

January 16, 2009



Ms. Lorraine R. Robles, SPHM  
San Antonio Housing Authority  
818 South Flores Street  
San Antonio, Texas 78204

**Consulting Engineers & Scientists**

Terracon Consultants, Inc.  
6911 Blanco Road  
San Antonio, Texas 78216-6164  
Phone 210.641.2112  
Fax 210.641.2124  
[www.terracon.com](http://www.terracon.com)

Subject: Air and Dust Sampling  
Perry Property, 710 Stockyard Drive  
San Antonio, Bexar County, Texas  
Project No. 90087361

Dear Ms. Robles:

The San Antonio Housing Authority (SAHA) retained Terracon Consultants, Inc. (Terracon) to conduct air and dust sampling at the Perry Property, a used furniture retail warehouse located at 710 Stockyard Drive in San Antonio, Texas. The warehouse is adjacent to the north side of the Artisan at San Pedro Creek Apartments construction site. The sampling was conducted by Jim Major, P.G. and Chris Nungesser of Terracon on December 31, 2008 to determine if specific metals, asbestos and dioxins were present in the air or dust.

The air sampling was conducted at the southeast and southwest portions of the interior of the warehouse. The air samples for metal constituents were collected over several hours on 37 millimeter (mm) cassettes with 0.8- $\mu$ m filters using Gilian BDx II battery-powered air sampling pumps in accordance with National Institute for Occupational Safety and Health (NIOSH) sampling methods. The air samples for asbestos were collected over several hours on 25 mm cassettes with 0.45- $\mu$ m mixed cellulose ester filters using high volume air sampling pumps in accordance with Asbestos Hazard Emergency Response Act (AHERA) sampling methods. The respective sampling rates and volumes are shown on Table 1.

The dust sampling was conducted on the horizontal surfaces of items in the southeast and southwest portions of the interior of the warehouse. The dust wipe samples were collected using dedicated sterile cotton gauze wipes. Each wipe was wetted slightly with deionized water obtained from the laboratory to help the dust collect onto the wipe. The horizontal surfaces selected for sampling consisted of items that appeared to have a consistent dust distribution and edges that could be readily measured to determine the total sampling area. Plastic laminate covered desks were selected for the metal dust sampling. The wipe was moved in an overlapping zig-zag pattern over the sampling surface and then the wipe was carefully folded over itself to prevent loss of the dust and the sampling area was wiped again in a direction perpendicular to the first wipe orientation. The wipe samples were placed into labeled, clean laboratory-supplied glass jars equipped with Teflon lined caps. After collection, the samples were placed on ice in a cooler.

**Table 1. Air and Dust Sampling Plan**

Sample Designation	Matrix	Parameters	Sampling Rate	Sample Volume or Area
SE Dust 1	Dust	RCRA 8 Metals + Be	NA	1.58 m <sup>2</sup>
SE Dust 2	Dust	PAHs	NA	0.43 m <sup>2</sup>
SE DUST 2	Dust	Dioxin/Furan	NA	1.51 m <sup>2</sup>
SE Dust 3	Dust	Corrosivity (pH)	NA	1.65 m <sup>2</sup>
SE Dust 4	Dust	Hold	NA	0.67 m <sup>2</sup>
SE Dust 5	Dust	Hold	NA	0.42 m <sup>2</sup>
SE Dust 6	Dust	Hold	NA	0.41 m <sup>2</sup>
SE DUST 7	Dust	Hold	NA	1.61 m <sup>2</sup>
Dioxin Blank	Gauze	Dioxin/Furan	NA	NA
Wipe Blank – Metals	Gauze	RCRA 8 Metals + Be	NA	NA
Wipe Blank – Metals	Gauze	Mercury	NA	NA
Wipe Blank – PAHs	Gauze	PAHs	NA	NA
Wipe Blank – pH	Gauze	pH	NA	NA
SE Air	Air	RCRA 8 Metals + Be	2 L/min	458 L
SW Air	Air	Hold	2 L/min	412 L
Air Blank	Cassette	RCRA 8 Metals + Be	NA	NA
SE Warehouse Dust Wipe	Dust	TEM	NA	1.56 m <sup>2</sup>
SW Warehouse Dust Wipe	Dust	Hold	NA	0.52 m <sup>2</sup>
SE Warehouse Air	Air	TEM	9.25 L/min	1507 L
SW Warehouse Air	Air	Hold	8.75 L/min	1417.5 L
Dust Wipe Blank	Gauze	TEM	NA	NA
Air Blank	Cassette	TEM	NA	NA

RCRA Metals + Be – arsenic, barium, cadmium, chromium, lead, mercury, silver, and selenium plus beryllium

NA – not applicable

PAHs – polycyclic aromatic hydrocarbons

TEM – transmission electron microscopy

L/min – liter per minute

sf – square feet

The analytical services required for the project were conducted by three separate laboratories – Stephen Moody Micro Services, Farmers Branch, Texas for asbestos sample analysis; Alamo Analytical Laboratories, LTD, San Antonio, Texas for air and wipe metals, polycyclic aromatic hydrocarbon (PAH) and corrosivity (pH) analyses; and DHL Laboratory/Pace Analytical, Roundrock, Texas for dioxin/furan analysis. The samples, accompanied with a completed chain-of-custody form, were transported by Terracon to the laboratories for analysis either in person or by overnight delivery. The samples were analyzed using the following methods.

**Table 2. Laboratory Analytical Methods**

Matrix	Parameter	Analytical Method
Air	Asbestos	TEM EPA 40 CFR 763
Air	RCRA 8 Metals and Beryllium	EPA SW 846 6010B/7471A
Dust	Asbestos	TEM
Dust	RCRA 8 Metals and Beryllium	EPA SW 846 6010B/7471A
Dust	PAHs	EPA SW 846 8270C
Dust	pH	EPA SW 846 9045B
Dust	Dioxin/Furan	EPA SW 846 8290

The laboratory results were compared to applicable Environmental Protection Agency (EPA), National Institute of Occupational Safety and Health (NIOSH), and Occupational Safety and Health Act (OSHA) standards. The results of laboratory analyses and the respective exposure limits or standards are summarized in the following table. The laboratory results indicated that the asbestos, and metals concentrations in the air samples were below the method detection limits as well as the OSHA TWA permissible exposure limit (PEL) and below the (NIOSH) recommended exposure limit (REL). The concentration per square meter for each of the wipe samples was calculated by dividing the total metal concentration laboratory analysis result by the area of the respective wiped surface. The laboratory results indicated that with the exception of barium, chromium and lead, the metal concentrations in the dust wipe samples were below the laboratory method detection limits. The barium, chromium and lead concentrations in the dust wipe samples were below the EPA Health-Based Benchmarks for dust for each of the respective metal compounds.

**Table 3. Summary of Laboratory Analysis Results**

Sample Designation	Matrix	Parameters	Concentration	EPA <sup>1</sup>	NIOSH	OSHA	Units
SE Dust 1 (1.58 m <sup>2</sup> )	Dust	Arsenic	<0.006	0.387	NA	NA	mg/m <sup>2</sup>
		Barium	0.127	110	NA	NA	mg/m <sup>2</sup>
		Beryllium	<0.003	3.14	NA	NA	mg/m <sup>2</sup>
		Cadmium	<0.003	1.56	NA	NA	mg/m <sup>2</sup>
		Chromium	0.015	4.70	NA	NA	mg/m <sup>2</sup>
		Lead	4.41	40*	NA	NA	ug/ft <sup>2</sup>
		Mercury	<0.025	0.157	NA	NA	mg/m <sup>2</sup>
		Selenium	<0.006	7.84	NA	NA	mg/m <sup>2</sup>
		Silver	<0.003	7.84	NA	NA	mg/m <sup>2</sup>
SE Dust 2 (0.43 m <sup>2</sup> )	Dust	PAHs	ND	NA	NA	NA	mg/m <sup>2</sup>
SE DUST 2 (1.51 m <sup>2</sup> )	Dust	Dioxin/Furan (TEQ)	0.003	2.0	NA	NA	ng/m <sup>2</sup>
SE Dust 3 (1.65 m <sup>2</sup> )	Dust	Corrosivity (pH)	7.84	NA	NA	NA	NA
SE Air (458 L)	Air	Arsenic	<0.005	NA	NA	0.01	mg/m <sup>3</sup>
		Barium	<0.0005	NA	0.5	0.5	mg/m <sup>3</sup>
		Beryllium	<0.0002	NA	0.0005	0.02	mg/m <sup>3</sup>
		Cadmium	<0.0005	NA	NA	0.005	mg/m <sup>3</sup>
		Chromium	<0.001	NA	0.5	0.5	mg/m <sup>3</sup>
		Lead	<0.003	NA	0.1	0.05	mg/m <sup>3</sup>
		Mercury	<0.0005	NA	0.05	0.1	mg/m <sup>3</sup>
		Selenium	<0.005	NA	0.2	0.2	mg/m <sup>3</sup>
		Silver	<0.001	NA	0.01	0.01	mg/m <sup>3</sup>
SE Warehouse Dust Wipe (1.56 m <sup>2</sup> )	Dust	TEM	<0.168	70	NA	NA	s/mm <sup>2</sup>
SE Warehouse Air (1507 L)	Air	TEM	<18.2	70	NA	NA	s/mm <sup>2</sup>

< XX – less than the laboratory method detection limit

ND – less than the laboratory method detection limits

<sup>1</sup> – Benchmarks from EPA Response to September 11

TEQ – Toxicity equivalent

mg/m<sup>2</sup> – milligrams per square meter

ng/m<sup>2</sup> – Nanograms per square meter

s/mm<sup>2</sup> – asbestos structures per square millimeter

\* - EPA and HUD Lead Abatement Clearance Standard for Floors

The lead concentration in the dust wipe sample was below the Housing and Urban Development (HUD) lead abatement clearance criteria of 40 micrograms per square foot (ug/ft<sup>2</sup>). The dioxin value listed in the table is presented as the toxicity equivalent using the ITE factors. No 2,3,7,8-TCDD, the most toxic dioxin, was detected and the remaining dioxin/furan concentrations detected in the wipe sample were below the EPA Health-Based Benchmark. Additional information regarding the Health-Based Benchmarks and dioxins are attached. The analytical reports and chain of custody forms are also attached.

Terracon's services were performed in a manner consistent with generally accepted practices of the profession undertaken in similar studies in the same geographical area during the same time period. Terracon makes no warranties, either expressed or implied, regarding the findings, conclusions or recommendations. Terracon does not warrant the work of laboratories, regulatory agencies or other third parties supplying information used in the preparation of the report. These sampling services were performed in accordance with the scope of work agreed with you, our client, as reflected in our proposal.

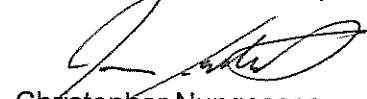
The findings, conclusions and recommendations resulting from these services are based upon information derived from the on-site activities and other services performed under this scope of work; such information is subject to change over time. Certain indicators of the presence of hazardous substances, petroleum products, or other constituents may have been latent, inaccessible, unobservable, non-detectable or not present during these services, and we cannot represent that the site contains no hazardous substances, toxic materials, petroleum products, or other latent conditions beyond those identified during this project. Site conditions may vary from those encountered at specific sampling locations or during other surveys, tests, assessments, investigations or exploratory services; the data, interpretations, and findings are based solely upon data obtained at the time and within the scope of these services.


This report has been prepared for the exclusive use of the San Antonio Housing Authority. Any authorization for use or reliance by any other party except a governmental entity having jurisdiction over the site is prohibited without the express written authorization of the San Antonio Housing Authority and Terracon. Any unauthorized distribution or reuse of this work is at the client's sole risk. Notwithstanding the foregoing, reliance by authorized parties will be subject to the terms, conditions and limitations stated in the proposal, report, and Terracon's Terms and Conditions. The limitation of liability defined in the terms and conditions is the aggregate limit of Terracon's liability to the client and all relying parties unless otherwise agreed in writing.

We appreciate the opportunity to have provided these services to SAHA. Please contact either of the undersigned at (210) 641-2112 if you have questions regarding the information provided in the report.

Sincerely,

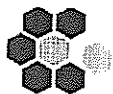
**Terracon Consultants, Inc.**

*for:*   
Christopher Nungesser  
Environmental Scientist

  
James R. Major, P.G.  
Investigation/Remediation Group Manager

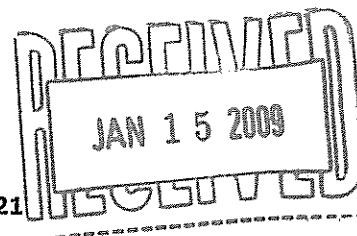
Perry Property Air and Dust Sampling  
Project No. 90087361  
January 16, 2009

## LABORATORY ANALYSIS REPORTS



**ALAMO ANALYTICAL LABORATORIES, LTD.**

10526 Gulfdale • San Antonio, Texas 78216-3601 • (210) 340-8121



01/12/2009

Jim Major  
Terracon Consultants, Inc.  
6911 Blanco Road  
San Antonio , Texas - 78216  
TEL: (210) 641-2112  
FAX: (210) 641-2124

Email:

RE: 90087361-Perry Prperty

Order No.: 0901001

Dear Jim Major:

The attached report/s contain Chain of Custody, Analytical Report/s and QA/QC report. If you have any questions regarding these tests results call (210) 340-8121.

Blank filters used for Method blank and LCS as for client request.

Thank you,

Reddy Gosala  
Laboratory Director

Note: The analysis contained in this report applies only to the samples tested and for the exclusive use of the addressed client. Reproduction of this report wholly or in part requires written permission of the client.

NELAP Certificate# T104704367-08-TX

1 of 2

CHAIN OF CUSTODY RECORD

COC #: 05350

ALAMO ANALYTICAL LABORATORIES LTD.



10526 Gulfdale

San Antonio, Texas 78216

(210) 340-8121 • (800) 572-6955

Fax: (210) 340-8123

www.alamoanalytical.com

admin@alamoanalytical.com

NELAP Certificate #

T104704367-08-TX

MUST BE COMPLETED BY CLIENT

Alamo's Client: **TERRACON** Client's P.O. #:  
 Project Manager: **Jim Mastor** Phone #: **210-641-2112**  
 Address: **6911 Blanco Road** Fax #: **210-641-2124**  
 Project Number: **90087361** Project Name: **PERRY PROPERTY**  
 Project Location: **710 Stockyard Drive** Sampler Signature: **C. Ch. Myer IV**  
 Turnaround time: Standard (7)  (in working days)  
 RUSH: 1  2  3-5  Days (additional charges)  
 TRRP 13 Report: Yes  No  (additional charges)  
 Analysis for Permit Compliance: Yes  No   
 DMR Form Required: Yes  No

LAB ID# (Do not use)	Sampling		Composite	Grab	Matrix	FIELD ID #	FIELD DESCRIPTION	No. of Containers	ANALYSIS		REMARKS (Preservation, Size/Amount, Etc.)
	Date	Time							PCRA 8 + PAH	PAH	
901001-01	12/31/08	11:55		X	WIPE	SE DUST 1		1	X		17 ft <sup>2</sup>
901001-02		12:20				SE DUST 2		1		X	4.67 ft <sup>2</sup>
901001-03		12:30				SE DUST 3		1		X	17.71 ft <sup>2</sup>
901001-04		13:47				SW DUST 4		1			ON HOLD 7.24 ft <sup>2</sup>
901001-05		13:26				SW DUST 5		1		X	ON HOLD 4.5 ft <sup>2</sup>
901001-06		13:31				SW DUST 6		1		X	ON HOLD 4.30 ft <sup>2</sup>
901001-07		13:48				WIPE BLANK - Metals		1			METALS WIPE BLANK
901001-08		13:48				WIPE BLANK - Metals		1			METALS WIPE BLANK
901001-09		12:20				WIPE BLANK - PAH		1			PAH WIPE BLANK
901001-10		12:30				WIPE BLANK - PH		1			PH WIPE BLANK

Relinquished by: (Signature / Print Name) **[Signature]** Date: 1-2-9 Time: 09:50 Received by: (Signature) \_\_\_\_\_  
 Relinquished by: (Signature / Print Name) \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_ Received by: (Signature) \_\_\_\_\_  
 Relinquished by: (Signature / Print Name) \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_ Received by: (Signature) \_\_\_\_\_  
 Relinquished by: (Signature / Print Name) \_\_\_\_\_ Date: 1-2-9 Time: 09:50 Received by: (Signature) **[Signature]**

Headspace Properly Sealed   
 Chilled ≤4° C   
 Comments: \_\_\_\_\_





# ALAMO ANALYTICAL LABORATORIES, LTD.

10526 Gulfdale • San Antonio, Texas 78216-3601 • (210) 340-8121

Client: Terracon Consultants, Inc.  
Work Order: 0901001  
Project Name: 90087361-Perry Prperty  
Client Sample ID: SEDUST1  
Lab ID: 0901001-01A

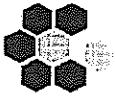
Report Date: 12-Jan-09  
Date Received: 02-Jan-09  
Collection Date: 31-Dec-08  
Matrix: WIPE

Analyte	Result	Reporting Limit	DF	Units	Digestion Date	Date Analyzed
<b>BERYLLIUM, Total</b>						
Beryllium	< 0.005	0.005	1	mg	07-Jan-09	07-Jan-09
		SW6010B				Analyst: JOL
<b>MERCURY, TOTAL</b>						
Mercury	< 0.04	0.04	1	mg	08-Jan-09	08-Jan-09
		SW7471A				Analyst: JOL
<b>METALS-RCRA, Total</b>						
Arsenic	< 0.01	0.01	1	mg	07-Jan-09	07-Jan-09
Barium	0.2	0.01	1	mg	07-Jan-09	07-Jan-09
Cadmium	< 0.005	0.005	1	mg	07-Jan-09	07-Jan-09
Chromium	0.023	0.01	1	mg	07-Jan-09	07-Jan-09
Lead	0.075	0.01	1	mg	07-Jan-09	07-Jan-09
Selenium	< 0.01	0.01	1	mg	07-Jan-09	07-Jan-09
Silver	< 0.005	0.005	1	mg	07-Jan-09	07-Jan-09

Approved by:

Note: The analysis contained in this report applies only to the samples tested and for the exclusive use of the addressed client. Reproduction of this report wholly or in part requires written permission of the client.

NELAP Certificate# T104704367-08-TX



# ALAMO ANALYTICAL LABORATORIES, LTD.

10526 Gulfdale • San Antonio, Texas 78216-3601 • (210) 340-8121

Client: Terracon Consultants, Inc.  
Work Order: 0901001  
Project Name: 90087361-Perry Prperty  
Client Sample ID: SEDUST2  
Lab ID: 0901001-02A

Report Date: 12-Jan-09  
Date Received: 02-Jan-09  
Collection Date: 31-Dec-08  
Preparation Date: 08-Jan-09  
Matrix: WIPE

## POLYNUCLEAR AROMATIC HYDROCARBONS SW8270C

Analyst: SLF

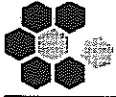
Analyte	Reporting			Units	Date Analyzed
	Result	Limit	DF		
Acenaphthene	< 0.66	0.66	1	ug	08-Jan-09
Acenaphthylene	< 0.66	0.66	1	ug	08-Jan-09
Anthracene	< 0.66	0.66	1	ug	08-Jan-09
Benzo(a)anthracene	< 0.66	0.66	1	ug	08-Jan-09
Benzo(a)pyrene	< 0.33	0.33	1	ug	08-Jan-09
Benzo(b)fluoranthene	< 0.66	0.66	1	ug	08-Jan-09
Benzo(g,h,i)perylene	< 0.66	0.66	1	ug	08-Jan-09
Benzo(k)fluoranthene	< 0.66	0.66	1	ug	08-Jan-09
Chrysene	< 0.66	0.66	1	ug	08-Jan-09
Dibenz(a,h)anthracene	< 0.33	0.33	1	ug	08-Jan-09
Fluoranthene	< 0.66	0.66	1	ug	08-Jan-09
Fluorene	< 0.66	0.66	1	ug	08-Jan-09
Indeno(1,2,3-cd)pyrene	< 0.66	0.66	1	ug	08-Jan-09
Dibenzofuran	< 0.66	0.66	1	ug	08-Jan-09
Naphthalene	< 0.66	0.66	1	ug	08-Jan-09
Phenanthrene	< 0.66	0.66	1	ug	08-Jan-09
Pyrene	< 0.66	0.66	1	ug	08-Jan-09

Analyte	Surrogate Recoveries	
	Recovery	Control Limits
Terphenyl-d14	114%	32-136

For Surrogates: 0 = Dil. Out

Approved by: *[Signature]*

Note: The analysis contained in this report applies only to the samples tested and for the exclusive use of the addressed client. Reproduction of this report wholly or in part requires written permission of the client.



**ALAMO ANALYTICAL LABORATORIES, LTD.**

10526 Gulfdale • San Antonio, Texas 78216-3601 • (210) 340-8121

---

<b>Client:</b>	Terracon Consultants, Inc.	<b>Date:</b>	09-Jan-09
<b>Lab Order:</b>	0901001	<b>Client Sample ID:</b>	SEDUST3
<b>Project Name:</b>	90087361-Perry Prperty	<b>Collection Date:</b>	12/31/2008 12:30:00 PM
<b>Project ID:</b>		<b>Matrix:</b>	WIPE
<b>Lab ID:</b>	0901001-03A	<b>Loc. ID:</b>	

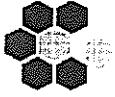
---

Analyses	Result	Report Limit	Units	Dilution	Date Analyzed	Batch ID
CORROSIVITY BY PH				SW9045B		Analyst: SS
pH	7.84	1	pH Units	1	1/5/2009	

Approved by:

Note: The analysis contained in this report applies only to the samples tested and for the exclusive use of the addressed client. Reproduction of this report wholly or in part requires written permission of the client.

NELAP Certificate# T104704367-08-TX



# ALAMO ANALYTICAL LABORATORIES, LTD.

10526 Gulfdale • San Antonio, Texas 78216-3601 • (210) 340-8121

Client: Terracon Consultants, Inc.  
Work Order: 0901001  
Project Name: 90087361-Perry Property  
Client Sample ID: SE AIR  
Lab ID: 0901001-11A

Report Date: 12-Jan-09  
Date Received: 02-Jan-09  
Collection Date: 31-Dec-08  
Matrix: AIR

Analyte	Result	Reporting Limit	DF	Units	Digestion Date	Date Analyzed
Mercury by AA Cold Vapor		N6009				Analyst: JOL
Mercury by AA cold vapor	< 0.0005	0.0005	1	mg/m <sup>3</sup>	08-Jan-09	08-Jan-09
METALS, Air Cassettes		N7300				Analyst: JOL
Arsenic	< 0.005	0.005	1	mg/m <sup>3</sup>	07-Jan-09	07-Jan-09
Barium	< 0.0005	0.0005	1	mg/m <sup>3</sup>	07-Jan-09	07-Jan-09
Beryllium	< 0.0002	0.0002	1	mg/m <sup>3</sup>	07-Jan-09	07-Jan-09
Cadmium	< 0.0005	0.0005	1	mg/m <sup>3</sup>	07-Jan-09	07-Jan-09
Chromium	< 0.001	0.001	1	mg/m <sup>3</sup>	07-Jan-09	07-Jan-09
Lead	< 0.003	0.003	1	mg/m <sup>3</sup>	07-Jan-09	07-Jan-09
Selenium	< 0.005	0.005	1	mg/m <sup>3</sup>	07-Jan-09	07-Jan-09
Silver	< 0.001	0.001	1	mg/m <sup>3</sup>	07-Jan-09	07-Jan-09

Approved by: *[Signature]*

Note: The analysis contained in this report applies only to the samples tested and for the exclusive use of the addressed client. Reproduction of this report wholly or in part requires written permission of the client.

NELAP Certificate# T104704367-08-TX



# ALAMO ANALYTICAL LABORATORIES, LTD.

10526 Gulfdale · San Antonio, Texas 78216-3601 · (210) 340-8121

Date: 09-Jan-09

CLIENT: Terracon Consultants, Inc.

Work Order: 0901001

Project: 90087361-Perry Prperty

## QC SUMMARY REPORT

Analyte	Batch ID	ICP_090107B	BLK	SPK value	LCS	LCSD	RPD %	RPD Limit	MS	MSD	%	RPD	Low - High Limit	Parent	DUP	% Limit	RPD

Beryllium	Batch ID: HG_R_S-1/8/2009	<0.1	50	97.2%	99.8%	3.0	0.0	80 - 120									
	Run ID: HG_090108A	Test Name: MERCURY, TOTAL															
		Test Code: SW7471A															

Mercury	Batch ID: N6009-1/8/2009	<0.04	0.5	97.6%	99.6%	2.0	25.0	97.6%	99.6%	2.0	25.0	77 - 120					
	Run ID: HG_090108D	Test Name: Mercury by AA Cold Vapor															
		Test Code: N6009															

Mercury by AA cold vapor	Batch ID: N7300-1/7/2009	<0.0005	0.005	98.0%	96.0%	2.0	20.0	80 - 120									
	Run ID: ICP_090107D	Test Name: METALS, Air Cassettes															
		Test Code: N7300															

Arsenic	Batch ID: PH_S-1/5/2009	<0.005	0.05	102.0%	101.4%	1.0	20.0	80 - 120									
Barium		<0.0005	0.05	86.2%	88.2%	2.0	20.0	80 - 120									
Beryllium		<0.0002	0.05	97.2%	0.0%	200.0	20.0	80 - 120									
Cadmium		<0.0005	0.05	100.0%	96.6%	3.0	20.0	80 - 120									
Chromium		<0.001	0.05	101.6%	99.6%	2.0	20.0	80 - 120									
Lead		<0.003	0.05	99.8%	96.2%	4.0	20.0	80 - 120									
Selenium		<0.005	0.05	101.6%	102.4%	1.0	20.0	80 - 120									
Silver		<0.001	0.05	100.4%	96.2%	4.0	20.0	80 - 120									
Vanadium		<0.002															

	Batch ID: PH_S-1/5/2009	Test Name: CORROSIVITY by pH															
	Run ID: PH_S_090105A	Test Code: SW9045B															

pH 7 99.9% 7.8 7.8 0.0 20.0

Analysis Date: Prep Date:





**ALAMO ANALYTICAL  
LABORATORIES LTD. (DBA CHEMRON)**

10526 Gulfdale • San Antonio, Texas 78216-3601 • (210) 340-8121  
alamo\_labs@sbcglobal.net • www.alamoanalytical.com

**SAMPLE LOG-IN CHECKLIST**

DATE: 1 / 2 / 9 TIME: 0950 a.m. / p.m. INITIALS: [Signature]

CLIENT: Terracon PROJECT: Perry Property

1. Is a Chain of Custody present?  Yes  No
2. Is the Chain of Custody properly completed?  Yes  No
3. Are custody seals present?  
If yes, are they intact? Yes  No
- Are they on: Sample  or on Shipping Container
4. Are all samples tagged or labeled?  
If yes, do the labels match the Chain of Custody?  Yes  No
5. Do all shipping documents agree (i.e., number of coolers arrived vs. on tickets?) If not, describe below. Yes  No  N/A
6. Are samples preserved properly? If not, describe below.  Yes  No
7. Are all samples within holding times on arrival? If not, describe below.  Yes  No
- Other
8. Condition of shipping container: Intact  or \_\_\_\_\_
9. Condition of samples: Intact  or \_\_\_\_\_
10. Temperature of samples: 2°C \_\_\_\_\_
11. Delivery agent: Client  UPS  Fed-Ex  or Alamo Plus
12. Sample disposal: Return to client  Alamo Analytical Disposal

**COMMENTS** (Reference checklist item number from above, or for comments on resolution below):  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ (Wipe/Arr)

**Record of contacting client for resolution of sample discrepancies (first and retrv contact)**

**Contacted How?**

Name: _____	Phone _____	Fax _____	Date: ____/____/____	Time: _____
Name: _____	Phone _____	Fax _____	Date: ____/____/____	Time: _____



January 15, 2009

Jim Major  
Terracon, Inc.  
6911 Blanco Rd  
San Antonio, Texas 78216

TEL: (210) 641-2112

FAX:

Order No.: 0901008

RE: Perry Property

Dear Jim Major:

DHL Analytical received 3 sample(s) on 1/6/2009 for the analyses presented in the following report.

There were no problems with the analyses and all data for associated QC met EPA or laboratory specifications except where noted in the Case Narrative and all estimated uncertainties of results are within method specifications.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

A handwritten signature in black ink, appearing to read "John DuPont". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

John DuPont  
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification  
Number: T104704211-08A-TX



DHL Analytical

Sample Receipt Checklist

Client Name Terracon, Inc.

Date Received: 1/6/2009

Work Order Number 0901008

Received by AK

Checklist completed by: [Signature] 1/6/09

Reviewed by: [Initials] 1/6/09

Carrier name: FedEx 1day

- Shipping container/cooler in good condltion? Yes [checked] No [ ] Not Present [ ]
Custody seals intact on shipping container/cooler? Yes [checked] No [ ] Not Present [ ]
Custody seals intact on sample bottles? Yes [ ] No [ ] Not Present [checked]
Chain of custody present? Yes [checked] No [ ]
Chain of custody signed when relinquished and received? Yes [checked] No [ ]
Chain of custody agrees with sample labels? Yes [checked] No [ ]
Samples in proper container/bottle? Yes [checked] No [ ]
Sample containers intact? Yes [checked] No [ ]
Sufficient sample volume for indicated test? Yes [checked] No [ ]
All samples received within holding time? Yes [checked] No [ ]
Container/Temp Blank temperature in compliance? Yes [checked] No [ ]
Water - VOA vials have zero headspace? Yes [ ] No [ ] No VOA vials submitted [checked]
Water - pH acceptable upon receipt? Yes [ ] No [ ] Not Applicable [checked]

Adjusted? \_\_\_\_\_ Checked by \_\_\_\_\_

Any No response must be detailed in the comments section below.

Client contacted \_\_\_\_\_ Date contacted: \_\_\_\_\_ Person contacted \_\_\_\_\_

Contacted by: \_\_\_\_\_ Regarding: \_\_\_\_\_

Comments: \_\_\_\_\_

Corrective Action \_\_\_\_\_



Pace Analytical Services, Inc.  
1700 Elm Street  
Minneapolis, MN 55414  
Phone: 612.607.1700  
Fax: 612.607.6444

**Report Prepared for:**

John Dupont  
DHL Analytical  
2300 Double Creek Drive  
Round Rock TX 78664

**REPORT OF  
LABORATORY  
ANALYSIS FOR  
PCDD/PCDF**

**Report Information:**

**Pace Project #: 1087271**  
**Sample Receipt Date: 01/07/2009**  
**Client Project #: N/A**  
**Client Sub PO #: N/A**  
**State Cert #: T104704192-06-TX**

**Invoicing & Reporting Options:**

The report provided has been invoiced as a Level 2 PCDD/PCDF Report. If an upgrade of this report package is requested, an additional charge may be applied.

Please review the attached invoice for accuracy and forward any questions to Scott Unze, your Pace Project Manager.

**This report has been reviewed and prepared by:**

Scott Unze, Project Manager  
(612) 607-6383  
(612) 607-6444 (fax)  
scott.unze@pacelabs.com

**Report Prepared Date:**

January 13, 2009



**Report of Laboratory Analysis**

This report should not be reproduced, except in full, without the written consent of Pace Analytical Services, Inc.

The results relate only to the samples included in this report.



Pace Analytical Services, Inc.  
1700 Elm Street  
Minneapolis, MN 55414  
Phone: 612.607.1700  
Fax: 612.607.6444

## **DISCUSSION**

This report presents the results from the analyses performed on two samples submitted by a representative of DHL Analytical. The samples were analyzed for the presence or absence of polychlorodibenzo-p-dioxins (PCDDs) and polychlorodibenzofurans (PCDFs) using a modified version of USEPA Method 8290. Reporting limits were set to correspond to one-fifth of the lowest calibration points.

The recoveries of the isotopically-labeled PCDD/PCDF internal standards in the sample extracts ranged from 60-124%. All of the labeled standard recoveries obtained for this project were within the 40-135% target range specified in Method 8290. Also, since the quantification of the native 2,3,7,8-substituted congeners was based on isotope dilution, the data were automatically corrected for variation in recovery and accurate values were obtained.

In one case, an interfering substance impacted the determination of a PCDF congener. The affected value was flagged "I" due to an incorrect isotope ratio.

A laboratory method blank was prepared and analyzed with the sample batch as part of our routine quality control procedures. The results show the blank to be free of PCDDs and PCDFs at the reporting limits.

Laboratory spike samples were also prepared using clean wipes that had been fortified with native standard materials. The spiked native compounds were recovered at 88-126%, with relative percent differences of 0.9-9.7%. These results indicate high degrees of accuracy and precision for these determinations. Matrix spikes were not prepared with the sample batch.

## **REPORT OF LABORATORY ANALYSIS**

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.

## **Appendix A**

### Sample Management

DHL Analytical  
2300 Double Creek Drive  
Round Rock, TX 78664

TEL: (512) 388-8222  
Work Order: 0901008

FAX: (512) 388-8229

Subcontractor:

Pace Analytical  
1700 Elm Str.  
Minneapolis, MN 55414

TEL: (612) 607-1700  
FAX: (612) 607-6444  
Acct #:

# CHAIN-OF-CUSTODY RECORD

1087271

06-Jan-09

Sample Id	Matrix	DHL#	Date Collected	Bottle Type	Requested Tests	
					SW8290	
SE DUST 2	Wipe	-01A	12/31/08 12:02 PM	4-OZGJAR	1	16.2 ft <sup>2</sup>
SW DUST 7	Wipe	-02A	12/31/08 01:21 PM	4-OZGJAR	1	17.2 ft <sup>2</sup>
DIOXIN BLANK 03	Wipe	-03A	12/31/08 01:21 PM	4-OZGJAR	1	

1124

General Comments:

Please analyze these samples with a Standard Turnaround Time.

Quality Control Package Needed: Standard / \_\_\_\_\_  
Call John DuPont if you have questions.

Relinquished by:	Date/Time	Received by:	Date/Time
<i>J. Barber</i>	1/6/09 17:30	<i>[Signature]</i>	1/6/09 17:30
		<i>[Signature]</i>	1/7/09 09:05

T = 2.0

**Sample Condition Upon Receipt**

Face Analytical

Client Name: DAL Analytical Project # 1087271

Courier:  Fed Ex  UPS  USPS  Client  Commercial  Pace Other

Tracking #: 7962 3274 6225

Optional  
 Proj. Due Date:  
 Proj. Name:

Custody Seal on Cooler/Box Present:  Yes  no      Seals intact:  Yes  no

Packing Material:  Bubble Wrap  Bubble Bags  None  Other      Temp Blank: Yes  No

Thermometer Used 80344042 179425      Type of Ice: Wet Blue None  Samples on Ice, cooling process has begun

Cooler Temperature 2.0°      Biological Tissue Is Frozen: Yes No

Date and Initials of person examining contents: 1/7/09

Temp should be above freezing to 6°C

Comments:

Chain of Custody Present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	1.
Chain of Custody Filled Out:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	2.
Chain of Custody Relinquished:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	3.
Sampler Name & Signature on COC:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	4.
Samples Arrived within Hold Time:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	5.
Short Hold Time Analysis (<72hr):	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	6.
Rush Turn Around Time Requested:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	7.
Sufficient Volume:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	8.
Correct Containers Used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	9.
-Pace Containers Used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Containers Intact:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	10.
Filtered volume received for Dissolved tests	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	11.
Sample Labels match COC:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	12. Reg. soil documentation not received 1/7/09 8h
-Includes date/time/ID/Analysis Matrix:	<u>WP</u>	
All containers needing acid/base preservation have been checked. Noncompliance are noted in 13.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Exceptions: VOA, Colform, TOC, Oil and Grease, WI-DRD (water)	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Initial when completed      Lot # of added preservative
Samples checked for dechlorination:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	14.
Headspace in VOA Vials (>6mm):	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	15.
Trip Blank Present:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	16.
Trip Blank Custody Seals Present	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Pace Trip Blank Lot # (if purchased):		

**Client Notification/ Resolution:**

Field Data Required?      Y / N

Person Contacted: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Comments/ Resolution: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Project Manager Review: (Signature)

Date: 01/07/09

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEMNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers)

## **Appendix B**

### Sample Analysis Summary



**Method 8290 Sample Analysis Results**

Client - DHL Analytical

Client's Sample ID	SE DUST 2		
Lab Sample ID	1087271001		
Filename	U90110B_11		
Injected By	AE		
Total Amount Extracted	1.51 m2	Matrix	Wipe
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	12/31/2008
ICAL ID	U81216	Received	01/07/2009
CCal Filename(s)	U90110A_14 & U90110B_14	Extracted	01/08/2009
Method Blank ID	BLANK-18735	Analyzed	01/11/2009 04:46

Native Isomers	Conc ng/m2	EMPC ng/m2	RL ng/m2		Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	0.0034	---	0.0013	J	2,3,7,8-TCDF-13C	2.00	94
Total TCDF	0.0270	---	0.0013		2,3,7,8-TCDD-13C	2.00	71
					1,2,3,7,8-PeCDF-13C	2.00	122
2,3,7,8-TCDD	ND	---	0.00180	A	2,3,4,7,8-PeCDF-13C	2.00	124
Total TCDD	0.0061	---	0.0018	J	1,2,3,7,8-PeCDD-13C	2.00	119
					1,2,3,4,7,8-HxCDF-13C	2.00	96
1,2,3,7,8-PeCDF	ND	---	0.0066		1,2,3,6,7,8-HxCDF-13C	2.00	94
2,3,4,7,8-PeCDF	ND	---	0.0066		2,3,4,6,7,8-HxCDF-13C	2.00	98
Total PeCDF	0.0240	---	0.0066	J	1,2,3,7,8,9-HxCDF-13C	2.00	91
					1,2,3,4,7,8-HxCDD-13C	2.00	95
1,2,3,7,8-PeCDD	ND	---	0.0066		1,2,3,6,7,8-HxCDD-13C	2.00	82
Total PeCDD	ND	---	0.0066		1,2,3,4,6,7,8-HpCDF-13C	2.00	74
					1,2,3,4,7,8,9-HpCDF-13C	2.00	70
1,2,3,4,7,8-HxCDF	ND	---	0.0066		1,2,3,4,6,7,8-HpCDD-13C	2.00	88
1,2,3,6,7,8-HxCDF	ND	---	0.0066		OCDD-13C	4.00	60
2,3,4,6,7,8-HxCDF	ND	---	0.0066				
1,2,3,7,8,9-HxCDF	ND	---	0.0066		1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	0.0410	---	0.0066		1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	ND	---	0.0066		2,3,7,8-TCDD-37Cl4	0.20	69
1,2,3,6,7,8-HxCDD	ND	---	0.0066				
1,2,3,7,8,9-HxCDD	ND	---	0.0066				
Total HxCDD	0.0740	---	0.0066				
1,2,3,4,6,7,8-HpCDF	---	0.032	0.0066	I	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	ND	---	0.0066		Equivalence: 0.0033 ng/m2		
Total HpCDF	0.0510	---	0.0066		(Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	0.1200	---	0.0066				
Total HpCDD	0.3900	---	0.0066				
OCDF	0.0980	---	0.0130				
OCDD	1.6000	---	0.0130				

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).  
EMPC = Estimated Maximum Possible Concentration  
RL = Reporting Limit.  
J = Value below calibration range  
A = Reporting Limit based on signal to noise  
I = Interference present

ND = Not Detected  
NA = Not Applicable  
NC = Not Calculated

**REPORT OF LABORATORY ANALYSIS**

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.



**Method 8290 Sample Analysis Results**

Client - DHL Analytical

Client's Sample ID	DIOXIN BLANK 03		
Lab Sample ID	1087271003		
Filename	R90112A16		
Injected By	SMT		
Total Amount Extracted	1.51 m2	Matrix	Wipe
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	12/31/2008
ICAL ID	R90109GC1	Received	01/07/2009
CCal Filename(s)	R90112A05 & R90112A20	Extracted	01/08/2009
Method Blank ID	BLANK-18735	Analyzed	01/13/2009 00:39

Native Isomers	Conc ng/m2	EMPC ng/m2	RL ng/m2	Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	ND	—	0.0013	2,3,7,8-TCDF-13C	2.00	69
Total TCDF	ND	—	0.0013	2,3,7,8-TCDD-13C	2.00	77
				1,2,3,7,8-PeCDF-13C	2.00	81
2,3,7,8-TCDD	ND	—	0.0013	2,3,4,7,8-PeCDF-13C	2.00	82
Total TCDD	ND	—	0.0013	1,2,3,7,8-PeCDD-13C	2.00	92
				1,2,3,4,7,8-HxCDF-13C	2.00	73
1,2,3,7,8-PeCDF	ND	—	0.0066	1,2,3,6,7,8-HxCDF-13C	2.00	74
2,3,4,7,8-PeCDF	ND	—	0.0066	2,3,4,6,7,8-HxCDF-13C	2.00	74
Total PeCDF	ND	—	0.0066	1,2,3,7,8,9-HxCDF-13C	2.00	93
				1,2,3,4,7,8-HxCDD-13C	2.00	77
1,2,3,7,8-PeCDD	ND	—	0.0066	1,2,3,6,7,8-HxCDD-13C	2.00	79
Total PeCDD	ND	—	0.0066	1,2,3,4,6,7,8-HpCDF-13C	2.00	68
				1,2,3,4,7,8,9-HpCDF-13C	2.00	81
1,2,3,4,7,8-HxCDF	ND	—	0.0066	1,2,3,4,6,7,8-HpCDD-13C	2.00	81
1,2,3,6,7,8-HxCDF	ND	—	0.0066	OCDD-13C	4.00	61
2,3,4,6,7,8-HxCDF	ND	—	0.0066			
1,2,3,7,8,9-HxCDF	ND	—	0.0066	1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	ND	—	0.0066	1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	ND	—	0.0066	2,3,7,8-TCDD-37Cl4	0.20	81
1,2,3,6,7,8-HxCDD	ND	—	0.0066			
1,2,3,7,8,9-HxCDD	ND	—	0.0066			
Total HxCDD	ND	—	0.0066			
1,2,3,4,6,7,8-HpCDF	ND	—	0.0066	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	ND	—	0.0066	Equivalence: 0.00 ng/m2		
Total HpCDF	ND	—	0.0066	(Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	ND	—	0.0066			
Total HpCDD	ND	—	0.0066			
OCDF	ND	—	0.0130			
OCDD	ND	—	0.0130			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).  
EMPC = Estimated Maximum Possible Concentration  
RL = Reporting Limit.

ND = Not Detected  
NA = Not Applicable  
NC = Not Calculated

**REPORT OF LABORATORY ANALYSIS**

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.



**Method 8290 Blank Analysis Results**

Lab Sample ID	BLANK-18735	Matrix	Solid
Filename	U90110A_05	Dilution	NA
Total Amount Extracted	1.51 m2	Extracted	01/08/2009
ICAL ID	U81216	Analyzed	01/10/2009 13:13
CCal Filename(s)	U90109B_12 & U90110A_14	Injected By	AE

Native Isomers	Conc ng/m2	EMPC ng/m2	RL ng/m2	Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	ND	—	0.0013	2,3,7,8-TCDF-13C	2.00	65
Total TCDF	ND	—	0.0013	2,3,7,8-TCDD-13C	2.00	66
				1,2,3,7,8-PeCDF-13C	2.00	82
2,3,7,8-TCDD	ND	—	0.0013	2,3,4,7,8-PeCDF-13C	2.00	84
Total TCDD	ND	—	0.0013	1,2,3,7,8-PeCDD-13C	2.00	80
				1,2,3,4,7,8-HxCDF-13C	2.00	79
1,2,3,7,8-PeCDF	ND	—	0.0066	1,2,3,6,7,8-HxCDF-13C	2.00	93
2,3,4,7,8-PeCDF	ND	—	0.0066	2,3,4,6,7,8-HxCDF-13C	2.00	91
Total PeCDF	ND	—	0.0066	1,2,3,7,8,9-HxCDF-13C	2.00	84
				1,2,3,4,7,8-HxCDD-13C	2.00	79
1,2,3,7,8-PeCDD	ND	—	0.0066	1,2,3,6,7,8-HxCDD-13C	2.00	85
Total PeCDD	ND	—	0.0066	1,2,3,4,6,7,8-HpCDF-13C	2.00	72
				1,2,3,4,7,8,9-HpCDF-13C	2.00	66
1,2,3,4,7,8-HxCDF	ND	—	0.0066	1,2,3,4,6,7,8-HpCDD-13C	2.00	80
1,2,3,6,7,8-HxCDF	ND	—	0.0066	OCDD-13C	4.00	61
2,3,4,6,7,8-HxCDF	ND	—	0.0066			
1,2,3,7,8,9-HxCDF	ND	—	0.0066	1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	ND	—	0.0066	1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	ND	—	0.0066	2,3,7,8-TCDD-37Cl4	0.20	68
1,2,3,6,7,8-HxCDD	ND	—	0.0066			
1,2,3,7,8,9-HxCDD	ND	—	0.0066			
Total HxCDD	ND	—	0.0066			
1,2,3,4,6,7,8-HpCDF	ND	—	0.0066	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	ND	—	0.0066	Equivalence: 0.00 ng/m2		
Total HpCDF	ND	—	0.0066	(Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	ND	—	0.0066			
Total HpCDD	ND	—	0.0066			
OCDF	ND	—	0.0130			
OCDD	ND	—	0.0130			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).  
EMPC = Estimated Maximum Possible Concentration  
RL = Reporting Limit

**REPORT OF LABORATORY ANALYSIS**

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.



### Method 8290 Laboratory Control Spike Results

Lab Sample ID	LCS-18736	Matrix	Solid/Wipe
Filename	U90110A_01	Dilution	NA
Total Amount Extracted	10.3 g	Extracted	01/08/2009
ICAL ID	U81216	Analyzed	01/10/2009 10:09
CCal Filename(s)	U90109B_12 & U90110A_14	Injected By	AE
Method Blank ID	BLANK-18735		

Native Isomers	Qs (ng)	Qm (ng)	% Rec.	Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	0.20	0.21	106	2,3,7,8-TCDF-13C	2.00	74
Total TCDF				2,3,7,8-TCDD-13C	2.00	71
				1,2,3,7,8-PeCDF-13C	2.00	85
2,3,7,8-TCDD	0.20	0.23	113	2,3,4,7,8-PeCDF-13C	2.00	88
Total TCDD				1,2,3,7,8-PeCDD-13C	2.00	82
				1,2,3,4,7,8-HxCDF-13C	2.00	87
1,2,3,7,8-PeCDF	1.00	1.09	109	1,2,3,6,7,8-HxCDF-13C	2.00	100
2,3,4,7,8-PeCDF	1.00	1.05	105	2,3,4,6,7,8-HxCDF-13C	2.00	100
Total PeCDF				1,2,3,7,8,9-HxCDF-13C	2.00	91
				1,2,3,4,7,8-HxCDD-13C	2.00	85
1,2,3,7,8-PeCDD	1.00	1.06	106	1,2,3,6,7,8-HxCDD-13C	2.00	90
Total PeCDD				1,2,3,4,6,7,8-HpCDF-13C	2.00	74
				1,2,3,4,7,8,9-HpCDF-13C	2.00	74
1,2,3,4,7,8-HxCDF	1.00	1.01	101	1,2,3,4,6,7,8-HpCDD-13C	2.00	86
1,2,3,6,7,8-HxCDF	1.00	1.07	107	OCDD-13C	4.00	68
2,3,4,6,7,8-HxCDF	1.00	1.00	100			
1,2,3,7,8,9-HxCDF	1.00	1.01	101	1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF				1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	1.00	0.98	98	2,3,7,8-TCDD-37Cl4	0.20	74
1,2,3,6,7,8-HxCDD	1.00	1.10	110			
1,2,3,7,8,9-HxCDD	1.00	1.07	107			
Total HxCDD						
1,2,3,4,6,7,8-HpCDF	1.00	1.11	111			
1,2,3,4,7,8,9-HpCDF	1.00	1.04	104			
Total HpCDF						
1,2,3,4,6,7,8-HpCDD	1.00	0.88	88			
Total HpCDD						
OCDF	2.00	2.45	122			
OCDD	2.00	2.25	112			

Qs = Quantity Spiked  
Qm = Quantity Measured  
Rec. = Recovery (Expressed as Percent)  
P = Recovery outside of target range  
X = Background subtracted value  
Nn = Value obtained from additional analysis  
NA = Not Applicable  
\* = See Discussion

## REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.



**Method 8290 Laboratory Control Spike Results**

Lab Sample ID	LCSD-18737	Matrix	Solid/Wipe
Filename	U90110A_02	Dilution	NA
Total Amount Extracted	10.3 g	Extracted	01/08/2009
ICAL ID	U81216	Analyzed	01/10/2009 10:54
CCal Filename(s)	U90109B_12 & U90110A_14	Injected By	AE
Method Blank ID	BLANK-18735		

Native Isomers	Qs (ng)	Qm (ng)	% Rec.	Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	0.20	0.23	115	2,3,7,8-TCDF-13C	2.00	76
Total TCDF				2,3,7,8-TCDD-13C	2.00	77
				1,2,3,7,8-PeCDF-13C	2.00	84
2,3,7,8-TCDD	0.20	0.23	114	2,3,4,7,8-PeCDF-13C	2.00	85
Total TCDD				1,2,3,7,8-PeCDD-13C	2.00	81
				1,2,3,4,7,8-HxCDF-13C	2.00	82
1,2,3,7,8-PeCDF	1.00	1.15	115	1,2,3,6,7,8-HxCDF-13C	2.00	94
2,3,4,7,8-PeCDF	1.00	1.09	109	2,3,4,6,7,8-HxCDF-13C	2.00	93
Total PeCDF				1,2,3,7,8,9-HxCDF-13C	2.00	85
				1,2,3,4,7,8-HxCDD-13C	2.00	80
1,2,3,7,8-PeCDD	1.00	1.15	115	1,2,3,6,7,8-HxCDD-13C	2.00	86
Total PeCDD				1,2,3,4,6,7,8-HpCDF-13C	2.00	72
				1,2,3,4,7,8,9-HpCDF-13C	2.00	69
1,2,3,4,7,8-HxCDF	1.00	1.07	107	1,2,3,4,6,7,8-HpCDD-13C	2.00	80
1,2,3,6,7,8-HxCDF	1.00	1.13	113	OCDD-13C	4.00	64
2,3,4,6,7,8-HxCDF	1.00	1.06	106			
1,2,3,7,8,9-HxCDF	1.00	1.07	107	1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF				1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	1.00	1.08	108	2,3,7,8-TCDD-37Cl4	0.20	81
1,2,3,6,7,8-HxCDD	1.00	1.19	119			
1,2,3,7,8,9-HxCDD	1.00	1.14	114			
Total HxCDD						
1,2,3,4,6,7,8-HpCDF	1.00	1.13	113			
1,2,3,4,7,8,9-HpCDF	1.00	1.08	108			
Total HpCDF						
1,2,3,4,6,7,8-HpCDD	1.00	0.95	95			
Total HpCDD						
OCDF	2.00	2.51	126			
OCDD	2.00	2.31	115			

Qs = Quantity Spiked  
Qm = Quantity Measured  
Rec. = Recovery (Expressed as Percent)  
P = Recovery outside of target range  
X = Background subtracted value  
Nn = Value obtained from additional analysis  
NA = Not Applicable  
\* = See Discussion

**REPORT OF LABORATORY ANALYSIS**

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.



**Method 8290**

**Spike Recovery Relative Percent Difference (RPD) Results**

Client DHL Analytical

Spike 1 ID LCS-18736  
 Spike 1 Filename U90110A\_01

Spike 2 ID LCSD-18737  
 Spike 2 Filename U90110A\_02

Compound	Spike 1 %REC	Spike 2 %REC	%RPD
2,3,7,8-TCDF	106	115	8.1
2,3,7,8-TCDD	113	114	0.9
1,2,3,7,8-PeCDF	109	115	5.4
2,3,4,7,8-PeCDF	105	109	3.7
1,2,3,7,8-PeCDD	106	115	8.1
1,2,3,4,7,8-HxCDF	101	107	5.8
1,2,3,6,7,8-HxCDF	107	113	5.5
2,3,4,6,7,8-HxCDF	100	106	5.8
1,2,3,7,8,9-HxCDF	101	107	5.8
1,2,3,4,7,8-HxCDD	98	108	9.7
1,2,3,6,7,8-HxCDD	110	119	7.9
1,2,3,7,8,9-HxCDD	107	114	6.3
1,2,3,4,6,7,8-HpCDF	111	113	1.8
1,2,3,4,7,8,9-HpCDF	104	108	3.8
1,2,3,4,6,7,8-HpCDD	88	95	7.7
OCDF	122	126	3.2
OCDD	112	115	2.6

%REC = Percent Recovered

RPD = The difference between the two values divided by the mean value

**REPORT OF LABORATORY ANALYSIS**

This report shall not be reproduced, except in full,  
 without the written consent of Pace Analytical Services, Inc.



# Asbestos Chain of Custody

Page 1 of 1

PLM-Bulk:  Rush=1 day  Normal=2 day  Extended  
 ANALYZE ALL  POSITIVE STOP

PCM-Air:  Rush=same day  1-2 day  
 TEM-Air:  6 hr  12 hr  24 hr  72 hr  
 TEM-Bulk:  24 hr  48 hr  72 hr  
 TEM-7402/Modified:  24 hr  48 hr  72 hr

Lab Job# 97-00001 TEM 3  
 Lab Job# 97-00002 TEM 3  
 Lab Job# \_\_\_\_\_ (w/adj)

\*\*Please call in advance for after-hour & weekend rush analysis\*\*

Company Name and City: TEJIZACON CONSULTANTS  
 Submitter's Name: CHRIS NUNGESSER Sample date: 12/31/08 P.O. No.: \_\_\_\_\_  
 Project: FERRY PROPERTY, 710 STOCK YARDS DR Project No.: \_\_\_\_\_  
 Contact Information: Name: JIM MAJOR Phone #: 210-930-3007  
 E-mail: (address): jmajor@ternacon.com Mobile #: 210-618-2800  
 Hard copy: (address): 6911 BLANCO RD, SAN ANTONIO, TX 78216 Fax #: 210-641-2124  
 Invoice Address (if different): SAME

\*\*\* Please review paperwork and samples before submitting to lab. Uncontained / Improperly packaged samples or excessive administrative requests may incur additional fees. \*\*\*

Sample No.	Sample Description	Vol. / Area	Location / Notes
1	SE WAREHOUSE DUST WIPE	<del>107</del> 16.7642	
2	SUN WAREHOUSE DUST WIPE	<del>117.5</del> 1561	ON HOLD
3	SE WAREHOUSE AIR	1507 LITERS	
4	SUN WAREHOUSE AIR	1417.5 LITERS	ON HOLD
5	DUST WIPE BLANK	NA	
6	AIR BLANK	NA	

Released by: Chris Nunger Date/Time: 12/31/08 Received By: Ch. Major Date/Time: 12/31/08  
 Released by: Ch. Major Date/Time: 12/31/08 Received By: Ch. Major Date/Time: 1-2-09/8 AM

Notes:

**TEM REPORT**

NVLAP Lab No. 102056  
 TDSHS License No. 30-0084  
 AIHA PAT ID No. 102577

Steve Moody Micro Services, Inc.  
 2051 Valley View Lane  
 Farmers Branch, TX 75234 (972) 241-8460

Lab Job No.: x9T-00001  
 Report Date: 01/05/2009  
 Sample Date: 12/31/2008

Client: Terracon - San Antonio, TX  
 Project: Perry Property, 710 Stockyards Drive  
 Project No.: Not Provided  
 Identification: Asbestos, Air Filter Analysis  
 Test Method: Transmission Electron Microscopy/X-Ray Analysis (TEM/EDX)  
 EPA 40 CFR 763

On 1/2/09, three (3) 25mm air cassette samples were submitted by a representative of Terracon - San Antonio, TX for asbestos analysis by TEM/EDX. Copies of the lab data sheets are attached; additional information may be found therein. The results are summarized below:

Sample No.	Sample Description / Location	Sample Volume (liters)	Area Analyzed (mm <sup>2</sup> )	Total Asbestos Structures	Detection Limit (s/cc)	Asbestos Concentration (s/cc)	Asbestos Concentration (s/mm <sup>3</sup> )
3	Southeast Warehouse Air	1507	0.055	0	0.005	<0.005	<18.2

Results may not be reproduced except in full. This test report relates only to the samples tested. These test results do not imply endorsement by NVLAP or any agency of the U.S. Government. Accredited by the National Voluntary Laboratory Accreditation Program for Airborne Asbestos Fiber Analysis under Lab Code 102056. Lab C.V. = 0.10. John Nimb 0.12 (Based on NIST SRM 18766 Standard)

Analyst: Tommie Smith



Laboratory Director: Steve Moody

Approved Signatory:

Client : **Terracon - San Antonio, TX**  
 Project : **Perry Property, 710 Stockyards Drive**  
 Lab Job No. : **x9T-00001** Client Sample No. : **3**

Filter : **.45 µm/MCE/385 mm²** Asbestos Structures : **0**  
 Sample Volume / Area : **1507 l** Asbestos Structures : **0 (>5µm)**  
 No. of Squares : **5** Detection Limit : **0.005 s/cc**  
 Square Field Area : **0.0110 mm²** Asbestos Concentration : **<0.005 s/cc**  
 Total Area Examined : **0.055 mm²** Asbestos Concentration : **<18.2 s/mm²**

Sample Description : **Southeast Warehouse Air**

Sqr #	Grid No.	Sqr ID	Struct #	Struct Type	Structure ID	L (µm)	W (µm)	SAED	Photo ID	EDX	Spectra ID
1		E01	0								
2		E07	0								
3		D08	0								
4	2	H01	0								
5		H07	0								

Comments :

Analyst : **Tommie Smith**  
 Date Analyzed : **01/05/09**

Scope : **JEOL100** KV : **100** Mag : **15,405**

Lab Job # : **x9T-00001** Sample No. : **3**

TEM Analysis Sheet

Client: **Terracon - San Antonio, TX** Filter: **.45 µm/MCE/962** Asbestos Structures: **0**  
 Project: **Perry Property, 710 Stockyards Drive** Sample Volume / Area: **15570 cm²** Asbestos Structures: **0 (>5µm)**  
 Lab Job No.: **x9T-00002** Client Sample No.: **1** No. of Squares: **10** Detection Limit: **1685 f/cm²**  
 Square Field Area: **0.0110 mm²** Asbestos Concentration: **<1685 f/cm²**  
 Total Area Examined: **0.110 mm²** Asbestos Concentration: **<27.3 f/mm²**

Sample Description: **Southeast Warehouse Dust Wipe**

Sqr #	Grid No.	Sqr ID	Struct #	Struct Type	Structure ID	L (µm)	W (µm)	SAED	Photo ID	EDX	Spectra ID
1		C04	0								
2		H01	0								
3		H07	0								
4		D13	0								
6	2	E16	0								
7		E10	0								
8		I04	0								
9		D07	0								
10		D01	0								

Comments:

Analyst: **Tommie Smith**  
 Date Analyzed: **01/05/09**

Scope: **JEOL100** KV: **100** Mag: **15,405** Lab Job #: **x9T-00002** Sample No.: **1**

**TEM REPORT**

Steve Moody Micro Services, Inc.  
 2051 Valley View Lane  
 Farmers Branch, TX 75234 (972) 241-8460

NVLAP Lab No. 102056  
 TDSHS License No. 30-0084  
 AIHA PAT ID No. 102577

Client : Terracon - San Antonio, TX  
 Project : Perry Property, 710 Stockyards Drive  
 Project No. : Not Provided  
 Identification : Asbestos, Wipe Sample  
 Test Method : Transmission Electron Microscopy/X-Ray Analysis (TEM/EDX)  
 ASTM D5755/95

Lab Job No. : x9T-00002  
 Report Date : 01/05/2009  
 Sample Date : 12/31/2008

On 1/2/09, three (3) wipe samples were submitted by a representative of Terracon - San Antonio, TX for asbestos analysis by TEM/EDX. Copies of the lab data sheets are attached. Additional information may be found therein. The results are summarized below:

Sample No.	Sample Description / Location	Sample Area (cm <sup>2</sup> )	Suspen Volume (ml)	Aliquot Volume (ml)	Area Analyzed (mm <sup>2</sup> )	Total Asbestos Structures	Analytical Sensitivity (s/cm <sup>2</sup> )	Asbestos Conc (s/cm <sup>2</sup> )
1	Southeast Warehouse Dust Wipe	15570	100	0.1	0.110	0	1685	<1685

Results may not be reproduced except in full. This test report relates only to the samples tested. These test results do not imply endorsement by NVLAP or any agency of the U.S. Government.

Analyst : Tommie Smith

Laboratory Director : Steve Moody

Approved Signatory :



Perry Property Air and Dust Sampling  
Project No. 90087361  
January 16, 2009

**HEALTH-BASED BENCHMARKS  
AND DIOXIN INFORMATION**



## EPA Response to September 11

You are here: [EPA Home](#) | [Response to 911](#) | [Indoor Programs](#) | [Residential Cleanup](#) | [Wipe Sampling](#)

### Benchmarks

Analyte	EPA Reporting Limit (ug/m2)	Health-Based Benchmark	RESIDENTIAL (This)
Aluminum	200	1,570,000 ug/m2	
Antimony	80	627 ug/m2	
Arsenic	20	387 ug/m2	
Barium	200	110,000 ug/m2	• Resi
Beryllium	20	3,140 ug/m2	• Hon
Cadmium	20	1,560 ug/m2	• Draf
Calcium	400	Essential Nutrient*	• Resi
Chromium	20	4,700 ug/m2	
Cobalt	200	31,140 ug/m2	
Copper	20	62,700 ug/m2	
Dioxin	Not Applicable	2 ng/m2	• Asbr
Iron	200	941,000 ug/m2	• Wipe
Lead	1.86	25 ug/ft2	
Magnesium	400	Essential Nutrient*	
Manganese	20	31,400 ug/m2	• Dus
Mercury	0.4	157 ug/m2	• Clea
Nickel	20	31,400 ug/m2	• Mon
Potassium	400	Essential Nutrient*	• Emc
Selenium	20	7,840 ug/m2	• Hea
Silver	20	7,840 ug/m2	
Sodium	4000	Essential Nutrient*	
Thallium	200	110 ug/m2	
Vanadium	200	10,100 ug/m2	
Zinc	20	470,000 ug/m2	

\* Health-based benchmarks for wipe samples were not developed for the following elements (classified calcium, magnesium, potassium, and sodium). These substances play critical roles in the body's normal function and the adverse health outcomes associated with deficiency. Because they possess relatively low oral toxicity criteria needed to develop health-based benchmarks for these essential nutrients have not been established.

The estimated background concentrations that were calculated were compared to literature values when available. Values reported in the literature regarding asbestos and MMVF in air, and lead and dioxin in settled dust from urban environments, that were collected and analyzed using methods similar to this Study, are consistent to the values generated by the samples collected in this background Study (Table 8-2). The consistent nature indicates that the concentrations observed from this Study population are similar to other urban environments.

The literature search conducted as part of this evaluation highlighted data gaps in the scientific literature for several of the compounds for which data were collected. These compounds include MMVF, crystalline silica, calcite, gypsum, and portlandite. The data collected and the calculated background concentrations provide a source of data that can be used to address these data gaps.

In general, the data sets for samples that were collected in residential areas and common areas were similar, however there were data sets in which the detected concentrations in common area were nominally higher than the residential spaces. The activity pattern, amount of foot traffic, type of cleaning, and frequency of cleaning may differ between these spaces, and some combination of these factors may be responsible for this observation.

**Table 8-2.** Comparison of estimated background values from this study to background or historical values reported in the scientific literature for select compounds.

Compound	Estimated Background UCL Value	Historical/Literature Value
Asbestos - PCMe	0.00024 s/cc	0.00022 s/cc <sup>(1)</sup>
MMVF - air	0.00006 s/cc	• 0.0001 f/cc <sup>(2)</sup>
Lead - air	0.03 • g/m <sup>3</sup>	0.02 • g/m <sup>3(3)</sup>
Lead - wipe floors	3.91 • g/ft <sup>2</sup>	3.45 • g/ft <sup>2(4)</sup>
Dioxin - wipe	0.693 ng/m <sup>2</sup>	0.67 ng/m <sup>2(5)</sup>

<sup>(1)</sup> Consumer Product Safety Commission Study. 1987.

<sup>(2)</sup> ATSDR. 2002.

<sup>(3)</sup> Calculated value from EPA historic ambient air lead data.

<sup>(4)</sup> HUD. 2001.

<sup>(5)</sup> Christmann. 1989.

**Table ES-2. Top 10 sources of dioxin-like compound releases and amounts released (g TEQ) for reference years 2000, 1995, and 1987**

Rank	2000 (1,422 g total)		1995 (3,444 g total)		1987 (13,965 g total)	
	Description	Amount (g TEQ)	Description	Amount (g TEQ)	Description	Amount (g TEQ)
1	Backyard barrel burning of refuse (air)	498.5	Municipal waste combustion (incineration of refuse) (air)	1,393.5	Municipal waste combustion (incineration of refuse) (air)	8,905.1
2	Medical waste/pathological incineration (air)	378.0	Backyard barrel burning of refuse (air)	628.0	Medical waste/pathological incineration (air)	2,570.0
3	Municipal wastewater treatment sludge (applied to land and incinerated) (land and air)	89.7	Medical waste/pathological incineration (air)	487.0	Secondary copper smelting (air)	983.0
4	Municipal waste combustion (incineration of refuse) (air)	83.8	Secondary copper smelting (air)	271.0	Backyard barrel burning of refuse (air)	604.0
5	Coal-fired utility boilers (electric generating plants) (air)	69.5	Cement kilns (hazardous waste burning) (air)	156.1	Bleached chemical wood pulp and paper mills (land, water)	370.1
6	Diesel heavy-duty trucks (air)	65.4	Municipal wastewater treatment sludge (applied to land and incinerated) (land and air)	133.3	Cement kilns (hazardous waste burning) (air)	117.8
7	Industrial wood combustion (air)	41.5	Coal-fired utility boilers (electric generating plants) (air)	60.1	Municipal wastewater treatment sludge (applied to land and incinerated) (land and air)	85.0
8	Diesel off-road equipment (includes ships, farm equipment, trains) (air)	33.1	Ethylene dichloride/vinyl chloride production (land, air, water)	35.7	Coal-fired utility boilers (electric generating plants) (air)	50.9
9	Ethylene dichloride/vinyl chloride production (land, air, water)	30.0	Diesel heavy-duty trucks (air)	33.3	Automobiles using leaded gasoline (air)	37.5
10	Sintering plants (air)	27.6	Bleached chemical wood pulp and paper mills (land and water)	30.0	2,4-Dichlorophenoxy acetic acid (2,4-D) (land)	33.4

#### 1.1.4. Toxicity Equivalence Factors

CDDs, CDFs, and PCBs are commonly found as complex mixtures when detected in environmental media and biological tissues or when measured as environmental releases from specific sources. Humans are likely to be exposed to mixtures of CDDs, CDFs, and dioxin-like PCB congeners that vary by source and pathway, complicating the assessment of human health risk assessment. In order to address this problem, the concept of a “toxicity equivalence” (TEQ) has been considered and discussed by the scientific community, and toxicity equivalence factors (TEFs) have been developed and introduced to facilitate risk assessment of exposure to these chemical mixtures.

On the most basic level, TEFs compare the potential toxicity of each dioxin-like compound in the mixture to the well-studied and well-understood toxicity of TCDD, the most toxic member of the group. The comparison procedure involves assigning individual TEFs to the 2,3,7,8-substituted CDD/CDF congeners and dioxin-like PCBs. To accomplish this, scientists have reviewed the toxicological databases and, with considerations of chemical structure, persistence, and resistance to metabolism, have agreed to ascribe specific “order of magnitude” TEFs for each dioxin-like congener relative to TCDD, which is assigned a TEF of 1. The other congeners have TEF values ranging from 1 to 0.00001.

Thus, these TEFs are the result of scientific judgment of a panel of experts using all of the available data and are selected to account for uncertainties in the available data and to avoid underestimating risk. In this sense, they can be described as “public health-conservative” values. To apply this TEF concept, the TEF of each congener present in a mixture is multiplied by the respective mass concentration, and the products are summed to represent the 2,3,7,8-TCDD TEQ of the mixture (eq 1-1).

$$TEQ = \sum_{i=1}^n (Congener_i \times TEF_i) + \dots + (Congener_n \times TEF_n) \quad (1-1)$$

The TEF values for CDDs and CDFs were originally adopted by international convention (U.S. EPA, 1989a). These values were further reviewed and/or revised, and TEFs were also developed for PCBs (Ahlborg et al., 1994; Van den Berg et al., 1998). A problem arises in that past and present quantitative exposure and risk assessments may not have clearly identified which of three TEF schemes was used to estimate the TEQ. This document uses a new uniform TEQ nomenclature that clearly distinguishes between the different TEF schemes and identifies the congener groups included in specific TEQ calculations. The nomenclature uses the following abbreviations to designate which TEF scheme was used in the TEQ calculation:

- I-TEQ refers to the international TEF scheme adopted by EPA in 1989 (U.S. EPA, 1989a). See Table 1-8.
- TEQ-WHO<sub>94</sub> refers to the 1994 World Health Organization (WHO) extension of the I-TEF scheme to include 13 dioxin-like PCBs (Ahlborg et al., 1994). See Table 1-9.
- TEQ-WHO<sub>98</sub> refers to the 1998 WHO update to the previously established TEFs for dioxins, furans, and dioxin-like PCBs (Van den Berg et al., 1998). See Table 1-10.

**Table 1-8. The TEF scheme for I-TEQ<sub>DF</sub>**

Dioxin congener	TEF	Furan congener	TEF
2,3,7,8-TCDD	1	2,3,7,8-TCDF	0.1
1,2,3,7,8-PeCDD	0.5	1,2,3,7,8-PeCDF	0.05
1,2,3,4,7,8-HxCDD	0.1	2,3,4,7,8-PeCDF	0.5
1,2,3,6,7,8-HxCDD	0.1	1,2,3,4,7,8-HxCDF	0.1
1,2,3,7,8,9-HxCDD	0.1	1,2,3,6,7,8-HxCDF	0.1
1,2,3,4,6,7,8-HpCDD	0.01	1,2,3,7,8,9-HxCDF	0.1
OCDD	0.001	2,3,4,6,7,8-HxCDF	0.1
		1,2,3,4,6,7,8-HpCDF	0.01
		1,2,3,4,7,8,9-HpCDF	0.01
		OCDF	0.001

**Table 1-9. The TEF scheme for dioxin-like PCBs, as determined by the World Health Organization in 1994**

Chemical structure	IUPAC number	TEF
3,3',4,4'-TCB	PCB-77	0.0005
2,3,3',4,4'-PeCB	PCB-105	0.0001
2,3,4,4',5-PeCB	PCB-114	0.0005
2,3',4,4',5-PeCB	PCB-118	0.0001
2',3,4,4',5-PeCB	PCB-123	0.0001
3,3',4,4',5-PeCB	PCB-126	0.1
2,3,3',4,4',5-HxCB	PCB-156	0.0005
2,3',4,4',5,5'-HxCB	PCB-157	0.0005
3,3',4,4',5,5'-HxCB	PCB-167	0.00001
3,3',4,4',5,5'-HxCB	PCB-169	0.01
2,2',3,3',4,4',5-HpCB	PCB-170	0.0001
2,2',3,4,4',5,5'-HpCB	PCB-180	0.00001
2,3,3',4,4',5,5'-HpCB	PCB-189	0.0001

## 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN

### Artificial Pollution Sources:

2,3,7,8-Tetrachlorodibenzo-p-dioxin is formed from the incineration of municipal, medical, and industrial wastes(1) and from the production of bleached wood pulp and paper(2). 2,3,7,8-Tetrachlorodibenzo-p-dioxin occurs as a contaminant in the manufacture of various pesticides(3) and, as a result, has been directly released into the environment during the use of these pesticides(SRC). 2,3,7,8-Tetrachlorodibenzo-p-dioxin is found in combustion emissions of various sources, including coal-fired or oil-fired power plants, wood burning, and home heating systems(4-8). 2,3,7,8-Tetrachlorodibenzo-p-dioxin also occurs in automobile and diesel exhaust(9,10). 2,3,7,8-Tetrachlorodibenzo-p-dioxin can form during the synthesis and combustion of chlorine-containing materials, such as polyvinylchloride (PVC), in the presence of naturally occurring phenols, vegetation treated with phenoxy acetic acid herbicides, paper and wood treated with chlorophenols, and pesticide-treated wastes(3). 2,3,7,8-Tetrachlorodibenzo-p-dioxin is a by-product formed in the manufacture of 2,4,5-trichlorophenol(3).

- [(1) Podoll RT et al; Environ Sci Technol 20: 490-2 (1986)
- (2) Fletcher CL, McKay WA; Chemosphere 26: 1041-69 (1993)
- (3) Arthur MR, Frea JL; J Environ Qual 18: 1-11 (1989)
- (4) USEPA; Federal Register 63FR17838-17851 April 10, (1998)
- (5) Chiu C et al; Chemosphere 12: 607-16 (1983)
- (6) Czuczwa JM, Hites RA; Environ Sci Technol 18: 444-50 (1984)
- (7) Gizzi F et al; Chemosphere 11: 577-83 (1982)
- (8) Thoma H; Chemosphere 17: 1369-79 (1988)
- (9) Bingham AG et al; Chemosphere 19: 669-73 (1989)
- (10) Marklund S et al; Chemosphere 16: 29-36 (1987) ]

\*\*PEER REVIEWED\*\*

### Average Daily Intake:

The maximum daily intake of 2,3,7,8-TCDD was estimated for residents of the Great Lakes region who regularly consume fish from the Great Lakes. The intake ranged from 0.39-8.4 ug/day.

[Cordle F, Use of Epidemiology in the Regulation of Dioxins in the Food Supply (1983) as cited in USEPA; Drinking Water Criteria Document for 2,3,7,8-Tetrachlorodibenzo-p-dioxin p.IV-3 (1985) EPA 600/x-84/94-1]

\*\*PEER REVIEWED\*\*

**The general population is exposed to 2,3,7,8-tetrachlorodibenzo-p-dioxin primarily through the ingestion of food(SRC).** The estimated average daily intake of 2,3,7,8-tetrachlorodibenzo-p-dioxin was 34.8 ng/day for the US population (1). **The results of this assessment indicate that foods from animal origins (e.g., milk and dairy products, beef, fish, and eggs) comprise 95 percent of the estimated total daily exposure(1).** The average daily intake of 2,3,7,8-tetrachlorodibenzo-p-dioxin from meat alone was 18.0 pg/day, **accounting for 52%** of the total daily intake of 2,3,7,8-tetrachlorodibenzo-p-dioxin from food sources(1). The average daily intake of 2,3,7,8-

tetrachlorodibenzo-p-dioxin from fish was 6.7 pg/day, which comprised 19% of the total daily intake in the United States(1). In an FDA study, the average exposure to the US population from 2,3,7,8-tetrachlorodibenzo-p-dioxin through the food supply was estimated(2). The results of the FDA assessment, indicate an average daily exposure of 15.9 pg/day of 2,3,7,8-tetrachlorodibenzo-p-dioxin of which 4 percent are due to dairy and milk products, 41 percent are due to meats, and 54 percent are due to ocean fish(2). For food samples collected from 16 locations in Japan between the years 1999 and 2000, the daily intake of 2,3,7,8-tetrachlorodibenzo-p-dioxin from fish and shellfish was 3.16 pg TEQ/person/day (16 of 16 positive samples) while from meat and eggs the daily intake was 0.33 pg TEQ/person/day (3 of 16 positive samples)(3). Inhalation of ambient air and ingestion of water are not major pathways of human exposure, accounting for only 2% (1 pg/day) and <0.01% ( $6.5 \times 10^{-3}$  pg/day), respectively, of the total daily intake of 2,3,7,8-tetrachlorodibenzo-p-dioxin(4).

(1) Travis CC, Hattemer-Frey HA; Sci Tot Environ 104: 97-127 (1991)

(2) Henry S et al; Chemosphere 25: 235-8 (1992)

(3) Tsutsumi T et al; Chemosphere 45: 1129-37 (2001)

(4) Hattemer-Frey HA, Travis CC; Chemosphere 18: 643-9 (1989)

\*\*PEER REVIEWED\*\*

## Occupational Exposure

### Other Standards Regulations and Guidelines:

One contaminant produced unintentionally during the manufacture of chlorophenols and phenoxy herbicides is **TCDD**. The resulting **TCDD**-containing wastes have been detected at many hazardous waste sites which in recent years have been in the process of remediation. Concerns about worker exposure to **TCDD**-contaminated soil (dust) during remediation of hazardous waste sites have produced a need for an occupational exposure limit for **TCDD**. The animal toxicology data and human experience with **TCDD** are reviewed, and an occupational exposure limit for **TCDD** is proposed. The animal data support risk estimations which are based on **TCDD** as a nongenotoxic carcinogen. **Studies on human populations have failed to demonstrate clearly any significant long-term health effects at [background] levels to which humans have been exposed.** The data indicate that an 8-hr time-weighted average limit of **2 ng/cu m is appropriate**, and the associated risk would be consistent with other carcinogens at their corresponding occupational exposure limits. **A preliminary occupational exposure limit of 0.2 ng/cu m (200 pg/cu m) is recommended, however, in light of other sources of exposure because of TCDD's ubiquitousness in the environment, its unclear mechanism of action, and its rather long biological half-life in humans.** This limit provides an ample margin of safety to prevent chloracne following repeated, acute exposure, and it addresses those chronic effects of **TCDD** observed in animal studies as well as those observed after accidental human exposure. The resulting body burden caused by chronic exposure to **TCDD** at the proposed occupational exposure limit is examined. Its toxicological significance is compared with human tissue data and with other similarly persistent chemicals.

[Leung HW et al; Am Ind Hyg Assoc J 49  
(9): 466-74 (1988)]

**\*\*PEER REVIEWED\*\***

## **CHROMIUM COMPOUNDS**

CASRN: NO CAS RN

This record contains general information for chromium ions and inorganic and organic chromium compounds, including statements in the literature referenced to chromium compounds and chromium salts. For compound specific information, refer to the appropriate individual records listed in the RELATED HSDB RECORDS field. For information on the metal, refer to the Chromium, ELEMENTAL record.

*For other data, click on the Table of Contents*

### **Occupational Exposure Standards:**

#### **OSHA Standards:**

Permissible Exposure Limit: Table Z-1 8-hr Time Weighted Avg: 1 mg/cu m. /Chromium metal and insoluble salts, as Cr/

[29 CFR 1910.1000 (7/1/2001)]**\*\*PEER REVIEWED\*\***

Permissible Exposure Limit: Table Z-1 8-hr Time Weighted Avg: 0.5 mg/cu m. /Chromium(II) compounds, as Cr/

[29 CFR 1910.1000 (7/1/2001)]**\*\*PEER REVIEWED\*\***

Permissible Exposure Limit: Table Z-1 8-hr Time Weighted Avg: 0.5 mg/cu m. /Chromium(III) compounds, as Cr/

[29 CFR 1910.1000 (7/1/2001)]**\*\*PEER REVIEWED\*\***

## **LEAD COMPOUNDS**

CASRN: NO CAS RN

This record contains general information for lead ions and compounds, including statements in the literature referenced to lead compounds, lead salts, etc. For compound-specific information, refer to the appropriate individual records as listed in the RELATED HSDB RECORDS field; for information on the metal itself, refer to the LEAD, ELEMENTAL record.

### **Occupational Exposure Standards:**

#### **OSHA Standards:**

The employer shall assure that no employee is exposed to lead at concentrations greater than 50 ug/cu m averaged over an 8-hr period. If an employee is exposed to lead for more than 8 hr in any work day, the permissible exposure limit, as a TWA for that day, shall be reduced according to the following formula: Maximum permissible limit (in

ug/cu m)= 400 divided by the number of hours worked in the day. /Lead, inorganic, as Pb/

[29 CFR 1910.1025(c) (7/1/98)]\*\*PEER REVIEWED\*\*

### **BARIUM COMPOUNDS**

CASRN: NO CAS RN

This record contains general information for barium ions and compounds, including statements in the literature referenced to barium compounds, barium salts, etc. For compound-specific information, refer to the appropriate individual records as listed in the RELATED HSDB RECORDS field; for information on the metal itself, refer to the BARIUM, ELEMENTAL record.

### **OSHA Standards:**

Permissible Exposure Limit: Table Z-1 8-hr Time Weighted Avg: 0.5 mg/cu m. /Barium, soluble compounds, as Ba/

[29 CFR 1910.1000 (7/1/99)]\*\*PEER REVIEWED\*\*

---

U.S. National Library of Medicine, 8600 Rockville Pike, Bethesda, MD 20894  
National Institutes of Health, Health & Human Services. **Hazardous Substance Database.** <http://toxnet.nlm.nih.gov/cgi-bin/sis/search/f?./temp/~GMJH8T:1> accessed on 1/14/2009.