54
C-14	<MDA	<MDA	<MDA	<MDA	ND
Cs-137	1.73	27.19	1.40	1.37	0.89
H-3	<MDA	<MDA	<MDA	33.69	<MDA
K-40	16.73	27.77	22.47	14.33	18.37
Ni-63	<MDA	<MDA	<MDA	<MDA	<MDA
Pb-210	10.29	2.24	1.59	2.36	0.92
Pb-212	2.09	2.76	2.59	1.57	2.21
Pb-214	8.49	2.13	2.35	1.57	1.74
Ra-226	4.68	1.45	1.16	0.99	1.22
Sr-90	<MDA	1.59	<MDA	<MDA	1.38
Th-234	2.99	<MDA	<MDA	4.09	5.35
Tl-208	1.61	2.29	2.02	1.28	1.05

Notes

All results in picocuries per gram (pCi/g)

Ac-228 = Actinium-228

Bi-214 = Bismuth-214

C-14 = Carbon-14

Cs-137 = Cesium-137

H-3 = Tritium

K-40 = Potassium-40

MDA = Minimum Detectable Activity

ND = Not Detected

Ni-63 = Nickel-63

OBR = Old Berwick Rd

Pb-210 = Lead-210

Pb-212 = Lead-212

Pb-214 = Lead-214

Ra-226 = Radium-226

RS = Residential Soil

SLC = Safety Light Corp Site

Sr-90 = Strontium-90

Th-234 = Thorium-234

Tl-208 = Thallium-208

VWP = Vance Walton Property

TABLE B
RESIDENTIAL SAMPLE RESULTS
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Radionuclide	SLC-RS-042215-06/4051 OBR	SLC-RS-042215-07/4061 OBR	SLC-RS-042215-08/4065 OBR	SLC-RS-042215-09/4071 OBR	SLC-RS-042215-10/4119 OBR
Ac-228	1.85	1.96	1.09	1.09	1.34
Bi-214	1.35	1.21	1.06	1.26	1.32
C-14	<MDA	<MDA	<MDA	<MDA	<MDA
Cs-137	<MDA	<MDA	0.13	0.56	0.71
H-3	<MDA	<MDA	<MDA	<MDA	<MDA
K-40	35.68	31.19	17.41	14.68	13.28
Ni-63	2.26	<MDA	<MDA	<MDA	<MDA
Pb-210	1.13	1.09	1.55	1.25	1.41
Pb-212	2.69	2.44	1.20	1.63	1.58
Pb-214	1.62	1.31	1.22	1.51	1.48
Ra-226	1.24	0.93	1.13	0.89	0.72
Sr-90	1.02	ND	<MDA	<MDA	<MDA
Th-234	<MDA	<MDA	1.72	4.53	3.59
Tl-208	1.83	1.44	0.86	1.32	1.36

Notes

AR results in picocuries per gram (pCi/g)

Ac-228 = Actinium-228

Bi-214 = Bismuth-214

C-14 = Carbon-14

Cs-137 = Cesium-137

H-3 = Tritium

K-40 = Potassium-40

MDA = Minimum Detectable Activity

ND = Not Detected

Ni-63 = Nickel-63

OBR = Old Berwick Rd

Pb-210 = Lead-210

Pb-212 = Lead-212

Pb-214 = Lead-214

Ra-226 = Radium-226

RS = Residential Soil

SLC = Safety Light Corp Site

Sr-90 = Strontium-90

Th-234 = Thorium-234

Tl-208 = Thallium-208

VWP = Vance Walton Property

TABLE B
RESIDENTIAL SAMPLE RESULTS
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Radionuclide	SLC-R5-042215-11/4119 OBR	SLC-R5-042215-12/4159 OBR
Ac-228	1.20	2.06
Bi-214	1.47	1.61
C-14	ND	<MDA
Cs-137	3.40	0.40
H-3	<MDA	<MDA
K-40	17.94	29.37
Ni-63	<MDA	<MDA
Pb-210	2.07	0.88
Pb-212	1.70	2.37
Pb-214	1.50	1.70
Ra-226	1.76	1.26
Sr-90	0.86	<MDA
Th-234	<MDA	<MDA
Tl-208	1.24	1.91

Notes:

All results in picocuries per gram (pCi/g)

Ac-228 = Actinium-228

Bi-214 = Bismuth-214

C-14 = Carbon-14

Cs-137 = Cesium-137

H-3 = Tritium

K-40 = Potassium-40

MDA = Minimum Detectable Activity

ND = Not Detected

Ni-63 = Nickel 63

OBR = Old Berwick Rd

Pb-210 = Lead-210

Pb-212 = Lead-212

Pb-214 = Lead-214

Ra-226 = Radium-226

RS = Residential Soil

SLC = Safety Light Corp Site

Sr-90 = Strontium-90

Th-234 = Thorium-234

Tl-208 = Thallium-208

VWP = Vance Walton Property

TABLE B
RESIDENTIAL SOIL SAMPLING RESULTS - 4050 OBR - GROUP A
PAGE 4 OF 7

Radionuclide	A1	A2	A3	A4	A5	A6	A7
Ac-228	1.30	1.65	1.36	1.51	1.79	1.67	1.56
Bi-214	1.37	1.18	1.38	1.17	1.60	1.44	1.65
C-14	2.69 J	3.95 U	4.96 U	4.91 U	1.88 J	4.67 U	4.84 U
Cs-137	0.78	0.45	0.51	0.48	0.34 U	0.29	0.89
H-3	25.9 U	30.7 U	35.3 U	24.7 U	22.3 U	19.6 U	31.57
K-40	14.88	17.08	14.14	18.63	21.65	20.95	13.15
Ni-63	4.59	1.97 U	2.02 U	2.5 U	3.43 J	2.67 U	2.64 U
Pb-210	2.02	1.24	2.18	1.22	0.98	1.33	1.01
Pb-212	1.46	1.72	1.35	1.48	2.13	1.96	1.56
Pb-214	1.49	1.62	1.39	1.36	1.92	1.75	1.30
Ra-226	0.51	0.60	1.66	2.07	1.61	1.38	1.01
Sr-90	1.23	1.21	0.69	0.68 U	0.70 U	0.57 U	0.67 U
Th-234	3.77	3.45 J	2.0 J	3.1 J	8.84 U	3.03 J	2.67 J
Tl-208	1.25	1.05	1.22	1.21	1.72	1.22	1.53

Notes

All results in picocuries per gram (pCi/g)

Ac-228 = Actinium-228

Bi-214 = Bismuth-214

C-14 = Carbon-14

Cs-137 = Cesium-137

H-3 = Tritium

K-40 = Potassium-40

MDA = Minimum Detectable Activity

ND = Not Detected

Ni-63 = Nickel-63

OBR = Old Berwick Rd

Pb-210 = Lead-210

Pb-212 = Lead-212

Pb-214 = Lead-214

Ra-226 = Radium-226

RS = Residential Soil

SLC = Safety Light Corp Site

Sr-90 = Strontium-90

Th-234 = Thorium-234

Tl-208 = Thallium-208

TABLE B
RESIDENTIAL SOIL SAMPLING RESULTS - 4050 OBR - GROUP A
PAGE 5 OF 7

Radionuclide	A8	A9	A10	A11	A12	A13
Ac-228	1.62	1.44	3.05	1.97	2.32	2.04
Bi-214	1.95	1.75	2.89	1.96	1.32	1.58
C-14	4.77 U	3.98 U	3.16 J	4.33 U	5.58 U	3.82 J
Cs-137	0.62	0.27	0.89	0.49	0.15 J	0.26 U
H-3	20.4 U	30.7 U	28.0 U	35.4 U	26.5 U	31.7 U
K-40	14.92	21.92	24.91	25.95	22.74	18.15
Ni-63	2.47 U	2.56 U	3.16 UR	2.74 U	2.7 U	2.25 U
Pb-210	1.05	0.90	2.47	0.91	0.97	0.56 J
Pb-212	2.16	2.15	3.88	2.40	2.12	2.21
Pb-214	1.96	1.89	3.13	1.89	1.51	1.64
Ra-226	1.43	1.91	2.45	1.29	0.75	0.98
Sr-90	0.59 J	0.47 U	0.68	0.72 U	2.32	0.52 J
Th-234	2.33 J	2.29 J	4.45 J	2.68 J	3.95	2.03 J
Tl-208	1.20	1.37	3.11	1.77	1.75	1.71

Notes:

All results in picocuries per gram (pCi/g)

Ac-228 = Actinium-228

Bi-214 = Bismuth-214

C-14 = Carbon-14

Cs-137 = Cesium-137

H-3 = Tritium

K-40 = Potassium-40

MDA = Minimum Detectable Activity

ND = Not Detected

Ni-63 = Nickel-63

OBR = Old Berwick Rd.

Pb-210 = Lead-210

Pb-212 = Lead-212

Pb-214 = Lead-214

Ra-226 = Radium-226

RS = Residential Soil

SLC = Safety Light Corp Site

Sr-90 = Strontium-90

Th-234 = Thorium-234

Tl-208 = Thallium-208

TABLE B
RESIDENTIAL SOIL SAMPLING RESULTS - 4050 OBR - GROUP B
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Radionuclide	B1	B2	B3	B4	B5	B6	B7
Ac-228	4.12	2.40	2.30	3.18	1.69	1.89	1.04
Bi-214	15.12	2.80	2.24	15.62	1.25	2.02	1.07
C-14	5.27 U	4.84 U	4.25 U	4.91 U	5.91 U	3.2 J	3.54 U
Cs-137	0.99	ND	ND	ND	ND	ND	ND
H-3	33.3 U	33.3 U	33.1 U	30.4 U	35.6 U	29.8 U	34.1 U
K-40	26.81	20.90	13.96	23.86	26.30	15.94	9.66
Ni-63	34.05	2.62 U	2.76 U	3.34	2.67 U	2.65 U	1.74 U
Pb-210	3.57	2.46	4.62	4.34	2.03	1.89	1.46
Pb-212	4.42	2.39	3.04	3.80	1.77	1.97	1.00
Pb-214	17.21	3.59	2.54	18.21	1.45	2.01	1.12
Ra-226	12.31	3.41	1.55	8.82	0.95	1.88	1.31
Sr-90	0.3 J	0.85	1.58	1.98	1.27	0.78 U	0.46 U
Th-234	6.10	6.49	4.52	3.1 J	1.75 J	2.83 J	1.19 J
Tl-208	3.25	1.83	2.75	2.60	1.48	1.35	0.82

Notes:-

All results in picocuries per gram (pCi/g)

Ac-228 = Actinium-228

Bi-214 = Bismuth-214

C-14 = Carbon-14

Cs-137 = Cesium-137

H-3 = Tritium

K-40 = Potassium-40

MDA = Minimum Detectable Activity

ND = Not Detected

Ni-63 = Nickel-63

OBR = Old Berwick Rd

Pb-210 = Lead-210

Pb-212 = Lead-212

Pb-214 = Lead-214

Ra-226 = Radium-226

RS = Residential Soil

SIC = Safety Light Corp Site

Sr-90 = Strontium-90

Th-234 = Thorium-234

Tl-208 = Thallium-208

TABLE B
RESIDENTIAL SOIL SAMPLING RESULTS - 4050 OBR - GROUP B
PAGE 7 OF 7

Radionuclide	B8	B9	B10	B11	B12	B13
Ac-228	2.29	<MDA	1.91	2.73	2.89	1.36
Bi-214	1.51	28.62	2.12	3.04	1.84	1.47
C-14	4.39 U	4.86 U	5.03 U	4.42 U	5.52 U	5.36 U
Cs-137	ND	ND	0.58	0.68	ND	ND
H-3	32.3 U	26.5 U	19.1 U	32.4 U	28.1 U	24.3 U
K-40	40.43	8.68	19.34	27.78	33.80	21.13
Ni-63	2.24 U	1.28 J	2.13 U	1.66 U	2.62 UR	3.34 UR
Pb-210	0.67 U	9.22	0.91	1.28	0.85	0.80
Pb-212	2.89	1.12	1.93	2.55	3.15	2.37
Pb-214	1.79	32.19	2.22	3.67	2.47	1.19
Ra-226	0.93	0.93	1.13	2.82	0.89	1.19
Sr-90	0.72 U	1.10	0.63 U	0.82	0.43 U	0.41 J
Th-234	3.48	3.1 J	2.98 J	2.42 J	4.16 J	3.81 J
Tl-208	2.50	0.91	1.45	2.11	2.51	1.88

Notes

All results in picocuries per gram (pCi/g)

Ac-228 = Actinium-228

Bi-214 = Bismuth-214

C-14 = Carbon-14

Cs-137 = Cesium-137

H-3 = Tritium

K-40 = Potassium-40

MDA = Minimum Detectable Activity

ND = Not Detected

Ni-63 = Nickel-63

OBR = Old Berwick Rd

Pb-210 = Lead-210

Pb-212 = Lead-212

Pb-214 = Lead-214

Ra-226 = Radium-226

RS = Residential Soil

SLC = Safety Light Corp Site

Sr-90 = Strontium-90

Th-234 = Thorium-234

Tl-208 = Thallium-208

TABLE E
SUMMARY OF CANCER RISK ESTIMATES FOR RADIONUCLIDES IN OFF-SITE SURFACE SOILS
██████████ CORPORATION CERCLA SITE

EXPOSURE UNIT	CASE 1 RISK FOR ALL RADIONUCLIDES IN SOIL (INGESTION/INHALATION/ EXTERNAL RADIATION/PRODUCE CONSUMPTION)	CASE 2 RISK FOR SITE RELATED RADIONUCLIDES IN SOIL (INGESTION/INHALATION/ EXTERNAL RADIATION/PRODUCE CONSUMPTION)	RISKS FOR SITE RELATED RADIONUCLIDES ABOVE BACKGROUND IN SOILS (INGESTION/INHALATION/EXTERNAL RADIATION/PRODUCE CONSUMPTION)		CASE 4 RISKS FOR SITE RELATED RADIONUCLIDES ABOVE BACKGROUND IN SOILS (INGESTION/INHALATION/ EXTERNAL RADIATION.... NO PRODUCE CONSUMPTION)
			CASE 3A ALL RADIONUCLIDES	CASE 3B POSITIVE DETECTS ONLY	
1231 River RD	2E-03	4E-04	1E-04	4E-05	8E-05
4051 OBR	2E-03	5E-04	1E-04	2E-05	8E-05
4061 OBR	2E-03	4E-04	8E-05	0E+00	6E-05
4065 OBR	1E-03	5E-04	7E-05	0E+00	4E-06
4071 OBR	1E-03	4E-04	8E-05	1E-05	6E-05
4159 OBR	2E-03	4E-04	9E-05	0E+00	6E-05
4050A OBR-95%UCL	3E-03	7E-04	7E-04	--	1E-04
4050B OBR-95%UCL	4E-03	2E-03	2E-03	--	5E-04
4119 OBR	2E-03	8E-04	6E-04	5E-04	3E-04
VWP	5E-03	3E-03	3E-03	3E-03	9E-04
4188 OBR	2E-03	8E-04	5E-04	5E-04	2E-04

Notes:

Risks presented assuming residential landuse scenario.

Background Risks

Radionuclides	Upper Prediction Limit	Arithmetic Mean
All Background Radionuclides	2E-03	1E-03
Site-Specific Radionuclides	6E-04	3E-04

FIGURE B
SUMMARY OF CANCER RISK ESTIMATES FOR RADIONUCLIDES IN OFF-SITE SURFACE SOILS
██████████ CORPORATION CERCLA SITE

