

September 15, 2017

Mr. Steve Teel Cleanup Project Manager Department of Ecology – Toxics Cleanup Program Southwest Regional Office

Re: Targeted Groundwater Monitoring Results Former Tacoma Metals Site Project No. 160420

Dear Steve:

Aspect Consulting, LLC (Aspect) has prepared this memorandum to summarize groundwater monitoring at the Former Tacoma Metals Site (Site) conducted on June 22, 2017. This targeted investigation was conducted to address Washington State Department of Ecology (Ecology) comments included in their Comments on the *Revised Augmented Remedial Investigation and Feasibility Report*, dated April 18, 2016 (Ecology, 2016). This memorandum is organized to discuss the scope, methods, findings, and recommendations.

Scope

The scope of this targeted investigation was discussed and agreed to during an April 12, 2017, phone call between Aspect (Peter Bannister) and Ecology Site Manager (Steve Teel). The groundwater monitoring scope addressed Ecology's remaining uncertainties with respect to Site groundwater characterization. Monitoring wells accessed during the targeted investigation are located near the north-northwest corner of the property near the Puyallup River (Figure 1).

Hexavalent Chromium

A hexavalent chromium cleanup level of 10 micrograms per liter was proposed in the *Revised Augmented Remedial Investigation and Feasibility Study Report - Former Tacoma Metals Site* (Kennedy/Jenks, 2014). Ecology requested that groundwater samples from selected wells be analyzed for total and dissolved chromium (see Comment 7.e., Ecology, 2016). During a monitoring event on December 3, 2016 (Aspect, 2017), reporting limits for hexavalent were greater than the proposed cleanup level, due to interference issues associated with the laboratory method. Therefore, to address Ecology's remaining uncertainty, an alternative laboratory method was selected with a reporting limit below the proposed cleanup level. Monitoring well MW-20 had the highest concentrations of total chromium (5.50 micrograms per liter) among four monitoring wells sampled on December 3, 2016, and was selected as the sampling location for this targeted investigation.

Light Non-Aqueous Phase Liquid

Light non-aqueous phase liquid (LNAPL) had been previously observed at monitoring well MW-8(R). A sample of LNAPL from MW-8(R) was evaluated by Friedman & Bruya, Inc. of Seattle, Washington and found to contain only creosote product (Kennedy/Jenks, 2007). The

Former Tacoma Metals Site September 15, 2017

following table provides historical LNAPL thickness measurements, and is an excerpt from the 2007 data summary report (Kennedy/Jenks, 2007).

MW-8(R)							
LNAPL Measurement History							
Date	LNAPL Thickness (feet)						
16-Dec-03	1.15 ^(c)						
8-Jan-04	0.01						
16-Jan-04	0.07						
28-Jan-04	0.07						
20-Feb-04	0.40						
10-Mar-04	0.25						
10-Jun-04	0.12						
17-Sep-04	<0.01 ^(d)						
10-Dec-04	0.08						
30-Mar-05	0.03						
9-Jun-05	0.90						
23-Oct-05	<0.01						
2-Feb-06	0.22						
12-Dec-06	0.18						

To address Ecology's remaining uncertainty, the LNAPL thickness at MW-8(R) was measured.

Figure 1. Excerpt from 2007 Data Summary Report

Methods

The scope of groundwater monitoring included water level and field parameter measurement, and collection of a groundwater sample for hexavalent chromium analysis, from monitoring well MW-20. In addition, the thickness of LNAPL was measured at monitoring well MW-8(R).

Aspect mobilized during low-tide conditions on June 22, 2017, for groundwater monitoring activities. Lower-low tide was predicted to occur at approximately 13:25, according to the National Oceanic and Atmospheric Administration (NOAA) tide station in Commencement Bay. Weather conditions included clear skies and a light breeze.

The following monitoring and sampling methods were followed at monitoring well MW-20:

- The depth to water was measured from the top of casing to the nearest 0.01 foot.
- Monitoring well MW-20 was purged using dedicated tubing in accordance with U.S. Environmental Protection Agency (EPA) low-flow purge methods until water quality parameters stabilized and turbidity was less than 25 nephelometric turbidity units (NTUs).
- A sample was field-filtered and collected in a laboratory-supplied container for dissolved hexavalent chromium analysis. Filtering was performed using an in-line, 0.45-micron filter.

Former Tacoma Metals Site September 15, 2017

The sample was stored in a cooler under chain-of-custody procedures and relinquished to BSK Associates, in Vancouver, Washington, for laboratory analysis of hexavalent chromium (by EPA 218.7).

The following monitoring methods were followed at monitoring well MW-8(R):

- The depths to the top of the LNAPL, and to water below the LNAPL, were measured from the top of casing to the nearest 0.01 foot using an oil-water interface probe.
- The depth to the LNAPL surface was subtracted from the depth to water surface to determine the thickness of LNAPL.

Field observations and parameters at monitoring well MW-20 were recorded on a groundwater sampling record form, and the LNAPL/water level depths at MW-8(R) were recorded in a field notebook. Copies of the groundwater sampling record form and the field notebook are provided in Appendix A.

Results and Discussion

The concentration of hexavalent chromium in groundwater from monitoring well MW-20 was not detected above the laboratory reporting limit of 0.20 microgram per liter. The field observations and laboratory analytical results are summarized in Table 1. The BSK Associates laboratory report is included as Appendix B.

The low potential hexavalent chromium concentrations, and the low total chromium concentrations previously observed, supports removing hexavalent chromium from the list of potential contaminants of concern. As suggested by Ecology, these findings support assigning a chromium (III) cleanup level of 120 ug/L, corrected for a site-specific hardness value of 180 (see Comment 7.e., Ecology 2016).

The measured LNAPL thickness at MW-8(R) was 0.89 feet, and was confirmed by a second reading of 0.88 feet (see field notes in Appendix A).

References

- Aspect Consulting, LLC (Aspect), 2017, Focused Groundwater Monitoring Results, Former Tacoma Metals Site, Letter to Mr. Steve Teel, Cleanup Project Manager, Dated March 21, 2017.
- Kennedy/Jenks Consultants, 2007, Supplemental Data Summary Report, Former Tacoma Metals Site, Tacoma, Washington, Prepared for Portland Avenue Associates, LLC, Dated May 2007.
- Kennedy/Jenks Consultants, 2014, Revised Augmented Remedial Investigation and Feasibility Report, Former Tacoma Metals Site, Tacoma, Washington, Prepared for Portland Avenue Associates, LLC, Dated September 2014.
- Washington State Department of Ecology (Ecology), 2016, Comments on the Revised Augmented Remedial Investigation and Feasibility Report, dated September 2014, prepared by Kennedy/Jenks, Former Tacoma Metals Site, Agreed Order DE 97-5435, Facility/Site No. 1257, Cleanup Site ID No. 3910, Dated April 18, 2016.

Former Tacoma Metals Site September 15, 2017

Limitations

Work for this project was performed for the Estate of Sophie Sussman (Client), and this letter was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This letter does not represent a legal opinion. No other warranty, expressed or implied, is made.

All reports prepared by Aspect Consulting for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect Consulting. Aspect Consulting's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

Sincerely,

Aspect consulting, LLC



Peter Bannister, PE Associate Engineer pbannister@aspectconsulting.com

Attachments:	Table 1 – Groundwater Quality Data
	Figure 1 – Sample Location and Affected Soil Area Map (Figure 3, Kennedy/Jenks
	Consultants)
	Appendix A – Groundwater Sampling Records and Field Notes
	Appendix B – BSK Associates Laboratory Report

cc: Loren Dunn, Beveridge & Diamond

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Table 1 - Groundwater Quality Data

Project No. 160420, Former Tacoma Metals Site, Tacoma, Washington

Field Observations

Well ID	Sample Date Time	Sample Tube Intake Depth	Static Depth to Water		
		ft bTOC	ft bTOC		
MW-20	6/22/17 13:25	25	8.86		

Field Parameters

Well ID	Sample Date Time	Temperature	Specific Conductivity			Oxidation- Reduction Potential	Turbidity
		°C	μS/cm	mg/L		mV	NTU
MW-20	6/22/17 13:25	14.9	2267	0.2	7.32	91.9	16.0

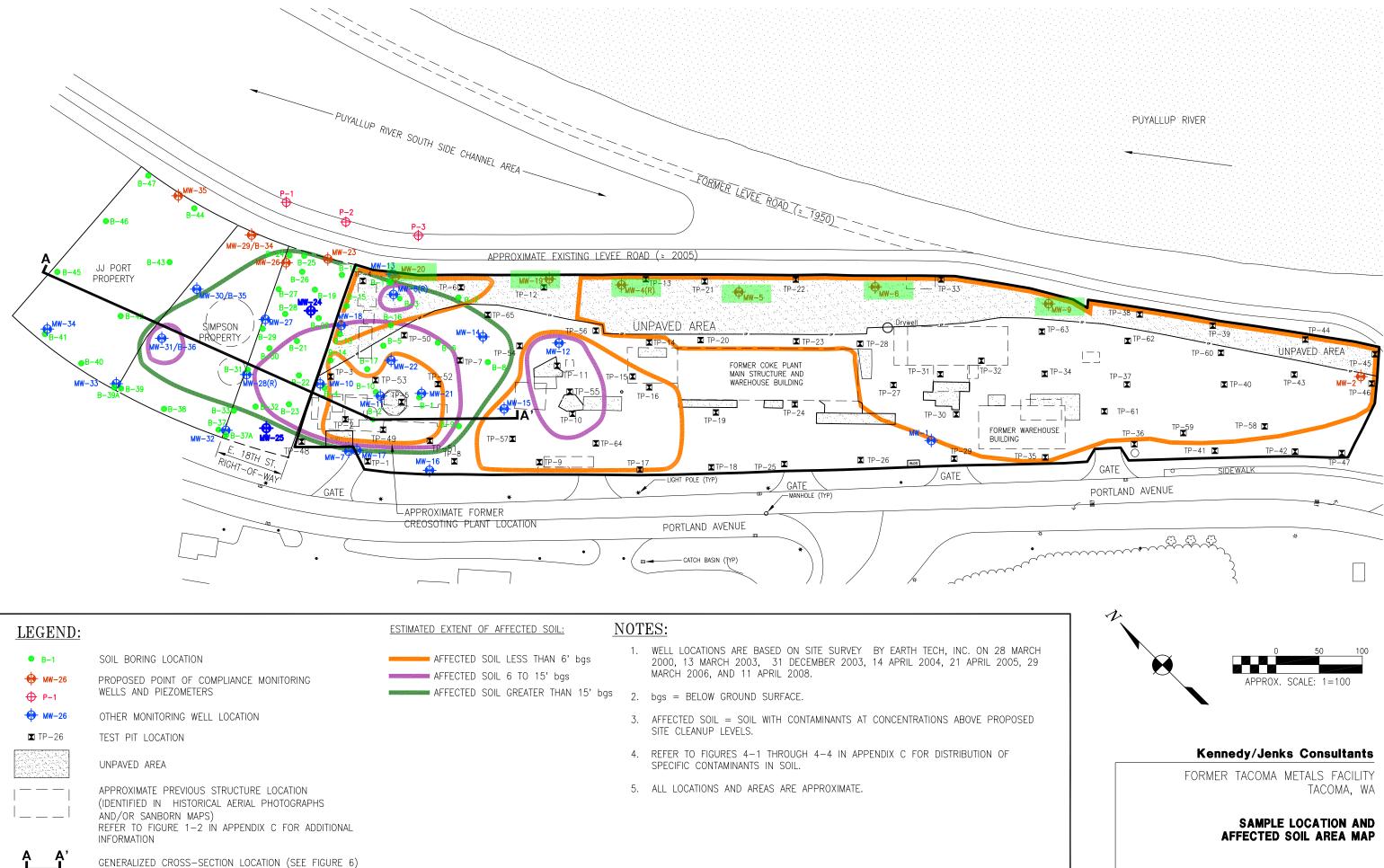
Laboratory Analytical Results

Well ID	Sample Date Time	Hexavalent Chromium µg/L
MW-20	6/22/17 13:25	<0.20
Proposed (10	

Notes

Units: ft bTOC = feet below top of casing; C = degrees Celcius; mg/L = micrograms/Liter; mV = millivolts; NTU = nephthalometric turbidity units; $\mu g/L$ = micrograms/Liter

Proposed Cleanup Levels provided in the Revised Augemented Remedial Investigation and Feasibility Study Report - Former Tacoma Metals Site (Kennedy/Jenks, 2014).



GENERALIZED CROSS-SECTION LOCATION (SEE FIGURE 6)



996098.00\2013 RI UPDATE\FIG_03

FIGURE 3

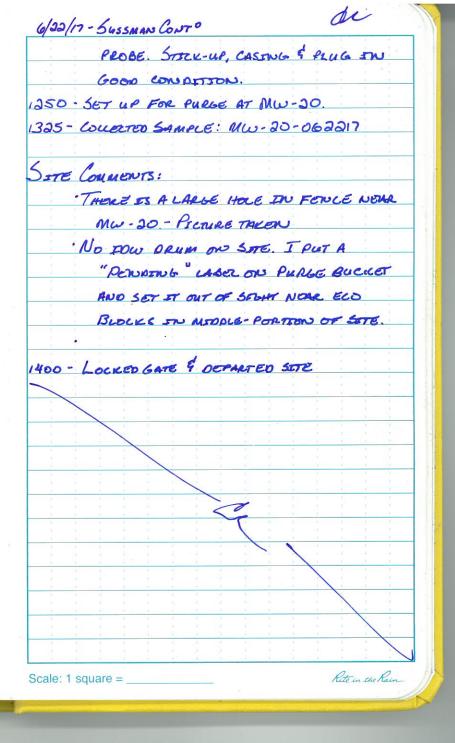
APPENDIX A

Groundwater Sampling Records and Field Notes



GROUNDWATER SAMPLING RECORD						WELL NUMBER: MW-20 Page: of					
Project Na	me:	Tacoma Metals			Project Number:160420						
	6/22/		-			Starting Water Level (ft TOC): 8.86					
	by:		тос			Casing Stickup (ft): Total Depth (ft TOC):					
Screened	Interval (ft. T(0C)				Casing Diam		e).	2	2	
		ГОС)						<u>.</u>		·	
Casing Vol	lume	(ft Water)	') x	(Lpfv)(gpf) =	(L)(gal)					
	umes: 3/4" =	= 0.02 gpf = 0.09 Lpf	2" = 0.16 gp	pf 4"	= 0.65 gpf	6" = 1.47	7 gpf		Sample Int	take Depth (ft TOC): ~ 25	
PURGIN		REMENTS					<u></u>				
Criteria:	1	Typical 0.1-0.5 Lpm	Stable and minimal	na	± 3%	± 10%	± 0.1	± 10 mV	± 10%		
Time	Cumul. Volume	Purge Rate	Water Level	Temp.	Specific	Dissolved	pН	Eh	Turbidity	Comments	
	(gal or L)	(gpm or (pm)	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	(°C)	Conductivity (µS/cm)	Oxygen (mg/L)		ORP (mv)	(NTU)		
		0.15	8.86							Start purge @ 1350	
1254			9.10	15.2	2278	3.78	7.30	96.9	3.98		
1257			9.10	15.0	2275	1.74	7.32				
1300			9.10	15.0		0.62		89.8	\$5.1		
1303			9.10	15.0	2270	0.25	7.32				
1306			9.10	14.9	2267	0.00	7.32	91.9	16.0		
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0/1111 22							Appe	arance	Γ		
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Observatio	ns/Comments	s:									
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APPENDIX B

BSK Associates Laboratory Report



BSK Associates Vancouver 2517 E. Evergreen Blvd. Vancouver, WA 98661 360-750-0055 (Main)

Peter Banister Aspect Consulting 350 Madison Avenue N. Bainbridge Island, WA 98110

RE: Report for V7F0491 Sussman - 160420

Dear Peter Banister,

Thank you for using BSK Associates for your analytical testing needs. In the following pages, you will find the test results for the samples submitted to our laboratory on 6/23/2017. The results have been approved for release by our Laboratory Director as indicated by the authorizing signature below.

The samples were analyzed for the test(s) indicated on the Chain of Custody (see attached) and the results relate only to the samples analyzed. BSK certifies that the testing was performed in accordance with the quality system requirements specified in the 2009 TNI Standard. Any deviations from this standard or from the method requirements for each test procedure performed will be annotated alongside the analytical result or noted in the Case Narrative. Unless otherwise noted, the sample results are reported on an "as received" basis.

If additional clarification of any information is required, please contact your Project Manager, Debra Karlsson, at (360) 750-0055.

Thanks again for using BSK Associates. We value your business and appreciate your loyalty.

Sincerely,

Renea Gangell

Renea Rangell, Laboratory Director - Vancouver



Accredited in Accordance with NELAP **ORELAP #4021**



V7F0491 Sussman - 160420

Case Narrative

Project and	l Report Details	Invoice Details
Client:	Aspect Consulting	Invoice To: Aspect Consulting
Report To:	Peter Banister	Invoice Attn: Peter Banister
Project #:	Sussman - 160420	Project PO#: -
Received:	6/23/2017 - 08:45	
Report Due:	7/10/2017	
Sample Receipt Conditions Cooler: Default Cooler Temperature on Receipt °C: 10.5		Containers Intact COC/Labels Agree Received On Blue Ice Packing Material - Other Initial receipt at BSK-VAL
Data Quali	ifiers	

The following qualifiers have been applied to one or more analytical results:

MS1.0 Matrix spike recoveries exceed control limits.

Report Distribution

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Peter Banister	FINAL.RPT	agriffin@aspectconsulting.com;eknoedler@aspe ctconsulting.com



Certificate of Analysis

Sample ID: V7F0491-01 Sampled By: Client Sample Description: MW-20-062217 // Aspect Constulting Sample Date - Time: 06/22/17 - 13:25 Matrix: Water Sample Type: Other

BSK Associates Laboratory Fresno

General Chemistry

Analyte	Method	Result	MDL	RL	Units	RL Mult	Batch	Prepared	Analyzed Qual
Hexavalent Chromium	EPA 218.6	ND	0.029	0.20	ug/L	1	A708387	07/05/17	07/05/17



BSK Associates Laboratory Fresno General Chemistry Quality Control Report

Analyte	Result	MDL	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
			EPA 21	18.6 - Q	uality Cor	ntrol						
Batch: A708387											Prepare	ed: 7/5/2017
Prep Method: Method Specific Preparation	n										An	alyst: RES/I
Blank (A708387-BLK1)												
Hexavalent Chromium	ND	0.029	0.20	ug/L							07/05/17	
Blank Spike (A708387-BS1)												
Hexavalent Chromium	2.0	0.029	0.20	ug/L	2.0		98	90-110			07/05/17	
Blank Spike Dup (A708387-BSD1)												
Hexavalent Chromium	2.0	0.029	0.20	ug/L	2.0		102	90-110	4	10	07/05/17	
Matrix Spike (A708387-MS1), Source: A7F1968-01												
Hexavalent Chromium	11	0.029	0.20	ug/L	2.0	9.4	89	90-110			07/05/17	MS1.0 <i>Low</i>
Matrix Spike Dup (A708387-MSD1), Source	Matrix Spike Dup (A708387-MSD1), Source: A7F1968-01											
Hexavalent Chromium	11	0.029	0.20	ug/L	2.0	9.4	93	90-110	1	10	07/05/17	



Certificate of Analysis

Notes:

- · The Chain of Custody document and Sample Integrity Sheet are part of the analytical report.
- Any remaining sample(s) for testing will be disposed of according to BSK's sample retention policy unless other arrangements are made in advance.
- All positive results for EPA Methods 504.1 and 524.2 require the analysis of a Field Reagent Blank (FRB) to confirm that the results are not a contamination error from field sampling steps. If Field Reagent Blanks were not submitted with the samples, this method requirement has not been performed.
- Samples collected by BSK Analytical Laboratories were collected in accordance with the BSK Sampling and Collection Standard Operating
 Procedures.
- J-value is equivalent to DNQ (Detected, not quantified) which is a trace value. A trace value is an analyte detected between the MDL and the laboratory reporting limit. This result is of an unknown data quality and is only qualitative (estimated). Baseline noise, calibration curve extrapolation below the lowest calibrator, method blank detections, and integration artifacts can all produce apparent DNQ values, which contribute to the un-reliability of these values.
- (1) Residual chlorine and pH analysis have a 15 minute holding time for both drinking and waste water samples as defined by the EPA and 40 CFR 136. Waste water and ground water (monitoring well) samples must be field filtered to meet the 15 minute holding time for dissolved metals.
- Summations of analytes (i.e. Total Trihalomethanes) may appear to add individual amounts incorrectly, due to rounding of analyte values occurring before or after the total value is calculated, as well as rounding of the total value.
- RL Multiplier is the factor used to adjust the reporting limit (RL) due to variations in sample preparation procedures and dilutions required for matrix interferences.
- Due to the subjective nature of the Threshold Odor Method, all characterizations of the detected odor are the opinion of the panel of analysts. The characterizations can be found in Standard Methods 2170B Figure 2170:1.
- · The MCLs provided in this report (if applicable) represent the primary MCLs for that analyte.

Definitions

mg/L:	Milligrams/Liter (ppm)	MDL:	Method Detection Limit	MDA95:	Min. Detected Activity
mg/Kg:	Milligrams/Kilogram (ppm)	RL:	Reporting Limit: DL x Dilution	MPN:	Most Probable Number
μg/L:	Micrograms/Liter (ppb)	ND:	None Detected at RL	CFU:	Colony Forming Unit
µg/Kg:	Micrograms/Kilogram (ppb)	pCi/L:	Picocuries per Liter	Absent:	Less than 1 CFU/100mLs
%:	Percent Recovered (surrogates)	RL Mult:	RL Multiplier	Present:	1 or more CFU/100mLs
NR:	Non-Reportable	MCL:	Maximum Contaminant Limit		

Please see the individual Subcontract Lab's report for applicable certifications.

BSK is not accredited under the NELAP program for the following parameters:

Certifications: Please refer to our website for a copy of our Accredited Fields of Testing under each certification.

Fresno			
State of California - ELAP	1180	State of Hawaii	4021
State of Nevada	CA000792016-1	State of Oregon - NELAP	4021
EPA - UCMR4	CA00079	State of Washington	C997-16
State of New York	12073		
Sacramento			
State of California - ELAP	2435		
San Bernardino			
State of California - ELAP	2993	State of Oregon - NELAP	4119-001
Vancouver			
State of Oregon - NELAP	WA100008-008	State of Washington	C824-16

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	ole Composition: 🗵 Single Source 🔲 **Blend	ed 🔲 **Co	mposite	Dis Dis	tribution Sample		ut c				
Sam	ole Taken: 🔲 Before Treatment 🔲 After Treatm		Treatment		Group (WA only): 🔲 A 🛛	В	Hexavalent				
	Matrix Types: SW=Surface Water BW=Bottled Water GW=Gr	bund Water WW=Waste	Water STW=	1 1		# of	Xai				
#	Sample Description/Location*	Date	Time	Matrix*	Comments	cont.	운				
1	MW-20-062217	6/22/17	1325	Water	Field Filtered	1	X				
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	for services rendered as noted herein are due in full within 30 days from the date involced. If no	t so paid, account balances are	deemed delinquer	nt. Delinquent bala	nces are subject to monthly service charges and is	nterest specified	in RSK's current			or The person similar for	

Payment for services rendered as noted herein are due in full within 30 days from the date involced. If not so paid, account balances are deemed delinquent, Delinquent balances are subject to monthly service charges and interest specified in BSK's current Standard Terms and Conditions for Laboratory Services. The person signing the ClientOcompany acknowledges that the they are either the client of an authorized agent to the Client that the Client agrees to be responsible for payment for the services on this Chain of Custody, and agrees to BSK's terms and conditions for Laboratory services. BSK's current terms and conditions for Laboratory services unless contractually bound otherwise. BSK's current terms and conditions to responsible for payment for the services on this Chain of Custody, and agrees to BSK's terms and conditions for Laboratory services. BSK's current terms and conditions to responsible for payment for the services on this Chain of Custody, and agrees to BSK's terms and conditions for Laboratory services. BSK's current terms and conditions for Laboratory services and interest services on the client terms and conditions for Laboratory services. BSK's current terms and conditions for Laboratory services and conditions for Laboratory services. BSK's current terms and conditions for Laboratory services and conditions for Laboratory services. BSK's current terms and conditions for Laboratory services and conditions for Laboratory services and conditions for Laboratory services and conditions for Laboratory services. BSK's current terms and conditions for Laboratory services and conditions for Laboratory services are subject to agree terms and conditions for Laboratory services are subject to agree terms and conditions for Laboratory services are subject to agree terms and conditions for Laboratory services are subject to agree terms and conditions for Laboratory services are subject to agree terms are subject to agree ter

	ssociates VAL-FL-0048-02				<u></u>			//25	Ň
Sa	mple Integrity					Wo	rk Or	der	
BS	K Bottles: Yes No Page	e of				l	_abel	_	
	Was temperature within range?	Yes No	RIA	Wer	e correct containe	rs and prese	rvatives	1 Van	
0	Chemistry ≤ 6°C Micro < 8°C	A			ived for the tests r	and the second se		Yes	No NA
COC Info	If samples were taken today, is there evidence (that chilling has begun?	Yes No	NA		e there bubbles in atiles Only)	the VOA via	ls?	Yes	No NA
S	Did all bottles arrive unbroken and intact?	Yes I	NO		a sufficient amou	nt of sample	received	? (Ye:	s) No
S	Did all bottle labels agree with COC?	(Yes)	to	Dos	samples have a ho	Id time <72 h	nours?	Yes	
	Was sodium thiosulfate added to CN sample(s) until chlorine was no longer present?	Yes No	NA	Was PM:	PM notified of dis	crepancies? //Time:		Yes	No (NA)
6	250ml(A) 500ml(B) 1Liter(C) 40ml VOA(V)	Checks	1						
	Bacti Na ₂ S ₂ O ₃	-	1						
	None (P) ^{White Cap}								
	Cr6 (P) Lt. Green Label/Blue Cap NH4OH(NH4)2SO4 DW	Cl, pH > 8	1	~					
	Cr6 (P) ^{Pink Label/Blue Cap} NH4OH(NH4)2SO4 WW	pH 9.3-9.7	11	H					
the lab	Cr6 (P) Black Label/Blue Cap NH40H(NH4)2SO4 7199	pH 9.0-9.5		,					
	HNO3 (P) Red Cap or HCI (P) Purple Cap/Lt. Blue Label		17						
or are performed in	H ₂ SO ₄ (P) or (AG) Yellow Cap/Label	pH < 2	1						
rfori	NaOH (P) Green Cap	Cl, pH >10		The second		in the second line of		and the second second	
bei	NaOH + ZnAc (P)	pH > 9					Carden Steel		
are	Dissolved Oxygen 300ml (g)	pries	C. C. C. C.)—					
A or			-(The second second second second second			-	
D Z	None (AG) 608/8081/8082, 625, 632/8321, 8151, 8270	—							
either N/	HCI (AG) ^{Lt. Blue Label} O&G, Diesel			\sim	1,				
	Ascorbic, EDTA, KH ₂ Ct (AG) ^{Pink Label} 525		H	4D	\mathcal{N}			5/	
0	Na ₂ O ₃ S 250mL (AG) ^{Neon Green Label} 515	-							
checks	Na ₂ S ₂ O ₃ 1 Liter (Brown P) 549	-	1	/					
bottles ne check	Na ₂ S ₂ O ₃ (AG) ^{Blue Label} 548, THM, 524	—	1						
ori u	Na ₂ S ₂ O ₃ (CG) ^{Blue Label} 504, 505, 547		1.						
tion/chl	Na ₂ S ₂ O ₃ + MCAA (CG) ^{Orange Label} 531	pH < 3	1						
tion	NH4CI (AG) ^{Purple Label} 552		1						
e Na	EDA (AG) ^{Brown Label} DBPs		\mathbf{H}						
preserv	HCL (CG) 524.2,BTEX,Gas, MTBE, 8260/624								
US D	Buffer pH 4 (CG)		10.4680	++	\sim		CONTRACTOR OF T	an analas an an	in we shall be a strain of
Jear	H ₃ PO ₄ (CG) ^{Salmon Label}			-11					
<u>-</u> ا	Other:			1					
- '	Asbestos 1Liter Plastic w/ Foil		1	-	The south second				
1	Low Level Hg / Metals Double Baggie		1	and the second second					
	Bottled Water	1	1						
	Clear Glass 250mL / 500mL / 1 Liter	_	\square						1
	Soil Tube Brass / Steel / Plastic						1.000		
	Tedlar Bag / Plastic Bag Container Preservative Date	— /Time/Initial:			Contoinon			D-t-T	(1
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