

Proposed Groundwater Monitoring Program

Well Information			Current NW Natural Sampling Schedule			Proposed NW Natural Sampling Schedule	Rationale
Well ID	Site Location	Water-Bearing Zone	Integrated Monitoring ¹	Integrated Monitoring ¹ with TPH-Dx and TPH-Gx	Integrated Monitoring ¹ with TPH-Dx, TPH-Gx, EPH, and VPH	Integrated Monitoring ¹ with TPH-Dx and TPH-Gx	
Monitoring Wells							
MW-1-22	Gasco	Fill			3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-1-55	Gasco	Upper Alluvium		1Q and 3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-1-82	Gasco	Lower Alluvium		3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-2-32	Gasco	Fill			Quarterly	Quarterly	Assess groundwater quality in the Fill WBZ downgradient of the Koppers and LNG Basins.
MW-2-61	Gasco	Upper Alluvium		1Q and 3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-2-104	Gasco	Lower Alluvium		3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-3-26	Gasco	Fill			Quarterly	Quarterly	Assess groundwater quality in the Fill WBZ downgradient of the Koppers and LNG Basins.
MW-3-56	Gasco	Upper Alluvium			3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-4-35	Gasco	Fill			Quarterly	Quarterly	Assess groundwater quality in the Fill WBZ downgradient of the Koppers and LNG Basins.
MW-4-57	Gasco	Upper Alluvium			3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-4-101	Gasco	Lower Alluvium			3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-5-32	Gasco	Upper Alluvium			3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-5-100	Gasco	Upper Alluvium			3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-5-175	Gasco	Deep Lower Alluvium		3Q		3Q	Confirm that COCs are stable or decreasing in the Deep Lower Alluvium WBZ.
MW-7-60	Gasco	Upper Alluvium		3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-8-29	Gasco	Fill		3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-8-56	Gasco	Upper Alluvium		3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-9-29	Gasco	Fill/Alluvium		3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-10-61	Gasco	Upper Alluvium		3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-12-36	Gasco	Fill/Alluvium		3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-14-110	Gasco	Lower Alluvium		3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-15-50	Gasco	Upper Alluvium		3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-15-66	Gasco	Upper Alluvium		3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-16-65	Gasco	Upper Alluvium			3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-18-125	Gasco	Lower Alluvium			3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-18-180	Gasco	Deep Lower Alluvium		3Q		3Q	Confirm that COCs are stable or decreasing in the Deep Lower Alluvium WBZ.
MW-19-22	Gasco	Fill			3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-19-125	Gasco	Lower Alluvium			3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-19-180	Gasco	Deep Lower Alluvium		3Q		3Q	Confirm that COCs are stable or decreasing in the Deep Lower Alluvium WBZ.
MW-20-120	Gasco	Lower Alluvium			3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-21-12	Gasco	Fill			Quarterly	Quarterly	Assess groundwater quality in the Fill WBZ downgradient of the Koppers and LNG Basins.
MW-21-75	Gasco	Lower Alluvium			3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-21-115	Gasco	Lower Alluvium			3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-21-165	Gasco	Deep Lower Alluvium			3Q	3Q	Confirm that COCs are stable or decreasing in the Deep Lower Alluvium WBZ.
MW-21U	Gasco	Upper Alluvium			3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-22U	Gasco	Upper Alluvium		1Q and 3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-23-27	Gasco	Fill			Quarterly	Quarterly	Assess groundwater quality in the Fill WBZ downgradient of the Koppers and LNG Basins.
MW-23-123	Gasco	Lower Alluvium		3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.

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MW-23U	Gasco	Upper Alluvium		3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-28U	Gasco	Upper Alluvium			3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-31U	Gasco	Upper Alluvium	3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-34U	Gasco	Upper Alluvium	3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-39F	Gasco	Fill			1Q and 3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-40F	Gasco	Fill			1Q and 3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-41U	Gasco	Upper Alluvium		3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-42F	Siltronic	Fill			1Q and 3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
MW-46F	Gasco	Fill		Quarterly		Quarterly	Assess groundwater quality in the Fill WBZ downgradient of the Koppers and LNG Basins.
MW-47F	Gasco	Fill		Quarterly		Quarterly	Assess groundwater quality in the Fill WBZ downgradient of the Koppers and LNG Basins.
MW-48F	Gasco	Fill		Quarterly		Quarterly	Assess groundwater quality in the Fill WBZ downgradient of the Koppers and LNG Basins.
MW-49F	Gasco	Fill		Quarterly		Quarterly	Assess groundwater quality in the Fill WBZ downgradient of the Koppers and LNG Basins.
MW-50F	Gasco	Fill		Quarterly		Quarterly	Assess groundwater quality in the Fill WBZ downgradient of the Koppers and LNG Basins.
MW-51F	Gasco	Fill		Quarterly		Quarterly	Assess groundwater quality in the Fill WBZ downgradient of the Koppers and LNG Basins.
MW-52F	Gasco	Fill		Quarterly		Quarterly	Assess groundwater quality in the Fill WBZ downgradient of the Koppers and LNG Basins.
MW-53F	Gasco	Fill		Quarterly		Quarterly	Assess groundwater quality in the Fill WBZ downgradient of the Koppers and LNG Basins.
NWN-1-20	Siltronic	Fill		3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
NWN-2-20	Siltronic	Fill			1Q and 3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
NWN-3-17	Siltronic	Fill		1Q and 3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
NWN-7-30	Siltronic	Fill		1Q and 3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
NWN-9-31	Siltronic	Fill			1Q and 3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
NWN-11-24	Siltronic	Fill		1Q and 3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
NWN-13-23	Siltronic	Fill		1Q and 3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
NWN-13-73	Siltronic	Upper Alluvium		1Q and 3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
NWN-13-106	Siltronic	Lower Alluvium		1Q and 3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
WS-8-33	Siltronic	Fill			1Q and 3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
WS-8-59	Siltronic	Upper Alluvium		1Q and 3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
WS-9-34	Siltronic	Fill			1Q and 3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
WS-12-125	Siltronic	Lower Alluvium			1Q and 3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
WS-12-161	Siltronic	Deep Lower Alluvium		1Q and 3Q		1Q and 3Q	Confirm that COCs are stable or decreasing in the Deep Lower Alluvium WBZ.
WS-13-69	Siltronic	Upper Alluvium		3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
WS-13-105	Siltronic	Lower Alluvium		3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
WS-16-161	Siltronic	Deep Lower Alluvium		1Q and 3Q		1Q and 3Q	Confirm that COCs are stable or decreasing in the Deep Lower Alluvium WBZ.
WS-17-52	Siltronic	Upper Alluvium		3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
WS-17-94	Siltronic	Lower Alluvium		3Q			Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
WS-47-183	Siltronic	Deep Lower Alluvium			1Q and 3Q	1Q and 3Q	Confirm that COCs are stable or decreasing in the Deep Lower Alluvium WBZ.
OW-1F	Siltronic	Fill			1Q and 3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
OW-2F	Siltronic	Fill			1Q and 3Q		Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
OW-5F	Gasco	Fill	Quarterly			Quarterly	Assess groundwater quality in the Fill WBZ downgradient of the Koppers and LNG Basins.

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OW-7-17	Gasco	Fill	Quarterly			Quarterly	Assess groundwater quality in the Fill WBZ downgradient of the Koppers and LNG Basins.
OW-8-15	Gasco	Fill	Quarterly			Quarterly	Assess groundwater quality in the Fill WBZ downgradient of the Koppers and LNG Basins.
OW-9-25	Gasco	Fill	Quarterly			Quarterly	Assess groundwater quality in the Fill WBZ downgradient of the Koppers and LNG Basins.
OW-10F	Gasco	Fill	3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
Groundwater Extraction Wells							
PW-1Lb	Siltronic	Lower Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-1Uc	Siltronic	Upper Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-2L	Siltronic	Lower Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-2U	Siltronic	Upper Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-3-118	Gasco	Lower Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-3U	Gasco	Upper Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-4L	Gasco	Lower Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-4U	Gasco	Upper Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-5L	Gasco	Lower Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-5U	Gasco	Upper Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-6L	Gasco	Lower Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-6U	Gasco	Upper Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-7-93	Gasco	Lower Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-8-68	Gasco	Lower Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-8Ub	Gasco	Lower Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-9-92	Gasco	Lower Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-10Lb	Gasco	Lower Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-10U	Gasco	Upper Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-11U	Gasco	Upper Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-11Ub	Gasco	Upper Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-12U	Gasco	Upper Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-13U	Gasco	Upper Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-14U	Gasco	Upper Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-15U	Gasco	Upper Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PW-16U	Gasco	Upper Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.

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Piezometers							
PZ5-5	Gasco-River	Fill	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PZ5-20	Gasco-River	Upper Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PZ5-55	Gasco-River	Lower Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PZ5-85	Gasco-River	Lower Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PZ6-5	Gasco-River	Fill	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PZ6-50	Gasco-River	Upper Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PZ6-115	Gasco-River	Lower Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PZ6-150	Gasco-River	Deep Lower Alluvium	1Q and 3Q			1Q and 3Q	Confirm that COCs are stable or decreasing in the Deep Lower Alluvium WBZ.
PZ7-5	Gasco-River	Fill	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PZ7-50	Gasco-River	Upper Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PZ7-100	Gasco-River	Lower Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PZ7-150	Gasco-River	Deep Lower Alluvium	1Q and 3Q			1Q and 3Q	Confirm that COCs are stable or decreasing in the Deep Lower Alluvium WBZ.
PZ8-5	Gasco-River	Fill	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PZ8-50	Gasco-River	Upper Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PZ9-5	Siltronic-River	Fill	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PZ9-50	Siltronic-River	Lower Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PZ9-75	Siltronic-River	Lower Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PZ9-110	Siltronic-River	Lower Alluvium	1Q and 3Q				Already sampled to inform the FS; data collected after 2022 will not be used in the FS.
PZ9-150	Siltronic-River	Deep Lower Alluvium	1Q and 3Q			1Q and 3Q	Confirm that COCs are stable or decreasing in the Deep Lower Alluvium WBZ.

Notes:

1. Analyses at all locations include PAHs or SVOCs (EPA 8270-SIM), VOCs (EPA 8260B), total cyanide (EPA 335.4), free cyanide (ASTM D-4282-02), available cyanide (OIA-1677), and total metals (EPA 6000 Series).* In addition, field measurements will be collected including DO, pH, conductivity, turbidity, temperature, and ORP.

** : aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc.

1Q: first quarter

3Q: third quarter

ASTM: ASTM International

COC: contaminant of concern

DO: dissolved oxygen

EPA: U.S. Environmental Protection Agency

EPH: extractable petroleum hydrocarbon

FS: feasibility study

LNG: liquefied natural gas

ORP: oxidation reduction potential

PAH: polycyclic aromatic hydrocarbon

SVOC: semivolatile organic compound

TPH-Dx: total petroleum hydrocarbons, diesel-range

TPH-Gx: total petroleum hydrocarbons, gasoline-range

VOC: volatile organic compound

VPH: volatile petroleum hydrocarbon

WBZ: water-bearing zone



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Figure 1
Proposed Groundwater Monitoring Program
 NW Natural Gasco Site
 Gasco OU