Mark Begich, Mayor

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Pesticide Screening of Select Streams in Anchorage, Alaska: 2003 Data Report

Document No. **APr03005**

MUNICIPALITY OF ANCHORAGE
WATERSHED MANAGEMENT PROGRAM

OCTOBER 2003

WATERSHED MANAGEMENT

Office of Planning, Development & Public Works

Mark Begich, Mayor

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MUNICIPALITY OF ANCHORAGE
WATERSHED MANAGEMENT PROGRAM

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Municipality of Anchorage

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Note: Reviewers provide valued insight and commentary from various frames of reference. The principal author retains responsibility for final form and content of the published document.

WATERSHED MANAGEMENT

Office of Planning, Development & Public Works

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1.0 Introduction

PURPOSE

The purpose of the bi-annual pesticide screening was to assist the Watershed Management Section (WMS) of the Municipality of Anchorage's (MOA's) Department of Public Works (DPW) in identifying if pesticides are found to be problematic within the Anchorage waterways and if further study effort is required.

Reduction of pesticide concentrations in streams and ground water clearly require management strategies that focus on reducing chemical use and subsequent transport in the hydrologic system. For these strategies to be effective, they need to be developed with careful consideration of the patterns and complexities of contaminant occurrence, behavior, and influences on water quality.

Pesticide Definition

A "pesticide" is defined by the State of Alaska as: "a chemical or biological agent intended to prevent, destroy, repel, or mitigate plant or animal life and any substance intended for use as a plant regulator, defoliant, or desiccate, including insecticides, fungicides, rodenticides, herbicides, nematocides, and biocides." For the purposes of MOA's pesticide program the term "pesticide" represents fungicides, herbicides, and insecticides.

BACKGROUND

Anchorage is not an agricultural area and does not have a widespread use of pesticides. Pesticide screening samples were collected in 1992 as part of the National Pollutant Discharge Elimination System (NPDES) permit for the MOA and did not indicate detectable levels of pesticides in Anchorage waterways. However, the NPDES permit required MOA to conduct a screening characterization for the presence of regulated quantities of pesticides in Anchorage waterways.

The monitoring program was designed to collect screening data within areas that are most likely to accumulate pesticides. The Environmental Protection Agency (EPA) and the Alaska Department of Environmental Conservation (ADEC) suggested that the water bodies with the highest probability of pesticide contamination be sampled. This would establish if previously collected data was biased towards lower values. It was determined that water column samples from closed basin lakes, those lakes where water does not discharge, would represent the areas of greatest likelihood of pesticide contamination. These lakes do not flush and would provide the highest pesticide accumulation.

The pesticides used in Anchorage can be grouped into two application categories, broadcast (those pesticides applied everywhere, such as insecticides and aphid spray applied by homeowners), and localized (those pesticides applied along roads and trails, such as herbicides applied by agencies). The MOA conducted a pesticide use survey (MOA WSM, 1999), with data compiled from MOA, AK Cooperative Extension, and ADEC, and concluded that the pesticides commonly used in the Anchorage area are as follows:

- **Sevin FL (Carbaryl),** this pesticide is applied twice by homeowners and by MOA during the summer for the prevention of aphid and spruce beetle attack.
- **3336WP (Fungo, Cercobin M),** this fungicide is applied three to four times during the spring for the prevention of black knot/rot on chokecherries by homeowners and MOA.
- **Turf Shield (Methyl Anthranilate),** this goose repellant is applied all year long to large turf areas throughout the MOA.
- **Confront (Triethylamine Triclopyr),** this herbicide is applied three times during the summer to kill dandelions by homeowners and MOA.
- **2,4-D (2,4-dichlorophenoxyacetic acid),** a white crystalline irritant herbicide used as a weed killer to control pests (an injurious or destructive insect) in grasses. It is also used to control aquatic vegetation. Homeowners as a broadcast application most often use this.
- **chloropyrifros (Dursban),** used as an insecticide, used by homeowners.
- **Glyphosate,** used as a herbicide, generally used by homeowners.
- **Ficam (benediocarb),** a contact insecticide, generally used by homeowners.
- **Benomyl,** used on golf courses as a fungicide.

Historical Pesticide Data

Past investigations have not detected pesticide compounds in MOA storm water runoff samples (MOA 1992). The United States Geological Survey (USGS) established a Cook Inlet Basin study unit as part of National Water Quality Assessment Program (NAWQA) and began water quality sampling in 1997. Two of the six basic fixed sites are located within MOA: Chester Creek at Arctic Boulevard and South Fork Campbell Creek. Water samples collected at these two sites from October 1998 to September 1999 were analyzed for the presence of pesticide compounds and other parameters, however validated data is not yet available (USGS 1999a). The unvalidated data indicate that pesticides were not detected in the NAWQA Anchorage water samples.

SCREENING PROGRAM

The pesticide screening program , conducted the summer of 2000 and 2003, consisted of sampling the water column in three basin lakes for the most commonly used pesticides in

Anchorage, 2, 4-D and Carbaryl. All samples were sent to an independent EPA-certified laboratory to screen for the presence of these pesticides.

2.0 Explanation of Data Submittal Elements

This data submittal is divided into the following elements:

- Summary information about the field phase of the project are contained in Section 3.0, including a project summary, variations from the project design, notable field observations, and data validation summary.
- Tabular summaries of the data are presented in Section 4.0, with brief descriptions.
- References are contained in Section 5.0.
- Sample analysis results and other primary documentation are contained in the Appendices. All project data have been entered into a project database, which accompanies this document on CD. Appendix A contains the field note forms and Appendix B contains the laboratory results and methodologies.

3.0 Project Summary

The following section presents a project summary, variations from the project design, and results of data validation. These sections are intended to:

- Provide context for the reported data by summarizing assumptions and methods underlying the data collection.
- List and explain variations from planning documents.
- Identify data that do not meet project objectives.

Detailed descriptions of the project approach and sampling methods, and other project requirements may be found in the project design document.

Problem Resolution

Pesticides are used in Anchorage for a variety of reasons that include home application for lawn care, golf course maintenance, industrial application within utility corridors and municipal use. The Municipality uses pesticides for street landscape maintenance, right-of-way maintenance, and Parks and Recreation maintenance.

Pesticide use in Anchorage is most common during the spring and summer months. The period of pesticide application also coincides with the heaviest rainfall period (July through September) for Anchorage, which may cause a portion of these chemicals to be washed into the local streams and lakes

Monitoring Network

This section describes the sampling locations, sampling parameters, and sampling times for the pesticide-screening program. Screening parameter(s) focused on the current most probable pesticide(s), as determined from current MOA and ADEC research. The most common and ubiquitous herbicide used in Anchorage is 2,4-D and Carbaryl. Samples were collected within lakes that are considered basin lakes, those that have little to no outflow. The following three lakes were sampled, Otis Lake, Hideaway Lake and Little Campbell Lake. Otis Lake and Hideaway Lake are surrounded by homes where both pesticide and herbicide use occurs. Little Campbell Lake is located within Kincaid Park, with no known pesticide use, and was chosen to represent a reference basin lake. Since all the lakes are basin lakes, they show the greatest effects of pesticide accumulation.

SAMPLING LOCATIONS

Pesticide sampling was conducted at three basin lakes, Otis Lake, Hideaway Lake, and Little Campbell Lake during the late summer. The late summer period was chosen to provide for the greatest accumulation of pesticides in these basin lakes.

SAMPLE COLLECTION PROCEDURES

Pesticide samples were collected from the approximate center of each lake (reached by rubber raft), where the total lake depth was greater than 3-meters. All samples were stored in amber glass bottles provided by the laboratory and appropriately labeled. Water temperature and pH were also noted at the time of collection. Copies of the field notes are included as Appendix A.

LABORATORY SAMPLING PARAMETERS

All samples were analyzed by laboratory analysis using EPA method 515.1 for 2,4-D, and EPA method 531.1 for Carbaryl. The laboratory performing the analyses, Coffey Laboratories, Inc., of Portland, Oregon provided proper sample containers, ice, coolers and chain of custody forms. The project name, station location, station identifier, date of sample, and name of person taking the sample was clearly marked on the sample container labels. Samples were stored on ice in coolers for overnight shipment to the laboratory. Each shipping container included a chain-of-custody form indicating the analyses to be performed by the laboratory. The recommended holding time specified by the laboratory was adhered to.

Analytical methods and testing procedures were in accordance with EPA-approved protocol and guidelines. Priority pollutants were analyzed to the appropriate detection limits as specified by the EPA. The laboratory performing the analyses is certified by the EPA and has an approved quality assurance/quality control (QA/QC) program.

A cost comparison of laboratory analysis and field screening using RaPID Assay® Carbaryl and 2,4-D screening immunoassay test kits was completed before sampling. Field screening and laboratory validated sampling were both done in the previous sampling year, 2000. It was determined that pre-screening added little value to the analysis.

CHAIN OF CUSTODY

A chain-of-custody form was completed in the field by the sampling team leader to ensure sample tracking. The original of the form was sent with the samples and together delivered to the contract laboratory and the duplicate copy was maintained by the Contractor.

Quality Control and Quality Assurance

Quality control refers to the continuing routine checks on quality within each segment of the monitoring program, such as sample collection, instrument calibration, sample analysis, handling, shipping and data collection.

FIELD PROCEDURES

All instruments were calibrated at the beginning of each day prior to use. All sampling equipment was rinsed and decontaminated between sampling events. Disposable gloves and equipment were used whenever possible.

Field data was recorded in the MOA field notebook, noting date, time, sampler and relevant sampling information.

LABORATORY MEASURES

As part of the laboratories EPA certification, a detailed quality assurance and quality control program is in place for the contracted laboratory. These procedures include analytical checks (e.g. sample blanks, replicate samples, spiked samples), instrument calibration, preventive maintenance procedures, and specific procedures used to assess data for precision, accuracy, representativeness, comparability, and completeness. Quality control samples were analyzed with each batch. Laboratory results were analyzed by a chemist for the Contractor and it was determined that the surrogates were within the Lab QAP criteria. All surrogates were between 90-120% recovery, an acceptable recovery for pesticides.

DEVIATIONS FROM THE WORK PLAN

All samples and a field duplicate (for QA/QC) were sent to the verification laboratory for analysis. No field screening immunoassay samples were analyzed.

Data Validation

Verification analyses for all parameters were conducted by Coffey Laboratories, Inc., in Portland, Oregon.

The data review was focused on criteria for the following quality assurance (QA) and quality control (QC) parameters and their overall effects on the data:

- Data validation
- Sample handling (chain-of-custody)
- Holding time compliance
- Matrix duplicates and matrix spikes

EPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic and Inorganic Data Review (February 1994) were used for data qualification, where applicable.

The following definitions provide brief explanations of the qualifiers assigned to results in the data review process:

B - The sample result is less than 5 times (10 times for common laboratory contaminants) the associated blank contamination.

ND - The analyte was analyzed for, but was not detected above, the reported quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ The analyte was not detected above the reported quantitation limit. However, the reported quantitation is approximate and may or may not represent the actual limit of quantitation necessary for accurate and precise measurement of the analyte in the sample.

J/none- Sample results for the analyte are estimated for positive results; results reported below the quantitation limit are not qualified (high bias).

J/UJ - Sample results for the analyte are estimated for both positive results and results reported below the quantitation limit (low bias).

R/UR- The sample results are rejected for both positive results and results reported below the quantitation limit because of serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified.

All screening and laboratory verification samples met the QA/QC objectives.

4.0 Project Data Summary

The analytical results from the pesticide screening activities are discussed in this section.

Fieldwork was completed on July 31, 2003. Weather conditions prior to and during sampling activities were warmer than typical summers in Anchorage. According to the National Weather Service, the temperatures ranged from 56°F to 84°F, with some precipitation and clouds but mostly sunny conditions. Average temperatures for Anchorage in late July range from 51°F to 65°F. Annual precipitation was 0.76 inches below normal.

Results and Discussion

Three basin lakes were selected by MOA for the Pesticides Screening NPDES task in Anchorage. The pesticides that were screened 2,4-D and Carbaryl were chosen, since these are the two most commonly applied within the Anchorage Bowl. The herbicide 2,4-D is known to be persistent in the environment well after application, and is currently monitored by ADEC as part of the Alaska State Drinking Water Program. The pesticide Carbaryl was chosen since it is commonly applied within the Anchorage area for the control of insects such as the spruce bark beetle.

The 2003 sample locations, date, time, water temperature and pH are shown in Table 1.

Table 1
PESTICIDE SCREENING SAMPLE LOCATIONS

WATER QUALITY PARAMETERS, 2003

Lake	Date	Time	Water Temp. (C)	pH	Latitude	Longitude
Otis Lake	07/31/2003	1305	18.4	7.47	61-11-30	149-50-31
Hideaway Lake	07/31/2003	1625	16.7	7.87	62-07-21	149-44-26
Little Campbell Lake	07/31/2003	1745	18.8	7.63	61-09-47	150-01-18

The 2003 laboratory verification results for Carbaryl and 2, 4-D are listed in Table 2.

Table 2

LABORATORY VERIFICATION RESULTS

CARBARYL AND 2, 4-D, 2003

Sample	QA/QC	Laboratory Results Carbaryl (mg/L)	Laboratory Results 2, 4-D (mg/L)
Otis Lake 1	Field	ND (0.001)	ND (0.00096)
Otis Lake 2	Field	---	ND (0.00096)
Hideaway Lake 1	Field	ND (0.001)	ND (0.00088)
Hideaway Lake 2	Duplicate	---	ND (0.00093)
Hideaway Lake 3	Field	ND (0.001)	ND (0.00093)
Hideaway Lake 4	Duplicate	---	ND (0.0009)
Little Campbell Lake 1	Field	ND (0.001)	ND (0.0009)
Little Campbell Lake 2	Field	---	ND (0.00086)
Little Campbell Lake 3	Duplicate	ND (0.001)	ND (0.00091)
Little Campbell Lake 4	Duplicate	---	ND (0.00028)

The 2000 sample locations, date, time, water temperature and pH are shown in Table 3.

Table 3

PESTICIDE SCREENING SAMPLE LOCATIONS

WATER QUALITY PARAMETERS, 2000

Lake	Date	Time	Water Temp. (C)	pH	Latitude	Longitude
Otis Lake	09/08/2000	0930	13.6	7.51	61-11-30	149-50-31
Hideaway Lake	09/08/2000	1045	11.7	7.58	62-07-21	149-44-26
Little Campbell Lake	09/08/2000	1150	13.8	7.43	61-09-47	150-01-18

The 2000 screening and laboratory verification results for Carbaryl and 2, 4-D are listed in Table 4.

Table 4
SCREENING AND LABORATORY VERIFICATION RESULTS

CARBARYL AND 2, 4-D, 2000

Sample	QA/QC	Screening Results Carbaryl (ppb)	Laboratory Verification Results Carbaryl (ppb)	Screening Results 2, 4-D (ppb)	Laboratory Verification Results 2, 4-D (ppb)
Otis Lake 1	Field	<0.2	ND (0.001)	<0.5	ND (0.4)
Otis Lake 2	Duplicate	<0.2	ND (0.001)	<0.5	ND (0.4)
Hideaway Lake 1	Field	0.25	ND (0.001)	<0.5	ND (0.4)
Little Campbell Lake 1	Field	<0.2	ND (0.001)	<0.5	ND (0.4)

The laboratory analysis of these samples resulted in a ND (none detected). All other screening and laboratory results were below method detection levels, indicating that pesticides commonly used in the Anchorage Bowl are not accumulating in the water columns of basin lakes.

The absence of pesticides in local waterbodies is consistent with previous studies completed by MOA (shown in Tables 3 and 4), DHHS, and the USGS NAWQA program.

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1999b. Pesticide Impact Assessment Program. Personal communication with Bob Gorman.

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1999b. Pesticides in Streams of the United States – Initial Results from the National Water Quality Assessment Program. Water Resources Investigations Report 98-4222.

1999c. Pesticide Program Market Place Surveys from 1998 and 1999.

1999. Restricted Use Products (RUP) Report. Office of Pesticide Programs. http://www.epa.gov/RestProd/

Appendix A Field Note Forms

COFFEY LABORATORIES, INC.
CHAIN OF CUSTODY AGREEMENT

1/2

CENTRAL OREGON BRANCH
827 SW 7th
Redmond, OR 97756
PHONE/FAX (541) 548-0972

CORPORATE HEADQUARTERS
12423 NE Whitaker Way
Portland, OR 97230
(503) 254-1794 FAX: (503) 254-1452

EASTERN OREGON BRANCH
419 SW 5th
Pendleton, OR 97801
PHONE/FAX (541) 276-0385

Report Attention: KATIE WINTER
Company Name: CH2MHILL
Mailing Address: 301 W. Northern Lts Blvd Ste. 601, Anchorage, AK 99503
Phone: (907) 278-2551 FAX: (907) 257-2000

Report Instructions (Special - Additional- Job Specific):

PO Number: 70035
Project Number: 167810.03.RW
Project Name: MOA Pesticide Screening
EPA Protocol Containers: ☒ N Other:

Sample Turnaround
- ☒ Standard
- ☐ Priority (Additonal Fee)
- ☐ Rush (Additional Fee)
- ☐ Emergency (Additional Fee)

Initials: KRW

Reporting Request
- ☒ State Compliance Format
- ☒ FAX Results - Preliminary
- ☐ FAX Results-Final
- ☐ Verbals Results
- ☐ Extra Report Copy (Fees Associated)

FOR LABORATORY USE ONLY Page ____ of ____
Job Number:
Custabbr: ☐ NEW
☐ VISA ☐ M/C Cardholder:
Card #: Exp: / /
Cash / Check / CC:$ #:
Billing Code: 1 2 3 4
QC LEVEL: 1 2 3 4
FEDX BUS COURIERS UPS LAB CLIENT MAIL AIR

Sample ID	Loc.	ID	#	Collection Date	Collection Time	Media	Analysis Requested	Test/ Profile
731Ø3 OL 2,4-D 1	Otis			7/31/03	1:05P	SW	2,4-D	
731Ø3 OL 2,4-D 2	Otis						2,4-D	
731Ø3 OL Car 1	Otis						Carbaryl	
731Ø3 HL 2,4-D 1	Hideaway				4:25P		2,4-D	
731Ø3 HL 2,4D 2	Hideaway						2,4-D	
731Ø3 HL 2,4D 3	Hideaway						2,4-D	
731Ø3 HL 2,4D 4	Hideaway						2,4-D	
731Ø3 HL Car 1	Hideaway						Carbaryl	
731Ø3 HL Car 2	Hideaway						Carbaryl	

Sampled By: K. Winter

AUTHORIZED CUSTOMER SIGNATURE: Katy [illegible] DATE: 7/31/03

Sample Comments	Relinquished by: (Please Sign)	Date	Time	Received by: (Sign)	Date	Time
				LAB		

White Copy-Laboratory Yellow Copy - Customer

COMPLETE THIS FORM PER INSTRUCTIONS ON REVERSE SIDE

SUBMISSION OF SAMPLES WITH TESTING REQUIREMENTS TO CLI WILL BE UNDERSTOOD TO BE AN AGREEMENT FOR SERVICES IN ACCORDANCE WITH THE CONDITIONS LISTED ON THE BACK OF THE CLIENT COPY.

Pg 2/2

COFFEY LABORATORIES, INC.
CHAIN OF CUSTODY AGREEMENT

CENTRAL OREGON BRANCH
827 SW 7th
Redmond, OR 97756
PHONE/FAX (541) 548-0972

CORPORATE HEADQUARTERS
12423 NE Whitaker Way
Portland, OR 97230
(503) 254-1794 FAX: (503) 254-1452

EASTERN OREGON BRANCH
419 SW 5th
Pendleton, OR 97801
PHONE/FAX (541) 276-0385

Report Attention: KATIE WINTER
Company Name: CH2MHILL
Mailing Address:
Phone:( ) FAX:( )

Report Instructions (Special - Additional- Job Specific):

PO Number: 70035
Project Number: 167810.03.RW
Project Name: MDA Pestiside Screening
EPA Protocol Containers: Y/N Other:

Sample Turnaround
- [x] Standard
- [ ] Priority (Additonal Fee)
- [ ] Rush (Additional Fee)
- [ ] Emergency (Additional Fee)

Reporting Request
- [x] State Compliance Format
- [x] FAX Results - Preliminary
- [ ] FAX Results-Final
- [ ] Verbals Results
- [ ] Extra Report Copy (Fees Associated)

Initials: KRW

FOR LABORATORY USE ONLY Page ___ of ___
Job Number:
Custabbr: ☐NEW
☐ VISA ☐ M/C Cardholder:
Card #: Exp: / /
Cash / Check / CC:$ #:
Billing Code: 1 2 3 4
QC LEVEL: 1 2 3 4
FEDX BUS COURIERS UPS LAB CLIENT MAIL AIR

Sample ID	Loc.	ID	#	Collection Date	Collection Time	Media	Analysis Requested	Test/ Profile
731Ø3 LCL 2,4-D 1	Little Campbell			7/31	5.45	SW	2,4-D	
731Ø3 LCL 2,4-D 2							2,4-D	
731Ø3 LCL 2,4-D 3							2,4-D	
731Ø3 LCL 2,4 D 4							2,4-D	
731Ø3 LCL Car 1							Carbaryl	
731Ø3 LCL Car 2							Carbaryl	

Sampled By: K. Winter
AUTHORIZED CUSTOMER SIGNATURE: Katy [illegible] DATE: 7/31/03

Sample Comments	Relinquished by: (Please Sign)	Date	Time	Received by: (Sign)	Date	Time
				LAB		

White Copy-Laboratory Yellow Copy - Customer

COMPLETE THIS FORM PER INSTRUCTIONS ON REVERSE SIDE

SUBMISSION OF SAMPLES WITH TESTING REQUIREMENTS TO CLI WILL BE UNDERSTOOD TO BE AN AGREEMENT FOR SERVICES IN ACCORDANCE WITH THE CONDITIONS LISTED ON THE BACK OF THE CLIENT COPY.

CH2MHILL SUBJECT _____ BY _____

SHEET NO. ____ of ____ DATE _____

PROJECT NO. _____

7/31 Sunny ~68°F 1pm

Oti's Lake

Temp = 18.4°C

pH = 7.47

Hideaway Lake

Temp = 16.7°C

pH = 7.87

Little Campbell Lake

Temp = 18.8°C

pH = 7.63

Appendix B Laboratory Results and Methodologies

Report Date: August 18, 2003
Job Number: A30804O
PO Number: 70035
Project No: 167810.03.RW
Project Name: MOA Pesticide Screening

Katie Winter
CH2M Hill
301 W. Northern Lights Blvd.
Suite 601
Anchorage, AK 99503

Analytical Narrative

The sample was received on 08/04/03 by Coffey Laboratories, Inc. (CLI) Sample Reception personnel under strict chain of custody protocol. The following information was provided at the time of sample reception:

Laboratory Sample ID	Field Identification	Matrix	Collection Date	Collection Time
A30804O-1	73103OL 2,4-D1	Surface Water	07/31/03	1305
A30804O-2	73103OL 2,4-D2	Surface Water	07/31/03	1305
A30804O-3	73103OL Car1	Surface Water	07/31/03	1305
A30804O-4	73103HL 2,4-D1	Surface Water	07/31/03	1625
A30804O-5	73103HL 2,4-D2	Surface Water	07/31/03	1625
A30804O-6	73103HL 2,4-D3	Surface Water	07/31/03	1625
A30804O-7	73103HL 2,4-D4	Surface Water	07/31/03	1625
A30804O-8	73103HL Car1	Surface Water	07/31/03	1625
A30804O-9	73103HL Car2	Surface Water	07/31/03	1625
A30804O-10	73103LCL 2,4-D1	Surface Water	07/31/03	1745
A30804O-11	73103LCL 2,4-D2	Surface Water	07/31/03	1745
A30804O-12	73103LCL 2,4-D3	Surface Water	07/31/03	1745
A30804O-13	73103LCL 2,4-D4	Surface Water	07/31/03	1745
A30804O-14	73103LCL Car1	Surface Water	07/31/03	1745
A30804O-15	73103LCL Car2	Surface Water	07/31/03	1745

Job Number: A30804O

Analytical Narrative (continued)

The recommended holding time for each batch of analyses was in accordance with the data quality objectives as specified in the CLI Quality Assurance Plan unless otherwise noted.

Acceptable precision and accuracy were achieved for all analyses associated with this work order as demonstrated by the recoveries of the quality control samples analyzed concurrently with each batch.

The data submitted in this report is for the sole and exclusive use of the above-named client. All samples associated with the work order will be retained a maximum of 15 days from the report date or until the maximum holding time expires. All results pertain only to samples submitted.

Thank you for allowing Coffey Laboratories to be of service to you. If you have questions or need further assistance, please do not hesitate to call our Customer Services Department.

Sincerely,

Technical Services

TS /atc

Coffey Laboratories, Inc.
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Analytical Data

CH2M Hill

Job Number: A30804O

Lab Sample ID: A30804O-1
Field ID: 73103OL 2,4-D1
Date/Time: 07/31/03 1305
Matrix: Surface Water

EPA Category: Synthetic Organic Chemicals
Analysis Performed: EPA 515.1; Chlorinated Herbicides by GC/ECD.
Analysis Date: 08/14/03
Analyst: MKM

Parameter	Detection Limit	Laboratory Blank	Analytical Result
2,4-D	0.00096	ND	ND
2,4-Dichlorophenylacetic acid Surr.	---	---	110.%

Results expressed as mg/L unless otherwise noted.
ND means none detected at or above the detection limit listed.

Analytical Data

CH2M Hill

Job Number: A30804O

Lab Sample ID: A30804O-2
Field ID: 73103OL 2,4-D2
Date/Time: 07/31/03 1305
Matrix: Surface Water

EPA Category: Synthetic Organic Chemicals
Analysis Performed: EPA 515.1; Chlorinated Herbicides by GC/ECD.
Analysis Date: 08/14/03
Analyst: MKM

Parameter	Detection Limit	Laboratory Blank	Analytical Result
2,4-D	0.00096	ND	ND
2,4-Dichlorophenylacetic acid Surr.	---	---	100.%

Results expressed as mg/L unless otherwise noted.
ND means none detected at or above the detection limit listed.

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Analytical Data

CH2M Hill

Job Number: A30804O

Lab Sample ID: A30804O-3
Field ID: 73103OL Car1
Date/Time: 07/31/03 1305
Matrix: Surface Water

EPA Category: Synthetic Organic Chemicals
Analysis Performed: EPA 531.1; Carbamates in Drinking Water by HPLC.
Analysis Date: 08/05/03
Analyst: RH

Parameter	Detection Limit	Laboratory Blank	Analytical Result
3-Hydroxycarbofuran	0.001	ND	ND
Aldicarb	0.001	ND	ND
Aldicarb sulfone	0.0007	ND	ND
Aldicarb sulfoxide	0.001	ND	ND
Carbaryl	0.001	ND	ND
Carbofuran	0.001	ND	ND
Methiocarb	0.001	ND	ND
Methomyl	0.001	ND	ND
Oxamyl	0.001	ND	ND
BDMC (surr)	---	---	110.%

Results expressed as mg/L unless otherwise noted.
ND means none detected at or above the detection limit listed.

Analytical Data

CH2M Hill

Job Number: A30804O

Lab Sample ID: A30804O-4
Field ID: 73103HL 2,4-D1
Date/Time: 07/31/03 1625
Matrix: Surface Water

EPA Category: Synthetic Organic Chemicals
Analysis Performed: EPA 515.1; Chlorinated Herbicides by GC/ECD.
Analysis Date: 08/14/03
Analyst: MKM

Parameter	Detection Limit	Laboratory Blank	Analytical Result
2,4-D	0.00088	ND	ND
2,4-Dichlorophenylacetic acid Surr.	---	---	100.%

Results expressed as mg/L unless otherwise noted.
ND means none detected at or above the detection limit listed.

Analytical Data

CH2M Hill

Job Number: A30804O

Lab Sample ID: A30804O-5
Field ID: 73103HL 2,4-D2
Date/Time: 07/31/03 1625
Matrix: Surface Water

EPA Category: Synthetic Organic Chemicals
Analysis Performed: EPA 515.1; Chlorinated Herbicides by GC/ECD.
Analysis Date: 08/14/03
Analyst: MKM

Parameter	Detection Limit	Laboratory Blank	Analytical Result
2,4-D	0.00093	ND	ND
2,4-Dichlorophenylacetic acid Surr.	---	---	120.%

Results expressed as mg/L unless otherwise noted.
ND means none detected at or above the detection limit listed.

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Analytical Data

CH2M Hill

Job Number: A30804O

Lab Sample ID: A30804O-6
Field ID: 73103HL 2,4-D3
Date/Time: 07/31/03 1625
Matrix: Surface Water

EPA Category: Synthetic Organic Chemicals
Analysis Performed: EPA 515.1; Chlorinated Herbicides by GC/ECD.
Analysis Date: 08/14/03
Analyst: MKM

Parameter	Detection Limit	Laboratory Blank	Analytical Result
2,4-D	0.00093	ND	ND
2,4-Dichlorophenylacetic acid Surr.	---	---	110.%

Results expressed as mg/L unless otherwise noted.
ND means none detected at or above the detection limit listed.

Analytical Data

CH2M Hill

Job Number: A30804O

Lab Sample ID: A30804O-7
Field ID: 73103HL 2,4-D4
Date/Time: 07/31/03 1625
Matrix: Surface Water

EPA Category: Synthetic Organic Chemicals
Analysis Performed: EPA 515.1; Chlorinated Herbicides by GC/ECD.
Analysis Date: 08/14/03
Analyst: MKM

Parameter	Detection Limit	Laboratory Blank	Analytical Result
2,4-D	0.0009	ND	ND
2,4-Dichlorophenylacetic acid Surr.	---	---	110.%

Results expressed as mg/L unless otherwise noted.
ND means none detected at or above the detection limit listed.

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Analytical Data

CH2M Hill

Job Number: A30804O

Lab Sample ID: A30804O-8
Field ID: 73103HL Carl
Date/Time: 07/31/03 1625
Matrix: Surface Water

EPA Category: Synthetic Organic Chemicals
Analysis Performed: EPA 531.1; Carbamates in Drinking Water by HPLC.
Analysis Date: 08/05/03
Analyst: RH

Parameter	Detection Limit	Laboratory Blank	Analytical Result
3-Hydroxycarbofuran	0.001	ND	ND
Aldicarb	0.001	ND	ND
Aldicarb sulfone	0.0007	ND	ND
Aldicarb sulfoxide	0.001	ND	ND
Carbaryl	0.001	ND	ND
Carbofuran	0.001	ND	ND
Methiocarb	0.001	ND	ND
Methomyl	0.001	ND	ND
Oxamyl	0.001	ND	ND
BDMC (surr)	---	---	90.%

Results expressed as mg/L unless otherwise noted.
ND means none detected at or above the detection limit listed.

Analytical Data

CH2M Hill

Job Number: A30804O

Lab Sample ID: A30804O-9
Field ID: 73103HL Car2
Date/Time: 07/31/03 1625
Matrix: Surface Water

EPA Category: Synthetic Organic Chemicals
Analysis Performed: EPA 531.1; Carbamates in Drinking Water by HPLC.
Analysis Date: 08/05/03
Analyst: RH

Parameter	Detection Limit	Laboratory Blank	Analytical Result
3-Hydroxycarbofuran	0.001	ND	ND
Aldicarb	0.001	ND	ND
Aldicarb sulfone	0.0007	ND	ND
Aldicarb sulfoxide	0.001	ND	ND
Carbaryl	0.001	ND	ND
Carbofuran	0.001	ND	ND
Methiocarb	0.001	ND	ND
Methomyl	0.001	ND	ND
Oxamyl	0.001	ND	ND
BDMC (surr)	---	---	90.%

Results expressed as mg/L unless otherwise noted.
ND means none detected at or above the detection limit listed.

Analytical Data

CH2M Hill

Job Number: A30804O

Lab Sample ID: A30804O-10
Field ID: 73103LCL 2,4-D1
Date/Time: 07/31/03 1745
Matrix: Surface Water

EPA Category: Synthetic Organic Chemicals
Analysis Performed: EPA 515.1; Chlorinated Herbicides by GC/ECD.
Analysis Date: 08/14/03
Analyst: MKM

Parameter	Detection Limit	Laboratory Blank	Analytical Result
2,4-D	0.0009	ND	ND
2,4-Dichlorophenylacetic acid Surr.	---	---	110.%

Results expressed as mg/L unless otherwise noted.
ND means none detected at or above the detection limit listed.

Analytical Data

CH2M Hill

Job Number: A30804O

Lab Sample ID: A30804O-11
Field ID: 73103LCL 2,4-D2
Date/Time: 07/31/03 1745
Matrix: Surface Water

EPA Category: Synthetic Organic Chemicals
Analysis Performed: EPA 515.1; Chlorinated Herbicides by GC/ECD.
Analysis Date: 08/14/03
Analyst: MKM

Parameter	Detection Limit	Laboratory Blank	Analytical Result
2,4-D	0.00086	ND	ND
2,4-Dichlorophenylacetic acid Surr.	---	---	110.%

Results expressed as mg/L unless otherwise noted.
ND means none detected at or above the detection limit listed.

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Analytical Data

CH2M Hill

Job Number: A30804O

Lab Sample ID: A30804O-12
Field ID: 73103LCL 2,4-D3
Date/Time: 07/31/03 1745
Matrix: Surface Water

EPA Category: Synthetic Organic Chemicals
Analysis Performed: EPA 515.1; Chlorinated Herbicides by GC/ECD.
Analysis Date: 08/14/03
Analyst: MKM

Parameter	Detection Limit	Laboratory Blank	Analytical Result
2,4-D	0.00091	ND	ND
2,4-Dichlorophenylacetic acid Surr.	---	---	120.%

Results expressed as mg/L unless otherwise noted.
ND means none detected at or above the detection limit listed.

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Analytical Data

CH2M Hill

Job Number: A30804O

Lab Sample ID: A30804O-13
Field ID: 73103LCL 2,4-D4
Date/Time: 07/31/03 1745
Matrix: Surface Water

EPA Category: Synthetic Organic Chemicals
Analysis Performed: EPA 515.1; Chlorinated Herbicides by GC/ECD.
Analysis Date: 08/14/03
Analyst: MKM

Parameter	Detection Limit	Laboratory Blank	Analytical Result
2,4-D	0.00028	ND	ND
2,4-Dichlorophenylacetic acid Surr.	---	---	90.%

Results expressed as mg/L unless otherwise noted.
ND means none detected at or above the detection limit listed.

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Analytical Data

CH2M Hill

Job Number: A30804O

Lab Sample ID: A30804O-14
Field ID: 73103LCL Car1
Date/Time: 07/31/03 1745
Matrix: Surface Water

EPA Category: Synthetic Organic Chemicals
Analysis Performed: EPA 531.1; Carbamates in Drinking Water by HPLC.
Analysis Date: 08/05/03
Analyst: RH

Parameter	Detection Limit	Laboratory Blank	Analytical Result
3-Hydroxycarbofuran	0.001	ND	ND
Aldicarb	0.001	ND	ND
Aldicarb sulfone	0.0007	ND	ND
Aldicarb sulfoxide	0.001	ND	ND
Carbaryl	0.001	ND	ND
Carbofuran	0.001	ND	ND
Methiocarb	0.001	ND	ND
Methomyl	0.001	ND	ND
Oxamyl	0.001	ND	ND
BDMC (surr)	---	---	90.%

Results expressed as mg/L unless otherwise noted.
ND means none detected at or above the detection limit listed.

Analytical Data

CH2M Hill

Job Number: A30804O

Lab Sample ID: A30804O-15
Field ID: 73103LCL Car2
Date/Time: 07/31/03 1745
Matrix: Surface Water

EPA Category: Synthetic Organic Chemicals
Analysis Performed: EPA 531.1; Carbamates in Drinking Water by HPLC.
Analysis Date: 08/05/03
Analyst: RH

Parameter	Detection Limit	Laboratory Blank	Analytical Result
3-Hydroxycarbofuran	0.001	ND	ND
Aldicarb	0.001	ND	ND
Aldicarb sulfone	0.0007	ND	ND
Aldicarb sulfoxide	0.001	ND	ND
Carbaryl	0.001	ND	ND
Carbofuran	0.001	ND	ND
Methiocarb	0.001	ND	ND
Methomyl	0.001	ND	ND
Oxamyl	0.001	ND	ND
BDMC (surr)	---	---	90.%

Results expressed as mg/L unless otherwise noted.
ND means none detected at or above the detection limit listed.