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Lawrence Livermore National Laboratory
Livermore Site
Annual Storm Water Monitoring Report
for Waste Discharge Requirements 95-174

Annual Report
2008–2009

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Acronyms and Definitions

ALPE	Arroyo Las Positas East (storm water influent sampling location)
ALPO	Arroyo Las Positas Outfall (storm water influent sampling location)
ASS2	Arroyo Seco South (storm water influent sampling location)
ASW	Arroyo Seco West (storm water effluent sampling location)
AWQC	ambient water quality criteria
B	building
BMP	best management practice
Bq/L	becquerel/liter
CA	California
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
DI	deionized water
DOE	Department of Energy
DRB	Drainage Retention Basin, renamed Lake Haussmann
EPD	Environmental Protection Department
ERD	Environmental Restoration Department
FY	fiscal year (October through September)
GRNE	Greenville Road East (storm water influent sampling location)
LCW	low conductivity water
LLNL	Lawrence Livermore National Laboratory
LLNS	Lawrence Livermore National Security, LLC
LOEC	lowest observed effects concentration
MCL	maximum contaminant level
mg/L	milligrams per liter
MSDS	Material Safety Data Sheet
MUSD	Maintenance and Utilities Services Department
na	not analyzed
NIF	National Ignition Facility
NOEC	no observed effects concentration
NPDES	National Pollutant Discharge Elimination System
O & G	oil and grease
PAD	Principal Associate Directors
pCi	picocurie
PMCL	primary maximum contaminant level
QA/QC	quality assurance/quality control
RHWM	Radiological Hazardous Waste Management
RQ	reportable quantity
SC	specific conductance
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
SI	système internationale
SM	standard method
SWAR	Storm Water Annual Report
SWPPP	Storm Water Pollution Prevention Plan
T	trailer
TDS	total dissolved solids
TF	treatment facility
TOC	total organic carbon
TSS	total suspended solids
U.S. EPA	United States Environmental Protection Agency
WDR	Waste Discharge Requirements
WPDC	West Perimeter Drainage Channel (storm water effluent sampling location)

**Lawrence Livermore National Laboratory
Livermore Site Annual Storm Water
Monitoring Report
for WDR 95-174**

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EXECUTIVE SUMMARY

Results of the storm water quality monitoring program at Lawrence Livermore National Laboratory (LLNL) in Livermore, California are reported as required in the Waste Discharge Requirements (WDR) 95-174, National Pollutant Discharge Elimination System (NPDES) Permit No. CA0030023. This report presents results for the 2008-2009 water year including: the Storm Water Pollution Prevention Plan (SWPPP) facility inspection results, wet and dry season observations, storm water discharge analytical data, and a summary interpretation of the data.

The facility inspection results indicated a few minor instances at the Livermore site in which best management practices (BMPs) listed in the SWPPP were not properly implemented, but corrective actions have either been made or are in progress. Other than minor debris accumulation (primarily leaves and sticks) at some sampling locations, storm water observations did not identify any pollutants. Although there are no numeric effluent limits placed on storm water discharges, data are compared with various criteria to determine if water quality remains similar to natural or upstream conditions, or that concentrations are below levels of concern. Acute and chronic fish toxicity testing indicated no toxicity in effluent storm water samples. Three constituents of influent storm water samples, nitrate, lead and gross alpha, were above LLNL site-specific threshold comparison criteria; however, all of the data exceeding LLNL thresholds during 2008-2009 are attributed to off-site activities upstream of the Laboratory. All effluent monitoring results for chemical and radioactive parameters were less than comparison criteria. These results suggest that LLNL's current BMPs are effective and that operations at the LLNL Livermore site during 2008-2009 did not impact storm water quality.

1.0 Introduction

This report discusses the results of the 2008-2009 Livermore site storm water monitoring program. Storm water monitoring quality results for the LLNL Livermore site are summarized, fulfilling the annual reporting requirements of WDR 95-174, issued by the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) on August 23, 1995, (hereafter referred to as "the Permit"). The Permit expired on August 23, 2000. LLNL submitted a Report of Waste Discharge (and an NPDES permit application) to renew the Permit on February 18, 2000, meeting the requirement to submit a renewal application 180 days in advance of permit expiration. SFBRWQCB staff confirmed the administrative continuance in November 2000 (Morse 2000).

The Livermore site is a 3.28-km² facility that is crossed by two intermittent streams, Arroyo Las Positas and Arroyo Seco. The average annual rainfall at the Livermore site is 34.6 cm; whereas the rainfall for the 2008-2009 reporting period was 26.02 cm. Monthly rainfall totals are presented in **Table 1**. LLNL monitors influent and effluent water quality as required by the Permit. The six perimeter storm water sampling locations are shown in **Figure 1**, along with three internal (on-site) monitoring locations around the drainage retention basin, renamed Lake Haussmann.

Table 1. Monthly rainfall totals (in cm) collected at the LLNL site meteorological station.

Date	Monthly Total (cm)
May 2008	0.00
June 2008	0.00
July 2008	0.00
August 2008	0.00
September 2008	0.03
October 2008	0.81
November 2008	3.91
December 2008	4.37
January 2009	3.84
February 2009	6.93
March 2009	5.11
April 2009	1.02
Water Year TOTAL	26.02

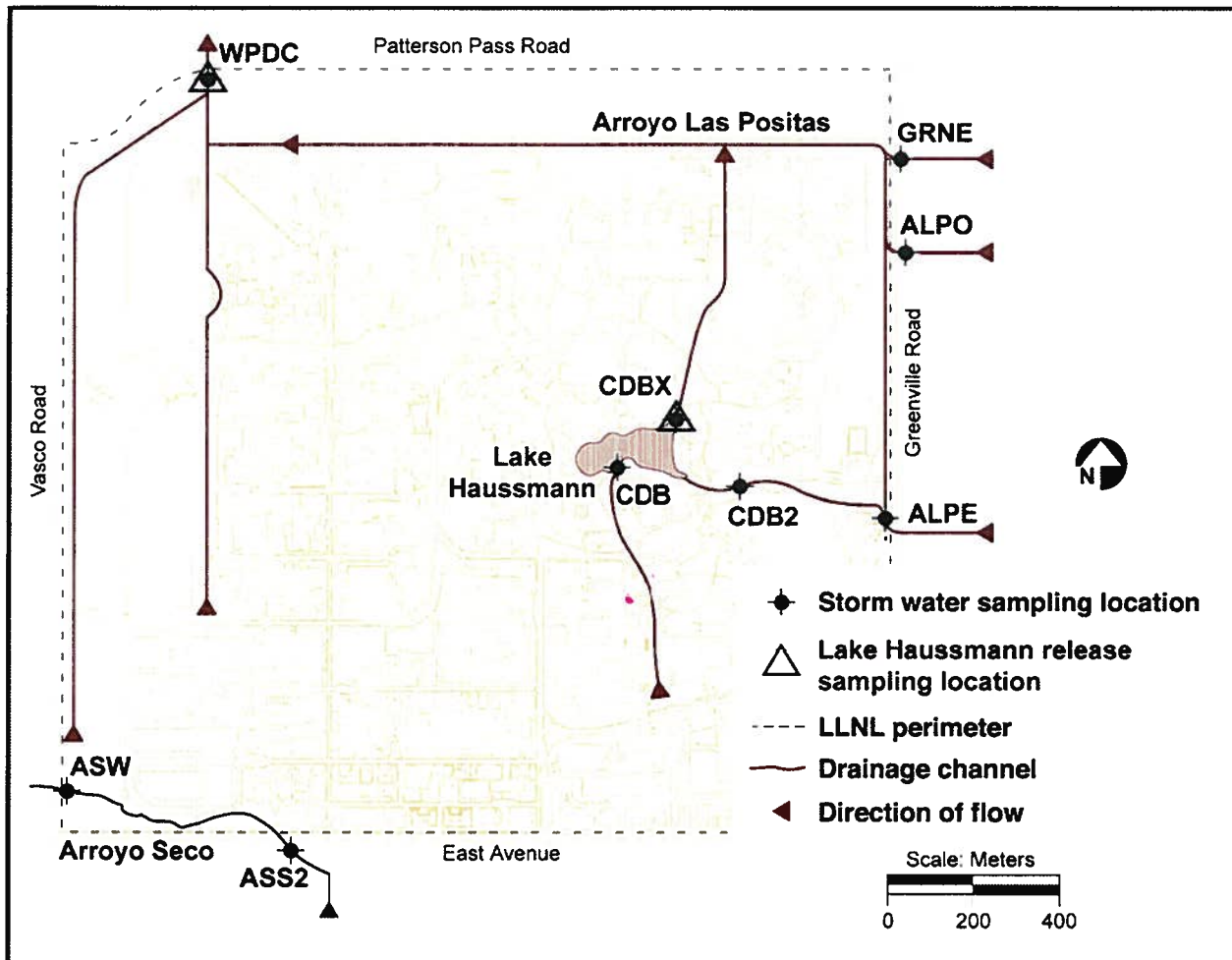


Figure 1. Routine storm water sampling and observation locations.

2.0 Nonstorm Water Discharges

The SFBRWQCB issued the Permit to LLNL, allowing storm water discharges associated with industrial activities and four categories of nonstorm water discharges, including mechanical equipment sources (e.g., air conditioners), building and grounds maintenance (e.g., landscape irrigation), fire suppression and safety systems (e.g., hydrant testing), and water systems (e.g., backflow preventors). In addition, the Permit allows LLNL to administratively control several building conduits that remain open because they are impractical to seal.

LLNL tracks authorized nonstorm water discharge sources through the Building Drain Management database and key plans, and an internal drain connection permitting process. As required by the Permit, Provision C.8, LLNL evaluates all new construction, remodeling, and equipment upgrades to determine if it is practical to eliminate permitted discharge sources. If it is practical to do so, the discharge is eliminated. Modifications that result in new connections to building conduits are added to the Building Drain Management database.

Authorized nonstorm water discharge sources and open building conduits are included in LLNL's Dry Season Observation Program. These observations help LLNL verify that the BMPs applied to these discharge sources continue to be properly

implemented. Areas in the Dry Season Observation Program include secondary containment areas, loading and receiving areas, floor drains open to the storm drainage system, and automatic sump pumps. These locations and observation results are discussed in detail in this report in **Section 4.0, Visual Observations**. Nonroutine releases are summarized in **Appendix A, Table A-1**. This table includes unplanned releases reportable under the Permit, Provision C.1, and nonroutine releases allowed under the Permit but requiring prior notification under Provision C.7.

3.0 Annual Site Inspections

Each of the Principal Directorates (LLNL's high level organizational unit) at LLNL conducts an annual inspection of its facilities to verify implementation of the SWPPP and ensure that measures to reduce pollutant loading to storm water runoff are adequately and properly implemented. The Principal Associate Directors (PAD) for each of the Principal Directorates certify that their facilities comply with the provisions of the Permit and the SWPPP. Each Principal Directorate documents and keeps on file the annual inspection results (as required by the Permit). These records include the dates, places, and times of the site inspections and the names of individuals performing the inspections. Because of the large number of facilities inspected (more than 500 buildings and trailers), the detailed inspection results are not included in this report, but the individual inspection records are available for submittal or review upon request. All inspections were completed; findings and deficiencies are summarized in **Appendix A, Table A-2**.

A few of the PAD annual SWPP inspections noted inconsistent or incomplete implementation of BMPs. All of these issues have either been corrected or are in process of being corrected as described in **Table A-2**. All other inspections indicated that the applicable BMPs were implemented correctly and adequately.

4.0 Visual Observations

Dry season observations were performed and are provided in **Appendix A, Table A-3**. The Permit requires that observations be conducted at least twice during the dry season (May through September). These observations occurred on June 30, and September 23, 2008, at storm water effluent sampling locations (**Figure 1**, ASW and WPDC), at storm water influent sampling locations (**Figure 1**, ASS2, ALPE, ALPO, and GRNE), at areas with a "high potential" of storm water pollution, and at nonstorm water discharge locations, to determine the presence of stains, sludges, odors, and other anomalous conditions. "High potential" areas include areas with automatic (e.g., sump pumps) or direct connections to the surface and areas where activities may result in accidental releases to the surface (e.g., loading/receiving areas and open rinse areas).

To determine the "high potential" areas, LLNL compiled and categorized potential storm water pollution areas, using information from the following sources:

- LLNL *Livermore Site Annual Storm Water Monitoring Report* (Brandstetter 1994).
- LLNL's Building Drain Management Database.
- LLNL's *Report of Waste Discharges*, March 1995 (Mathews and Welsh 1995).
- LLNL's Observation Records.

LLNL then conducted inspections, visual observations, and assessments of these potential areas for storm water pollution. Areas determined as "high potential" are included in the dry season observation program as follows:

- Arroyo Seco and Arroyo Las Positas (observations conducted at influent and effluent locations).
- Avenue K storm drain.
- Automatic sump pump area at Building 191.
- Loading/receiving areas in Buildings 194 and 341.
- Concrete wash area near Parking Lot F-2.
- Floor drain areas open to the environment in Buildings 111, 194, 391, and 551.

During this reporting period, the dry season observations did not identify any unusual discharges. Observed evidence of flow at some locations was from discharges of treated groundwater allowed under the *Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Record of Decision* (US Department of Energy 1992). All indications of nonstorm water flows were attributable to permitted discharges or natural sources.

Wet season observations are summarized in **Appendix A, Table A-4**. The Permit requires that wet season observations be conducted monthly during the wet season (October 2008 through April 2009) when significant storm events occur (a significant storm is defined as runoff lasting more than one hour). These observations are conducted at storm water influent and effluent sampling locations. Observations often indicated turbidity at both influent and effluent locations, but no unusual conditions or anomalies were observed. Storm event observations occurred in December 2008 and January, February, March, and April 2009; although significant runoff was only associated with the January, February, and March observations. Wet season observations were also conducted during the months of October and November 2008. However, due to storm events not occurring or occurring during non-work hours, the October and November observations did not coincide with a storm event.

5.0 Storm Water Sampling and Analysis

The Permit requires collection of two samples each wet season at effluent locations ASW and WPDC, and at influent locations ALPE, ALPO, ASS2, and GRNE. Permit-driven storm water samples were collected on January 22, 2009 and February 17, 2009. Samples were collected as soon as possible after runoff began (most within the first hour). Water quality data from these storm water samples for the 2008-2009 reporting period are presented in **Appendix A, Tables A-5 and A-6**. Quality assurance and quality control (QA/QC) checks are performed on all sampling and analysis from LLNL. All data analysis included standard QA/QC practices. LLNL reports on QA annually in the Site Annual Environmental Report (e.g., Mathews et al. 2008); this information is available upon request.

The Permit currently does not contain numeric limits for storm water effluent. Therefore, site-specific comparison criteria were developed from historical data to identify out-of-the ordinary data values (**Table 2**). These criteria are used to identify data values that require further investigation and explanation. In addition to the Livermore site-specific comparison criteria, storm water results are compared to other published values, including: United States Environmental Protection Agency (U.S. EPA) benchmarks; *The Water Quality Control Plan, San Francisco Bay Basin (Region 2)* (Basin Plan) (SFBRWQCB 1995); US EPA and State MCLs and Ambient Water Quality Criteria (AWQC). Although these latter criteria were established for other regulatory programs, use of a broad range of criteria can help LLNL evaluate the quality of

Livermore site storm water effluent and determine the adequacy of BMPs. If a measured concentration is found to be higher than the comparison criteria, but the value is the same or higher at the influent location, the source is assumed to be unrelated to Livermore site operations; therefore, further analysis is not warranted.

Table 2. Livermore site-specific threshold comparison criteria for selected water quality parameters for storm water runoff.

Parameter	Comparison criteria
Total suspended solids (TSS)	750 mg/L ^a
Chemical oxygen demand (COD)	200 mg/L ^a
pH	<6.0, >8.5 ^a
Nitrate (as NO ₃)	10 mg/L ^a
Ortho-phosphate	2.5 mg/L ^a
Beryllium	1.6 µg/L ^a
Chromium(VI)	15 µg/L ^a
Copper	36 µg/L ^a
Lead	15 µg/L ^b
Mercury	Above RL ^c
Zinc	350 µg/L ^a
Diuron	14 µg/L ^a
Oil and grease	9 mg/L ^a
Tritium	36 Bq/L ^a
Gross alpha	0.34 Bq/L ^a
Gross beta	0.48 Bq/L ^a

Note: The sources of values above these are examined to determine if any action is necessary.

- a Site-specific value calculated from historical data and studies. These values are lower than the MCLs and EPA benchmarks except for zinc, TSS, and COD.
- b California and EPA drinking water action level
- c RL = reporting limit = 0.0002 mg/L for mercury

5.1 Toxicity monitoring

As required by the Permit, grab samples were collected from the site storm water effluent location, WPDC, and analyzed for acute and chronic toxicity using fathead minnows (*Pimephales promelas*) as the test species. In the acute test, 96-hour survival is observed in undiluted storm water collected from location WPDC. The Permit states that an acceptable survival rate is 20 percent lower than a control sample. If the acute toxicity test is failed, the Permit requires LLNL to conduct toxicity testing during the next significant storm event. After failing two consecutive tests, LLNL must perform a toxicity reduction evaluation to identify the source of the toxicity.

The 96-hr acute toxicity test results (95 percent survival, compared to 100 percent survival in the lab control sample), from the January 22, 2009 sample collected at WPDC, showed that this water was not acutely toxic to fathead minnow survival (Table 3a). In the 7-day chronic fish toxicity test, storm water dilutions at 0 (Lab Control), 12.5, 25, 50, 75, and 100 percent (undiluted storm water at WPDC, collected on January 22, 2009) were used to determine a dose-response relationship, if any, for both

survival and growth of the fathead minnow (**Table 3b**). These tests are required only at effluent location WPDC and are not conducted with water from corresponding influent locations. The testing laboratory provides water for the control sample, which consists of EPA synthetic moderately-hard water. From these data, no observed effect concentrations (NOECs) and lowest observed effect concentrations (LOECs) were calculated. The NOECs and LOECs for survival and growth were both 100 percent. The results demonstrate that there was no observed toxicity in LLNL storm water effluent.

Table 3a. Single point acute fish toxicity test results for January 22, 2009, at WPDC.

Location	Influent or Effluent	% Survival				
		Replicate A	Replicate B	Replicate C	Replicate D	Mean
Lab Control	EPA synthetic "moderately hard" water	100	100	100	100	100
WPDC	Site Effluent	100	90	100	90	95

Table 3b. Chronic fish toxicity test results for January 22, 2009, at WPDC.

Sample	7-day survival	7-day weight ^a
Concentration (%)	Avg. (%)	Avg. (mg)
Lab Control	100	0.69
12.5	77.5	0.51
25	90	0.60
50	87.5	0.65
75	75	0.53
100	97.5	0.68

^a Weight of the fathead minnows at the end of the 7-day toxicity test.

5.2 Nonradioactive parameters

Table 4 lists the constituents that exceeded the threshold comparison criteria in **Table 2** during storms sampled in 2008-2009 (full results are in **Appendix A, Tables A-5 and A-6**). Note that only influent samples showed constituent concentrations above the threshold comparison criteria. Upstream activities near the Livermore site on the Arroyo Seco and Arroyo Las Positas include another scientific research institution, grape vineyards, an electrical transfer station, and cattle ranching; these activities are potential sources for the constituents shown in **Table 4**.

Table 4. Constituents in storm water greater than the LLNL-specific threshold comparison criteria.

Constituent	Date (2009)	Location	Influent or Effluent	Result	LLNL threshold criteria
Nitrate (as NO ₃)	1/22	GRNE	Influent	17 mg/L	10 mg/L
Nitrate (as NO ₃)	1/22	ALPO	Influent	12 mg/L	10 mg/L
Gross Alpha	1/22	ALPE	Influent	0.74 ± 0.27 Bq/L	0.34 Bq/L
Lead	2/17	ALPE	Influent	18 µg/L	15 µg/L

Nitrate concentrations, above the comparison criteria of 10 mg/L, were found in samples collected from GRNE and ALPO on January 22, 2009 (Table 4). These locations have shown similar elevated nitrate concentrations in recent years (for example, GRNE @ 35 mg/L and ALPO @ 14 mg/L, in the December 18, 2007 sample from the previous storm year); however both GRNE and ALPO are influent locations and therefore these elevated nitrate values are not related to LLNL activities. ALPE, another influent location upstream of LLNL activities, also showed one non-radioactive constituent (Table 4; lead @ 18 µg/L in the February 17, 2009 sample) above the LLNL-specific threshold criteria.

As in past years, bromacil and glyphosate (both widely used herbicides) were detected in storm water samples. Concentrations of bromacil at influent locations ranged from <0.5 µg/L to 45 µg/L, while the maximum concentration reported in an effluent sample was 3.7 µg/L. Similarly, concentrations of glyphosate at influent locations ranged from <5 µg/L to 37 µg/L; the maximum concentration reported in an effluent sample (17 µg/L) was detected just downstream of the influent maximum (See Appendix A, Tables A-5 and A-6).

Last year one unusual compound, pentachlorophenol (PCP), was identified at low levels (2.2 µg/L to 3.2 µg/L) in several samples collected during the January 4, 2008 storm. This year PCP was again detected, but at even lower levels (1.1 µg/L to 1.4 µg/L, just above the 1.0 µg/L reporting limit) in samples collected on February 17, 2009 at two influent (ASS2 and ALPE) locations and one effluent (ASW) location. Since 1987, most of the pentachlorophenol used in the U.S. has been restricted to the treatment (as a wood preservative) of utility poles and railroad ties. Although not used on-site, LLNL will continue to monitor for this compound in future storm water samples.

5.3 Radioactive parameters

Environmental measurements are reported in *Système Internationale* (SI) units. The SI unit for radioactivity is the becquerel (Bq), equal to 1 nuclear disintegration per second. The more commonly used unit, picocurie (pCi), is equal to 1 nuclear disintegration per 27 seconds. Results for tritium, gross alpha, and gross beta activities from storm water samples collected during 2008-2009 are included in Appendix A, Tables A-5 and A-6. One measurement of radioactivity (gross alpha @ 0.74 ± 0.27 Bq/L) was above the LLNL specific comparison criteria of 0.34 Bq/L on January 22, 2009 at ALPE (Table 4). Given that ALPE is an influent location, upstream of LLNL

activities, this result appears to be unrelated to LLNL operations. All other results for tritium, gross alpha, and gross beta activities were less than their respective comparison criteria (**Table 2**).

LLNL began analyzing storm water for plutonium in runoff in 1998. Samples were analyzed from the Arroyo Seco and Arroyo Las Positas effluent locations (ASW and WPDC). The plutonium activities measured in samples from ASW and WPDC on January 22, 2009 and February 17, 2009 were below detection limit (0.0037 Bq/L, or 0.100 pCi/L). (See **Appendix A, Tables A-5 and A-6**)

6.0 Summary and Conclusions

The storm water monitoring program at LLNL goes beyond the requirements of the Permit by sampling at more locations and for more parameters than the Permit requires. This additional monitoring is called for under the environmental monitoring requirements of various DOE Orders. Furthermore, LLNL investigates water quality parameters that are found to be above historic levels as demonstrated by the site-specific comparison criteria in **Table 2**.

Storm water observations were performed monthly during the wet season and quarterly during the dry season, with no major deficiencies noted. Inspections of best management practices (BMPs) listed in the SWPPP revealed some areas for improvement, for which corrective actions have either been made or are in progress.

Three constituents (nitrate, lead and gross alpha) were above the LLNL site-specific threshold comparison criteria (**Table 4**). All of these elevated results were at influent locations and are unrelated to activities on the Livermore Site. The acute and the chronic fish toxicity tests showed no toxicity in LLNL storm water effluent. These results suggest that LLNL's current BMPs are effective and that operations at the LLNL Livermore site during 2008-2009 did not impact storm water quality.

7.0 References

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APPENDIX A TABLES

Tables A-1 through A-6

Table A-1. Summary of non-routine releases May 1, 2008–April 30, 2009.

Date of Incident	Location	Description
7/8/08	Building 612 yard	A 55-gallon drum of stabilized waste was leaking from pinhole openings in the bottom of the drum. The waste was Low Level Waste sludge that was previously analyzed, direct survey with an E-120 showed no radioactivity. The analysis for metals showed all metals results were below regulated values. The drum was over packed after determining no additional liquids were seeping from the penetrations. The area was cleaned using absorbent and the area was deconned using water to remove the fine clay absorbent residue.
7/31/08	Building 391	A rented man lift leaked hydraulic oil, which was weeping and dripping from around a connection near a control panel high on the equipment. A plastic bag and wipes were used to catch hydraulic oil as the lift was moved out of the project area and staged for pick up by the rental company. All puddled hydraulic oil was wiped up or cleaned up with absorbent, approximately 1 gallon of oil was released. The majority was captured before it hit the ground or absorbed into the asphalt. No oil reached uncovered dirt or a storm drain.
8/7/08	Building 255	Approximately 16 ounces of oil spilled from two government vehicles in an approximately two-foot by one-foot area north of B-255. The spill was cleaned up using absorbent materials, all of the spilled oil was recovered. The absorbent material used was collected for disposal and managed appropriately as non-hazardous waste, since the absorbent material was not fully saturated with fluid.
8/12/08	Building 612	A leaking 55-gallon drum containing nonhazardous spent ion-exchange resin was found in the 612-5 container storage unit located in the Area 612 Facility. The leaking drum was located on the top level of double-stacked drums; the pinhole leak was detected by the presence of free liquid on the lids of the drums on the lower level. The liquid was tested for pH and it was found to be 3. RHWB technicians over packed the leaking drum into an 85-gallon drum. The black top area and pallets were decontaminated using water and absorbent.
8/25/08	Building 331, Room 1117 equipment room.	About 5 gallons of York "S" Oil leaked from a chiller pump onto the concrete floor, near a condensate drain. About 95% of the oil went into the drain, which was confirmed to be part of the sanitary sewer system. Absorbent was applied to the oil remaining on the floor and swept up. The system is not radioactively contaminated and there would be no metal fines of concern. Water Resources staff noted that this was not a reportable incident but a courtesy notification was made to the City of Livermore Water Resources Division.
9/18/08	Building 253	A worker in B-253 splashed sulfuric acid on his face and immediately used the in-room safety shower. Approximately 400 gallons of water discharged from the shower onto the vinyl floor. A small amount, approximately 40 gallons or less, flowed out of the room's south door onto the asphalt. Less than five gallons flowed from the asphalt into two nearby storm drains on the south side of the building. Measurements showed that the water had a neutral pH of 7. A RHWB Technician used a wet/dry vacuum to collect the shower water, which was transferred into a 55-gallon drum. The drum was labeled non-hazardous liquid and will be discharged to the sanitary sewer. A second drum was half filled with solid lab trash that was generated as part of the response; this drum was labeled hazardous and placed in a nearby Waste Accumulation Area (WAA).
9/23/08	Building 133	Water shop personnel were replacing a divider plate on the cooling tower to clean individual cells. Unknown to them the bolts were not welded on the outside and when they removed the plate, the water in the basin started leaking through the bolt holes. They immediately started installing the new plate and contacted the maintenance coordinator, who in turn contacted the environmental analyst. About 100 gallons of tower water was released to the ground, it did not travel very far and did not leave the site.
9/25/08	Building 482	A hydraulic line from a MUSD truck crane sprung a leak, spilling one quart of hydraulic fluid to asphalt and grass. The spill was cleaned up immediately with drysorb and absorbent towels. The resultant waste was characterized as nonhazardous and will be disposed of in the municipal trash. No hydraulic fluid reached running water or a storm drain.

Table A-1. Summary of non-routine releases May 1, 2008–April 30, 2009.

Date of Incident	Location	Description
9/27/08	Avenue H south of Outer Loop Road	There was a fire in a Labor Shop trash truck containing 2 cubic yards of construction scraps. The truck was dumped onto the asphalt shoulder of Avenue H just south of South Outer Loop Road. The Fire Department responded and put out the fire with approximately 300 gallons of water. Most of the water, approximately 250 gallons, ran into the storm drain at the southwest corner of Avenue H and Outer Loop Road. That culvert discharges into the drainage channel that runs along the North and East sides of T-5475, and proceeds into the dammed recharge area South of the East Traffic Circle. The channel then continues into the Drainage Retention Basin. There are approximately 2000 feet of dry channel and a dam between the discharged water and the Drainage Retention Basin. The discharged water did not go offsite.
10/13/08	Building 581	Approximately three quarts of hydraulic oil were released from equipment on the Clean, Dry Air (CDA) pad, located south of B-581. Absorbent pads were used to clean up the oil. No oil left the pad or entered any storm drain or soil. The oily pads were managed through the Plant Engineering oily rag waste stream.
11/24/08	Building 581	Approximately 1,000 gallons of potable water was released from an irrigation line break to the storm drain near B-581. The storm drain line receives treated ground water discharged from Lake Haussmann. Because water was already flowing in the storm drain line, the 1,000 gallons mixed with the ground water discharge and was carried off site. The spill reporting matrix identifies releases leaving the LLNL site, but not exceeding a reportable quantity, as low impact releases that must be immediately reported to the Regional Board and followed up by a written confirmation. A Record of Communication was sent to SFBRWQCB 11/25/08.
12/18/08	Building 391	About 200 gallons of sewage spilled southeast of B-391, due to a plug in the line outside the building. No solid waste was on the ground, only liquid sewage with some paper waste. The area was cordoned off to prevent public exposure, and dilute bleach was applied to the affected area as deemed necessary by the Industrial Hygienist. Standing sewage was containerized (if possible) and appropriately disposed.
12/19/08	Building 335	A hydraulic line broke on a bobcat performing soil excavation east of B-335, releasing approximately two gallons of hydraulic fluid to the soil and asphalt in the area. RHWM contained the hydraulic fluid with absorbent and picked up the fluid, soil and absorbent (to be disposed in the municipal trash). The equipment was recovered by a trailer and repaired.
12/31/08	Building 235	About eight ounces of mineral oil was spilled on the road on the north side of B-235. The oil was immediately cleaned up.
1/6/09	Building 321A	During a visual inspection of a malfunctioning house vacuum system, material/debris from within the system was observed to have discharged to the ground outside the unit. Approximately two pounds of material was released to the asphalt and concrete area immediately surrounding the house vacuum system CD-1. CD-1 contents had been analyzed in November of 2006 and determined to be hazardous for copper and cadmium, and since that time the contents have been managed as hazardous waste. The Industrial Hygienist was consulted regarding cleanup requirements and determined that facility personnel could perform the cleanup using a portable HEPA vacuum. Facility personnel immediately began cleanup, material in the portable HEPA vacuum was managed as hazardous waste along with the remaining contents of the house vacuum system. No RQs were exceeded and cleanup was immediate; therefore, no reporting was required to an outside agency or DOE.

Table A-1. Summary of non-routine releases May 1, 2008–April 30, 2009.

Date of Incident	Location	Description
1/7/09	East Gate	The driver of a small personally owned truck noticed his vehicle was leaking transmission fluid as he drove out of the East Gate. He made a U-turn at the traffic light on Greenville and drove back inside the gate, stopping just past the guard shack. The trail of transmission fluid extended from the F-9 Parking Lot to the East Gate, out East Gate Drive to Greenville and back to the intersection of East Gate Drive and Outer Loop Road. The Fire Department responded to the spill, spread absorbent, and began sweeping. RHWm responded within minutes and finished the cleanup. The amount of oil spilled was less than three gallons and the fluid was cleaned up immediately.
2/10/09	Building 482	A damaged 6" potable water line released approximately 2,400 gallons of water that flowed across the lawn and into a nearby storm drain. The potable water mixed with treated ground water discharges and therefore would have entered Arroyo Las Positas and exited the site at the northwestern corner. The volume of water released into Arroyo Las Positas is insignificant compared to the routine discharges from the ground water treatment units.
2/11/09	U187	Approximately 0.5 gallons of mineral oil leaked onto the ground from abandoned capacitors north of U187 (TFC groundwater treatment facility). It was cleaned up by RHWm staff using absorbent and the removal of some contaminated soil, and disposed of as hazardous waste.
2/12/09	Building 611	A heavy equipment truck spilled approximately 5 gallons of a diesel oil & water mixture onto Avenue H (Heavy Equipment Shop area), South Outer Loop Road, and Avenue J (near Motor Pool, B-611). RHWm staff used absorbent pads, pigs, and absorbent to clean up the spill. Additionally, approximately 2.5 gallons of diesel oil & water mixture in the truck's catch pan was removed and disposed of as hazardous waste.
2/12/09	Building 438	Approximately 0.5 gallons of hydraulic oil leaked from a forklift on the north side of B-438. The oil and contaminated soil were cleaned up by RHWm staff and disposed of as hazardous waste.
2/12/09	Building 581	Approximately 150 gallons of DI water were released to ground (gravel area just off the concrete pad) from a tank overflow on the north end of the building between B-581 and B-681 (Outside the OAB corridor).
3/9/09	Building 365	A mechanical equipment room leaked approximately 100 gallons of city water from a defective pump. The water flowed down the stairs to outside landscaping and also leaked through the ceiling to room 112 below. Room 112 did not contain any hazardous, radioactive, or biohazardous materials.

Table A-2. Summary of best management practice inspections in potential pollutant source/industrial activity areas.

Principal Directorate Responsible for Potential Pollutant Source/Industrial Activity	Deficiencies in BMPs or BMP Implementation and Additional/Revised BMPs or Corrective Actions.
1-Director's Office/Security Organization	No direct responsibility for facilities at the Livermore Site. (Facilities managed by Operations & Business)
2-Science & Technology	<u>B041, B115, B117, B451, B453, T3724, T4576:</u> Storm drains blocked in multiple locations and debris will be cleared. <u>T3724, T4525:</u> Roof downspouts detached from building or blocked with debris. Repair/maintenance has been requested. <u>B453/West Side:</u> Two storm drains located near a small construction project will be protected prior to excavation activities in the area.
3-Global Security	No direct responsibility for facilities at the Livermore Site. (Facilities managed by Operations & Business)
4-Weapons and Complex Integration	<u>B191:</u> Scheduled for repairs. No deficiencies were found.
5-National Ignition Facility and Photon Science	<u>B298/B392 Corpyards:</u> Improve general housekeeping. Replace tarp covering capacitors or remove capacitors - Funds have been set aside to remove capacitors; following this inspection, the capacitors were removed from the corpyard. Refrain from storing materials in/near drainage channels - Remove two 55-gallon drums (1 each at East and NW gate). Drums were removed subsequent to this inspection.
6-Operations and Business	<u>B231, B253, B254, B436:</u> Improve management of vacuum pump/exhaust vent oil spills and leaks; including protecting/relocating pumps, and clean up of oil stains. <u>B125:</u> Downspouts from the awning are being modified to direct rainwater discharges away from the grease trap area. <u>B436:</u> Metal grindings from outdoor fabrication are being swept up and managed appropriately.

Table A-3 Record of Dry Season Observations				Discharge Observations		
Location	Inspector	Date	Time	Floating Material, Debris, Odor, Discolorations, or Oil and Grease?	Observations	Description
ALPE	Karl Brunckhorst	30-Jun-08	3:12 PM	Leaves, sticks, paper, plastic		
ALPO	Karl Brunckhorst	30-Jun-08	3:17 PM	Leaves, sticks, paper, plastic		
ASS2	Karl Brunckhorst	30-Jun-08	3:27 PM	Leaves, sticks		
ASW	Karl Brunckhorst	30-Jun-08	3:38 PM	Leaves, sticks, paper, plastic		ERD'S Treatment Facility "A" is discharging, no corrective action taken.
AVE. K	Karl Brunckhorst	30-Jun-08	4:29 PM	Leaves, sticks, paper, plastic		
B111	Karl Brunckhorst	30-Jun-08	3:32 PM	Leaves, sticks		
B191/HEAF	Karl Brunckhorst	30-Jun-08	3:54 PM			
B194	Karl Brunckhorst	30-Jun-08	3:50 AM		Clean	
B341	Karl Brunckhorst	30-Jun-08	4:10 PM	Leaves, sticks, paper		Clean
B391	Karl Brunckhorst	30-Jun-08	3:58 PM	Leaves, sticks, paper		
B551W	Karl Brunckhorst	30-Jun-08	4:14 PM	Leaves, sticks		
GRNE	Karl Brunckhorst	30-Jun-08	3:21 PM	Leaves, sticks, paper, plastic, styrofoam		

Table A-3 Record of Dry Season Observations				Discharge Observations		
Location	Inspector	Date	Time	Floating Material, Debris, Odor, Discolorations, or Oil and Grease?	Observations	Description
LABOR ONLY Lot F-2	Karl Brunckhorst	30-Jun-08	4:20 PM		Clean	Rinsing activities inside containment area where non-hazardous materials are being removed, no corrective action taken.
WPDC	Karl Brunckhorst	30-Jun-08	3:43 PM	Leaves, sticks		Lake Haussmann & ERD Treatment Facility B discharging, no corrective action taken.
ALPE	Karl Brunckhorst	23-Sep-08	9:55 AM	Leaves, sticks, paper, plastic		
ALPO	Karl Brunckhorst	23-Sep-08	10:03 AM	Leaves, sticks, paper, plastic		
ASS2	Karl Brunckhorst	23-Sep-08	10:13 AM	Leaves, sticks		
ASW	Karl Brunckhorst	23-Sep-08	10:28 AM	Leaves, sticks, paper, cans, plastic		Evidence of prior discharge from ERD's Treatment Facility "A", no corrective action taken.
AVE. K	Karl Brunckhorst	23-Sep-08	10:52 AM	Leaves, sticks, paper, plastic		
B111	Karl Brunckhorst	23-Sep-08	10:24 AM	Leaves, sticks		
B191/HEAF	Karl Brunckhorst	23-Sep-08	11:10 AM		Clean	
B194	Karl Brunckhorst	23-Sep-08	10:40 AM		Clean	
B341	Karl Brunckhorst	23-Sep-08	10:46 AM	Leaves, sticks		

Table A-3 Record of Dry Season Observations				Discharge Observations		
Location	Inspector	Date	Time	Floating Material, Debris, Odor, Discolorations, or Oil and Grease?	Observations	Description
B391	Karl Brunckhorst	23-Sep-08	10:43 AM	Leaves, sticks, plastic		
B551W	Karl Brunckhorst	23-Sep-08	10:48 AM	Leaves, sticks		
GRNE	Karl Brunckhorst	23-Sep-08	10:05 AM	Leaves, sticks, paper		
LABOR ONLY Lot F-2	Karl Brunckhorst	23-Sep-08	9:50 AM	Sediment, gravel		Evidence of wash water inside containment area, no corrective action taken.
WPDC	Karl Brunckhorst	23-Sep-08	10:33 AM	Leaves, sticks		Lake Hausmann discharging, no corrective action taken.

Table A-4 Record of Wet Season Observations				Discharge Observations			
Location	Inspector	Date	Time	Floating Material, Debris, Odor, Discolorations, or Oil and Grease?	Turbidity	Runoff	Comments
ALPE	Karl Brunckhorst	31-Oct-08	10:49 AM	Leaves, sticks, paper, plastic	No	No Runoff	
ALPO	Karl Brunckhorst	31-Oct-08	10:47 AM	Leaves, sticks, paper, plastic	No	No Runoff	
ASS2	Karl Brunckhorst	31-Oct-08	10:34 AM	Leaves, sticks	No	No Runoff	
ASW	Karl Brunckhorst	31-Oct-08	10:38 AM	Leaves, sticks, plastic, paper, cans	No	No Runoff	
GRNE	Karl Brunckhorst	31-Oct-08	10:44 AM	Leaves, sticks, plastic	No	No Runoff	
WPDC	Karl Brunckhorst	31-Oct-08	10:42 AM	Leaves, sticks	No	No Runoff	
ALPE	Karl Brunckhorst	25-Nov-08	10:24 AM	Leaves, sticks, paper, plastic	Low	No Runoff	ERD's Treatment Facility B discharging
ALPO	Karl Brunckhorst	25-Nov-08	10:21 AM	Leaves, sticks, paper, plastic	No	No Runoff	
ASS2	Karl Brunckhorst	25-Nov-08	10:05 AM	Leaves, sticks	No	No Runoff	
ASW	Karl Brunckhorst	25-Nov-08	10:09 AM	Leaves, sticks, paper	No	No Runoff	
GRNE	Karl Brunckhorst	25-Nov-08	10:18 AM	Leaves, sticks, paper, plastic	No	No Runoff	
WPDC	Karl Brunckhorst	25-Nov-08	10:14 AM	Leaves, sticks, plastic	No	No Runoff	Styrofoam Lake Haussmann & ERD's Treatment Facility B discharging

Table A-4 Record of Wet Season Observations				Discharge Observations			
Location	Inspector	Date	Time	Floating Material, Debris, Odor, Discolorations, or Oil and Grease?	Turbidity	Runoff	Comments
ALPE	Karl Brunckhorst	15-Dec-08	9:35 AM	Leaves, sticks, paper	Low	Insignificant	
ALPO	Karl Brunckhorst	15-Dec-08	9:28 AM	Leaves, sticks, paper, plastic	No	No Runoff	
ASS2	Karl Brunckhorst	15-Dec-08	9:02 AM	Leaves, sticks	Low	Insignificant	
ASW	Karl Brunckhorst	15-Dec-08	9:10 AM	Leaves, sticks, paper	No	No Runoff	
GRNE	Karl Brunckhorst	15-Dec-08	9:23 AM	Leaves, sticks, paper, plastic	Low	Insignificant	Lake Haussmann & ERD's Treatment Facility B discharging
WPDC	Karl Brunckhorst	15-Dec-08	9:17 AM	Leaves, sticks, plastic	Low	Insignificant	
ALPE	Crystal Foster	22-Jan-09	8:30 AM	Leaves, sticks	Moderate	Significant	
ALPO	Crystal Foster	22-Jan-09	8:40 AM	Leaves, sticks	Moderate	Significant	
ASS2	Karl Brunckhorst	22-Jan-09	8:30 AM	Leaves, sticks	Moderate	Significant	
ASW	Karl Brunckhorst	22-Jan-09	8:45 AM	Leaves, sticks, paper	Moderate	Significant	
GRNE	Crystal Foster	22-Jan-09	8:50 AM	Leaves, sticks, paper, plastic	Low	Significant	
WPDC	Karl Brunckhorst	22-Jan-09	9:15 AM	Leaves, sticks	Moderate	Significant	Lake Haussmann & ERD's Treatment Facility B discharging

Table A-4 Record of Wet Season Observations				Discharge Observations			
Location	Inspector	Date	Time	Floating Material, Debris, Odor, Discolorations, or Oil and Grease?	Turbidity	Runoff	Comments
ALPE	Crystal Foster	17-Feb-09	8:20 AM	Leaves, sticks	Moderate	Significant	
ALPO	Crystal Foster	17-Feb-09	8:35 AM	Leaves, sticks, paper	Moderate	Significant	Soil stockpile near sample location
ASW	Karl Brunckhorst	17-Feb-09	8:30 AM	Leaves, sticks	Moderate	Significant	
ASS2	Karl Brunckhorst	17-Feb-09	8:10 AM	Leaves, sticks	Moderate	Significant	
GRNE	Crystal Foster	17-Feb-09	8:50 AM	Leaves, sticks	Low	Significant	
WPDC	Karl Brunckhorst	17-Feb-09	8:50 AM	Leaves, sticks	Moderate	Significant	Styrofoam Lake Haussmann & ERD's Treatment Facility B
ALPE	Karl Brunckhorst	3-Mar-09	3:16 PM	Leaves, sticks, paper	Moderate	Significant	
ALPO	Karl Brunckhorst	3-Mar-09	3:13 PM	Leaves, sticks, paper, plastic	Moderate	Significant	
ASS2	Karl Brunckhorst	3-Mar-09	2:58 PM	Leaves, sticks	Moderate	Significant	
ASW	Karl Brunckhorst	3-Mar-09	3:02 PM	Leaves, sticks, paper	Moderate	Significant	ERD's Treatment Facility A discharging; Styrofoam
GRNE	Karl Brunckhorst	3-Mar-09	3:09 PM	Leaves, sticks, plastic	Moderate	Significant	
WPDC	Karl Brunckhorst	3-Mar-09	3:06 PM	Leaves, sticks	Moderate	Significant	Lake Haussmann & ERD's Treatment Facility B discharging

Table A-4 Record of Wet Season Observations				Discharge Observations			
Location	Inspector	Date	Time	Floating Material, Debris, Odor, Discolorations, or Oil and Grease?	Turbidity	Runoff	Comments
ALPE	Karl Brunckhorst	9-Apr-09	10:52 AM	Leaves, sticks, paper, plastic	No	No Runoff	
ALPO	Karl Brunckhorst	9-Apr-09	10:48 AM	Leaves, sticks, paper, plastic	No	No Runoff	
ASS2	Karl Brunckhorst	9-Apr-09	10:30 AM	Leaves, sticks	No	No Runoff	
ASW	Karl Brunckhorst	9-Apr-09	10:36 AM	Leaves, sticks, paper	No	No Runoff	ERD's Treatment Facility A discharging
GRNE	Karl Brunckhorst	9-Apr-09	10:44 AM	Leaves, sticks, plastic	No	No Runoff	
WPDC	Karl Brunckhorst	9-Apr-09	10:40 AM	Leaves, sticks	Low	No Runoff	Lake Haussmann & ERD's Treatment Facility B discharging

Table A-5. Storm water quality data for January 22, 2009.

DESCRIBE DISCHARGE LOCATION	DATE/TIME OF SAMPLE COLLECTION	TIME DISCHARGE STARTED	ANALYTICAL RESULTS For First Storm Event							
			BASIC PARAMETERS				OTHER PARAMETERS			
			pH	TSS	O&G	TOC	DO	Aluminum	Arsenic	
WPDC (ALP Effluent)	1/22/09	Ongoing	7.61	25	<5	8.4	11	1.3	<0.0002	
	9:15 AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>	AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>								
GRNE (ALP Influent)	1/22/09	Ongoing	7.15	27	<5.7	3.2	12	N/A	N/A	
	8:50 AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>	AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>								
ALPO (ALP Influent)	1/22/09	Ongoing	7.81	130	<5	9.8	11	N/A	N/A	
	8:40 AM <input type="checkbox"/> PM <input type="checkbox"/>	AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>								
ALPE (ALP Influent)	1/22/09	Ongoing	8.03	59	<5	32	11	N/A	N/A	
	8:30 AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>	AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>								
TEST REPORTING UNITS:			pH Units	mg/L	mg/L	mg/L	mg O/L	mg/L	mg/L	
TEST METHOD USED:			SM-4500HB	SM-2540D	E1664HEM	SM-5310C	SM-4500OG	E200.7	E200.8	
ANALYZED BY (SELF/LAB):			BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	

ALP - Arroyo Las Positas
 TSS - Total Suspended Solids
 SC - Specific Conductance
 O&G - Oil & Grease
 TOC - Total Organic Carbon
 DO - Dissolved Oxygen
 N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater

Table A-5. Storm water quality data for January 22, 2009.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS For First Storm Event						
	OTHER PARAMETERS						
	Barium	Beryllium	Boron	Bromacil	Cadmium	Chemical Oxygen Demand	
WPDC (ALP Effluent)	0.066	<0.0002	0.46	3.7	<0.001	<25	
GRNE (ALP Influent)	N/A	<0.002	N/A	<0.5	<0.0002	<25	
ALPO (ALP Influent)	N/A	<0.002	N/A	20	<0.0002	65	
ALPE (Influent)	N/A	<0.002	N/A	1.2	<0.0002	120	
TEST REPORTING UNITS:	mg/L	mg/L	mg/L	ug/L	mg/L	mg O/L	
TEST METHOD USED:	E210.2	E210.2	E213.2	E410.4	E213.2	E410.4	
ANALYZED BY (SELF/LAB):	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	

ALP - Arroyo Las Positas

TSS - Total Suspended Solids

SC - Specific Conductance

O&G - Oil & Grease

TOC - Total Organic Carbon

DO - Dissolved Oxygen

N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater

Table A-5. Storm water quality data for January 22, 2009.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS For First Storm Event										
	OTHER PARAMETERS										
	Chromium	Copper	Diazinon	Diuron	Glyphosate	Hexavalent Chromium	Lead	Mercury			
WPDC (ALP Effluent)	<0.003	0.0054	<0.2	1.7	6.7	0.00069	0.0012	<0.0002			
GRNE (ALP Influent)	N/A	0.0048	<0.2	5	<5	0.00035	<0.005	<0.0002			
ALPO (ALP Influent)	N/A	0.014	<0.2	2.1	9.5	0.0015	0.006	<0.0002			
ALPE (ALP Influent)	N/A	0.0096	<0.2	12	<5	<0.0002	<0.005	<0.0002			
TEST REPORTING UNITS:	mg/L	mg/L	ug/L	ug/L	ug/L	mg/L	mg/L	mg/L			
TEST METHOD USED:	E200.8	E200.8	E525.2	E632	E547	E218.6	E200.8	E245.1			
ANALYZED BY (SELF/LAB):	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs			

ALP - Arroyo Las Positas

TSS - Total Suspended Solids

SC - Specific Conductance

O&G - Oil & Grease

TOC - Total Organic Carbon

DO - Dissolved Oxygen

N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater

Table A-5. Storm water quality data for January 22, 2009.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS									
	For First Storm Event									
	OTHER PARAMETERS									
	Nickel	Nitrate (asNO3)	Ortho-Phosphate	Pentachloro-phenol	Pyrene	Simazine	Total Dissolved Solids	Zinc		
WPDC (ALP Effluent)	0.0046	3.7	0.3	<1	<0.1	<0.3	180	0.15		
GRNE (ALP Influent)	N/A	17	0.52	<1	<0.1	3	92	0.067		
ALPO (ALP Influent)	N/A	12	0.58	<1	<0.1	<0.3	390	0.048		
ALPE (Influent)	N/A	6.5	2.1	<1	<0.1	<0.3	1300	0.027		
TEST REPORTING UNITS:	mg/L	mg/L	mg/L	ug/L	ug/L	ug/L	mg/L	mg/L		
TEST METHOD USED:	E200.8	E300.0	E365.1	E525.2	E525.2	E525.2	SM-2540C	E200.8		
ANALYZED BY (SELF/LAB):	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs

ALP - Arroyo Las Positas

TSS - Total Suspended Solids

SC - Specific Conductance

O&G - Oil & Grease

TOC - Total Organic Carbon

DO - Dissolved Oxygen

N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater

Table A-5. Storm water quality data for January 22, 2009.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS For First Storm Event				
	OTHER PARAMETERS				
	Gross alpha	Gross beta	Tritium	Plutonium 239+240	
WPDC (ALP Effluent)	0.025 ± 0.059	0.130 ± 0.052	5.3 ± 2.1	-0.00020 ± 0.00059	
GRNE (ALP Influent)	0.013 ± 0.016	0.110 ± 0.036	1.3 ± 2.0	N/A	
ALPO (ALP Influent)	0.140 ± 0.074	0.270 ± 0.052	1.5 ± 2.0	N/A	
ALPE (Influent)	0.74 ± 0.27	0.420 ± 0.078	2.0 ± 2.0	N/A	
TEST REPORTING UNITS:	Bq/L	Bq/L	Bq/L	Bq/L	Bq/L
TEST METHOD USED:	E900	E900	E906	AS:PUISO	Eberline
ANALYZED BY (SELF/LAB):	Eberline	Eberline	Eberline	Eberline	Eberline

Radioactivities are reported as the measured concentration and an uncertainty (s +/-2 counting error). If the concentration is less than or equal to the uncertainty, the result is considered to be a nondetection.

ALP - Arroyo Las Positas

TSS - Total Suspended Solids

SC - Specific Conductance

O&G - Oil & Grease

TOC - Total Organic Carbon

DO - Dissolved Oxygen

N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater

Table A-5. Storm water quality data for January 22, 2009.

DESCRIBE DISCHARGE LOCATION	DATE/TIME OF SAMPLE COLLECTION	TIME DISCHARGE STARTED	ANALYTICAL RESULTS For First Storm Event					
			BASIC PARAMETERS					
			pH	TSS	O&G	TOC	DO	
ASW (Arroyo Seco Effluent)	1/22/09	Ongoing	7.11	38.	<5	6.9	11	
	8:45 AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>	AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>						
ASS2 (Arroyo Seco Influent)	1/22/09	Ongoing	7.06	10.	<5	7.5	11	
	8:30 AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>	AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>						
TEST REPORTING UNITS:								
TEST METHOD USED:								
ANALYZED BY (SELF/LAB):								
TSS - Total Suspended Solids								
SC - Specific Conductance								
O&G - Oil & Grease								
TOC - Total Organic Carbon								
DO - Dissolved Oxygen								
N/A - Not Analyzed								
Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastew								
			pH Units	mg/L	mg/L	mg/L	mg O/L	
			SM-4500HB	SM-2540D	E1664HEM	SM-5310C	SM-4500OG	
			BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	

Table A-5. Storm water quality data for January 22, 2009.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS For First Storm Event			
	OTHER PARAMETERS			
	Beryllium	Bromacil	Cadmium	Chemical Oxygen Demand
ASW (Arroyo Seco Effluent)	<0.002	<0.5	<0.002	<25
ASS2 (Arroyo Seco Influent)	<0.002	<0.5	<0.002	<25
TEST REPORTING UNITS:				
TEST METHOD USED:				
ANALYZED BY (SELF/LAB):				
TSS - Total Suspended Solids				
SC - Specific Conductance				
O&G - Oil & Grease				
TOC - Total Organic Carbon				
DO - Dissolved Oxygen				
N/A - Not Analyzed				
Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater				
	mg/L	ug/L	mg/L	mg O/L
	E210.2	E525.2	E213.2	E410.4
	BC Labs	BC Labs	BC Labs	BC Labs

Table A-5. Storm water quality data for January 22, 2009.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS For First Storm Event							
	OTHER PARAMETERS							
	Copper	Diazinon	Diuron	Glyphosate	Hexavalent Chromium	Lead	Mercury	
ASW (Arroyo Seco Effluent)	0.0051	<0.2	<1	17.	0.00028	<0.005	<0.0002	
ASS2 (Arroyo Seco Influent)	0.0048	<0.2	<1	37.	0.00036	<0.005	<0.0002	
TEST REPORTING UNITS:								
TEST METHOD USED:								
ANALYZED BY (SELF/LAB):								
TSS - Total Suspended Solids								
SC - Specific Conductance								
O&G - Oil & Grease								
TOC - Total Organic Carbon								
DO - Dissolved Oxygen								
N/A - Not Analyzed								
Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater								
	mg/L	ug/L	ug/L	ug/L	mg/L	mg/L	mg/L	
E200.8	E525.2	E632	E547	E218.6	E200.8	E245.1		
BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	

Table A-5. Storm water quality data for January 22, 2009.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS For First Storm Event							
	OTHER PARAMETERS							
	Nitrate (asNO3)	Ortho-Phosphate	Pentachloro-phenol	Pyrene	Simazine	Total Dissolved Solids	Zinc	
ASW (Arroyo Seco Effluent)	2.7	0.44	<1	<0.1	<0.3	44.	0.056	
ASS2 (Arroyo Seco Influent)	3.5	0.55	<1	<0.1	<0.3	44.	0.058	
TEST REPORTING UNITS:								
TEST METHOD USED:								
ANALYZED BY (SELF/LAB):								
TSS - Total Suspended Solids								
SC - Specific Conductance								
O&G - Oil & Grease								
TOC - Total Organic Carbon								
DO - Dissolved Oxygen								
N/A - Not Analyzed								
Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater								
	mg/L	mg/L	ug/L	ug/L	ug/L	mg/L	mg/L	mg/L
	E300.0	E365.1	E525.2	E525.2	E525.2	SM-2540C	E200.7	
	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs

Table A-5. Storm water quality data for January 22, 2009.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS For First Storm Event			
	OTHER PARAMETERS			
	Gross alpha	Gross beta	Tritium	Plutonium 239+240
ASW (Arroyo Seco Effluent)	0.015±0.015	0.12±0.041	3.77±2.035	0.0011±0.00089
ASS2 (Arroyo Seco Influent)	0.0036±0.014	0.11±0.041	2.083±1.96	N/A
TEST REPORTING UNITS:	Bq/L	Bq/L	Bq/L	Bq/L
TEST METHOD USED:	E900	E900	E906	AS;PUISO
ANALYZED BY (SELF/LAB):	Eberline	Eberline	Eberline	Eberline

Radioactivities are reported as the measured concentration and an uncertainty (s +/-2 counting error). If the concentration is less than or equal to the uncertainty, the result is considered to be a nondetection.

TSS - Total Suspended Solids

SC - Specific Conductance

O&G - Oil & Grease

TOC - Total Organic Carbon

DO - Dissolved Oxygen

N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater

Table A-6. Storm water quality data for February 17, 2009.

DESCRIBE DISCHARGE LOCATION	DATE/TIME OF SAMPLE COLLECTION	TIME DISCHARGE STARTED	ANALYTICAL RESULTS For Second Storm Event						
			BASIC PARAMETERS				OTHER PARAMETERS		
			pH	TSS	O&G	TOC	DO	Aluminum	Arsenic
WPDC (ALP Effluent)	2/17/09 8:50 AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>	Ongoing	7.62	130	<5.6	4.5	12	N/A	N/A
	2/17/09 8:50 AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>	Ongoing	7.64	170	<5.6	2.2	12	N/A	N/A
ALPO (ALP Influent)	2/17/09 8:35 AM <input type="checkbox"/> PM <input type="checkbox"/>	Ongoing	8.02	310	<5	6.5	11	N/A	N/A
	2/17/09 8:20 AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>	Ongoing	8.24	400	<5	5	11	N/A	N/A
TEST REPORTING UNITS:			pH Units	mg/L	mg/L	mg/L	mg O/L	mg/L	mg/L
TEST METHOD USED:			SM-4500HB	SM-2540D	E1664-HEM	SM-4500OG	SM-5310C	E200.7	E200.8
ANALYZED BY (SELF/LAB):			BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs

ALP - Arroyo Las Positas
 TSS - Total Suspended Solids
 SC - Specific Conductance
 O&G - Oil & Grease
 TOC - Total Organic Carbon
 DO - Dissolved Oxygen
 N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewa

Table A-5. Storm water quality data for February 17, 2009.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS For Second Storm Event						
	OTHER PARAMETERS						
	Barium	Beryllium	Boron	Bromacil	Cadmium	Chemical Oxygen Demand	
WPDC (ALP Effluent)	N/A	<0.0002	N/A	1.1	0.00022	58	
GRNE (ALP Influent)	N/A	0.0003	N/A	45	<0.0002	<25	
ALPO (ALP Influent)	N/A	0.00052	N/A	15	<0.0002	60	
ALPE (Influent)	N/A	0.00034	N/A	1.5	0.00021	96	
TEST REPORTING UNITS:	mg/L	mg/L	mg/L	ug/L	mg/L	mg O/L	
TEST METHOD USED:	E210.2	E210.2	E213.2	E525.2	E213.2	E410.4	
ANALYZED BY (SELF/LAB):	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	

ALP - Arroyo Las Positas

TSS - Total Suspended Solids

SC - Specific Conductance

O&G - Oil & Grease

TOC - Total Organic Carbon

DO - Dissolved Oxygen

N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater

Table A-5. Storm water quality data for February 17, 2009.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS For Second Storm Event									
	OTHER PARAMETERS									
	Chromium	Copper	Diazinon	Diuron	Glyphosate	Hexavalent Chromium	Lead	Mercury		
WPDC (ALP Effluent)	N/A	0.021	<0.2	<1	<5	0.00054	0.0058	<0.0002		
GRNE (ALP Influent)	N/A	0.016	<0.2	1.8	<5	0.00025	0.0051	<0.0002		
ALPO (ALP Influent)	N/A	0.023	<0.2	<1	<5	0.00082	0.012	<0.0002		
ALPE (ALP Influent)	N/A	0.031	<0.2	7.1	7	0.0004	0.018	<0.0002		
TEST REPORTING UNITS:	mg/L	mg/L	ug/L	ug/L	ug/L	mg/L	mg/L	mg/L		
TEST METHOD USED:	E200.8	E200.8	E525.2	E632	E547	E218.6	E200.8	E245.1		
ANALYZED BY (SELF/LAB):	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs		

ALP - Arroyo Las Positas

TSS - Total Suspended Solids

SC - Specific Conductance

O&G - Oil & Grease

TOC - Total Organic Carbon

DO - Dissolved Oxygen

N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater

Table A-5. Storm water quality data for February 17, 2009.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS For Second Storm Event									
	OTHER PARAMETERS									
	Nickel	Nitrate (asNO3)	Ortho-Phosphate	Pentachloro-phenol	Pyrene	Simazine	Total Dissolved Solids	Zinc		
WPDC (ALP Effluent)	N/A	1.4	0.17	<1	<0.1	<0.3	71	0.17		
GRNE (ALP Influent)	N/A	6.7	0.43	<1	<0.1	1.6	59	0.12		
ALPO (ALP Influent)	N/A	9	0.4	<1	<0.1	<0.3	300	0.07		
ALPE (Influent)	N/A	3	0.67	1.4	0.2	<0.3	150	0.15		
TEST REPORTING UNITS:	mg/L	mg/L	mg/L	ug/L	ug/L	ug/L	mg/L	mg/L		
TEST METHOD USED:	E200.8	E300.0	E365.1	E525.2	E525.2	E525.2	SM-2540C	E200.8		
ANALYZED BY (SELF/LAB):	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs

ALP - Arroyo Las Positas

TSS - Total Suspended Solids

SC - Specific Conductance

O&G - Oil & Grease

TOC - Total Organic Carbon

DO - Dissolved Oxygen

N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater

Table A-6. Storm water quality data for February 17, 2009.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS For Second Storm Event			
	OTHER PARAMETERS			
	Gross alpha	Gross beta	Tritium	Plutonium 239+240
WPDC (ALP Effluent)	0.047 ± 0.024	0.140 ± 0.044	1.8 ± 2.1	0.00026 ± 0.00035
GRNE (ALP Influent)	0.050 ± 0.026	0.190 ± 0.037	-1.8 ± 2.0	N/A
ALPO (ALP Influent)	0.160 ± 0.067	0.320 ± 0.048	-1.9 ± 2.0	N/A
ALPE (Influent)	0.160 ± 0.063	0.410 ± 0.059	-2.9 ± 2.0	N/A
TEST REPORTING UNITS:	Bq/L	Bq/L	Bq/L	Bq/L
TEST METHOD USED:	E900	E900	E906	AS;PUISO
ANALYZED BY (SELF/LAB):	Eberline	Eberline	Eberline	Eberline

Radioactivities are reported as the measured concentration and an uncertainty (s +/-2 counting error). If the concentration is less than or equal to the uncertainty, the result is considered to be a nondetection.

ALP - Arroyo Las Positas

TSS - Total Suspended Solids

SC - Specific Conductance

O&G - Oil & Grease

TOC - Total Organic Carbon

DO - Dissolved Oxygen

N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater

Table A-6. Storm water quality data for February 17, 2008.

DESCRIBE DISCHARGE LOCATION	DATE/TIME OF SAMPLE COLLECTION	TIME DISCHARGE STARTED	ANALYTICAL RESULTS For Second Storm Event						
			BASIC PARAMETERS						
			pH	TSS	O&G	TOC	DO		
ASW (Arroyo Seco Effluent)	2/17/09	Ongoing							
	8:30 AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>	AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>	7.3	130.	<5	3.1	11.		
ASS2 (Arroyo Seco Influent)	2/17/09	Ongoing							
	8:10 AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>	AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>	7.3	58.	<5	3.8	12.		
TEST REPORTING UNITS:			pH Units	mg/L	mg/L	mg/L	mg O/L		
TEST METHOD USED:			SM-4500HB	SM-2540D	E1664HEM	SM-5310C	SM-5310C		
ANALYZED BY (SELF/LAB):			BC Labs	BC Labs	BC Labs	BC Labs	BC Labs		

TSS - Total Suspended Solids

SC - Specific Conductance

O&G - Oil & Grease

TOC - Total Organic Carbon

DO - Dissolved Oxygen

N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastew

Table A-6. Storm water quality data for February 17, 2009.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS For Second Storm Event			
	OTHER PARAMETERS			
	Beryllium	Bromacil	Cadmium	Chemical Oxygen Demand
ASW (Arroyo Seco Effluent)	<0.0002	<0.5	<0.0002	51.
ASS2 (Arroyo Seco Influent)	<0.0002	<0.5	<0.0002	<25
TEST REPORTING UNITS:				
TEST METHOD USED:				
ANALYZED BY (SELF/LAB):				
TSS - Total Suspended Solids				
SC - Specific Conductance				
O&G - Oil & Grease				
TOC - Total Organic Carbon				
DO - Dissolved Oxygen				
N/A - Not Analyzed				
Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater				
mg/L	ug/L	mg/L	mg O/L	
E210.2	E525.2	E213.2	E410.4	
BC Labs	BC Labs	BC Labs	BC Labs	BC Labs

Table A-6. Storm water quality data for February 17, 2009.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS For Second Storm Event						
	OTHER PARAMETERS						
	Copper	Diazinon	Diuron	Glyphosate	Hexavalent Chromium	Lead	Mercury
ASW (Arroyo Seco Effluent)	0.017	<0.2	<1	8.6	0.00048	0.0056	<0.0002
ASS2 (Arroyo Seco Influent)	0.0069	<0.2	1.2	<5	<0.0002	<0.0002	<0.0002
TEST REPORTING UNITS:							
TEST METHOD USED:							
ANALYZED BY (SELF/LAB):							
TSS - Total Suspended Solids							
SC - Specific Conductance							
O&G - Oil & Grease							
TOC - Total Organic Carbon							
DO - Dissolved Oxygen							
N/A - Not Analyzed							
Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater							
	mg/L	ug/L	ug/L	ug/L	mg/L	mg/L	mg/L
	E200.8	E525.2	E632	E547	E218.6	E200.8	E245.1
	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs

Table A-6. Storm water quality data for February 17, 2009.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS For Second Storm Event							
	OTHER PARAMETERS							
	Nitrate (asNO3)	Ortho-Phosphate	Pentachloro-phenol	Pyrene	Simazine	Total Dissolved Solids	Zinc	
ASW (Arroyo Seco Effluent)	1.1	0.18	1.1	0.13	<0.3	30.	0.099	
ASS2 (Arroyo Seco Influent)	1.1	0.29	1.1	<0.1	<0.3	28.	0.067	
TEST REPORTING UNITS:	mg/L	mg/L	ug/L	ug/L	ug/L	mg/L	mg/L	
TEST METHOD USED:	E300.0	E365.1	E525.2	E525.2	E525.2	SM-2540C	E200.7	
ANALYZED BY (SELF/LAB):	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs	BC Labs

TSS - Total Suspended Solids

SC - Specific Conductance

O&G - Oil & Grease

TOC - Total Organic Carbon

DO - Dissolved Oxygen

N/A - Not Analyzed

Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater

Table A-6. Storm water quality data for February 17, 2009.

DESCRIBE DISCHARGE LOCATION	ANALYTICAL RESULTS For Second Storm Event		
	OTHER PARAMETERS		
	Gross alpha	Gross beta	Tritium
ASW (Arroyo Seco Effluent)	0.059±0.024	0.16±0.033	-0.46±2.07
ASS2 (Arroyo Seco Influent)	0.017±0.013	0.061±0.024	-0.0696±2.035
TEST REPORTING UNITS:	Bq/L	Bq/L	Bq/L
TEST METHOD USED:	E900	E900	E906
ANALYZED BY (SELF/LAB):	Eberline	Eberline	Eberline
Radioactivities are reported as the measured concentration and an uncertainty (s +/-2 counting error). If the concentration is less than or equal to the uncertainty, the result is considered to be a nondetection.			
TSS - Total Suspended Solids			
SC - Specific Conductance			
O&G - Oil & Grease			
TOC - Total Organic Carbon			
DO - Dissolved Oxygen			
N/A - Not Analyzed			
Test Method Used: E is EPA Method and SM is Standard methods for the examination of water and wastewater			
			Plutonium 239+240
			0.0012±0.00063
			N/A
			AS:PUISO
			Eberline



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