**Table 7-1**
**Potential Hot Spots Evaluation**

| Media | RAO No. | Type of Potential Hot Spot | Acceptable Risk Levels | Hot Spot Thresholds | Potential Receptor Pathway | Depth Interval | Chemicals |
|---|---|---|---|---|---|---|---|
| Soil | 1b | Potential Highly Concentrated Hot Spot – Ecological[2] | Screening level values from the Gasco HERA and Siltronic RA Addendum | 10x acceptable risk level | Plants, invertebrates, mammals, and birds | Surface soil and MGP residuals in areas with ecological habitat (0 to 3.5 feet bgs) | Soil COCs from Gasco HERA[3] and Siltronic RA Addendum |
| | 1a | Potential Highly Concentrated Hot Spot – Human Health | Screening level values from the Gasco HERA and the Siltronic RA Addendum | 10x acceptable risk level (noncarcinogen RBC) 100x acceptable risk level (carcinogen RBC) | Occupational and construction direct contact | Surface soil and MGP residuals (0 to 3.5 feet bgs) | Soil COCs from Gasco HERA[3] and Siltronic RA Addendum |
| | 2a | | | | Construction and excavation direct contact | Subsurface soil and MGP residuals (0 to 12/20 feet bgs) | Soil COCs from Gasco HERA[3] and Siltronic RA Addendum |
| | 1a | Potential Highly Mobile Hot Spot | N/A | Leaching to groundwater pathway does not apply from hot spot perspective since MGP residuals are in direct contact with groundwater. Rather, potentially mobile hot spots will be identified based on the presence of DNAPL. | | | |
| | 2a | | | | | | |
| Seasonal Pond Surface Water | 3 | Potential Surface Water Hot Spot – Ecological | Screening level values from the Gasco HERA and Siltronic RA Addendum | > Acceptable risk level | Aquatic life | 0 feet to base of Fill WBZ | Surface water COCs from Gasco HERA[3] and Siltronic RA Addendum |
| Doane Creek Surface Water | 3 | The Doane Creek watershed extends well beyond the boundaries of the Gasco OU and is potentially affected by upstream, off-site sources. The evaluation of Doane Creek surface water quality and the determination of whether source control actions are needed to further control water quality are best addressed under the Doane Creek source control program. | | | | | |
| Seasonal Pond Substrate | 3 | Potential Highly Concentrated Hot Spot – Ecological | N/A | Already identified as potential highly concentrated hot spot via soil | Benthic community, mammals, birds, and fish | Surface soil and MGP residuals (0 to 3.5 feet bgs) | Seasonal pond substrate COCs from Gasco HERA[3] |
| Doane Creek Soil/Sediment | 3 | Potential Highly Concentration Hot Spot – Ecological | Screening level values from the Siltronic RA Addendum | 10x Acceptable risk level | Plants, invertebrates, mammals, and birds | Surface soil, sediment and MGP residuals in areas with ecological habitat (0 to 3.5 feet bgs) | Soil/sediment COCs from Siltronic RA Addendum |

**Table 7-1**
**Potential Hot Spots Evaluation**

| Media | RAO No. | Type of Potential Hot Spot | Acceptable Risk Levels | Hot Spot Thresholds | Potential Receptor Pathway | Depth Interval | Chemicals |
|---|---|---|---|---|---|---|---|
| Groundwater | 4a | Potential Groundwater Hot Spot – Fill WBZ to River – Human Health | Table 40: Human Health Water Quality Criteria for Toxic Pollutants Organism Only (DEQ April 2014) | > Acceptable risk level | Ingestion of organisms only | 0 feet to base of Fill WBZ | Groundwater COCs from Gasco HERA and Siltronic RA Addendum[3] for Fill WBZ groundwater |
| | 4b | Potential Groundwater Hot Spot – Fill WBZ – Ecological | Screening level values from Gasco HERA and Siltronic RA Addendum for aquatic-dependent wildlife | > Acceptable risk level | Willamette River aquatic life | 0 feet to base of Fill WBZ | Groundwater Aquatic Life COCs from Gasco HERA and Siltronic RA Addendum[3] for Fill WBZ groundwater |
| | | | Screening level values from Gasco HERA and Siltronic RA Addendum for aquatic-dependent wildlife | > Acceptable risk level | Mammals and birds | 0 feet to base of Fill WBZ | Aquatic dependent wildlife COCs from Gasco HERA and Siltronic RA Addendum[3] for Fill WBZ groundwater |
| | 5a | Potential Groundwater Hot Spot – Alluvium WBZ Upland - Human Health | Screening level values from the Siltronic RA Addendum | > Acceptable risk level | Occupational inhalation and dermal contact | Upper, Lower, Deep Lower Alluvium WBZ | Groundwater COCs from Gasco HERA and Siltronic RA Addendum[3] for Alluvium WBZ groundwater |
| | 5a | Potential Groundwater Hot Spot – Alluvium WBZ[1] to River – Human Health | Table 40: Human Health Water Quality Criteria for Toxic Pollutants Organism Only (DEQ April 2014) | > Acceptable risk level | Ingestion of organisms only | Upper, Lower, and Deep Lower Alluvium WBZ | Groundwater COCs from Gasco HERA and Siltronic RA Addendum[3] for Alluvium WBZ groundwater |
| | 5b | Potential Groundwater Hot Spot – Alluvium WBZ[1] to River – Ecological | Screening level values from Gasco HERA and Siltronic RA Addendum for aquatic dependent wildlife | > Acceptable risk level | Willamette River aquatic life | Upper, Lower, and Deep Lower Alluvium WBZ | Groundwater Aquatic Life COCs from Gasco HERA and Siltronic RA Addendum[3] for Alluvium WBZ groundwater |
| DNAPL (residual and mobile) | 6, 7 | Potential Highly Concentrated or Highly Mobile Hot Spot | Presence of DNAPL | Presence | N/A | 0 feet to base of Fill WBZ and Alluvium WBZ | DNAPL |

Notes:
1. Potential hot spot evaluation for the Alluvium WBZ includes the Upper, Lower, and Deep Lower Alluvium WBZs.
2. Includes seasonal pond substrate and Doane Creek soil.
3. Gasco HERA COCs include COCs listed in DEQ's May 22, 2015, letter for the media where unacceptable risks were identified.

bgs: below ground surface
COC: contaminant of concern
DEQ: Oregon Department of Environmental Quality
DNAPL: dense nonaqueous phase liquid
HERA: Human Health and Ecological Risk Assessment
MGP: manufactured gas plant
N/A: not applicable
RA: Risk Assessment
RAO: remedial action objective
RBC: risk-based concentration
RI/RA: Remedial Investigation/Risk Assessment
WBZ: water-bearing zone

**Table 9-1**
**Remedial Action Objectives**

| Medium | RAO No. | | Receptor/ Endpoint | RAOs to Prevent Exposures above RBCs | RAOs to Prevent Contaminant Migration | RAO to Mitigate Hot Spots | Estimated Time Frames (Years) to Achieve RAOs |
|---|---|---|---|---|---|---|---|
| Surface Soil | 1 | 1a | Human Health | Protect site occupational, construction, and excavation workers, and trespassers (Doane Creek) from unacceptable risk posed through ingestion and dermal contact, and protect site occupational and construction workers from unacceptable risks due to inhalation exposures (particulates, volatilization to outdoor air, vapor intrusion into buildings) associated with surface soil and MGP residuals (0 to 3.5 feet bgs) containing COCs at concentrations exceeding DEQ generic or site-specific risk-based concentrations. | Reduce migration of COCs in contaminated upland surface soil (including bank soil and MGP residuals within this depth interval) by erosion to the Willamette River and Doane Creek, and reduce leaching to the Fill WBZ, so that the risks are at acceptable levels to human health and ecological receptors from exposure to sediment and surface water and groundwater in the Fill WBZ (see RAO 4a,b). | Excavate or treat human health and ecological hot spots of contamination in surface soil by reducing their concentration, volume, toxicity, and mobility. | 2 to 5 |
| | | 1b | Ecological | Protect populations of ecological receptors from unacceptable risk posed through ingestion of, and dermal contact with surface soil and MGP residuals containing COCs at concentrations exceeding DEQ generic or site-specific risk-based concentrations. | -- | | |
| Subsurface Soil | 2 | 2a | Human Health | Protect site construction and excavation workers from unacceptable risk posed through ingestion, dermal contact, and inhalation exposure to subsurface soil and MGP residuals (0 to 12 feet bgs Gasco Site, 0 to 20 feet bgs northern Siltronic Site), and protect site occupational workers from unacceptable risk posed by inhalation of COCs from indoor/outdoor volatilization from subsurface soil containing COCs at concentrations exceeding DEQ generic or site-specific risk-based concentrations. | Reduce leaching of COCs from unsaturated subsurface soil and MGP residuals within this depth interval into the Fill WBZ and Alluvium WBZ, so that risks are at acceptable levels to human health and ecological receptors from exposure to groundwater in the Fill WBZ (see RAO 4a,b) and Alluvium WBZ (see RAO 5a,b) | Excavate or treat human health and ecological hot spots of contamination in subsurface soil by reducing their concentration, volume, toxicity, and mobility. | 5 to 15 |
| | | 2b | Ecological | -- | | | |
| Wetland Ponds and Doane Creek | 3 | 3a | Ecological | Protect populations of ecological receptors from: 1) unacceptable risk posed through ingestion of and contact with surface water, pore water, and soil/sediment, and 2) potential exposures via bioaccumulation from sediment to prey organisms containing COCs at concentrations exceeding DEQ generic or site-specific risk-based concentrations. | Prevent access to the wetland ponds area by ecological receptors, and eliminate potential migration of COCs from the wetland ponds to soil and groundwater. Reduce the migration of COCs from Gasco OU sediments and surface water to the Willamette River via Doane Creek, such that the risks are at acceptable levels to human health and ecological receptors. | Excavate or treat ecological hot spots of contamination in wetland ponds soil/sediment by reducing their concentration, volume, toxicity, and mobility. | 2 to 5 |
| Surficial Fill Groundwater | 4 | 4a | Human Health | Protect site occupational workers and trespassers from unacceptable risk posed through dermal contact and indoor/outdoor volatilization (LNG Tank Basin, Willamette River and Doane Creek bank seeps) and site construction/excavation workers from inhalation and dermal contact by exposure to MGP residuals and surficial fill groundwater containing COCs at concentrations exceeding DEQ generic or site-specific risk-based concentrations. | Reduce the migration of COCs in the surficial Fill WBZ to the Willamette River and Doane Creek, so that the risks are at acceptable levels to human health and ecological receptors from exposure to sediment and surface water. | Treat human health and ecological groundwater hot spots of contamination in the Fill WBZ by reducing their concentration, volume, toxicity, and mobility. | 2 to 5 |
| | | 4b | Ecological | Protect terrestrial ecological receptors from unacceptable risks associated with exposure to shallow groundwater seeps into the LNG Tank Basin and onto the Willamette River and Doane Creek bank containing COCs at concentrations exceeding risk-based concentrations. | | | |

**Table 9-1**
**Remedial Action Objectives**

| Medium | RAO No. | | Receptor/ Endpoint | RAOs to Prevent Exposures above RBCs | RAOs to Prevent Contaminant Migration | RAO to Mitigate Hot Spots | Estimated Time Frames (Years) to Achieve RAOs |
|---|---|---|---|---|---|---|---|
| Alluvial WBZ Groundwater | 5 | 5a | Human Health | Protect site occupational workers from unacceptable risk posed through inhalation and dermal exposure to Alluvium WBZ groundwater containing COCs at concentrations exceeding site-specific risk-based concentrations. | Reduce migration of COCs in the Alluvium WBZ to sediments and surface water in the Willamette River, so that the risks are at acceptable levels to human health and ecological receptors from exposure to sediment and surface water. | Treat human health and ecological hot spots of contamination in Alluvium WBZ groundwater by reducing their concentration, volume, toxicity, and mobility. | 20+ |
| | | 5b | Ecological | -- | | | |
| MGP Residuals (Non-Mobile) in Saturated Media | 6 | | Human Health and Ecological | -- | Prevent leaching of COCs from MGP residuals in saturated fill material and migration of groundwater within the Fill WBZ, from the Fill WBZ to the Alluvium WBZ and within the Alluvium WBZ, so that risks are at acceptable levels to human health and ecological receptors from exposure to groundwater in the Fill WBZ (see RAO 4a,b) and Alluvium WBZ (see RAO 5a,b) and sediment and surface water in the Willamette River and Doane Creek. | Excavate or treat human health and ecological hots spots of contamination associated with MGP residuals in the uplands by reducing their concentration, volume, toxicity, and mobility. | 20+ |
| DNAPL (Liquid Phase, Mobile) | 7 | | Human Health and Ecological | -- | Prevent migration of DNAPL beyond the top of the bank. Treat/reduce DNAPL migration in the uplands within the Fill WBZ, from the Fill WBZ to the Alluvium WBZ, and within the Alluvium WBZ. Reduce leaching of COCs from DNAPL and migration of COCs in groundwater within the Fill WBZ and Alluvium WBZ, so that the risks are at acceptable levels to human health and ecological receptors from exposure to groundwater in the Fill WBZ (see RAO 4a,b) and Alluvium WBZ (see RAO 5a,b) and sediment and surface water in the Willamette River and Doane Creek. | Excavate or treat hots spots of contamination associated with DNAPL in the uplands by reducing their concentration, volume, toxicity, and mobility. | 20+ |

Notes:
Achievement of RAO 4 and RAO 5 with respect to the Willamette River will rely on timely implementation of both the upland and in-water remedial actions.
--: not applicable
bgs: below ground surface
COC: contaminant of concern
DEQ: Oregon Department of Environmental Quality
DNAPL: dense non-aqueous phase liquids
LNG: liquefied natural gas
MGP: manufactured gas plant
OU: operable unit
RAO: remedial action objective
RCB: risk-based concentration
WBZ: water-bearing zone