APPENDIX D – SURFACE WATER DATA

FINAL REMEDIAL INVESTIGATION REPORT
CASMALIA RESOURCES SUPERFUND SITE
CASMALIA, CALIFORNIA

Prepared By: URS Corporation

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LIST OF ACRONYMS

µg/L	micrograms per liter
CASRN	Chemical Abstract Services Registry Number
COPC	chemical of potential concern
CSC	Casmalia Steering Committee
DQO	data quality objective
EDB	1,2 dibromoethane
FS	Feasibility Study
FSP	field sampling plan
GPS	global positioning system
HH	Human health
MCL	maximum contaminant level
mg/L	milligrams per liter
MIBK	methyl isobutyl ketone
MTBE	methyl-tert-butyl ether
NA	Not applicable
ND	Not Detected
PAHs	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
pg/L	picograms per liter
PRG	Preliminary Remediation Goal
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RGMEW	Routine Groundwater Monitoring Element of Work
RI/FS	Remedial Investigation/Feasibility Study
RICH	RI Change Form
SA	semi-annual
SAP	Sampling Analysis Plan
SOP	Standard Operating Procedures
SVOC	semi-volatile organic compound
TCE	trichloroethene
TEQ	toxic equivalent
TEPH	total extractable petroleum hydrocarbons
UCL	upper confidence limit
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

1.0 INTRODUCTION

The Casmalia Steering Committee (CSC) collected surface water drainage data in accordance with the June 2004 Remedial Investigation/Feasibility Study (*RI/FS) Work Plan* (CSC, 2004) and the Final Fall 2005 Phase II Memo, dated November 18, 2005 (Fall 2005 Sampling Memo – CSC, 2005), which were prepared by the CSC and submitted to the U.S. Environmental Protection Agency (EPA). In accordance with the Routine Groundwater Monitoring Element of Work (RGMEW – ICF Kaiser, 1997), sampling and analysis of surface waters contained in the five on-site ponds was conducted. The RGMEW includes groundwater and pond surface water quality sampling for the purposes of achieving Performance Standards specified in Section 2.12 of the Casmalia Consent Decree Statement of Work.

The following sections describe the nature and findings of the work completed as part of the 2004 and 2005 activities.

1.1 Purpose of the Investigation

In general accordance with the scope of work described in Section 5.1.3 of the 2004 RI/FS Work Plan, entitled *"Collect Surface Water Samples"* the CSC performed field sampling and contracted laboratory chemical analyses of surface water samples collected from select on-site and off-site locations. Surface water samples collected and analyzed as part of the investigations described herein supplement existing data for the on-site ponds, the RCRA Canyon drainage, and C-Drainage already collected as part of monitoring programs, and will be used to evaluate potential exposures to human and ecological receptors to on-site pond water and surface water drainage in Zone 1.

1.2 Scope of the Investigation

Surface water samples were collected from both on-site and off-site areas. All of the on-site and off-site water surface water samples collected were analyzed for the Appendix IX analytical suite with additional chemicals of potential concern (COPC). Surface water samples from on-site ponds were additionally analyzed for total extractable petroleum hydrocarbons (TRPH) (as diesel and motor oil. On-site surface water drainage sampling was conducted at the location where surface runoff exits RCRA Canyon just prior to entering a pipe draining into Pond A-5. Off-site surface water drainage samples were collected from two locations in the North drainage, one location along the A-Drainage, and three locations along the C-Drainage (Figure D-1).

On-site surface water pond samples were collected from the A-series Pond, Pond 13, Pond 18, Pond A-5, and the RCF Pond (Figure D-1). On-site pond sampling for purposes of the RI was performed during the RGMEW fourteenth and fifteenth semi-annual (SA) sampling events.

2.0 METHODOLOGY

2.1 Detailed Approach

2.1.1 Surface Water Drainage Sampling

Location coordinates for Phase I and II surface water drainage samples were derived from Figure 4-1 of the 2004 RI/FS Work Plan and Figure 4.1-P2 from the Fall 2005 Sampling Memo, respectively. The coordinates were provided to the surveying subcontractor for staking in the field. Surface water drainage samples were collected as closely as possible to the staked locations, given access and water availability. All locations were visited and reviewed during a sampling location reconnaissance survey by URS staff and U.S. Environmental Protection Agency (USEPA) oversight personnel. The pre-staked location was used as a guide, but the final sample points were chosen based upon observed flow conditions at each location. Location coordinates for all surface water drainage sample collection points are presented in Table D-1.

The approved 2004 RI/FS Work Plan sampling program called for collection of surface water on two occasions, including once under summer flow conditions and again following winter rains. In addition, the approved Fall 2005 Sampling Memo program called for collection of surface water in the North and RCRA Canyon Drainages on two occasions, including once during the initial rainy season (October/November) and once during the height of the rainy season (March/April). The drainages were also to be sampled during the summer months, if they continued to run. The North drainage was observed to support only sporadic flow likely associated with weak seeps that locally emerge in the lower reaches of the deeply incised creek channel. Surface water samples in the North Drainage were collected from shallow pools associated with these seeps. In contrast, the C-Drainage supports perennial surface water flow. Surface water sampling in the RCRA canyon area was conducted on three events: December 2004, March 2005, and December 2005, following rainfall events sufficient to produce surface runoff. Surface water runoff was observed in the A-Drainage only during the winter storms of 2005, thus only one sample was collected from this location. All surface water drainage sampling locations are depicted in Figure D-1.

All surface water samples collected as part of the first sampling event were collected by submerging laboratory-provided containers just under the surface of the water until full, in accordance with the methods described for surface water drainage sampling in Standard Operating Procedure 3-4 (SOP 3-4). As further described below, with the exception of samples collected for analysis of volatile constituents, surface water sampling procedures were modified to allow use of a peristaltic pump to facilitate sample collection in shallow water conditions. This modification is documented in RI Change (RICH) form number 006 (Appendix Q, RICH-006).

Analyses for inorganic constituents were conducted on both filtered (dissolved) and unfiltered (totals) samples from each location. As would be expected, reported totals values were typically greater than reported dissolved values for a given analyte. However, in several instances the opposite relation is noted. Differences in reported values for totals versus dissolved were typically minor, and within anticipated analytical variability. However, some differences may be attributable to natural variation in turbidity and constituent concentrations that is inherent in dynamic surface water environments.

2.1.2 Surface Water Pond Sampling

One sample from each of the five surface water ponds (A-series pond, Pond 13, Pond 18, Pond A-5, and RCF pond) was collected during the RGMEW fourteenth and fifteenth SA sampling events, conducted during October – November 2004 and April 2005, respectively. All surface water pond samples were collected in accordance with the specifications and procedures outlined in the RGMEW Quality Assurance Project Plan (QAPP) and Field Sampling Plan (FSP).

Analyses for inorganic constituents were conducted on both filtered (dissolved) and unfiltered (totals) samples from each location. As would be expected, reported totals values were typically greater than reported dissolved values for a given analyte. However, in several instances the opposite relation is noted. Differences in reported values for totals versus dissolved were typically minor, and within anticipated analytical variability. However, some differences may be attributable to natural variation in turbidity and constituent concentrations that is inherent in dynamic surface water environments.

2.1.3 Contractors and Subcontractors

The CSC contracted URS Corporation to perform sampling of surface water drainages, and MACTEC to perform sampling of the on-site surface water ponds. The specific work conducted by each party is further discussed below.

2.1.3.1 Principal Contractors – URS Corporation and MACTEC Engineering and Consulting

Surface water sampling tasks were divided between two principal contractors. URS Corporation conducted the RI sampling program for on-site and off-site surface water drainages, while MACTEC and their subcontractor, Blaine Tech Services, conducted the RGMEW sampling program, which included all on-site surface water ponds. URS staff coordinated the field surveying and staking of surface drainage sampling locations by the surveying subcontractor, and coordinated the analysis of these samples directly with the contract laboratory.

2.1.3.2 Surveying Subcontractor – Pacific Engineering, Incorporated

All field surveying and demarcation activities for the surface water drainage samples were subcontracted to Pacific Engineering, Incorporated (now Cannon Associates) in Santa Maria, California. All surveying activities were conducted under the direct supervision of a California registered civil engineer (Leroy Cadena, California registered civil engineer No. C55373). Using northing-easting coordinates provided by URS, Pacific Engineering located and staked the proposed surface drainage sampling locations on the ground surface. Surface water drainage sample locations are consistent with those indicated on Figure 4-1 of the 2004 RI/FS Work Plan and the Fall 2005 Sampling Memo.

2.1.3.3 Analytical Laboratory

2.1.3.3.1 Surface Water Drainage Samples

All laboratory chemical analyses of surface water drainage samples were conducted by BC Laboratories, Incorporated, in Bakersfield, California. BC Laboratories is a California Certified environmental testing laboratory (California Department of Health Services Environmental Laboratory Accreditation Certification No.1186).

2.1.3.3.2 Surface Water Pond Samples

All laboratory chemical analyses of surface water pond samples were conducted by BC Laboratories, Incorporated, in Bakersfield, California. BC Laboratories is a California Certified environmental testing laboratory (California Department of Health Services Environmental Laboratory Accreditation Certification No.1186) and Frontier Analytical Laboratory in El Dorado Hills, California. Frontier Laboratory is a California Certified environmental testing laboratory (California Department of Health Services, National Environmental Laboratory Accreditation Certification No. 02113CA).

The samples were analyzed by each of the analytical laboratories using the target analyte list for each analytical method and required reporting limits as presented in the RGMEW QAPP.

2.1.4 Equipment and Tools

2.1.4.1 Surveying Equipment and Software

Surveying of surface water drainage sampling locations was completed using Global Positioning System (GPS) equipment. Location coordinates were loaded into a TDS Ranger 200C® data collector running SurveyPro® with robotic and GPS software. Coordinate locations were located and staked in the field using a Thales G-Max® real time kinematics dual frequency GPS rover and base system. Staked coordinate locations are reported to a lateral accuracy of 0.033 feet, and ground surface elevations are reported to a vertical accuracy of 0.065 feet. Control points used in field surveying were the same as those used to create the April 2004 Site topographic map.

2.1.4.2 Surface Water Drainage Sampling Equipment

All surface water drainage samples were initially collected by submerging laboratory-provided containers just under the surface of the water until full. However, as described in RICH-006, modifications were made to allow an alternative sample collection method to facilitate collection of surface water samples in shallow water conditions using a peristaltic pump. Upon approval of RICH-006, all surface water samples collected during 2004 in the North Drainage and in RCRA Canyon and samples collected during fall 2004 in the C-Drainage, with the exception of those for volatiles analysis, were collected using a battery powered peristaltic pump equipped with polyethylene and silicone tubing. The pump was also used to pressure filter through a 0.45-micron filter for dissolved metals analyses. Because of the small size of sample containers for volatiles (40 ml VOA vials), and to minimize potential volatilization, surface water samples collected for volatiles analyses were always collected by carefully submerging clean laboratory-provided VOA vials just beneath the water surface until full. All samples collected during the March 2005 event were collected using the immersion method, and filtering of these samples was performed in the laboratory. Table D-1 lists the collection method for each sample.

2.1.4.3 Surface Water Pond Sampling Equipment

Surface water pond sampling equipment and procedures are described below:

- Pond sampling was performed from within a boat anchored at the approximate center of each pond. The total depth of the pond was measured from the top of the pond surface;

- A discrete interval bailer was then lowered to a depth approximately halfway between the pond surface and the pond bottom. The bailer was then opened to allow water to enter the bailer by pulling a string affixed to the check ball. After closing the sampler to prevent the mixing of the captured sample with water from other depths, the sampler was brought into the boat where the captured sample was transferred into designated laboratory-provided sample bottles;
- The sample collection procedure was repeated until all sample bottles had been filled; and,
- Dissolved metal samples were filtered in the field. Unfiltered samples were also collected; however, only filtered (i.e., dissolved) sample results are discussed in this report.

2.1.4.4 Analytical Testing Equipment

All laboratory chemical analyses were conducted in accordance with the specifications procedures outlined in the 2004 RI/FS Work Plan and RGMEW QAPP and FSP. Chemical analyses were conducted in general accordance with the procedures and equipment specified in the EPA SW-846 guidance document.

2.2 Deviations from the 2004 RI/FS Work Plan and Fall 2005 Sampling Plan

The scope and methods used in completing the surface water drainage sampling program differed somewhat from that described in the 2004 RI/FS Work Plan and Final Fall 2005 Phase II Sampling Plan. Deviations from these plans are described below.

- Following collection of the initial round of surface water samples from the C drainage, the method of sample collection was modified to allow use of a peristaltic pump. The rationale for this modification and the revised sampling procedures are documented in RICH-006 (see Appendix Q).
- Surface water samples were not collected in April/March 2006 due to the brevity of the rainy season and involvement of field staff with intensive site stormwater management activities during the one significant rainfall event experienced during that period. There was no flow in the drainages during the summer months of 2006; therefore no samples were collected.

3.0 INVESTIGATION RESULTS

Results of the surface water sampling and analysis program are summarized below. All surface water sampling locations are depicted in Figure D-1.

3.1 Surface Water Drainage

Information regarding surface water drainage samples (identity, location, collection date and method, and analytical program) is summarized in Table D-1. Laboratory analytical results for all surface water drainage samples are presented in a series of summary tables, including Tables D-2 through D-8. Table D-2 presents a summary checklist of the COPCs detected in the surface drainage water. Analytical results for individual surface water drainage samples are presented in Table D-3 (total and dissolved inorganics) and Table D-4 (organics). To assist in evaluating the significance of findings, Tables D-3 and D-4 also present possibly applicable screening levels, including California and Federal Maximum Contaminant Levels (MCLs), tap water Preliminary Remediation Goals (PRGs), and lowest human health and ecological screening levels (jointly referred to as "screening levels"). Ranges of detected analytes in surface water drainage are summarized in Tables D-5 (inorganics) and Table D-6 (organics), and a summary of threshold screening level exceedences is presented in Tables D-7 (inorganics) and Table D-8 (organics). A comparison of compounds detected above screening levels for each surface water drainage sampling location, indicating the location of the maximum detected value for each, is presented in Table D-9.

Because screening levels for inorganic constituents are applicable only to dissolved constituent concentrations, total inorganic concentrations are not evaluated with respect to screening level exceedences in the following discussion.

3.2 Summary of Analytical Results for Benchmark Drainage Locations

Due to their relative locations upgradient and across topographic drainage divides from the Site, surface water drainage samples collected from the North Drainage (locations RISWOF-02 and RISWOF-06) and the upstream C-Drainage (RISWOF-03) are considered benchmark data for comparison with results from locations situated either on-site or downstream from the Site.

3.2.1 North Drainage

Surface water drainage samples were collected from location RISWOF-02 during four discrete sampling events: August 2004, October 2004, March 2005, and January 2006 (Figure D-1 and Table D-1). Results for these samples are discussed below.

3.2.1.1 Inorganics

With the exception of total and amenable cyanide, all target inorganic constituents were reported at detectable concentrations in one or more surface water drainage samples from the North Drainage benchmark location (Table D-2). A total of 16 out of 27 individual inorganic constituents were reported at dissolved concentrations in excess of one or more screening level, including aluminum, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc (Table D-3). Due to their

typically lower values, ecological screening levels were the most frequently exceeded threshold, individually accounting for 10 of the 16 exceedences (Table D-7). The only dissolved inorganic constituents reported to exceed screening levels in addition to ecological thresholds are aluminum, arsenic, cadmium, lead, manganese, and selenium. Of these, arsenic, manganese, and selenium were reported at concentrations significantly above other screening levels.

3.2.1.2 Volatile Organic Compounds

Two of the 75 target volatile organic compounds (VOCs) were detected in surface water drainage samples collected from the North Drainage, including nonanal and p-isopropyltoluene. However, screening levels have not been developed for these compounds (Table D-4 and D-8).

3.2.1.3 Semi-volatile Organic Compounds

Twelve of 112 target semi-volatile organic compounds (SVOCs) were detected in surface drainage water samples collected from the North Drainage, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, bis(2-chloroethyl)ether, bis(2-ethylhexyl)phthalate, chrysene, dibenzo(a,h)anthracene, hexachloropropene, n-nitrosodiethylamine, n-nitrosodipropylamine, and n-nitrosopyrrolidine (Table D-2). The compounds benzo(a)pyrene, bis(2-chloroethyl)ether, dibenzo(a,h)anthracene, n.nitrosodiethylamine, n-nitrosodipropylamine, n-nitrosopyrrolidine were reported at concentrations slightly exceeding human health screening levels, with benzo(a)pyrene also slightly exceeding its ecological screening level (Table D-4 and D-8).

3.2.1.4 Polychlorinated Biphenyls

No polychlorinated biphenyls (PCBs) were detected in any of the surface water drainage samples collected from the North Drainage.

3.2.1.5 Pesticides and Herbicides

No pesticides or herbicides were detected in any of the surface water drainage samples collected from the North Drainage.

3.2.1.6 Dioxins/Furans

Detectable concentrations of dioxins and furans were present in each sample, and included a total of 11 individual congeners (Table D-2 and D-6). Total toxicity equivalent quotients (TEQs) exceeded human health and ecological screening levels (Table D-4 and D-8).

3.2.1.7 Poor Purging Compounds

Three poor purging compounds were detected in surface water drainage samples collected from the North Drainage. Methyl isobutyl ketone (MIBK) was the only constituent that exceeded available screening levels, including human health and ecological screening levels.

3.2.2 Upper C-Drainage

Surface water drainage samples were collected from the upper C-Drainage (RISWOF-03) during three discrete sampling events: August 2004, November 2004, and March 2005 (Figure D-1 and Table D-1). As discussed above, results for samples collected from this location are considered benchmark data for comparison with results for samples collected from on-site and from locations situated downstream of the Site.

3.2.2.1 Inorganics

With the exception of total and amenable cyanide, antimony, copper, mercury, silver, and tin, all target inorganic constituents were reported at detectable concentrations in one or more surface water drainage samples from the upper C-Drainage (Table D-2). Analytical results for samples from the upper C-Drainage indicate seven of 27 inorganic analytes were reported at dissolved concentrations in excess of one or more screening level, including aluminum, arsenic, barium, nickel, selenium, vanadium, and zinc (Table D-3). Due to their low values, ecological screening levels were the most frequently exceeded threshold, individually accounting for five of the seven screening level exceedences reported in the upper C-Drainage (Table D-7). In addition to ecological screening levels, dissolved arsenic was reported to exceed the human health screening level for all sampling events at this location. Aluminum was reported to exceed its California MCL and human health screening level in the sample collected during March 2005.

3.2.2.2 Volatile Organic Compounds

No VOCs were reported at detectable concentrations in the surface water drainage samples collected from the upper C-Drainage benchmark location.

3.2.2.3 Semi-volatile Organic Compounds

Only two of 112 target SVOCs were detected in surface water drainage samples collected from the upper C-Drainage, including benzo(a)anthracene and n-nitrosodipropylamine. N-nitrosodipropylamine was reported at concentrations slightly exceeding human health screening levels (Table D-4 and D-8). Reported concentrations for this compound varied over only a small range, with reported concentrations of less than 0.07 micrograms per liter (µg/l) (Table D-6).

3.2.2.4 Polychlorinated Biphenyls

No PCBs were detected in any of the surface water drainage samples collected from the upper C-Drainage.

3.2.2.5 Pesticides and Herbicides

No pesticides or herbicides were detected in any of the surface water drainage samples collected from the upper C-Drainage.

3.2.2.6 Dioxins/Furans

Detectable concentrations of dioxins and furans were present in each sample, and included a total of six individual congeners (Table D-2 and D-6). Total TEQs exceeded human health and ecological screening levels (Table D-4 and D-8).

3.2.2.7 Poor Purging Compounds

Ethylene glycol was detected in the surface water drainage samples collected from the Upper C-Drainage; however, not at a concentration that exceeded available screening levels.

3.3 Summary of Analytical Results for Downgradient Off-site Drainage Locations

3.3.1 A-Drainage

Surface water drainage samples were collected from one location in the A-Drainage (RISWOF-01) during March 2005 (Figure D-1 and Table D-1). Results for these samples are discussed below.

3.3.1.1 Inorganics

Fifteen of 27 target inorganic constituents were reported at detectable concentrations in the single surface water drainage sample collected from the A-Drainage (Table D-2). A total of five out of 27 inorganic constituents were reported at dissolved concentrations in excess of one or more screening level, including aluminum, arsenic, barium, nickel, and zinc (Table D-3). Due to their typically lower values, ecological screening levels were the most frequently exceeded threshold, individually accounting for four of the five exceedences (Table D-7). The only dissolved inorganic constituent reported to exceed screening levels other than ecological thresholds is arsenic, with concentrations reported to exceed the human health screening level for this analyte.

3.3.1.2 Volatile Organic Compounds

No VOCs were reported at detectable concentrations in the surface water drainage sample collected from the A-Drainage.

3.3.1.3 Semi-volatile Organic Compounds

Naphthalene and n-nitrosodipropylamine were the only target SVOCs detected in the surface water drainage samples collected from the A-Drainage. Only the latter was reported at a concentration slightly exceeding its human health screening level (Table D-4 and D-8).

3.3.1.4 Polychlorinated Biphenyls

No PCBs were detected in the surface water drainage sample collected from the A-Drainage.

3.3.1.5 Pesticides and Herbicides

No pesticides or herbicides were detected in the surface water drainage sample collected from the A-Drainage.

3.3.1.6 Dioxins/Furans

Detectable concentrations of dioxins were present in the surface water drainage sample collected from the A-Drainage, and included one congener. Total TEQs concentrations did not exceed available screening levels (Table D-4 and D-8).

3.3.1.7 Poor Purging Compounds

Ethylene glycol was detected in the surface water drainage sample collected from the A-Drainage; however not at a concentration that exceeds available screening levels.

3.3.2 Lower C-Drainage

Surface water drainage samples were collected from two locations (RISWOF-04 and RISWOF-05) during three discrete sampling events: August 2004, October/November 2004, and March 2005 (Figure D-1 and Table D-1). As discussed above, results for samples collected from the upper C-Drainage location (RISWOF-03) are considered benchmark data for comparison with results for samples collected from on-site and from locations situated downstream of the Site.

3.3.2.1 Inorganics

With the exception of total and amenable cyanide, mercury, and tin, all target inorganic constituents were reported at detectable concentrations in one or more surface water drainage samples from the two lower C-Drainage sampling locations (Table D-2). Analytical results for samples from the lower C-Drainage indicate eight of 27 inorganic analytes were reported at dissolved concentrations in excess of one or more screening level, including aluminum, arsenic, barium, manganese, nickel, selenium, vanadium, and zinc (Table D-3). Due to their low values, ecological screening levels were the most frequently exceeded threshold, individually accounting for six of the eight constituent exceedences in the lower C-Drainage (Table D-7). The only dissolved inorganic constituents in the lower C-Drainage reported to exceed screening levels other than ecological thresholds are aluminum and arsenic.

3.3.2.2 Volatile Organic Compounds

Carbon disulfide was the only VOC detected in the lower C-Drainage, and was reported in the downstream sampling location on only one occasion at a concentration below available screening levels (Table D-4).

3.3.2.3 Semi-volatile Organic Compounds

Only four of 112 target SVOCs were detected in surface water drainage samples collected from the lower C-Drainage, including benzo(a)anthracene, bis(2-ethylhexyl) phthalate, bis(2-chloroethyl)ether, and n-nitrosodipropylamine (Table D-2). Bis(2-chloroethyl)ether and n-nitrosodipropylamine were reported at concentrations slightly exceeding human health screening levels (Table D-4 and D-8). Reported concentrations for these compounds varied only slightly between sampling events and sample locations (Table D-4 and D-6).

3.3.2.4 Polychlorinated Biphenyls

No PCBs were detected in any of the surface water drainage samples collected from the lower C-Drainage.

3.3.2.5 Pesticides and Herbicides

No pesticides or herbicides were detected in any of the surface water drainage samples collected from the lower C-Drainage.

3.3.2.6 Dioxins/Furans

Detectable concentrations of dioxins and furans were present in each sample, and included a total of nine individual congeners (Table D-2 and D-6). Total TEQs exceeded human health and ecological screening levels in both locations (Table D-4 and D-8).

3.3.2.7 Poor Purging Compounds

Three poor purging compounds were detected in surface water drainage samples collected from the lower C-Drainage. Acetone and acetonitrile were reported at concentrations slightly exceeding human health screening levels (Table D-4 and D-8).

3.4 Summary of Analytical Results For On-site Drainage Area

3.4.1 RCRA Canyon Area

Surface water drainage samples were collected from a single location in RCRA Canyon (RISWRC-01) during three discrete sampling events: December 2004, March 2005, and December 2005 (Figure D-1 and Table D-1). Results for these on-site samples were compared to data for benchmark locations and locations downgradient of the Site. Historical surface water data were previously collected from the RCRA Canyon Area by Harding Lawson and Associates during five separate sampling events between December 2001 and January 2002. Analytical results for these historical surface water drainage samples are summarized in Attachment D-1, and copies of laboratory analytical results for these samples are presented in Attachment D-2.

3.4.1.1 Inorganics

Twenty-one of 27 target inorganic constituents were reported at detectable concentrations in the surface water drainage samples collected from RCRA Canyon (Table D-2). A total of 11 out of 27 inorganic constituents were reported at dissolved concentrations in excess of one or more screening levels, including arsenic, barium, cadmium, chromium, copper, manganese, molybdenum, nickel, selenium, vanadium and zinc (Table D-3). Due to their typically lower values, ecological screening levels were the most frequently exceeded threshold, individually accounting for seven of the 11 exceedences (Table D-7). The only dissolved inorganic constituents reported to exceed screening levels other than ecological thresholds are arsenic, cadmium, and selenium, with dissolved arsenic and selenium concentrations reported to exceed all screening levels.

3.4.1.2 Volatile Organic Compounds

Nonanal was the only VOC detected in RCRA Canyon and was reported on only one occasion at a concentration below laboratory reporting limits (Table D-4).

3.4.1.3 Semi-volatile Organic Compounds

Benzo(b)fluoranthene, bis(2-chloroethyl)ether, hexachlorobutadiene, n-nitrosodipropylamine, and n-nitrosopyrrolidine were the only target SVOCs detected in the surface water drainage samples collected from the RCRA Canyon area. Bis(2-chloroethyl)ether, n-nitrosodipropylamine, and n-nitrosopyrrolidine were reported at concentrations slightly exceeding human health screening levels (Table D-4 and D-8).

3.4.1.4 Polychlorinated Biphenyls

No PCBs were detected in any of the surface water drainage samples collected from the RCRA Canyon area.

3.4.1.5 Pesticides and Herbicides

No pesticides or herbicides were detected in any of the surface water drainage samples collected from the RCRA Canyon area.

3.4.1.6 Dioxins/Furans

Detectable concentrations of dioxins were present in each sample, and included two individual congeners (Table D-2 and D-6). Total TEQs did not exceed screening levels (Table D-4 and D-8).

3.4.1.7 Poor Purging Compounds

Ethylene glycol was detected in the surface water drainage samples collected from the RCRA Canyon Area; however, not at concentrations that exceed available screening levels.

3.5 Surface Water Ponds

Information regarding surface water pond samples (location, collection date, and analytical program) is summarized in Table D-10. To assist in evaluating the significance of findings, Table D-11 presents possibly applicable screening levels, including California and Federal MCLs, tap water PRGs, and lowest human health and ecological screening levels (jointly referred to as “screening levels”). Analytical results for individual surface water pond samples are presented in Table D-12 (total and dissolved inorganics) and Table D-13 (organics).

Because screening levels for inorganic constituents are applicable only to dissolved constituent concentrations, total inorganic concentrations are not evaluated with respect to screening level exceedences in the following discussion.

3.6 Summary of Analytical Results for On-site Surface Water Ponds

All five pond locations were sampled and analyzed during the fourteenth and fifteenth SA events. Analytical results for individual surface water pond samples are presented Table D-12 (total and dissolved inorganics) and Table D-13 (organics).

3.6.1 A-Series Pond

Surface water pond samples were collected from the A-Series Pond during the fourteenth and fifteenth SA events on November 3, 2004 and April 8, 2005, respectively (Figure D-1 and Table D-10). Results for these samples are discussed below.

3.6.1.1 Inorganics

With the exception of cyanide, lead, silver, and thallium, all target inorganic constituents were reported at detectable concentrations in one or more surface water pond samples from the A-Series Pond (Table D-12). Vanadium was reported at a concentration above screening levels during the fourteenth SA event. Arsenic, nickel, and selenium were reported at concentrations above the screening levels during both the fourteenth and fifteenth SA events.

3.6.1.2 Volatile Organic Compounds

Three VOCs were detected in surface water pond samples collected from the A-Series Pond, including 1,2 dibromoethane (EDB), 1,1-dichloro-1-fluoroethane, and dimethyl sulfide (Table D-13). The EDB concentration was reported above the screening level during the fourteenth SA event. The A-Series Pond did not have any VOC screening level exceedences during the fifteenth SA event.

3.6.1.3 Semi-volatile Organic Compounds

Seven SVOCs were detected in surface water pond samples collected from the A-Series Pond, including 1,1-oxybis_2-Methoxy_ethane, 1,2,3-trimethylbenzene, benzo(a)anthracene, bis(2-chloroethyl) ether, naphthalene, n-nitrosodipropylamine, and n-nitrosopyrrolidine (Table D-13). The compounds bis(2-chloroethyl) ether, and n-nitrosopyrrolidine were reported with concentrations exceeding the screening levels during the fourteenth SA event. The compounds n-nitrosodipropylamine and n-nitrosopyrrolidine were reported with concentrations exceeding screening levels during the fifteenth SA event.

3.6.1.4 Polychlorinated Biphenyls

No PCBs were detected in any of the surface water pond samples collected from the A-Series Pond.

3.6.1.5 Pesticides and Herbicides

No pesticides or herbicides were detected in any of the surface water pond samples collected from the A-Series Pond.

3.6.1.6 Dioxins/Furans

No dioxins/furans were detected in any of the surface water pond samples collected from the A-Series Pond.

3.6.1.7 Total Extractable Petroleum Hydrocarbons

TEPH were detected in surface water samples collected from the A-Series Pond during both SA events. Reported concentrations range from 160 – 390 micrograms per liter (µg/L) for diesel, to 91 – 210 µg/L for motor oil; however, there are no available screening levels for TEPH.

3.7.1 Pond 13

Surface water pond samples were collected from Pond 13 during the fourteenth and fifteenth SA events on October 28, 2004 and April 7, 2005, respectively (Figure D-1 and Table D-10). Results for these samples are discussed below.

3.7.1.1 Inorganics

Fourteen inorganic compounds were detected in surface water pond samples collected from Pond 13 (Table D-12). Chromium was reported with a concentration exceeding screening levels during the fourteenth SA event. Arsenic, nickel, and selenium were reported at concentrations above the screening levels during both the fourteenth and fifteenth SA events.

3.7.1.2 Volatile Organic Compounds

Three VOCs were detected in surface water pond samples collected from Pond 13, including EDB, dimethyl sulfide, and methylene chloride (Table D-13). Pond 13 did not have any screening level exceedences during the fourteenth SA event. The EDB concentration was reported above the screening level during the fifteenth SA event.

3.7.1.3 Semi-volatile Organic Compounds

Twelve SVOCs were detected in surface water pond samples collected from Pond 13 (Table D-13). The compounds 1,2,4 trimethylbenzene, benzo(a)pyrene, and n-nitrosopyrrolidine were reported with concentrations exceeding the screening levels during the fourteenth SA event. The compounds bis(2-ethylhexyl) phthalate, n-nitrosodipropylamine, and n-nitrosopyrrolidine were reported with concentrations exceeding screening levels during the fifteenth SA event. The bis(2-ethylhexyl) phthalate detection is considered suspect because it was found in an associated blank sample.

3.7.1.4 Polychlorinated Biphenyls

No PCBs were detected in any of the surface water pond samples collected from Pond 13.

3.7.1.5 Pesticides and Herbicides

No pesticides or herbicides were detected in any of the surface water pond samples collected from Pond 13.

3.7.1.6 Dioxins/Furans

OCDD was the only dioxin/furan detected in Pond 13 and was reported with a concentration above the screening level during the fourteenth SA event.

3.7.1.7 Total Extractable Petroleum Hydrocarbons

TEPH were detected in surface water samples collected from Pond 13 during both SA events. Reported concentrations range from 240 – 430 µg/L for diesel, to 91 – 110 µg/L for motor oil; however, there are no available screening levels for TEPH.

3.8.1 Pond 18

Surface water pond samples were collected from Pond 18 during the fourteenth and fifteenth SA events on November 4, 2004 and April 12, 2005, respectively (Figure D-1 and Table D-10). Results for these samples are discussed below.

3.8.1.1 Inorganics

All target inorganic constituents were reported at detectable concentrations in one or more surface water pond samples from Pond 18 (Table D-12). Arsenic, nickel, and selenium, were reported at concentrations above the screening levels during both the fourteenth and fifteenth SA events.

3.8.1.2 Volatile Organic Compounds

Seven VOCs were detected in surface water pond samples collected from the Pond 18, including 1,1 dichlorethane, acetaldehyde, carbon disulfide, dimethyl sulfide, methylene chloride, methyl-tert-butyl ether (MTBE), propanol, tetrahydrofuran, and trichloroethene (TCE) (Table D-13). Pond 18 did not have any screening level exceedences during the fourteenth SA event. The compounds MTBE, tetrahydrofuran and TCE were reported with concentrations exceeding the screening levels during the fifteenth SA event.

3.8.1.3 Semi-volatile Organic Compounds

Six SVOCs were detected in surface water pond samples collected from Pond 18, including 1,2,3-trimethylbenzene, 1-ethyl-2-methylbenzene, benzo(a)anthracene, benzo(ghi)perylene, n-nitrosodiethylamine, and n-nitrosodimethylamine (Table D-13). Pond 18 did not have any screening level exceedences during the fourteenth SA event. The compounds n-nitrosodiethylamine and n-nitrosodimethylamine were reported with concentrations exceeding the screening levels during the fifteenth SA event.

3.8.1.4 Polychlorinated Biphenyls

No PCBs were detected in any of the surface water pond samples collected from Pond 18.

3.8.1.5 Pesticides and Herbicides

No pesticides or herbicides were detected in any of the surface water pond samples collected from Pond 18.

3.8.1.6 Dioxins/Furans

No dioxins/furans were detected in any of the surface water pond samples collected from Pond 18.

3.8.1.7 Total Extractable Petroleum Hydrocarbons

TEPH were detected in surface water samples collected from Pond 18 during both SA events. Reported concentrations range from 170 µg/L for diesel, to 91 – 110 µg/L for motor oil; however, there are no available screening levels for TEPH. Pond 18 reported the highest levels of TEPH concentrations among all on-site ponds.

3.9.1 Pond A-5

Surface water pond samples were collected from Pond A-5 during the fourteenth and fifteenth SA events on November 3, 2004 and April 8, 2005, respectively (Figure D-1 and Table D-10). Results for these samples are discussed below.

3.9.1.1 Inorganics

With the exception of cadmium, cyanide, lead, and thallium, all target inorganic constituents were reported at detectable concentrations in one or more surface water pond samples from Pond A-5 (Table D-12). Arsenic, chromium, nickel, selenium, and vanadium were reported at concentrations above the screening levels during the fourteenth SA events. Arsenic, manganese, nickel, and selenium were reported with concentrations above screening levels during the fifteenth SA event

3.9.1.2 Volatile Organic Compounds

Eleven VOCs were detected in surface water pond samples collected from Pond A-5 (Table D-13). TCE was the only VOC compound with a concentration exceeding the screening level during the fourteenth and fifteenth SA event.

3.9.1.3 Semi-volatile Organic Compounds

Nine SVOCs were detected in surface water pond samples collected from Pond A-5 (Table D-13). The compounds n-nitrosodipropylamine and n-nitrosopyrrolidine were reported with concentrations exceeding the screening levels during the fourteenth SA event. The compounds bis(2-ethylhexyl) phthalate, n-nitrosodipropylamine, and n-nitrosopyrrolidine were reported with concentrations exceeding screening levels during the fifteenth SA event. The bis(2-ethylhexyl) phthalate detection is considered suspect because it was found in an associated blank sample.

3.9.1.4 Polychlorinated Biphenyls

No PCBs were detected in any of the surface water pond samples collected from Pond A-5.

3.9.1.5 Pesticides and Herbicides

No pesticides or herbicides were detected in any of the surface water pond samples collected from Pond A-5.

3.9.1.6 Dioxins/Furans

OCDD was the only dioxin/furan detected in Pond A-5 and was reported with a concentration above the screening level during the fourteenth SA event.

3.9.1.7 Total Extractable Petroleum Hydrocarbons

TEPH were detected in surface water samples collected from Pond A-5 during both SA events. Reported concentrations range from 290 – 380 µg/L for diesel, to 180 µg/L for motor oil; however, there are no available screening levels for TEPH.

3.10.1 RCF Pond

Surface water pond samples were collected from the RCF Pond during the fourteenth and fifteenth SA events on October 28, 2004 and April 7, 2005, respectively (Figure D-1 and Table D-10). Results for these samples are discussed below.

3.10.1.1 Inorganics

Twelve inorganic compounds were detected in surface water pond samples collected from the RCF Pond (Table D-12). Arsenic, chromium, nickel, and selenium were reported with concentrations exceeding screening levels during the fourteenth SA event. Arsenic, nickel, and selenium were reported at concentrations above the screening levels during the fifteenth SA events.

3.10.1.2 Volatile Organic Compounds

Dimethyl sulfide and methylene chloride were detected in surface water pond samples collected from the RCF Pond (Table D-13). Methylene chloride was the only VOC compound with a concentration exceeding the screening level during the fourteenth and fifteenth SA event.

3.10.1.3 Semi-volatile Organic Compounds

Twelve SVOCs were detected in surface water pond samples collected from the RCF Pond (Table D-13). The compounds benzo(a)pyrene and n-nitrosopyrrolidine were reported with concentrations exceeding the screening levels during the fourteenth SA event. The compounds bis(2-ethylhexyl) phthalate, bis(2-chloroethyl) ether, and n-nitrosodipropylamine were reported with concentrations exceeding screening levels during the fifteenth SA event. The bis(2-ethylhexyl) phthalate detection is considered suspect because it was found in an associated blank sample.

3.10.1.4 Polychlorinated Biphenyls

No PCBs were detected in any of the surface water pond samples collected from the RCF Pond.

3.10.1.5 Pesticides and Herbicides

No pesticides or herbicides were detected in any of the surface water pond samples collected from the RCF Pond.

3.10.1.6 Dioxins/Furans

OCDD was the only dioxin/furan detected in the RCF Pond and was reported with a concentration above the screening level during the fourteenth SA event.

3.10.1.7 Total Extractable Petroleum Hydrocarbons

TEPH were detected in surface water samples collected from the RCF Pond only the fourteenth SA event. Reported concentrations range from 300 µg/L for diesel, to 140 µg/L for motor oil; however, there are no available screening levels for TEPH.

3.11 Conclusions Regarding Nature and Extent of Surface Water Impacts

This section summarizes pertinent surface water findings for benchmark, downgradient, and on-site surface water drainage, as well as on-site surface water pond locations.

3.12 Surface Water Drainage

A comparison of inorganic and organic constituents detected in the various surface water drainage sampling locations is presented in Table D-9 to aid in the following discussion.

3.12.1 Benchmark Locations

A total of 16 out of 27 inorganic constituents were reported in benchmark locations in the North Drainage and upper C-Drainage at dissolved concentrations in excess of one or more screening level, including aluminum, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc (Table D-7 and D-9). Reported values for these constituents in the North Drainage are considerably elevated relative to those in upper C-Drainage (Table D-5). Screening level exceedences were reported for each of these dissolved constituents in samples collected from the North Drainage, whereas exceedences in the upper C-Drainage were limited to aluminum, arsenic, barium, nickel, selenium, vanadium, and zinc. Ecological screening levels were the most frequently exceeded threshold. Aluminum and arsenic are the only dissolved constituents common to both the North Drainage and the upper C-Drainage that are reported at concentrations that consistently exceed thresholds other than ecological levels. In each location, both constituents exceed human health screening levels. Aluminum concentrations also exceed the California MCL in both locations. Arsenic concentrations in the North Drainage exceed the federal MCL and PRG for this constituent, and are approximately four-times higher than those reported for the upper C-Drainage. In addition, dissolved selenium concentrations in the North Drainage also consistently exceed screening levels other than ecological thresholds.

As indicated in findings of the Gamma Survey (Appendix I), soil mineralology in the North Drainage is apparently unique relative to other off-site and on-site locations, and field observations indicate surface water in the North Drainage area emerges from weak underground seeps, contributing mineral-rich waters into this drainage. Noted differences in dissolved inorganics concentrations between these two benchmark locations are likely attributable to soil and hydrologic conditions unique to the North Drainage.

Detections of organic compounds in the benchmark locations were mainly limited to several SVOCs and dioxins. Organic constituents common to both benchmark sampling locations

include Benzo(a)anthracene and n-nitrosodipropylamine (Table D-8). Of the detected organics, SVOCs (dominantly polycyclic aromatic hydrocarbons [PAHs]) are reported only at relatively low concentrations, slightly in excess of human health and ecological screening levels. Total TEQ concentrations in the benchmark locations exceeded human health and ecological screening levels, possibly indicating contribution from anthropogenic sources unrelated to the Site. Only one poor purging compound, MIBK, exceeded available screening levels, both human health and ecological. No PCBs, pesticides or herbicides were detected in samples collected from benchmark locations in the North Drainage or the upper C-Drainage.

In summary, surface water data for benchmark locations report the presence of several naturally occurring inorganic constituents, SVOCs (mainly PAHs) and dioxins and furans at concentrations exceeding screening levels, indicating that elevated levels of these constituents exist in locations situated upgradient and physically removed from the Site.

It is important to note that the findings of the human health risk assessment (Section 8 and Appendix T) and the ecological risk assessment (Section 9 and Appendix U) indicate that inorganic and organic constituents detected in excess of available screening levels in benchmark surface drainage water samples do not pose unacceptable exposures to potential receptors.

3.12.2 Off-site Area

3.12.2.1 A-Drainage

A total of five out of 27 inorganic constituents were reported in the A-Drainage at dissolved concentrations in excess of one or more screening level, including aluminum, arsenic, barium, nickel, and zinc (Table D-7 and D-9). Reported values for these constituents in the A-Drainage are considerably lower relative to those in North Drainage (Table D-5). Ecological screening levels were the most frequently exceeded threshold. Arsenic is the only dissolved constituent that exceeds human health screening levels, in addition to ecological levels.

Naphthalene and n-nitrosodipropylamine were the only detected SVOCs in the surface water sample from the A-Drainage. The naphthalene concentration does not exceed available screening levels; however, n-nitrosodipropylamine was reported at a concentration slightly in excess of its human health screening level. The reported concentration of n-nitrosodipropylamine is similar to concentrations of this compound reported for benchmark locations. No PCBs, pesticides or herbicides were detected in the surface water drainage sample collected from the A-Drainage. Total TEQ concentrations did not exceed available screening levels. No poor purging compounds were detected at concentrations that exceeded available screening levels.

3.12.2.2 Lower C-Drainage

Analytical results for samples from lower C-Drainage indicate eight of 27 individual inorganic analytes were reported at dissolved concentrations in excess of one or more screening level, including aluminum, arsenic, barium, manganese, nickel, selenium, vanadium, and zinc. Each of these constituents is also reported to exceed screening levels in the North Drainage benchmark sampling location; however, exceedences in the upper C-Drainage benchmark location are limited to aluminum, arsenic, barium, nickel, selenium, vanadium, and zinc (Table D-7). With the exception of aluminum and manganese, the range of dissolved concentrations for the majority

of constituents exceeding screening levels in the lower C-Drainage sampling locations are comparable to those reported for the upper C-Drainage benchmark location. Although dissolved manganese concentrations for lower C-Drainage samples are roughly four- to five-times those for the upper C-Drainage benchmark location, these levels are significantly below those reported for the North Drainage benchmark location (Table D-5).

With the exception of a low concentration of carbon disulfide (below screening levels) and acetonitrile, all organic compounds detected within samples from the lower C-Drainage were also reported to be present in benchmark sampling locations within the upper C-Drainage and/or the North Drainage. With the exception of acetone, acetonitrile, ethylene glycol, and, n-nitrosodipropylamine, reported organic compound concentrations in samples from the lower C-Drainage are typically lower than those reported for benchmark locations. Carbon disulfide and acetonitrile were not detected in any other off-site or on-site surface water drainage sampling locations, and appear to be unique to the lower C-Drainage. No pesticides, herbicides, or PCBs were detected in surface water drainage samples from the C-Drainage. Maximum concentrations of total TEQs were reported in the lower C-Drainage and reported levels exceeded human health and ecological screening levels. No poor purging compounds were detected at concentrations that exceeded available screening levels.

In summary, detected inorganics for samples from the lower C-Drainage are also present at generally higher concentrations in the North Drainage benchmark locations. Findings from lower C-Drainage samples indicate this area to be elevated with respect to manganese compared to the upper C-Drainage benchmark location. However, field observations indicate that ranching operations and land use activities in this area have greatly disturbed the lower C-Drainage, creating high turbidity surface water and resulting in high total and dissolved inorganics concentrations in this area. The reported concentration of n-nitrosodipropylamine in the southernmost lower C-Drainage sample location exceeds levels of this compound reported for benchmark locations; however, reported concentrations in both sampling locations exceed available screening levels. Additionally, the presence of carbon disulfide in the lower C-Drainage is apparently unique to this area.

It is important to note that the findings of the human health risk assessment (Section 8 and Appendix T) and the ecological risk assessment (Section 9 and Appendix U) indicate that inorganic and organic constituents detected in excess of available screening levels in off-site surface water drainage samples do not pose unacceptable exposures to potential receptors.

3.12.3 On-site Area

3.12.3.1 RCRA Canyon

Each of the 11 inorganic constituents reported in RCRA Canyon at dissolved concentrations in excess of screening values were also detected in the North Drainage benchmark locations. The upper C-Drainage benchmark location, however, only reported six of these 11 constituents at dissolved concentrations exceeding screening levels. In general, dissolved inorganic concentrations varied over a relatively small range between the benchmark locations and the RCRA Canyon location. However, three of the 11 inorganic constituents exceeding screening levels, including arsenic, nickel, and selenium were encountered in RCRA Canyon at maximum dissolved concentrations when compared to all other surface water drainage sampling locations.

Nonanal, benzo(b)fluoranthene, bis(2-choroethyl)ether, hexachlorobutadiene, n-nitrosodipropylamine, n-nitrosopyrrolidine, and dioxins were the only organic compounds detected in the RCRA Canyon surface water samples. Bis(2-choroethyl)ether, n-nitrosodipropylamine, and n-nitrosopyrrolidine were detected in excess of screening levels, but each were reported at levels less than or comparable to those reported for benchmark locations. No pesticides, herbicides, or PCBs were detected in surface water drainage samples from RCRA Canyon. Total TEQ concentrations did not exceed available screening levels. No poor purging compounds were detected at concentrations that exceeded available screening levels.

It is important to note that the findings of the human health risk assessment (Section 8 and Appendix T) and the ecological risk assessment (Section 9 and Appendix U) indicate that inorganic and organic constituents detected in excess of available screening levels in on-site surface water drainage samples do not pose unacceptable exposures to potential receptors.

3.13 Surface Water Ponds

Summary tables of the inorganic and organic analytical results collected from the on-site surface water ponds during the fourteenth and fifteenth SA events are presented in Table D-12 and Table D-13.

Inorganic analytical results for samples collected from the surface water ponds indicate arsenic, nickel, and selenium were reported with screening level exceedences in all five ponds during both SA events. Pond 13 was reported with the highest concentrations of these metals; Pond 13 is located south and downgradient of the RCF Pond as shown in Figure D-1. Chromium, manganese, and vanadium were the only other inorganic compounds reported above screening levels. Chromium exceeded the screening level in Pond 13, Pond A-5, and the RCF Pond. Manganese exceeded the screening level in Pond A-5, and vanadium exceeded the screening level in the A-Series Pond and Pond A-5.

The majority of the screening level exceedences during the fourteenth and fifteenth SA events were for SVOCs. N-nitrosodipropylamine and n-nitrosopyrrolidine were reported above screening levels in all ponds, with the exception of Pond 18. EDB, methylene chloride, MTBE, tetrahydrofuran, and TCE were the only VOCs reported above screening levels. In general, the surface water ponds have maintained low to non-detect concentrations of chlorinated VOCs over time, which are presented in Attachment D-4.

The dioxin, OCDD, was reported above the screening level in Pond 13, Pond A-5, and the RCF Pond. No other dioxins, furans, PCBs, pesticides, or herbicides were detected in the surface water pond samples collected during the fourteenth and fifteenth SA event.

Based on general mineral, total dissolved solids (TDS), and pH analytical results, the Pond water is characterized as sodium-chloride type. The general mineral concentrations for all of the surface water ponds have remained stable over time, with the exception of chloride, sodium, sulfate, and TDS. These four general minerals have gradually increased over time until the Fall 2005 sampling event. General mineral concentrations and organic constituent concentrations over time for the surface water ponds are presented in Attachments D-3 and D-4, respectively. The pH values were generally neutral to slightly basic, ranging from 7.39 to 9.02.

4.0 EVALUATION OF ADDITIONAL DATA NEEDS

The surface water data obtained during this RI investigation were evaluated with respect to the surface water Data Quality Objectives (DQOs) identified in the RI/FS Work Plan. RI/FS Work Plan Sections 4.3 through 4.6 identify specific decisions and decision rules for issues related to this Task, including those related to human and ecological risk assessment, contaminant nature, extent, fate and transport, and feasibility study (FS) evaluations. The DQO decisions specific to surface water data are identified and discussed below.

4.1 DQO Decisions Related to Human Health and Ecological Risk Assessments for Surface Water

The specific decisions and decision rules related to human health risk assessment are as follows:

- *What are the chemicals and media of potential concern relative to human exposures and what levels of sensitivity/confidence are required to support human health risk-related decisions?*
- *If the soil, sediment, surface water and groundwater concentrations for chemicals that are naturally occurring are greater in each study area than background concentrations, chemical will be included as COPC in risk assessment.*
- *If the 95% upper confidence limit (UCL) on the mean soil, sediment, soil vapor, surface water and groundwater concentration for COPCs in the study area result in risk estimates within acceptable limits for the relevant exposure pathways, then no further sampling will be proposed for the chemical or media. If cumulative risks for the study area are within acceptable limits, no further action will be recommended.*
- *A 95% confidence against Type I errors (alpha = 0.05) and an 80% confidence against Type II errors (beta = 0.20) will be targeted for UCL calculations. For background comparisons alpha = 0.2 and beta = 0.1 will be targeted per 2002 Superfund guidance.*

The specific decisions and decision rules related to ecological risk assessment are as follows:

- *What are the chemicals and media of concern relative to ecological pathways and receptors and what levels of sensitivity/confidence are required to support ecological risk related decisions?*
- *Where is contamination located and are chemicals being transported?*
- *If the maximum and/or 95% UCL on the mean soil, soil vapor, sediment, and/or surface water concentrations for COCs in each study area are greater than ecological risk screening levels, then additional sampling and analysis may be proposed.*
- *If the maximum and/or 95% UCL on the mean soil, soil vapor, sediment, and surface water concentrations for COCs in the study area are less than ecological risk screening levels, then no further sampling will be proposed.*
- *A 95% confidence against Type I errors (alpha = 0.05) and an 80% confidence against Type II errors (beta = 0.20) will be targeted for UCL calculations for background comparisons: alpha = 0.2 and beta = 0.1 will be targeted.*

Surface water data developed during the RI provide the information necessary to identify COPCs and to perform risk calculations relative to potential human and ecological exposures.

Specifically, surface water samples have been collected and analyzed in accordance with the approved planning documents, and laboratory data are of acceptable quality and are suitable for determination of COPCs and use in risk assessment for surface water. In accordance with the above-listed decision rules, decisions regarding the need for additional surface water data will be made upon determination of 95% UCL mean surface water concentrations for the identified COPCs as part of the human health and ecological risk assessments.

4.2 DQO Decisions Related to Surface Water Contaminant Nature, Extent, Fate and Transport

The specific decisions and decision rules related to surface water contaminant nature, extent, fate and transport are as follows:

- *To assess potential off-site contaminant transport, the investigation will be focused on drainages (and other similar preferential pathways) because contaminants would be expected to concentrate there*.

Surface water samples have been collected in those drainages identified in the RI/FS Work Plan and the Fall 2005 Sampling Memo as having the potential to transport contaminants via surface water flow. Currently available data are sufficient to characterize the nature and extent of chemical impacts to surface drainage waters at and in proximity to the Site, and no further data are necessary. In most cases, constituent concentrations detected in on-site or downgradient locations are less than or comparable to those reported in benchmark locations. Moreover, the findings of the ecological and human health risk assessments indicate that the detected constituents in surface drainage waters do not pose unacceptable exposures to potential receptors.

4.3 DQO Decisions Related to FS Evaluations for Surface Water

The specific decisions and decision rules related to feasibility study are as follows:

- *What is the chemical nature and physical extent of the contaminated area requiring remediation?*
- *The FS does not require any specific limits on chemical quality data evaluation decision errors, but rather relies on the chemical data evaluation decision limits that are appropriate for site characterization and risk assessment.*

The data provide the information necessary to assess potential spatial and temporal variations in constituent concentrations in these areas and adequately define the chemical nature of surface water contaminants and the physical extent of chemical impacts throughout the reach of the particular drainage courses sampled. Available data are sufficient to assess risks to potential human and ecological receptors, and identify any response actions that may be appropriate.

5.0 REFERENCES

Casmalia Steering Committee (CSC), 2005b. Revision 4 – Fall *2005 Phase II Sampling – Soil Vapor, Surface Drainage Water, and Background Soil*. November 18.

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