Gelman Sciences, Inc. d/b/a
Pall Life Sciences
642 South Wagner Road
Ann Arbor, MI 48103
734.436.4025 phone
734.436.4040 fax

CASE NARRATIVE

Monthly Data Pall Life Sciences
Project: 1,4-Dioxane Remediation
Date: March 2018

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Gelman Sciences, Inc. d/b/a Pall Life Sciences (PLS) attests to the validity of the laboratory data generated by PLS's Ann Arbor, Michigan Environmental Laboratory facilities reported herein. All analyses performed by PLS's Environmental Laboratory facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. PLS's Environmental group has reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

All samples were analyzed by Pall Corporation's Environmental Laboratory for 1,4-dioxane and bromate. The test results in this report meet all NELAP requirements for parameters for which accreditation are required or available. One drinking water sample from 697 South Wagner Road was also analyzed by Ann Arbor Technical Services (ATS). Both PLS and ATS data has been reported for this sample. ATS is a Certified Drinking Water Laboratory for Michigan and Wisconsin.

Any exceptions to NELAP requirements are noted in this report. All exceptions are noted per laboratory standard operating procedure based on EPA Method 1624c. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results. The odd even rule is used for rounding. Holding times were met for all samples analyzed. Proper preservation was observed on all samples unless otherwise detailed in the individual sections below.

RECEIPT/ STORAGE

The samples were received on the days noted in the report for the Month; the samples arrived in good condition, properly preserved and on ice when necessary. Samples that require 1,4-dioxane analysis are collected in hydrochloric HCl acid-preserved vials to a pH of ≤2, with the exception of the Pall ozone treatment samples. These samples have chemicals that, when mixed with the HCl acid, cause interferences and trap damage. Every attempt is made to analyze these samples within 24 hours of receipt.

Samples that require Bromate analysis are collected and preserved in the laboratory with ethylene di-amine and refrigerated.

The barium sample was taken as a composite sample, preserved with nitric acid, and refrigerated before and after being sent to ATS for analysis.

Samples that are delivered to the laboratory the same day as they are collected are likely not to have reached a fully chilled temperature. This is acceptable as long as there is evidence that chilling has begun. All samples are iced or refrigerated at 4°C (±2°C) from the time of collection until sample preparation or analysis.

1,4-Dioxane (GC-MS)

All ground water and treated water samples were analyzed for 1,4-Dioxane (GC-MS) in accordance with EPA 1624C, which has been modified to enhance detection limits. Samples that were diluted to bring them within the calibrated range of the instrument are noted with a "D" under the Qualifier Code section of the data report. Reporting limits were adjusted based on each dilution.

Reporting limit for undiluted samples is 1ppb (part per billion, micrograms per liter, µg/L). All quality control parameters were within the acceptance limits.

Bromate (Ion Chromatography)

All surface water and treated samples were analyzed for Bromate (Ion Chromatography) in accordance with EPA 300.1. Surrogates are added to all samples. All quality control parameters were within the acceptance limits with the balance of sample analyzed.

The reporting limit for treated samples is 5.0ppb and for surface samples is 2.0ppb.

Qualifiers

1,4-Dioxane Qualifier Codes:

Qualifier Code	*Description*
nd:	The compound was analyzed for, but was not detected at or above the detection limit indicated.
D:	Analyte value quantified from a dilution, reporting limit is raised to reflect dilution.
E:	The compound result is greater than the upper quantitation limit in the associated calibration curve, reported as estimate.
B:	The sample vials contained air bubbles larger than 5mm, which may affect compound results.
J:	The compound was positively identified; the associated numerical value is the approximate concentration.
M:	Matrix effects, sample required dilution.
R:	The reported value is unusable and rejected due to variance from quality control criteria.
V:	The reported value is considered estimated due to variance from quality control criteria.
H:	Sample was analyzed past 14 day hold time, but within 28 days.
O:	Samples analyzed in outside laboratory.
S:	Samples split with DEQ.

Bromate Qualifier Codes:

Qualifier Code	*Description*
nd:	The compound was analyzed for, but was not detected at or above the detection limit indicated.
E:	The compound result is greater than the upper quantitation limit in the associated calibration curve.
J:	The compound was positively identified; the associated numerical value is the approximate concentration.
R:	The reported value is unusable and rejected due to variance from quality control criteria.
V:	The reported value is considered estimated due to variance from quality control criteria.
H:	Sample was analyzed past 28 day hold time

Analyst: *Susan E.O. Peters* Susan EO Peters Date: 04-03-18

Report Checked by: *Laurel Beyer* Laurel Beyer Date: 4/3/18

PALL Life Sciences
642 South Wagner Road
Ann Arbor, MI 48103-9019 US
734.436.4025 phone

Sample Analysis Report

March, 2018

Analyst Initials: SEQP
Date: 04-03-18

Sample Name - Date/Time Sampled	1,4-Dioxane Results (ppb)	R.L. (ppb)	Bromate Results (ppb)	R.L. (ppb)	Bromide Results (ppb)	R.L. (ppb)	Comments	Qualifier(s)
Residential Wells								
Not Determined								
697 South Wagner Rd-03-16-18-11:24-1	nd	1.0						
697 South Wagner Rd-03-16-18-11:24-	nd	1.0					ATS Laboratory	O
Extraction Wells								
C3								
DOLPH-03-06-18-10:42-1	98	5.0						D
TW-14-03-08-18-12:37-1	56	1.0						
TW-20-03-06-18-10:33-1	880	10.0						D
D2								
LB-4-03-06-18-11:02-1	430	10.0						D
TW-21-03-06-18-10:56-1	400	10.0						D
E								
TW-17-03-08-18-12:40-1	150	10.0						D
TW-18-03-06-18-10:53-1	250	5.0						D
TW-19-03-06-18-11:08-1	520	10.0						D
TW-23-03-06-18-11:27-1	690	10.0						D
Marshy								
PW-1-03-06-18-10:39-1	840	10.0						D
SW								

Sample Name - Date/Time Sampled	1,4-Dioxane Results (ppb)	R.L. (ppb)	Bromate Results (ppb)	R.L. (ppb)	Bromide Results (ppb)	R.L. (ppb)	Comments	Qualifier(s)
TW-22-03-06-18-11:43-1	390	10.0						D
TW-8-03-06-18-11:38-1	650	10.0						D
Monitoring Wells								
C3								
MW-1 Replacement-03-28-18-11:45-1	3500	100						D
MW-125-03-14-18-17:52-1	170	10.0						D
MW-127s-03-14-18-13:04-1	nd	1.0						
MW-128s-03-14-18-16:19-1	nd	1.0						
MW-20-03-22-18-14:32-1	nd	1.0						
MW-28-03-13-18-09:32-1	nd	1.0						
MW-35-03-13-18-17:23-1	3.0	1.0						
D0								
A2 Cleaning Supply-03-08-18-13:20-1	82	1.0						
MW-51-03-22-18-14:06-1	nd	1.0						
MW-53d-03-07-18-13:21-1	nd	1.0						
MW-53i-03-07-18-16:02-1	32	1.0						
MW-53s-03-07-18-14:38-1	nd	1.0						
MW-93-03-13-18-14:22-1	3.3	1.0						
D2								
465 Dupont-03-19-18-11:45-1	1000	50.0						D
MW-133i-03-16-18-11:08-1	1.6	1.0						
MW-133s-03-14-18-10:03-1	1.2	1.0						
MW-56s-03-13-18-12:35-1	83	1.0						
E								
MW-100-03-19-18-15:00-1	2100	100.0						D
MW-103s-03-20-18-14:11-1	64	1.0						

Sample Name - Date/Time Sampled	1,4-Dioxane Results (ppb)	R.L. (ppb)	Bromate Results (ppb)	R.L. (ppb)	Bromide Results (ppb)	R.L. (ppb)	Comments	Qualifier(s)
MW-105d-03-15-18-14:58-1	200	10.0						D
MW-112i-03-20-18-12:44-1	9.0	1.0						
MW-112s-03-20-18-11:28-1	nd	1.0						
MW-127d-03-14-18-11:45-1	nd	1.0						
MW-128d-03-14-18-15:01-1	nd	1.0						
MW-133d-03-16-18-12:30-1	3.6	1.0						
MW-30d-03-16-18-14:12-1	180	10.0						D
MW-56d-03-13-18-11:09-1	nd	1.0						
MW-64-03-13-18-14:50-1	38	1.0						
MW-66-03-13-18-16:01-1	1.7	1.0						
MW-72d-03-16-18-15:49-1	170	1.0						
MW-76i-03-26-18-14:38-1	93	1.0						
MW-76s-03-28-18-10:38-1	230	10.0						D
MW-84s-03-27-18-11:30-1	26	10.0						D
Marshy								
NMW-1s-03-21-18-15:20-1	2300	50.0						D
NMW-2s-03-20-18-15:28-1	2200	50.0						D
SW								
MW-57-03-26-18-13:56-1	1.6	1.0						
Surface Water								
Not Applicable								
HC/HR-03-01-18-08:39-1			nd	2.0				
HC/HR-03-02-18-09:10-1			nd	2.0				
HC/HR-03-05-18-08:00-1			nd	2.0				
HC/HR-03-06-18-08:30-1			nd	2.0				
HC/HR-03-07-18-12:00-1			nd	2.0				

Sample Name - Date/Time Sampled	1,4-Dioxane Results (ppb)	R.L. (ppb)	Bromate Results (ppb)	R.L. (ppb)	Bromide Results (ppb)	R.L. (ppb)	Comments	Qualifier(s)
HC/HR-03-08-18-09:45-1			nd	2.0				
HC/HR-03-09-18-08:50-1			nd	2.0				
HC/HR-03-12-18-09:50-1			nd	2.0				
HC/HR-03-13-18-10:00-1			nd	2.0				
HC/HR-03-14-18-10:15-1			nd	2.0				
HC/HR-03-15-18-08:54-1			nd	2.0				
HC/HR-03-16-18-09:52-1			nd	2.0				
HC/HR-03-19-18-09:08-1			nd	2.0				
HC/HR-03-20-18-09:30-1			nd	2.0				
HC/HR-03-21-18-08:19-1			nd	2.0				
HC/HR-03-22-18-08:56-1			nd	2.0				
HC/HR-03-23-18-08:48-1			nd	2.0				
HC/HR-03-26-18-08:57-1			nd	2.0				
HC/HR-03-27-18-09:20-1			nd	2.0				
HC/HR-03-28-18-09:25-1			nd	2.0				
HC/HR-03-29-18-09:20-1			nd	2.0				
Treatment System								
OUTFALL-03-01-18-1	5.7	1.0						
OUTFALL-03-01-18-2			7.4	5.0				
OUTFALL-03-04-18-1	6.0	1.0						
OUTFALL-03-04-18-2			5.9	5.0				
OUTFALL-03-05-18-1	6.5	1.0						
OUTFALL-03-05-18-2			7.7	5.0				
OUTFALL-03-06-18-1	5.8	1.0						
OUTFALL-03-06-18-2			7.4	5.0				
OUTFALL-03-07-18-1	5.9	1.0						
OUTFALL-03-07-18-2			7.5	5.0				

Sample Name - Date/Time Sampled	1,4-Dioxane Results (ppb)	R.L. (ppb)	Bromate Results (ppb)	R.L. (ppb)	Bromide Results (ppb)	R.L. (ppb)	Comments	Qualifier(s)
OUTFALL-03-08-18-2			7.8	5.0				
OUTFALL-03-08-18-1	6.2	1.0						
OUTFALL-03-11-18-2			7.4	5.0				
OUTFALL-03-11-18-1	6.2	1.0						
OUTFALL-03-12-18-2			6.9	5.0				
OUTFALL-03-12-18-1	5.9	1.0						
OUTFALL-03-13-18-2			6.3	5.0				
OUTFALL-03-13-18-1	6.0	1.0						
OUTFALL-03-14-18-2			6.7	5.0				
OUTFALL-03-14-18-1	5.6	1.0						
OUTFALL-03-15-18-1	5.6	1.0						
OUTFALL-03-15-18-2			6.9	5.0				
OUTFALL-03-18-18-1	5.9	1.0						
OUTFALL-03-18-18-2			7.0	5.0				
OUTFALL-03-19-18-1	6.1	1.0						
OUTFALL-03-19-18-2			7.0	5.0				
OUTFALL-03-20-18-1	6.4	1.0						
OUTFALL-03-20-18-2			6.3	5.0				
OUTFALL-03-21-18-2			6.6	5.0				
OUTFALL-03-21-18-1	6.4	1.0						
OUTFALL-03-22-18-2			7.3	5.0				
OUTFALL-03-22-18-1	5.7	1.0						
OUTFALL-03-25-18-2			7.4	5.0				
OUTFALL-03-25-18-1	5.8	1.0						
OUTFALL-03-26-18-1	5.8	1.0						
OUTFALL-03-26-18-2			7.5	5.0				
OUTFALL-03-27-18-1	5.6	1.0						

Sample Name - Date/Time Sampled	1,4-Dioxane Results (ppb)	R.L. (ppb)	Bromate Results (ppb)	R.L. (ppb)	Bromide Results (ppb)	R.L. (ppb)	Comments	Qualifier(s)
OUTFALL-03-27-18-2			7.9	2.0				
OUTFALL-03-28-18-1	5.0	1.0						
OUTFALL-03-28-18-2			7.8	5.0				
OUTFALL-03-29-18-1	4.6	1.0						
OUTFALL-03-29-18-2			7.5	5.0				
Red Pond-03-05-18-06:10-1	390	10.0						D
Red Pond-03-12-18-08:38-1	370	10.0						D
Red Pond-03-19-18-10:00-1	370	10.0						D
Red Pond-03-26-18-08:34-1	360	10.0						D

PLS Qualifier Codes:

nd: The compound was analyzed for, but was not detected at or above the detection limit indicated.
D: Analyte value quantified from a dilution, reporting limit is raised to reflect dilution.
O: Samples analyzed in outside laboratory.

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Data Transmittal Cover Page

Project Name: Pall Corporation
ATS Project Number: G001-002
ATS Report Number(s): SRF_0326181

Project Description: This data report contains the results of one water sample, received by ATS on 3/26/18, to be analyzed for 1,4-Dioxane.

We certify that the sample analyses for this report have been conducted in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written Standard Operating Procedure specific to the ATS Laboratories, as required by USEPA. Laboratory data sheets, SOPs, and QA/QC information are available for inspection and audit at the laboratory upon request. Unless specifically noted on the data report, all applicable sample preservation and holding time requirements have been met.

Recipient: Ms. Sue Peters **Email:** Sue_Peters@Pall.com
FAX Number:

No. of Pages (including cover pg.): 7

From: Sarah Stubblefield, Senior Chemist / Lab Manager **Email:** Sarah.Stubblefield@AnnArborTechnicalServices.com
FAX Number: 734-995-3731

Additional Message: Email Copy: Ms. Laurel Beyer (Laurel_Beyer@Pall.com)

Date: 3/30/18 **Signed:**

IF YOU DO NOT RECEIVE ALL PAGES OF THIS TRANSMITTAL, PLEASE CALL 734-995-0995.

LABORATORY OPERATIONS
SAMPLE DELIVERY GROUP (SDG) CASE NARRATIVE

ATS Project Number: G001-002
Report Date: 3/30/18
SDG Number: 0326181

SDG Summary

This case narrative applies to the following sample that was received by Ann Arbor Technical Services, Inc. (ATS) on 3/26/18, and associated matrix-specific QA/QC:

Samples

Client Sample Identification	Sample Date	Analysis	Matrix
697 South Wagner Road	3/16/18	1,4-Dioxane	Drinking Water

Upon receipt, samples were scheduled for the following analyses:

- 1,4-Dioxane by EPA method 1624 (select samples)

Sample Receipt and Chain of Custody Records

Samples were delivered directly to ATS by Pall Corporation staff. Samples were received with proper chain of custody records included. Sample condition and anomalies are presented in the "Chain of Custody and Sample Receipt Documentation" section of this report.

Data Review and Approval

All data contained in this report have been generated in accordance with guidelines provided in the referenced standard test method, and are consistent with detailed procedures described in a written standard operating procedure (SOP) specific to the ATS Laboratory, as required by USEPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition, all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

A single QA/QC batch is defined as no more than 20 samples excluding method blanks (MB, LRB), fortified blanks (BS, LFB, LCS), matrix spikes (MS, SPK), and duplicates whether spiked or native (MSD, SPK DUP, DUP, LR).

Data Deliverables

This data package constitutes a Level II package, other data report packages (Level I, Level IV DVP, EPA R5 EDD) are available upon request. There were no hardcopy data summary sheets generated for this project.

Consultants in Chemistry & Environmental Science
290 South Wagner Road, Ann Arbor, Michigan 48103 Tel 734/995-0995 Fax 734/995-3731

Sample Analysis

1,4-Dioxane Analysis (GC/MS): Samples were analyzed in accordance with EPA method 1624 (Volatile Organic Compounds by Isotope Dilution Gas Chromatography – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate 1,4-Dioxane. Samples were reported to project specific reporting limits.

Anomalies Noted:

- **None**

Analytical QA/QC Summary

Calibration Verification

Method calibration was verified through the running of a mid-level initial calibration verification (CV) standard at a frequency of every 12 hours. All verification standards met the acceptance criteria with the following exceptions:

- **None**

Instrument Blanks

Instrument blanks were analyzed at a frequency of every 12 hours. All blanks met the acceptance criteria with the following exceptions:

- **None**

QA/QC Batch Summary

Laboratory Reagent Blanks

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. The LRB's met the acceptance criteria with the following exceptions:

- **None**

Laboratory Fortified Blanks and Matrix Spikes

A laboratory fortified blank (LFB) / laboratory control sample (LCS) was analyzed with each QA/QC batch. The LCS/LFB's met the acceptance criteria with the following exceptions:

- **None**

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. The MS/MSD met the acceptance criteria with the following exceptions:

- **None**

Matrix Duplicates

A replicate analysis was analyzed with each QA/QC batch. All replicates met the acceptance criteria with the following exceptions:

- **None**

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted:

- **None**

/ March 30, 2018

Mark T. DeLong (Quality Assurance Coordinator)

/ March 30, 2018

Philip B. Simon (Laboratory Director)

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9604
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Organic Analysis
Data Summary Sheet

For: Ms. Sue Peters
Pall Corporation
642 South Wagner Road
Ann Arbor, MI 48103

ATS Project: Pall Corporation #G001-002
Report Date: 3/30/18
ATS SRF: 0326181

Sample Identification: 697 South Wagner Road

Sample Date: 3/16/18
Sample Time: 11:24 AM
Sampled By: Client
Laboratory Receipt Date: 3/26/18
Sample Matrix: Drinking Water

Parameter	Method	Units	Result	Reporting Limit	Analysis Date	Analysis Time	Analyzed By
Organic Analysis							
1,4-Dioxane	EPA 1624	mg/L	<0.001	0.001	3/28/18	17:13	JEB

Comments

All methods reference USEPA methods unless otherwise noted.

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control Data Summary

QC Batch Number: QCORG0328181
Parameter: 1,4-Dioxane (EPA 1624)
ATS Project: Pall Corporation #G001-002
Report Date: 3/30/18

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#A100-PEC				
Q8886-0 3/27/18	0.023 mg/L	0.022 mg/L	0.022 mg/L	7.5
Q8886-0 3/27/18 Matrix Spike	0.056 mg/L	0.056 mg/L	0.056 mg/L	1.0

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A100-PEC, #G001-002, #Z999-001				
Laboratory Fortified Blank 3/28/18	<0.001 mg/L	0.010 mg/L	0.009 mg/L	88.0
#A100-PEC				
Q8886-0 3/27/18 Matrix Spike	0.022 mg/L	0.040 mg/L	0.056 mg/L	85.4
Q8886-0 3/27/18 Matrix Spike Duplicate	0.022 mg/L	0.040 mg/L	0.056 mg/L	83.9

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A100-PEC, #G001-002, #Z999-001		
Laboratory Reagent Blank 3/28/18	<0.001 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.

Control Limits:

Recoveries
- Laboratory Fortified Blank (85 - 115 %)
- Matrix Spike <5ppb (70 - 130 %)
- Matrix Spike >5ppb (80 - 120 %)

Relative Range
- Replicates <2ppb (<50%)
- Replicates >2 ppb (<30%)

250 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-8985 Fax. 734/995-3731
Michigan Laboratory ID: 9004
Wisconsin Laboratory ID: 998321720

CHAIN OF CUSTODY RECORD

PROJECT ID / NUMBER	LABORATORY INFORMATION
Drinking Water Samples	Pall Corperation

SAMPLE CUSTODIAN (Print & Signature)

Susan E.O. Peters, Pall Corporation 642 South Wagner Road

SHIPPING INFORMATION: SHIPPER (Check one) / TRACKING NUMBER(S) (if applicable)

Date		Fed Ex		UPS		DHL		Courier		Tracking Number
Date		Fed Ex		UPS		DHL		Courier		Tracking Number
Date		Fed Ex		UPS		DHL		Courier		Tracking Number
Date		Fed Ex		UPS		DHL		Courier		Tracking Number

RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME	RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME
ROBERT URSINO	3/16/2018						
RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME	RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME

COMMENTS (Preservation, etc.)

preservative HCl, expected n.d. (<1ppb), need data before the end of the month

LINE NO.	BAR CODE	DATE	TIME	COMP.	GRAB	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	PRIORITY NUMBER	ANALYSIS: 1,4-dioxane	MATRIX (Indicate Soil/Water/Air Sediment/Sludge Extract)
1.		03/16/2018	11:24		X	697 South Wagner Rd.	2		X	n.d. (<1ppb)
2.										
3.										
4.										
5.										
6.										
7.										
8.										
9.										
10.										
11.										
12.										
13.										
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15.										
16.										
17.										
18.										
19.										
20.										