INFORMATION SHEET

CLOSURE AND POST-CLOSURE MAINTENANCE,
BIO INDUSTRIES, INC.
FORMER BIO-REMEDIATION FACILITY FOR PETROLEUM-CONTAMINATED SOILS
TEHAMA COUNTY

On 21 June 1996, the California Regional Water Quality Control Board Central Valley Region (Central Valley Water Board) originally issued Waste Discharge Requirements Order No. 96-184 to Bio Industries, Inc. (Discharger). On 5 June 1998, the Central Valley Water Board rescinded the 1996 Order, and adopted Waste Discharge Requirements Order No. 98-139. This Order rescinds and replaces Order No. 98-139.

Facility Operations

On 30 November 2011, Bio Industries, Inc. notified the Central Valley Water Board, Central Valley Region, of its intent to close its facility at 19760 Callahan Road, Red Bluff, Tehama County. There, the Discharger accepted soils with petroleum-contamination, occasionally also with minor anti-freeze, fire-fighting foam, and metals associated with automotive engine wear. Typical sources were underground storage tank excavations and emergency cleanups of motor vehicle accidents. The facility accepted non-hazardous soils as defined in Title 27 California Code of Regulations Division 2, §20005, et seq. (Title 27). The facility did not accumulate soils in concentrations that constitute designated waste as defined in Title 27. The facility treated gasoline-contaminated soils primarily by aeration. For other soils, the Discharger added moisture and non-toxic nutrients. Attachment A is a map of the facility location and surrounding parcels.

The Discharger treated contaminated soils in five cells, and then disposed of soils that meet criteria for inert waste into an inert cell. The Discharger plans to continue using former Treatment Cell 4 for temporary storage of polluted soils under an Industrial Storm Water Permit. Both the former treatment cells and the inert cell have compacted clay liners with a minimum thicknesses of 24 inches and a maximum permeabilities of $1x10^{-6}$ centimeters per second. Storm water drainage from former treatment cells flows to surface water. Cells 1, 4, and 5 have eastward draining valves that discharge to arroyos up-slope of surface water effluent sampling points. Cells 3 and 2 internally drain into Cell 1 through open pipes. The inert cell drains through ditches to a sedimentation basin, which has no outlet. Attachment B is a map of cells and storm water management and monitoring features.

Unsaturated Zone Monitoring

In 2000, the Discharger installed pressure-vacuum lysmeters LY-1 through LY-6 about two feet beneath the cells. To date, no lysimeter has produced a sample. Therefore, in October 2009, prior to heavy seasonal rains, the Discharger primed lysimeters with distilled water. Four lost all recoverable water likely due to low native soil moisture.

Groundwater Monitoring

From 1992 to 1999, the Discharger installed shallow groundwater monitoring wells, SW-1 through SW-6, and deeper monitoring wells, MW-1, MW-2S, MW-2D, MW-3, and MW-4. Table 1, below, summarizes monitoring well constructions, based on available public agency records. Recent field investigations indicate that at least some of these records are inaccurate.

Shallow wells target perched groundwater but rarely produce sufficient volume for sampling, and may not sample a common water-bearing unit. While they have

a common terminal depth of 10 feet bgs, topographic relief among shallow wells is about 14 feet. Deeper wells MW-1 and MW2D, have hydraulically confined open and slotted casing intervals, and may sample two distinct water-bearing units. Wells MW-2S, MW-3, and MW-4 also have confined slotted casing intervals, but with likely unconfined filter media intervals that extend far above targeted water bearing units. While hydraulic gradients are uncertain, the Discharger currently considers wells MW-1, MW-3, and MW-4 as points of compliance, and wells MW-2S and MW-2D as background wells.

Table 1, Monitoring Well Constructions, Bio Industries, Inc., Red Bluff, Tehama County

Well	Date Installed	TOC elevation (feet amsl)	22 Apr 09 SWLs (feet amsl)	Screened or Open Interval (feet bgs)	Filter Media Interval (feet bgs)
SW-1	May-92	417.29	Dry	5 to 10	5 to 10
SW-2	May-92	427.50	Dry	5 to 10	5 to 10
SW-3	May-92	406.96	Dry	5 to 10	5 to 10
SW-4	May-92	408.93	Dry	5 to 10	5 to 10
SW-5	May-92	420.58	Dry	5 to 10	5 to 10
SW-6	no data	not surveyed	Dry	5 to 10	5 to 10
MW-1	Apr-92	417.33	338.06	159 to 160	None
MW-2S	May-92	444.36	348.78	*110 to 120*	5 to 121
MW-2D	May-92	444.36	337.23	*155 to 165*	126 to 165
MW-3	May-92	407.14	338.54	*126 to 136*	5 to 136
MW-4	Dec-99	431.63	344.63	*105? To 120*	6 to 120

Notes:

1. Well construction data based on applications and well drillers' reports on file at Tehama County Environmental Health Department and California Department of Water Resources. Static water levels are from Discharger's quarterly monitoring data.
2. TOC, top of casing, SWL, static water level, amsl, above mean sea level. Casing stick-up is about 3 feet above grade.
3. Based on well driller's report, MW-1 appears to be an open-hole completion below steel riser pipe. All other wells have 0.010-inch slotted PVC casing and #3 filter sand.
4. Estimated top of screened interval in MW-4 based on proposed construction, 26 Oct 09.

Based on public records summarized in Table 1, filter media likely provides a conduit between perched a deeper groundwater in deep monitoring wells, However, based on observations during trenching near the wellhead of well MW-3, November 2012, and follow-up interviews with the driller, filter media does not extend to 5 feet bgs. A six-inch diameter steel driven casing

likely extends to about 20 feet bgs, with concrete-based grout within the annulus between the PVC riser and casing, at minimum from grade to about 9 feet bgs. Top of filter media is unknown.

Table 2 summarizes petroleum pollutants in groundwater. Although not detected in groundwater, the table also shows Total Petroleum Hydrocarbons as gasoline (TPHg) and tert Amyl Ethyl Ether (TAME), due to their detections in surface water.

Table 2, Petroleum Constituents in Groundwater, Bio Industries, Inc., Red Bluff, Tehama County

All data in micrograms/Liter (µg/L)

	Date	TPHg	TPHd	TPH o&g	Benzene	Toluene	Ethylbenzene	Xylenes	MtBE	TAME
MW-1	1/11/2003	<50	350	<5.0	<0.5	<0.5	<0.5	<0.5	<0.5	NA
	4/13/2004	<50	<50	**5.1**	<0.3	<0.3	<0.5	<0.5	<0.5	<0.5
	10/6/2004	<50	**65**	<5.0	<0.3	<0.3	<0.5	<0.5	<0.5	<0.5
MW-2S	4/1/1997	<50	<50	<5.0	<0.5	<0.5	**0.73**	**1.9**	NA	NA
	11/1/2003	<50	**12000**	<5.0	<0.5	<0.5	<0.5	<0.5	NA	NA
	2/4/2003	NA	**210**	NA	NA	NA	NA	NA	NA	NA
	10/11/2007	<50	**1900**	<1.0	<0.5	<0.5	<0.5	<0.1	<0.5	<10
	4/22/2009	<50	<50	**1.1**	<0.5	<0.5	<0.5	<0.1	<0.5	<10
MW-2D	1/11/2003	NA	NA	**20**	NA	NA	NA	NA	NA	NA
	2/4/2003	NA	**88**	NA	NA	NA	NA	NA	NA	NA
	10/6/2004	<50	**66**	<5.0	<0.3	<0.3	<0.5	<0.5	<0.5	<0.5
	4/22/2009	<50	<50	**1.3**	<0.5	<0.5	<0.5	<0.1	<0.5	<10
	5/13/2009	NA	NA	**1.2**	NA	NA	NA	NA	NA	NA
MW-3	1/11/2003	<50	**860**	<5.0	<0.5	<0.5	<0.5	<0.5	<0.5	NA
	2/4/2003	NA	**130**	NA	NA	NA	NA	NA	NA	NA
	10/6/2004	<50	**73**	<5.0	<0.3	<0.3	<0.5	<0.5	<0.5	<0.5
	4/22/2009	<50	<50	**2.5**	<0.5	<0.5	<0.5	<0.1	<0.5	<10
MW-4	3/14/2001	<50	<50	NA	<0.5	<0.5	<0.5	<0.5	**9.6**	NA
	1/11/2003	<50	**260**	**7**	<0.5	<0.5	<0.5	<0.5	<0.5	NA
	5/17/2006	<50	<50	**1**	<0.5	<0.5	<0.5	<0.1	<0.5	<10
	4/10/2008	<50	<50	**1**	<0.5	<0.5	<0.5	<0.1	<0.5	<10

Notes:

1. Data from the Discharger's 2009 Annual Monitoring Report dated 18 January 2010, by Lawrence and Associates, Shasta Lake City, Shasta County
2. Total petroleum hydrocarbons, as gasoline, diesel, and oil and grease, TPHg, TPHd, and TPHo&g, Methyl tert Butyl Ether, MtBE, tert Amyl Methyl Ether, TAME
3. NA, no analysis.

As shown in the above table, petroleum constituents occur occasionally in both shallow and deeper wells. While records may be inaccurate, staff considers the occasional detections of volatile organic compounds as due to cross-contamination in poorly constructed monitoring wells. Based on interviews with the well driller, and reviews of analytical results, staff considers TPH detections as possibly due to residual lifting foam and lubricants (cooking oil) used during air-rotary drilling of pilot borings.

Surface Water Monitoring

As shown on Attachment B, the Discharger monitors surface water down-slope of treatment cells effluent points E-1 and E-2, at reference points in Brickyard Creek at R-1 and R-2, and in the sedimentation basin at SP-1. Points E-1, E-2, and SP-1 have shown occasional dilute organic pollutants, largely TPH-d and TPH-og. To date R-1 and R-2 have shown no pollutants. Table 3 summarizes detections.

Table 3, Petroleum Constituents in Surface Water, Bio Industries, Inc., Red Bluff, Tehama County

All data in micrograms/Liter (µg/L)

Sample Point	Date	TPHg	TPHd	TPH o&g	Benzene	Toluene	Ethylbenzene	Xylenes	MtBE	TAME
E-1	2/25/2004	<50	<50	<5.0	<0.5	<0.5	<0.5	<0.1	<0.5	**1.5**
	12/26/2006	<50	<50	**1.4**	<0.5	<0.5	<0.5	<1	<5	<5
	2/15/2009	<50	<50	**1.5**	<0.5	<0.5	<0.5	<1	<5	<5
	10/14/2009	<50	<50	**1.1**	<0.5	<0.5	<0.5	<1	<5	<5
E-2	12/26/2006	<50	<50	**1.4**	<0.5	<0.5	<0.5	<1	<5	<5
	2/9/2007	<50	<50	**1.1**	<0.5	<0.5	<0.5	<1	<5	<5
	2/15/2009	<50	<50	**1.6**	<0.5	<0.5	<0.5	<1	<5	<5
	10/14/2009	<50	<50	**1**	<0.5	<0.5	<0.5	<1	<5	<5
SP-1	10/6/2004	<50	**63**	<5.0	<0.3	<0.3	<0.5	<0.5	<0.5	<0.5
	4/10/2008	<50	**2400**	**4.6**	<0.5	<0.5	<0.5	<1	<5	<5
	4/22/2009	<50	<50	**3.1**	<0.5	<0.5	<0.5	<1	<5	<5
	5/13/2009	<50	<50	**1.4**	<0.5	<0.5	<0.5	<1	<5	<5

Notes:

1. Data from the Discharger's 2009 Annual Monitoring Report dated 18 January 2010, by Lawrence and Associates, Shasta Lake City, Shasta County
2. Total petroleum hydrocarbons, as gasoline, diesel, and oil and grease, TPHg, TPHd, and TPHo&g, Methyl tert Butyl Ether, MtBE, tert Amyl Methyl Ether, TAME

3. NA, no analysis.

Because the facility is now inactive, further surface water monitoring under the current Industrial Storm Water Permit is likely sufficient for closure and post-closure maintenance.

Monitoring and Reporting Program

For closure and post-closure maintenance, the MRP requires a characterization in detail of the inert cell. To ensure that previous pre-screening of treated soils was adequate, and no remaining long term threat to human health and the environment remain, the characterization generally includes a tiered laboratory analytical program based on field screening and results of EPA Method 8015 modified gasoline, diesel, and oil and grease. Follow-up analyses include volatile and semi-volatile organic compounds, poly-chlorinated biphenyls, and metals.

This MRP has increased monitoring of key petroleum constituents, now including some weathering products, major ions sufficient for Stiff and Piper Diagrams, and, as previously, metals common in automotive engine waste oil.

Based on likely non-representative analytical results of local groundwater and limited potential for impacts to groundwater from the cells, the MRP will likely require a relatively short compliance period of three years. However, if characterization of the inert cell indicates a remaining threat to groundwater and surface water, the MRP would require further long term monitoring. Constituents of concern would generally include metals sufficient to help explain major ion anomalies, volatile organic compounds commonly found in soil gas and with high mobility in water, and key semi-volatile organic compounds, common industrial pollutants with high mobility in water.

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