CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

TENTATIVE ORDER

UPDATED SITE CLEANUP REQUIREMENTS AND RESCISSION OF ORDER R2-2002-0014
FOR:

THE DOW CHEMICAL COMPANY and
CORTEVA, INC.
901 LOVERIDGE ROAD
PITTSBURG
CONTRA COSTA COUNTY

The California Regional Water Quality Control Board, San Francisco Bay Region (hereinafter the Regional Water Board or the Board), finds that:

SITE DESCRIPTION & LOCATION

1. The Dow Chemical Company (Dow) formerly owned and operated a chemical manufacturing facility at 901 Loveridge Road, Pittsburg, Contra Costa County, as shown in Figure 1 (hereafter referred to as the site or facility). In 2017, Dow and DuPont merged, and on June 1, 2019, the merged companies split into three entities, Dow, Inc., DuPont, and Corteva, Inc. Corteva now owns and operates the site. Dow and Corteva are jointly referred to as Discharger herein. The site is bounded by New York Slough on the north, the Pittsburg-Antioch Highway on the south, Loveridge Road on the west, and parklands and other commercial properties on the east. Residential areas exist further to the south beyond the Pittsburg-Antioch Highway. The facility occupies 330 acres of the approximately 993 acres formerly owned by Dow, which includes a 251-acre wetland preserve located on the east side of the site. In addition to active chemical manufacturing facilities, the site contains several closed solid waste disposal units and an inactive Class III solid waste landfill (referred to as the Northeast Landfill) that was used historically for the disposal of waste generated at the site. Dow has submitted a Closure Plan for the Northeast Landfill.

2. Corteva currently manufactures a variety of agricultural chemicals, fumigants, and hydrochloric acid at the Pittsburg facility. Historically, Dow used the site to manufacture fungicides, latex, chlorine, sodium hydroxide, hydrogen, and a variety of agricultural chemicals, fumigants, hydrochloric acid and chlorinated solvents, including carbon tetrachloride and tetrachloroethene. Corteva leases portions of the facility to other manufacturers including the Cynera Company, M.G. Generon, Douglas Products, and K2 Pure Solutions, which manufactures chlorine bleach and chlorine gas.

PURPOSE OF ORDER

3. The purpose of this Order is to update the site cleanup requirements (SCRs) for the ongoing remediation of volatile and semi-volatile organic compounds (VOCs and SVOCs, respectively) in groundwater at the site. This Order does not change the Discharger's continued use of engineered in-situ bioremediation (EISB) as the primary remedy for the cleanup of VOC contamination. This Order summarizes the progress of the site's cleanup, sets new schedules for evaluating and reporting the progress of the cleanup, and requires further evaluation of alternative cleanup methods that may be implemented to accelerate site cleanup.

4. This Order regulates the cleanup of contaminants in site soil and groundwater that are the result of numerous historic spills and leaks that occurred throughout the facility during Dow's operations. These releases are not sourced from, or directly associated with, the 25 designated solid waste management units (SWMUs or WMUs) at the site that are regulated separately, pursuant to title 27 CCR, under Waste Discharge Requirements (WDRs) Order No. R2-2018-0006. The WDR Order regulates the operation, closure, post-closure maintenance, and monitoring of solid waste management units at the site. This SCR Order does not alter WDR Order No. R2-2018-0006.

5. This Order rescinds and replaces the previous SCR Order (Order No. R2-2002-0014) and updates the status of remediation and monitoring of VOCs and SVOCs in groundwater at the site. This SCR Order and the attached Self-Monitoring Program incorporate the monitoring requirements for the Discharger's remediation program.

REGULATORY HISTORY

6. In 1987, the Regional Water Board adopted WDR Order No. 87-064 requiring Dow to characterize each SWMU for water quality impacts and to evaluate alternatives for remediation of contamination associated with these SWMUs, if necessary.

7. In 1997, the Regional Water Board adopted WDR Order No. 97-123, which required Dow to extract groundwater impacted with VOCs and SVOCs to reduce contaminant mass and mitigate impacts in specific areas. Order No. 97-123 established interim minimum groundwater extraction rates to take advantage of Dow's existing groundwater treatment capacity until a final remedy could be implemented. Order No. 97-123 also established injection standards for the treated groundwater should Dow select injection as the preferred disposal method. Additionally, Order No. 97-123 established interim extraction requirements in anticipation of a larger, site-wide corrective action remedy based on hydraulic containment of VOCs in groundwater.

8. In 1998, the Regional Water Board adopted WDR Order No. 98-059, which rescinded Order No. 87-064 and required corrective actions for the SWMUs and for VOCs in

groundwater. The 1998 WDRs (Order No. 98-059) accepted Dow's 1997 proposal for site-wide corrective action of VOC-impacted groundwater using hydraulic containment. However, prior to implementation, Dow determined that hydraulic containment would not be economically feasible due primarily to site hydrogeology. As a result, Dow evaluated and selected the use of EISB as the site-wide corrective action remedy and submitted a revised corrective action plan in 1999.

9. In 2002, the Regional Water Board adopted two companion orders for the Dow Site: Waste Discharge Requirements Order R2-2002-0007 and Site Cleanup Requirements Order R2-2002-0014. WDR Order R2-2002-0007 updated the waste discharge requirements for the site's 25 SWMUs, whereas the SCR Order No. R2-2002-0014 required remediation and monitoring of VOCs and SVOCs in groundwater at the site from spills and releases that are not clearly associated with the site's SWMUs. The 2002 SCR Order conditionally approved the use of the EISB system as the primary remedy for cleanup of existing groundwater impacts from VOC contamination, and also established requirements for Dow to periodically evaluate the effectiveness of the EISB system.

10. In April 2013, the Executive Officer approved the use of screening levels for the contaminants detected in groundwater at the site. The screening levels are compiled in the Regional Water Board's Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater (ESL). Tier 1 values in the ESLs are conservative and assume all potential exposure pathways are complete. As an alternative, Dow proposed the use of Tier 2 values, which are adjusted to more closely reflect actual site conditions. These values recognize ecologic exposure as the pathway most likely to yield unacceptable risk at this site. This is consistent with the USEPA's concurrence that the human exposure was adequately addressed by administrative controls at the site.

11. In 2018, the Regional Water Board adopted WDR Order No. R2-2018-0006, which updated the monitoring and maintenance requirements for the for the site's closed SWMUs.

12. Wastewater at the facility is processed onsite before being reused or conveyed and treated at the Delta Diablo wastewater treatment facility. Site stormwater runoff from within the manufacturing areas is also collected and conveyed to Delta Diablo for treatment. Rain that falls on the site outside of the manufacturing areas is collected and conveyed to a stormwater detention basin. The collected stormwater is tested and treated as required by the Statewide General Permit for Storm Water Discharges Associated with Industrial Activities, Order No. 2014-0057-DWQ, before it is released to New York Slough.

GEOLOGY

13. Geologic structure in the seismically active San Francisco Bay region is controlled by the major northwest-trending San Andreas Fault System. The Dow site is located within the Diablo Range, near the eastern fringe of the San Andreas Fault System. Major faults that have been active during the Holocene Period located near the site include (from east to west and from closest to farthest): the Greenville fault, the Concord-Green Valley fault, the Calaveras fault (northern segment), and the Hayward fault (northern segment). Although most of the relative motion on these faults is right-lateral strike-slip movement, there is a component of shortening or compression normal to these, which is accommodated primarily by buried (blind) thrust faults such as the Mt. Diablo thrust fault.

14. The site vicinity has experienced strong shaking from earthquakes during historic times. The most significant of these included the 1906 San Francisco earthquake and strong events on the Hayward fault in in 1836 and 1868. The largest peak ground acceleration (PGA) at the site is estimated to be between about 0.33g and 0.44g and was associated with magnitude 6.0 earthquake that occurred in 1889 on the Greenville fault.

15. Deterministic evaluations indicate the seismic risk at the northeast landfill is controlled by the Mt. Diablo Thrust Fault, the Concord-Green Valley Fault, and the San Andreas Fault. For most engineering purposes, potential ground motions from a maximum credible earthquake (MCE) on the Mt. Diablo Thrust fault control structural design. The MCE on this fault has a moment magnitude of 6.7 and an estimated site PGA of 0.34g to 0.36g.

HYDROGEOLOGY

16. The facility lies within the Pittsburg Plain Groundwater Basin, which is bounded by the hills south of the facility, the Sacramento-San Joaquin River Delta on the north, Bay Point to the west, and the City of Antioch to the east. The basin is filled with unconsolidated fluvial and alluvial sediments deposited in the Sacramento-San Joaquin River delta and in alluvial fans formed by streams draining from the hills south of the facility. Groundwater at the facility is first encountered at depths between 2 to 13 feet below ground surface (bgs).

17. The sediment that comprises the shallow subsurface beneath the site consists of a low-permeability silty clay in the upper 40 feet (designated as the water-table interval). This silty clay unit is underlain by a saturated sand unit that extends from approximately 40 to 135 feet bgs. In the northern portion of the site, a layer of low permeability material consisting mostly of clay is also present between approximately 85 to 110 feet bgs. This lower clay layer extends southward from the northern

boundary of the facility (New York Slough) and pinches out approximately 200 feet south of 2nd Street. Where present, the lower clay layer divides the saturated sand unit into two intervals designated as the mid-depth interval (40-85 feet bgs) and the deep interval (110-135 feet bgs). As the lower clay layer thickens towards the northern boundary of the facility (toward the Slough), the mid-depth interval of the saturated sand unit generally becomes thinner and finer grained and pinches out in various locations near the Slough bank. Regionally, a clay layer exists below the deep interval of the saturated sand unit from approximately 130 to as much as 800 feet bgs.

GROUNDWATER CONTAMINATION

18. VOCs and SVOCs have been detected at elevated concentrations in groundwater at various locations beneath the facility in the interior of the site and near the perimeter adjacent to New York Slough and Bundesen Bay. Organic contaminants present in groundwater beneath the site include:

- tetrachloroethene (PCE)
- trichloroethene (TCE)
- 1,2-dichlorethene (1,2-DCE)
- 1,1-dichloroethene (1,1-DCE)
- 1,2-dichloroethane (1,2-DCA)
- 1,1-dichloroethane (1,1-DCA)
- vinyl chloride
- carbon tetrachloride (CCL4)
- chloroform
- methylene chloride
- chloromethane
- 1,2-dichloropropane
- hexachlorobenzene
- hexachloroethane
- pentachlorophenol

- benzene
- toluene

Table 1 summarizes the current (2018) concentrations of the most prominent and most commonly detected VOCs in groundwater in each transmissive zone in the interior of the site and near the perimeter.

Table 1: Current (2018) Maximum Concentrations (μg/l) of Principal VOCs in Monitoring Wells in Each Transmissive Groundwater Zone

Contaminant	Mid-Depth Zone	Deep Zone
PCE	36,000	40,000
TCE	36,000	47,000
cis 1,2-DCE	17,000	14,000
1,1-DCE	160	130
1,1-DCA	220	820
Vinyl Chloride	2,500	3,800
Carbon Tetrachloride	75,000	37,000
Chloroform	62,000	64,000
Methylene Chloride	6,900	650

19. This organic groundwater contamination resulted from historic spills and leaks to the ground that occurred throughout the facility during Dow's operations. These releases are not associated directly with the SWMUs regulated under WDR Order No. R2-2018-0006 and are therefore not regulated under the WDR Order.

20. Mercury and methyl mercury are present in groundwater in the northern portion of the site in an area known as the Former Outfall Pond (FOP). The mercury was sourced from Dow's former chlor-alkali plant, which is located at the southwestern corner of the FOP. The FOP is a SWMU that was formally closed in 2000 in compliance with WDR Order No. 98-059.

In December 2012, the Regional Water Board approved a corrective action plan to reduce the potential for mercury migration in groundwater beneath the capped area west of the FOP. The remedy consisted of planting trees to uptake and transpire shallow groundwater to control groundwater gradients. It was implemented in 2014 and is being evaluated annually as required by the WDR Order No. R2-2018-0006. Because the mercury contamination is sourced from a SWMU, it is not regulated under this SCR Order.

SURFACE WATER IMPACTS

21. VOCs were detected in surface water grab samples collected at three locations in Bundesen Bay during sampling events conducted in 1988 and 1997. Additionally, grab samples collected from a groundwater seep entering the southwestern corner of Bundesen Bay contained significant VOC concentrations. The discharge of VOC-contaminated groundwater beneath the Dow facility into Bundesen Bay is the source of VOC impacts to surface water in Bundesen Bay.

22. From 2005 to 2013, Dow operated a groundwater extraction system as an interim corrective action to control the groundwater seeps to Bundesen Bay. In September 2013, Water Board staff concurred with a proposal to treat groundwater in-situ using emulsified zero valent iron (EZVI). In May through June 2014, EZVI was injected into the subsurface adjacent to Bundesen Bay. The EZVI injections created a groundwater treatment zone between the Block 600 Tank Farm and Bundesen Bay. All extraction wells associated with the interim corrective action were abandoned in January 2017. Surface water sampling, conducted quarterly, indicates that VOC detections in surface water have decreased to concentrations that are consistently below reporting limits and/or screening levels based on Tier 2 standards or ESLs. Table 2 compares current concentrations of CVOCs against historic values in Bundesen Bay.

Table 2: Comparison of 2018 vs 2000 CVOC Concentrations (μg/l) in Surface Water Sampling Locations in Bundesen Bay

Constituent	SW Corner 2000	SW Corner 2018	SE Corner 2000	SE Corner 2018	Mouth 2000	Mouth 2018	Tier 2 Screening Level
Carbon Tetrachloride	350	0.8	9.6	0.3 J	13	0.2 J	9.8
Chloroform	1400	3.1	31	3	34	2.9	620
Methylene Chloride	480	0.4 J	17	0.4 J	13	0.4 J	2,200

Constituent	SW Corner 2000	SW Corner 2018	SE Corner 2000	SE Corner 2018	Mouth 2000	Mouth 2018	Tier 2 Screening Level
Tetrachloroethene	600	6.9	16	4.6	17	4.4	120
Trichloroethene	210	6.7	4.1	6.4	3.8	6.5	360
Cis-1,2-Dichloroethene	70	5.5	1.6	5.9	1.5	5.8	590
Vinyl Chloride	<50	2	ND	2	ND	2.1	780

CORRECTIVE ACTIONS

23. Studies conducted in 1998 and 1999 indicated that contaminants in groundwater were being significantly degraded by naturally occurring biological activity in the subsurface. The studies further demonstrated that the rate of contaminant degradation could be accelerated by increasing the supply of nutrients to the microbial populations. In response to these observations, Dow submitted a plan in July 1999 proposing the implementation of full-scale EISB as the best alternative for satisfying the objectives of WDR Order No. 98-059.

24. In March 2000, Dow began operation of a prototype EISB system in conjunction with interim groundwater extraction, as proposed in their July 1999 revised corrective action plan. In concept, the EISB system breaks down chlorinated organic contaminants (VOCs and SVOCs) by accelerating the naturally occurring biodegradation of organics through injection of liquid amendments (i.e., carbon donor) into the mid-depth and deep aquifer intervals beneath the site that promote reducing geochemical conditions and stimulate the metabolic rates of intrinsic bacterial communities.

25. The EISB system originally consisted of 39 biocirculation wells that were aligned and spaced in a manner (approximate 100-foot centers) to create three distinct geographic zones of bioremediation that will intercept and treat organic contaminants migrating in groundwater. These three zones are designated as the western, northern, and central bioremediation treatment zones (Figure 2 of the SMP). Dow has operated the EISB system continuously since March 2000, although the number of biocirculation wells has been reduced over time from 39 to 28 in 2019.

26. The biocirculation wells are typically 130 feet deep and have two screened intervals separated by a blank casing section. The typical well design consists of a 30-foot long upper screen interval and a 20-foot long lower screen interval separated by a 35 to 50-

foot well seal. The upper well-screen straddles the mid-depth interval and is located from about 25 to 55 feet bgs. The lower well-screen interval is set near the bottom of the deep interval from about 110 to 130 feet bgs.

27. The number, pattern, and pumping rates of wells are modified as necessary to optimize circulation of amendments and enhancement of the bioreactive zones. In May 2014, Regional Water Board staff approved the closure of 10 of the EISB wells after they were found to have COVC concentrations that were consistently below cleanup standards.

28. To improve the efficiency of the EISB system and reduce methane generation, iron sulfide precipitation, and biofouling of the wells, the amount of amendment added to the EISB wells was reduced in 2014-2015. In the summer of 2014, EZVI was injected into the shallow groundwater in the area adjacent to Bundesen Bay to promote reductive dechlorination of organic chemicals in the target area and enhance the naturally occurring biodegradation processes.

29. In August 2015 Dow modified the EISB system in the western and northern bioremediation zones by converting eight biocirculation wells to semi-passive operation in the western zone and shutting down four biocirculation wells in the northern zone that are located immediately upgradient of the 2014 EZVI injections near Bundesen Bay. The eight western-zone biocirculation wells were operated in a semi-passive mode for one year from August 2015 to August 2016. During that time, the monitoring frequency of the effluent and downgradient wells was increased to quarterly in this area.

EVALUATION OF EISB EFFECTIVENESS

30. Evaluation of the effectiveness of the EISB has been conducted and reported routinely in the groundwater monitoring data submitted pursuant to the 2002 SCRs. During startup, the EISB system was monitored using 27 monitoring wells sampled on a quarterly basis. Seventeen of the monitoring wells were screened in the mid-depth interval and 10 were screened in the deep interval. Dow subsequently installed several additional monitoring wells, located closer to and better aligned with the EISB circulation wells in both the mid-depth and deep intervals. Sampling for monitoring and operational purposes is also performed at the EISB system circulation wells.

31. In addition to measuring the concentrations of parent (PCE and carbon tetrachloride) and daughter (TCE, cis-1,2-DCE, vinyl chloride, chloroform, and methylene chloride) contaminants, the following analytical parameters were historically measured quarterly as indicators of biological activity:

    a. Electron donors

b. Electron acceptors

c. Dissolved hydrogen

d. Dissolved gases

e. Microbiological activity

Adjustments to the monitoring program have been performed as necessary as the EISB system has been optimized and site conditions have changed. These changes have been documented in the annual SCR reports. The system has operated for 18 years and formal effectiveness evaluations have been conducted every three years.

32. Since 2002, the effectiveness of the EISB system has been routinely evaluated by collecting and analyzing groundwater samples from monitoring wells placed upgradient and downgradient of the EISB areas. The most recent Effectiveness Evaluation Report (EER) was submitted to the RWQCB in March 2018 (Toxicological and Environmental Associates, Inc. [TEA] 2018). The monitoring well network used to evaluate EISB Effectiveness consisted of several groups of wells:

- Effluent Monitoring wells – Located along the immediate downgradient perimeter of the EISB
- Influent Monitoring wells – Located along the immediate upgradient perimeter of the EISB
- Downgradient wells – Located between the effluent monitoring wells and the northern site boundary (New York Slough)
- Site Perimeter wells – Located along the site's northern and northwestern boundaries furthest from the EISB and closest to potential off-site receptors.

33. Since the startup of the EISB, there has been a significant decline of the total CVOC concentrations detected in most of the downgradient and perimeter wells over time, as shown in Table 3.

Table 3: Concentrations Over Time in Downgradient and Perimeter Wells

Well	Total CVOC Concentrations[a] February 2000[b] (μg/l)	Total CVOC Concentrations[a] March 2017 (μg/l)
MW-201B1	9,366	2,409
MW-201C	2,117 (March 2001)	20.2
MW-422B	277,700	68.4
MW-422C	119,400	110.4
MW-423B	103,200	23,650
MW-423C	80,730	60.2
MW-424B	12,166	328.2
MW-424C	2,342	249.1
MW-425B	15,085 (June 2000)	124.3
MW-425C	2,091 (June 2000)	64
MW-804B	5,340 (May 2007)	37.8
MW-804C	78,827 (May 2007)	88,530
PZ-612C	45,110 (May 2007)	5,108 (April 2017)
MW-316B	8.85 (May 2007)	184.3
MW-202B1	<DLc	15

Well	Total CVOC Concentrations[a] February 2000[b] (μg/l)	Total CVOC Concentrations[a] March 2017 (μg/l)
MW-316C	7,765 (Feb. 2006)	3,063
MW-202C	3,580	5.5
MW-206B	9,500 (April 2002)	38,361
MW-206C	7 (April 2002)	1,087
MW-306B	<DL (May 2007)	13.7
MW-306C	<DL (May 2007)	18.1
MW-407C	105.4	3,925
TP-413C	23,455 (May 2001)	61

a Sum of the detected concentrations of Carbon Tetrachloride, Chloroform, Methylene Chloride, Tetrachloroethene, Trichloroethene, 1,2-DIchlororethene, and Vinyl Chloride

b Unless otherwise noted

c <DL = Below Detection Limit

34. A comparison of the upgradient versus the downgradient total CVOC concentrations across various transects of the EISB in the latest SMR (samples taken in May and October 2018), is shown in Table 4, which demonstrates effective bioremediation of CVOCs across the treatment zone of various portions of the EISB.

Table 4: Comparison of VOC Concentrations across the EISB (2018)

Upgradient to Downgradient Well	Total Upgradient CVOC Concentrations (μg/l) *	Total Downgradient CVOC Concentrations (μg/l)*
PZ-00B/C to MW-004C	514	1.4
MW-123B/C to MW-100C	5,735	1,034

Upgradient to Downgradient Well	Total Upgradient CVOC Concentrations (μg/l) *	Total Downgradient CVOC Concentrations (μg/l)*
MW-512 B/C to MW-502B/C	67,180	66.7
MW-513 B/C to MW-511 B/C	183,150	1,142
MW-635 B/C to MW-633B	776.8	0.7
MW-636 B/C to MW-603B	424	102
MW-637B to MW-629B	184,600	21.9
MW-638B to MW-631B	77,145	4.2

* Sum of the detected concentrations of Carbon Tetrachloride, Chloroform, Methylene Chloride, Tetrachloroethene, Trichloroethene, 1,2-DIchlororethene, and Vinyl Chloride

35. Dow also evaluates the EISB performance by comparing the total CVOC concentrations at 16 Point of Compliance (POC) wells over time. This comparison shows partial success, as shown in Table 5.

Table 5: CVOC concentrations over time in POC wells:

POC Well	Total CVOC Concentrations (μg/l) 2007*	Total CVOC Concentrations (μg/l) 2017*
PZ-005B	472	3,453
PZ-005C	112	44.6
MW-101B	405	1,374
MW-123B	7,225	5,967
MW-123C	3,746	2,742
MW-512B	298,700	61,220
MW-512C	275,140	4,494

POC Well	Total CVOC Concentrations (μg/l) 2007*	Total CVOC Concentrations (μg/l) 2017*
MW-513B	178,500	235,210
MW-513C	98,040	195,810
MW-623C	6.3	58.5
MW-635B	1,927	558
MW-635C	39,751	4,812
MW-636B	90.3	77.1
MW-636C	13,158	24.3
MW-637B	71,610	3,131
MW-638B	116,580	42,600

* Sum of the detected concentrations of Carbon Tetrachloride, Chloroform, Methylene Chloride, Tetrachloroethene, Trichloroethene, 1,2-DIchlororethene, and Vinyl Chloride

36. The above data indicate that the EISB system effectively degrades CVOCs in groundwater, as evidenced by degradation in individual wells over time, and across the transects between source area wells and downgradient/perimeter wells. Portions of the EISB system consistently show that concentrations have been reduced to levels below Tier 2 values. However, the data also show that there are persistent CVOC concentrations in some source areas that require further treatment.

Recent Corrective Actions in Eastern Area

37. Dow performed subsurface investigations in 2015 and 2016 in the Eastern Area (the portion of the site between “H” Street and Kirker Creek and comprises Blocks 740, 760, 840, and 860 (See Figure 3)) to identify the nature and extent of contaminants affecting groundwater sampling results in monitoring well MW-118. The results of these investigations indicated that a contaminant source area existed within Block 860 that was distinct from contaminants routinely monitored by the groundwater monitoring programs under the 2002 SCRs and WDRs. These 2015-2016 investigations identified higher VOC concentrations and residual source material in a localized area immediately upgradient of MW-118. VOCs of concern in the Eastern Area include PCE, TCE, cis-1,2-DCE, vinyl chloride, carbon tetrachloride, chloroform, and

methylene chloride.

38. A workplan to implement an in-situ remedial solution to stimulate in-situ bioremediation and chemical reduction processes for treatment of the residual contamination using source reduction injections was approved by the Regional Water Board in October 2017. The injections were conducted between November 20, 2017 and February 6, 2018. An in-situ chemical reduction (ISCR) mixture was injected to establish the Eastern Area bioremediation treatment zone. The injections cover a total vertical interval from 10 to 45 feet bgs across 60 locations. Analytical results collected to date indicate that some CVOC concentrations have decreased. Task 4 of this Order requires further investigation to evaluate the effectiveness of the injection activities of this area.

Monitoring Program Revisions

39. Significant modifications have been made to the site's Self-Monitoring Program (SMP) since the last SCR Order was issued in 2002. In 2016 Water Board staff concurred with a proposal to allow self-monitoring reports to be submitted on an annual (rather than semiannual) basis. This change was justified by a review of over 20 years of groundwater data and a demonstration that monitoring results did not change enough between semi-annual sampling events to justify semi-annual reporting. In 2017, Water Board staff concurred with a proposal to reduce the monitoring frequency of seven effluent monitoring wells, based on the observation that the concentrations in these wells were either decreasing, stable, non-detect, or consistently below the Tier 2 screening standards. Staff also concurred with Dow's proposal to eliminate analysis of several biogeochemical parameters that were used during the early stages of the EISB system to assess whether the EISB had the proper conditions favorable for degrading VOCs. These parameters were determined to no longer be needed to evaluate the EISB system. A revised SMP that reflects these changes is attached to this Order.

BASIN PLAN AND RESOLUTIONS

40. The Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) is the Regional Water Board's master water quality control planning document. It designates beneficial uses and water quality objectives for waters of the State, including surface waters and groundwater. It also includes programs of implementation to achieve water quality objectives. The Basin Plan was duly adopted by the Regional Water Board and approved by the State Water Resources Control Board (State Water Board), Office of Administrative Law, and U.S. EPA, where required.

41. State Water Board Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California," applies to this discharge. It requires the maintenance of high-quality water unless a lesser water quality is consistent with

maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial uses, and will not result in exceedance of applicable water quality objectives. This Order and its requirements are consistent with Resolution No. 68-16. It does not authorize any degradation of water quality and requires not only the continued cleanup of VOC contamination in groundwater, but also the periodic review of the effectiveness of the current cleanup remedy, as well as an evaluation of alternative or enhanced corrective actions to accelerate the cleanup of the groundwater.

42. State Water Board Resolution No. 92-49, "Policies and Procedures for Investigation and Cleanup and Abatement of Discharges under California Water Code (Water Code) Section 13304," applies to this discharge. It directs the Regional Water Boards to set cleanup levels equal to background water quality or the best water quality, which is reasonable, if background levels cannot be restored. Cleanup levels other than background must be consistent with the maximum benefit to the people of the State, not unreasonably affect present and anticipated beneficial uses of such water, and not result in exceedance of applicable water quality objectives. This order and its requirements are consistent with the provisions of Resolution No. 92-49, as amended.

43. The Basin Plan considers that all groundwaters to be suitable, or potentially suitable, for municipal or domestic water supply (MUN) and that, in making any exceptions, the Regional Water Board will consider the criteria referenced in Regional Water Board Resolution No. 89-39, “Sources of Drinking Water”, where:

    (a) The total dissolved solids exceed 3,000 mg/l (5,000 µS/cm, electrical conductivity), and it is not reasonably expected by the Regional Water Board that the groundwater could supply a public water system, or

    (b) There is contamination, either by natural processes or human activity (unrelated to the specific pollution incident), that cannot reasonably be treated for domestic use using best management practices or best economically achievable treatment practices, or

    (c) The water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day.

44. Basis for California Water Code Section 13304 Order: The Discharger has caused or permitted, causes or permits, or threatens to cause or permit waste to be discharged or deposited where it is or probably will be discharged into waters of the State and creates or threatens to create a condition of contamination or nuisance. Specifically, Dow caused or permitted waste to be discharged into waters of the State and caused a condition of contamination or nuisance through its historic spills and leaks of VOCs. Corteva is permitting waste to be discharges as the owner of the site on which there is

ongoing migration of waste.

BENEFICIAL USES

Groundwater

45. The Site resides within the boundaries of the Pittsburg Plain Groundwater Basin, as defined in the Basin Plan. The existing and potential beneficial uses identified for groundwater in this basin, according to the Basin Plan, include:

- Municipal and Domestic Supply (MUN)
- Industrial Process Supply (PROC)
- Industrial Service Supply (IND)
- Agricultural Supply (AGR)

46. Groundwater beneath the Dow site north of the Amtrak rail line in all three identified water bearing zones has TDS/electrical conductivity that is significantly higher than the 3,000 mg/l (5,000 µS/cm) levels considered as maximums for suitability for MUN. It is not reasonable to expect that the groundwater could supply a public water system because significant pumping of the aquifer is likely to result in saltwater intrusion that would further degrade water quality. There is evidence that past pumping of the aquifer in the early 1900s resulted in increased salinity. Therefore, the groundwater beneath the site meets the exception in Resolution No. 89-39.

Surface Water

47. The northern portion of the facility is bounded by New York Slough. New York Slough is located within the San Francisco Bay/Delta system between Suisun Bay to the west and the confluence of the Sacramento and San Joaquin Rivers to the east. The Contra Costa Water District maintains a drinking water intake at Mallard Slough four miles west of the Dow facility. The Mallard Slough intake is used to augment the main supply primarily during winter and spring months when the salinity is low. The existing and potential beneficial uses identified for surface water in New York Slough and contiguous water bodies such as Bundesen Bay, according to the Basin Plan, include:

- Ocean, Commercial, and Sport Fishing (COMM)
- Preservation of Rare and Endangered Species (RARE)

- Water Contact Recreation (REC1)
- Non-Water Contact Recreation (REC2)
- Fish Migration (MIGR)
- Fish Spawning (SPWN)
- Wildlife Habitat (WILD)
- Estuarine Habitat (EST)
- Marine Habitat (MAR)
- Navigation (NAV)
- Industrial Process Supply (PROC)
- Industrial Service Supply (IND)
- Groundwater Recharge (GWR)
- Agricultural Supply (AGR)
- Municipal and Domestic Supply (MUN)

CALIFORNIA ENVIRONMENTAL QUALITY ACT

48. This site has been subject to cleanup requirements under Regional Water Board Order Nos. R2-2002-0014, under which cleanup has been proceeding for many years. This Order does not change the nature of the cleanup activities at the site or approve any cleanup plan beyond those imposed by previous orders and does not have the potential for significant impacts on the environment. As such, the general rule that the California Environmental Quality Act (CEQA) only applies to projects that have the potential for causing a significant effect on the environment (the “common sense” exemption) applies, and no environmental document needs to be prepared in connection with the adoption of this Order. Cal. Code Regs., tit. 14, § 15061(b)(3).

SAFE DRINKING WATER POLICY

49. It is the policy of the State of California that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes. While there is no realistic potential for groundwater beneath the facility to be used for drinking water purposes, this order promotes the policy by requiring measures to prevent further groundwater contamination from the site’s

historic leaks and spills to soil and groundwater.

NOTIFICATION

50. The Regional Water Board has notified the Discharger and interested agencies and persons of its intent under California Water Code Section 13304 to prescribe site cleanup requirements for the discharge and has provided them with an opportunity to submit their written comments.

IT IS HEREBY ORDERED that Order No. R2-2002-0014 is rescinded except for enforcement purposes and, pursuant to Section 13304 of the California Water Code, that the Discharger, its agents, successors, and assigns, shall comply with the following:

A. PROHIBITIONS

1. The discharge of wastes or hazardous substances in a manner that will degrade water quality or adversely affect beneficial uses of waters of the State is prohibited.

2. Further significant migration of wastes or hazardous substances through subsurface transport to waters of the State is prohibited.

3. Activities associated with the investigation and cleanup of subsurface pollution that may cause significant adverse migration of wastes or hazardous substances are prohibited.

B. TASKS

1. Continued Implementation of July 1999 Corrective Action Plan: The Discharger shall continue to implement the EISB system, as proposed in their Revised Corrective Action Plan of July 1999, and as implemented starting in March 2000. The EISB system shall be operated in a manner that optimizes the treatment and bioremediation of VOC and SVOC contamination in site groundwater. The EISB system shall continue to operate as intended without interruption except for limited periods of maintenance and repair.

   The operation, configuration, and components of the EISB system may be revised over time to optimize its performance, with the approval of the Executive Officer. Effectiveness of the remedy is evaluated on the degree to which groundwater and surface water monitoring demonstrates adequate reduction of chemical contamination. Minor modifications to the EISB operations are permitted if the Water Board is notified concurrently and those modifications do not constrain the operation and effectiveness of the EISB. The Discharger shall operate the EISB system until the Executive Officer is satisfied that site cleanup standards have been met.

COMPLIANCE DATE: Upon adoption of this Order

2. EISB System Effectiveness Evaluation: Once every three years, The Discharger shall evaluate the performance of the EISB system based on groundwater and surface water chemical monitoring results in accordance with the SMP. The purpose of the evaluation is to (1) monitor changes in concentrations and estimated total mass of COCs in groundwater, (2) document changes in subsurface conditions and confirm they are favorable for in-situ degradation of contaminants (abiotic degradation, reductive dechlorination, etc.), (3) report on the nature and extent of contamination in the areas influenced by the EISB, (4) aid in evaluating compliance with Tier 2 cleanup standards for chemicals in groundwater treated by the EISB system at the perimeter wells, and (5) assess the performance of the EISB system monitoring program for achieving these goals. The evaluation shall include the components and information presented in the SMP.

   a. Extent of Groundwater Contamination

      The current extent of contaminants in groundwater shall be determined using the most recent data or other relevant collected in accordance with the updated Self-Monitoring Program (SMP).

   b. Mass Reduction and Plume Stability

      Present plume maps and corresponding analysis of plume behavior, using an appropriate method. Related contaminants, such as parent and daughter compounds, may be grouped to simplify and focus the evaluation. Summarize the evaluation methods, calculations, parameters, and performance indicators (such as statistical stability analysis, etc.). Graphically illustrate the rate of mass reduction observed at the site and discuss its implications on plume stability and treatment effectiveness.

   c. Evaluation of Appropriate and Reasonably Achievable Cleanup Standards

      Discuss the feasibility of achieving the Tier 2 values at the perimeter wells established by the Water Board for the site, considering EISB performance and treatment effectiveness.

      Using the total mass for each contaminant or group of contaminants, and the volume of contaminated groundwater associated with each, estimate the concentration of each contaminant or group of contaminants in groundwater corresponding to the extrapolated mass reductions. Summarize estimation methods, calculations, and parameters used. In one or more tables, summarize all methods and information associated with the above estimation process. Graphically illustrate the extrapolated rates of mass reduction. Discuss the

feasibility of achieving the estimated concentrations corresponding to the extrapolated mass reduction.

d. Assessment of the EISB System Monitoring Program

The Discharger shall evaluate EISB performance using the following general criteria: (1) Reduction in COCs in groundwater to Tier 2 levels downgradient of the EISB in effluent, downgradient and perimeter monitoring wells, and (2) Operational status of the EISB. The Evaluation Report shall discuss the ability of the current monitoring well network to confirm the establishment of active, contiguous, biologically active zones or abiotic conditions surrounding EISB circulation wells in each remediation zone.

If significant gaps exist, or if the current monitoring well network cannot confirm the establishment of biologically active zones, the Discharger shall propose improvements to the monitoring network, including the installation of additional wells as necessary. If the evaluation of the EISB system effectiveness demonstrates that biologically active or appropriate abiotic zones are not established, or that adequate contaminant destruction is not occurring, the Discharger shall propose additional measures to increase contaminant destruction, containment, or both.

COMPLIANCE DATE: March 1, 2021, then every three years thereafter

3. Evaluation of alternative or enhanced corrective actions: If it is determined that the EISB System is not going to achieve cleanup standards on a reasonable timeframe, the Discharger shall submit a proposal for analyzing alternative or enhanced corrective actions to accelerate the reduction of COCs in groundwater to Tier 2 levels.

COMPLIANCE DATE: Six months from adoption of this Order.

4. Further evaluation of Eastern Area Contamination: The Discharger shall submit a proposal for additional corrective actions, as needed, to achieve Tier 2 standards in groundwater at the Eastern Area.

COMPLIANCE DATE: Six months from adoption of this Order.

5. Self-Monitoring Program: The Discharger shall comply with the Self-Monitoring Program (SMP) attached to this Order and as may be amended by the Executive Officer. The SMP is incorporated herein by this reference as part of this Order. The attached SMP is designed to collect information necessary to perform the EISB effectiveness evaluations specified in Task B.2. The attached SMP is also designed to monitor the migration, stability, and degradation of VOC and SVOC impacts to all transmissive zones beneath the Facility. The attached SMP may be amended at the

discretion of the Executive Officer, as necessary, to improve evaluation of site conditions and discharges.

COMPLIANCE DATE: IMMEDIATE

PROVISIONS

1. Compliance: The Discharger shall comply immediately, or as prescribed by the time schedule contained herein, with all Prohibitions, Tasks, and Provisions of this Order. All required submittals must be acceptable to the Executive Officer. The Discharger must also comply with all conditions of this Order. Violations may result in enforcement actions, including Regional Water Board orders or court orders requiring corrective action or imposing civil monetary liability or in modification or revocation of this Order by the Regional Water Board.

2. Technical Reports: All technical reports submitted pursuant to this Order shall be prepared under the supervision of and signed under penalty of perjury by a California registered civil engineer or a California Professional Geologist.

3. Modifications to Self-Monitoring Program: At any time, the Discharger may file a written request (including supporting documentation) with the Executive Officer, proposing modifications to the attached SMP. If the proposed modifications are acceptable, the Executive Officer may issue a letter of approval that incorporates the proposed revisions into the SMP.

4. Delayed Compliance: If the Discharger is delayed, interrupted, or prevented from meeting one or more of the completion dates specified for the Tasks, the Discharger shall promptly notify the Executive Officer of the delay and reason for the delay, and the Regional Water Board may consider revisions to this Order.

5. Operation and Maintenance: The Discharger shall maintain in good working order and operate as efficiently as possible any facility or control system installed to achieve compliance with the requirements of this Order.

6. Availability: A copy of this Order shall be maintained by the Discharger and shall be made available by the Discharger to all employees or contractors performing work necessary to comply with the tasks set forth in this Order.

7. Change in Ownership: In the event of any change in control or ownership of the facility presently owned or controlled by the Discharger, the Discharger shall notify the succeeding owner or operator of the existence of this Order by letter, a copy of which shall be forwarded to the Regional Water Board upon a final change in control or ownership.

8. Stormwater: The Discharger shall comply with the provisions of its NPDES permit for the management, monitoring, and discharge of stormwater.

9. Reporting of Hazardous Substance Release: If any hazardous substance is discharged in or on any waters of the State or discharged or deposited where it probably will be discharged in or on any waters of the State, the Discharger shall:

   a. Report such discharge to the following:

      i. The Regional Water Board by calling (510) 622-2369 during regular office hours

         (Monday through Friday, 8 a.m. – 5 p.m.); and to

      ii. The California Office of Emergency Services at (800) 852-7550.

   b. A written report shall be filed with the Regional Water Board within five working days. The report shall describe:

      i. The nature of the waste or pollutant.

      ii. The estimated quantity involved.

      iii. The duration of the incident.

      iv. The cause of the release.

      v. The estimated size of the affected area, and nature of the effect.

      vi. The corrective actions taken or planned and a schedule of those measures.

      vii. The persons/agencies notified.

      This reporting is in addition to any reporting to the California Office of Emergency Services that is required pursuant to the Health and Safety Code.

10. Lab Qualifications: All samples shall be analyzed by State-certified laboratories or laboratories accepted by the Regional Water Board using approved U.S. EPA methods for the type of analysis to be performed. All laboratories shall maintain quality assurance / quality control (QA/QC) records for Regional Water Board review. This provision does not apply to analyses that can only reasonably be performed onsite (e.g., temperature).

11. Document Distribution: Copies of all correspondence, technical reports, and other

documents pertaining to compliance with this Order shall be provided to the following entities:

a. The Regional Water Board,

b. The California Department of Toxic Substances Control, and

c. Contra Costa Health Services, Hazardous Materials Program.

The Executive Officer may modify this distribution list as needed.

12. Submittal Revisions: Where the Discharger becomes aware that it failed to submit any relevant facts in a report or submitted incorrect information in any report to the Regional Water Board, it shall promptly submit such facts or information.

13. Severability: Provisions of this Order are severable. If any provisions of these SCRs are found to be invalid, the remainder of these SCRs shall not be affected.

14. Geotracker Requirements: The State Water Board has adopted regulations requiring electronic report and data-submittal to Geotracker. The text of the regulations can be found at the following URL:

http://www.waterboards.ca.gov/water_issues/programs/ust/electronic_submittal/index.shtml

Parties responsible for cleanup of pollution at sites overseen by the Regional Water Board's Land Disposal Programs are required to submit the following information electronically to Geotracker:

a. Groundwater analytical data;

b. Surveyed locations of monitoring wells;

c. Boring logs describing monitoring well construction; and

d. Portable data format (PDF) copies of all reports (the document in its entirety [signature pages, text, figures, tables, etc.] must be saved as a single PDF file).

Note that the Discharger is still responsible for submitting one hard copy of all reports pursuant to this Order. The Regional Water Board may require direct submittal of electronic reports and correspondence in addition to the State Water Board's Geotracker requirements.

15. Entry and Inspection: The Discharger shall allow the Regional Water Board, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

a. Enter upon the Discharger's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this Order;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Order;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Order; and

d. Sample or monitor at reasonable times, for the purposes of assuring compliance with this Order or as otherwise authorized by the CWC, any substances or parameters at any location.

16. Maintenance of Records: The Discharger shall retain records of all monitoring information including all calibration and maintenance records, all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this Order, and records of all data used to complete the application for this Order. Records shall be maintained for a minimum of five years from the date of the sample, measurement, report, or application. This period may be extended during the course of any unresolved litigation regarding this discharge or when requested by the Executive Officer. Records of monitoring information shall include:

a. The date, exact place, and time of sampling or measurements;

b. The individuals who performed the sampling or measurements;

c. The date(s) analyses were performed;

d. The individuals who performed the analyses;

e. The analytical techniques or method used; and

f. The results of such analyses.

17. Report Certification: All application reports or information to be submitted to the Executive Officer shall be signed and certified as follows:

a. For a corporation – by a principal executive officer or the level of vice president.

b. For a partnership or sole proprietorship – by a general partner or the proprietor, respectively.

c. For a municipality, State, federal, or other public agency – by either a principal executive officer or ranking elected official.

A duly authorized representative of a person designated in this provision may sign documents if all the following are met:

a. The authorization is made in writing by a person described in paragraph (a) of this provision;

b. The authorization specifies either an individual or position having responsibility for the overall operation of the regulated facility or activity; and

c. The written authorization is submitted to the Executive Officer.

Any person signing a document under this Provision shall make the following certification:

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

18. Cost Recovery: The Discharger (as applicable) shall be liable, pursuant to CWC section 13304 to the Regional Water Board for all reasonable costs actually incurred by the Regional Water Board to investigate unauthorized discharges of waste and to oversee cleanup of such waste, abatement of the effects thereof, or other remedial action, required by this Order. If the site addressed by this Order is enrolled in a State Water Board-managed reimbursement program, reimbursement shall be made pursuant to this Order and according to the procedures established in that program. Any disputes raised by the Discharger (as applicable) over reimbursement amounts or methods used in that program shall be consistent with the dispute resolution procedures for that program.

19. Periodic Order Review: The Regional Water Board will review this Order periodically and may revise it when necessary. The Discharger (as applicable) may request revisions and upon review the Executive Officer may recommend that the Regional Water Board revise these requirements.

I, Michael Montgomery, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on xxx, 2019.

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Michael Montgomery
Executive Officer

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FAILURE TO COMPLY WITH THE REQUIREMENTS OF THIS ORDER MAY SUBJECT YOU TO ENFORCEMENT ACTION, INCLUDING BUT NOT LIMITED TO: IMPOSITION OF ADMINISTRATIVE CIVIL LIABILITY UNDER WATER CODE SECTIONS 13268 OR 13350, OR REFERRAL TO THE ATTORNEY GENERAL FOR INJUNCTIVE RELIEF OR CIVIL OR CRIMINAL LIABILITY.

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Attachments: Figure 1 - Site Location Map

Figure 2 - Monitoring Well and EISB Locations

Self-Monitoring Program