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APPENDIX A: POST-COMBUSTION GRAPHICAL OUTPUT

1.1 Scenario 1: UL9540A Thermal Runaway (from UL9540A cell test data)

1.1.1 TVG Flammable Vapor Cloud Extent (36.51 min Release)

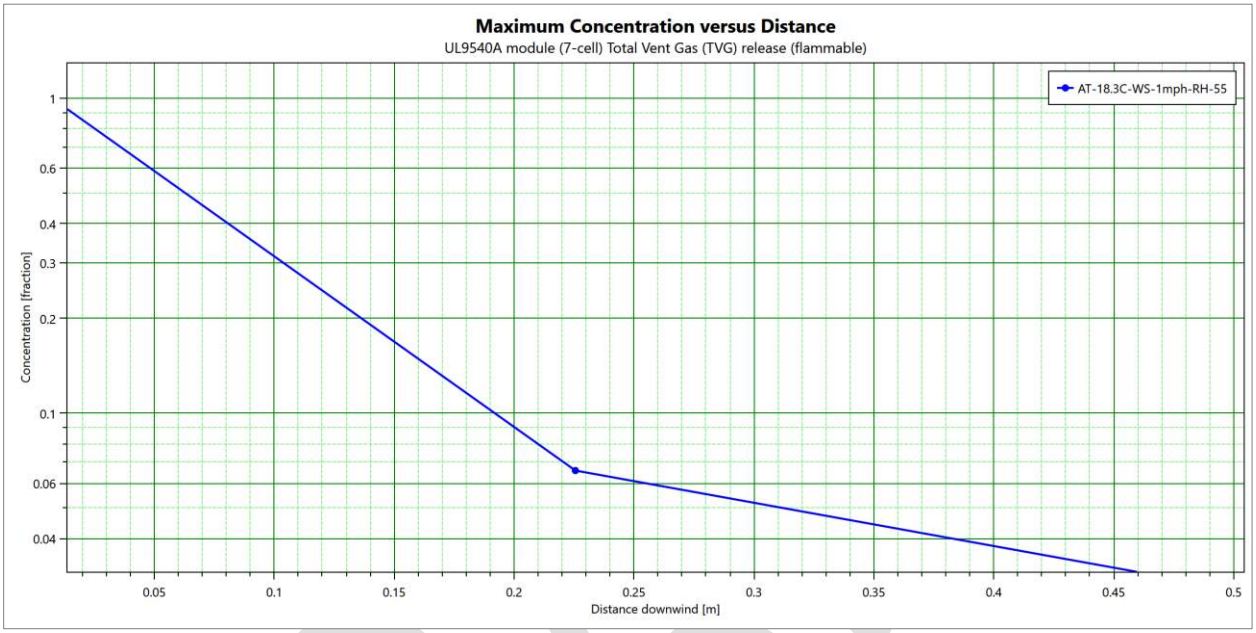

Figure 1 Maximum concentration vs distance for flammable vapor cloud

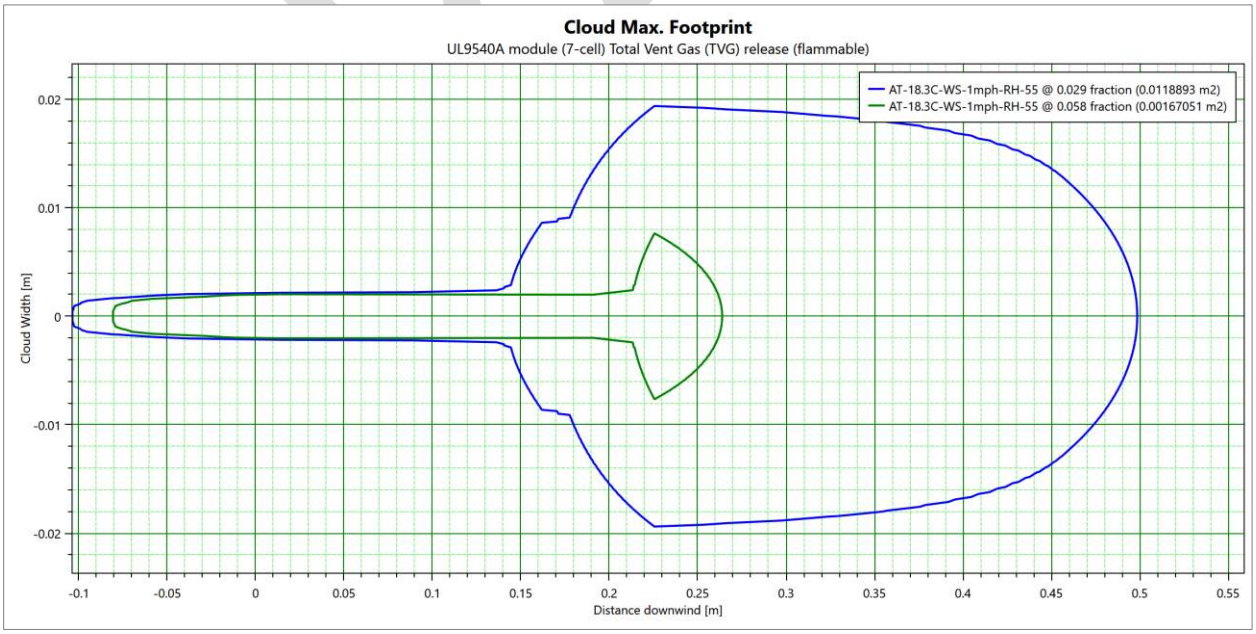

Figure 2 Maximum horizontal extent of vapor cloud for LFL (5.8%) and ½ LFL (2.9%)

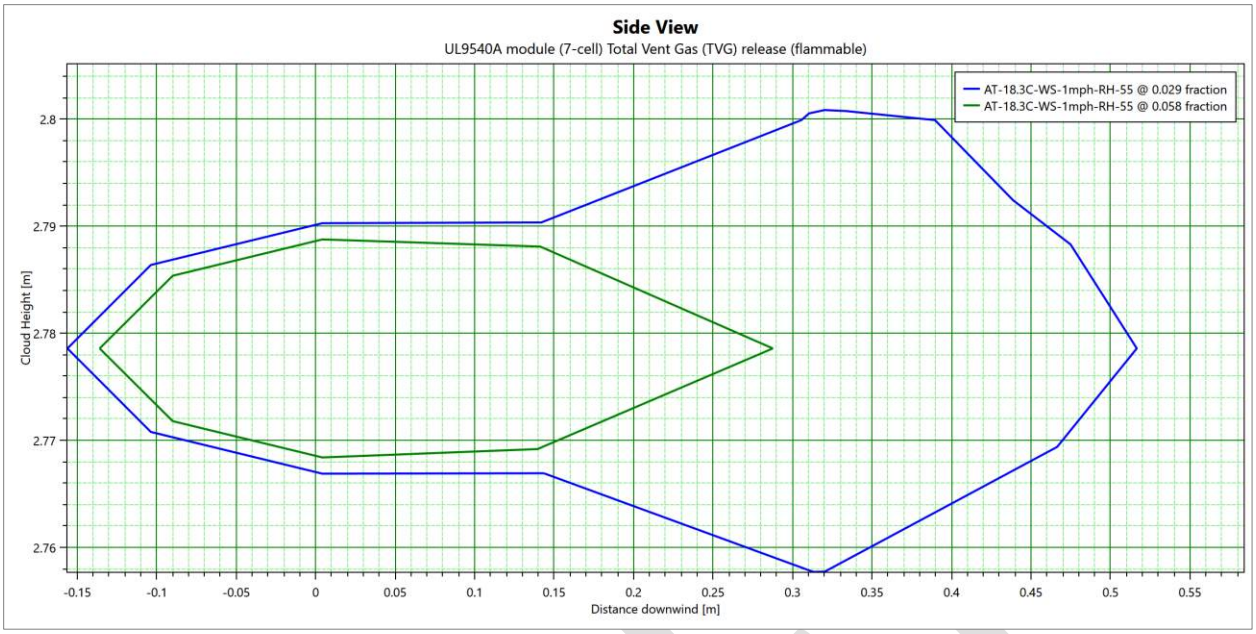

Figure 3 Maximum vertical extent of vapor cloud for LFL (5.8%) and ½ LFL (2.9%)

1.1.2 CO IDLH (1,200 ppm) Component Extent (36.51min Release)

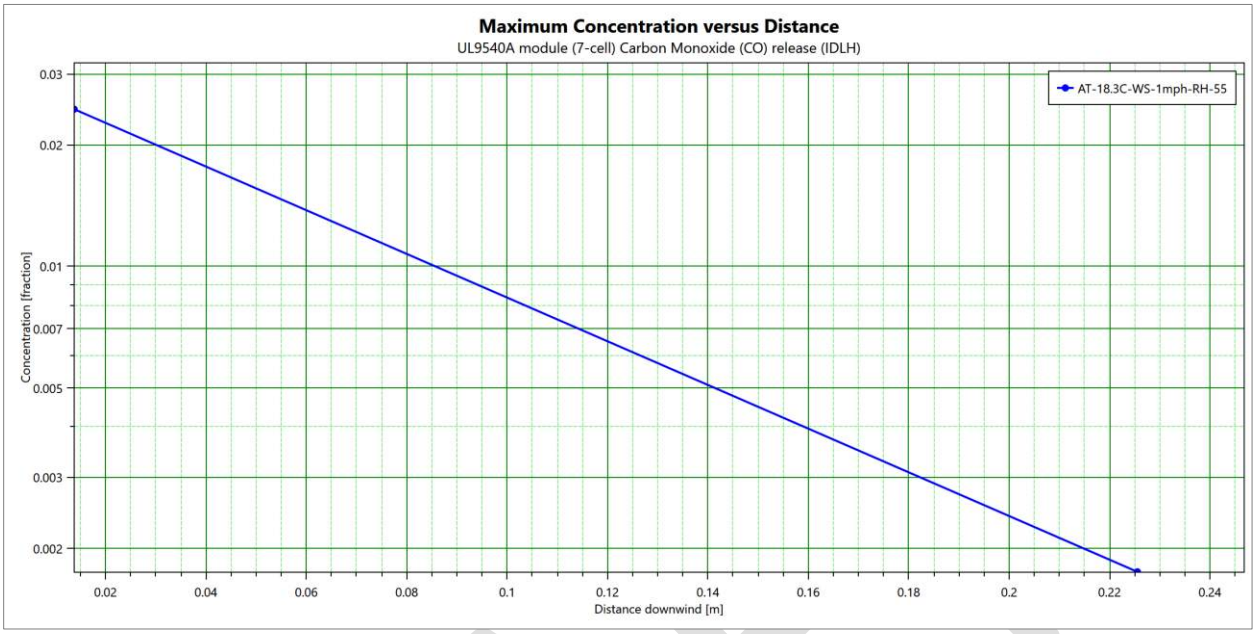

Figure 4 Maximum Concentration vs distance for CO gas component

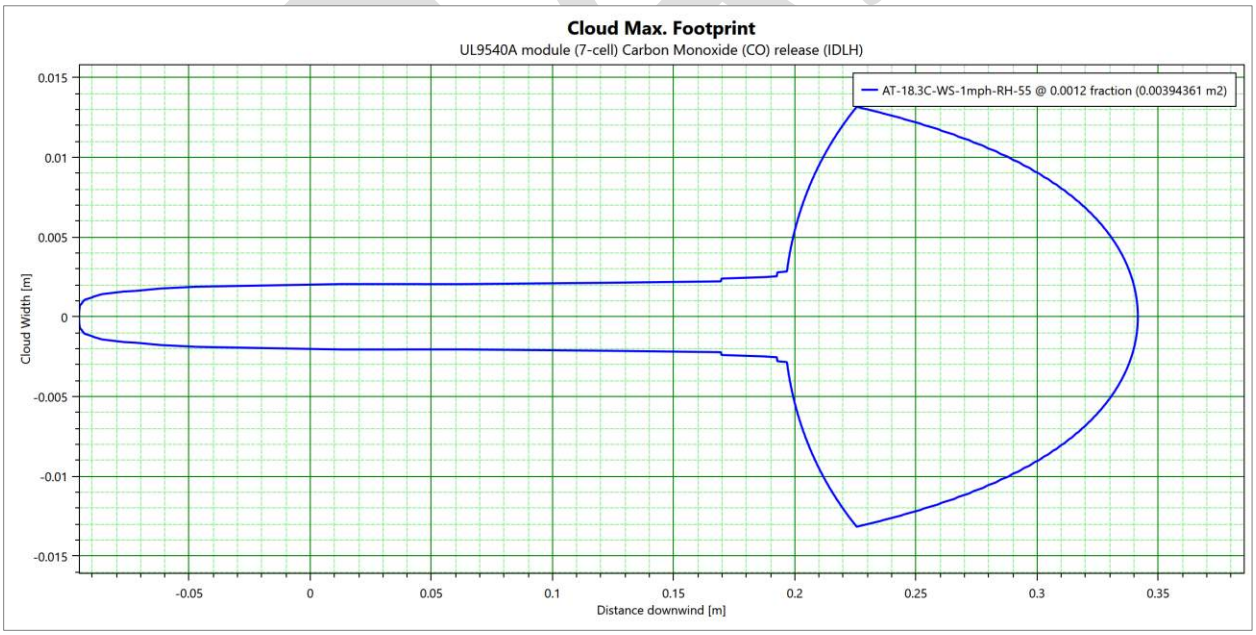

Figure 5 Maximum horizontal extent of vapor cloud for CO IDLH (1,200 ppm)

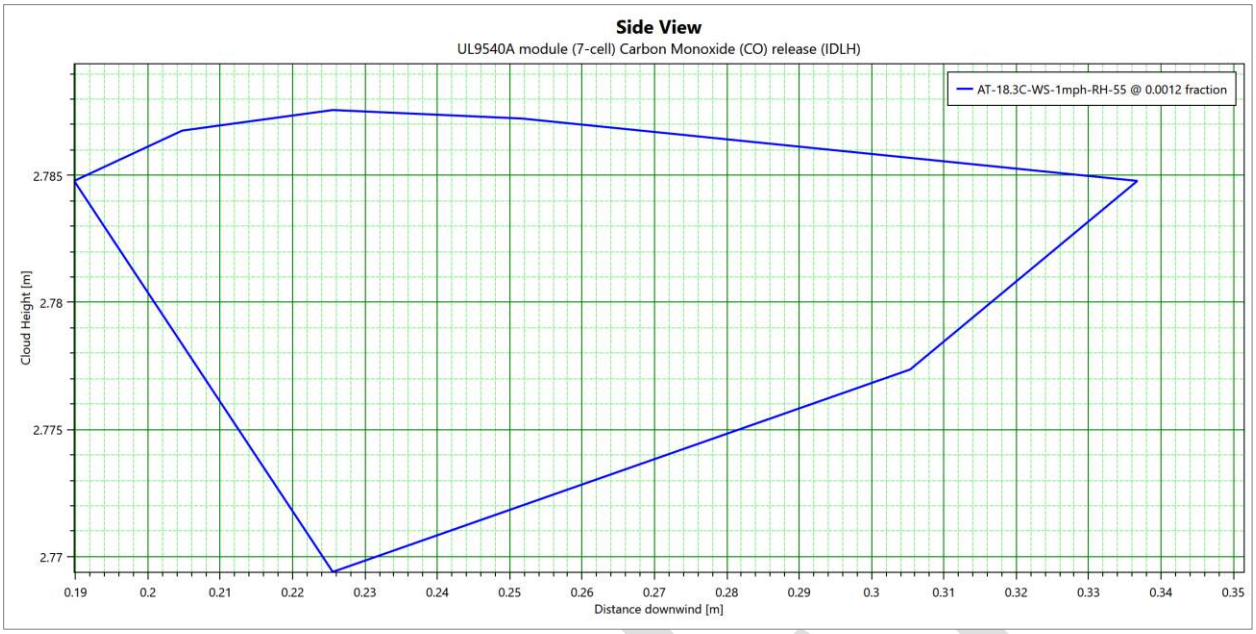

Figure 6 Maximum vertical extent of vapor cloud for CO IDLH (1,200 ppm)

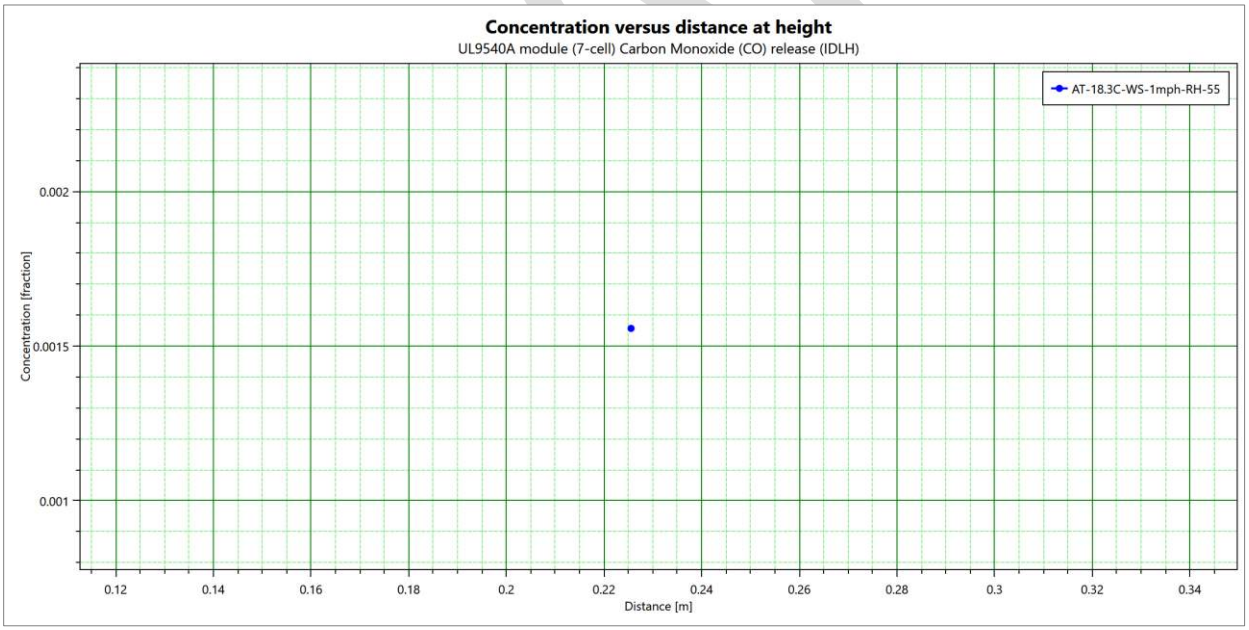

Figure 7 Concentration vs distance for CO IDLH (1,200 ppm)

1.1.3 CO2 IDLH (40,000 ppm) Component Extent (36.51min Release)

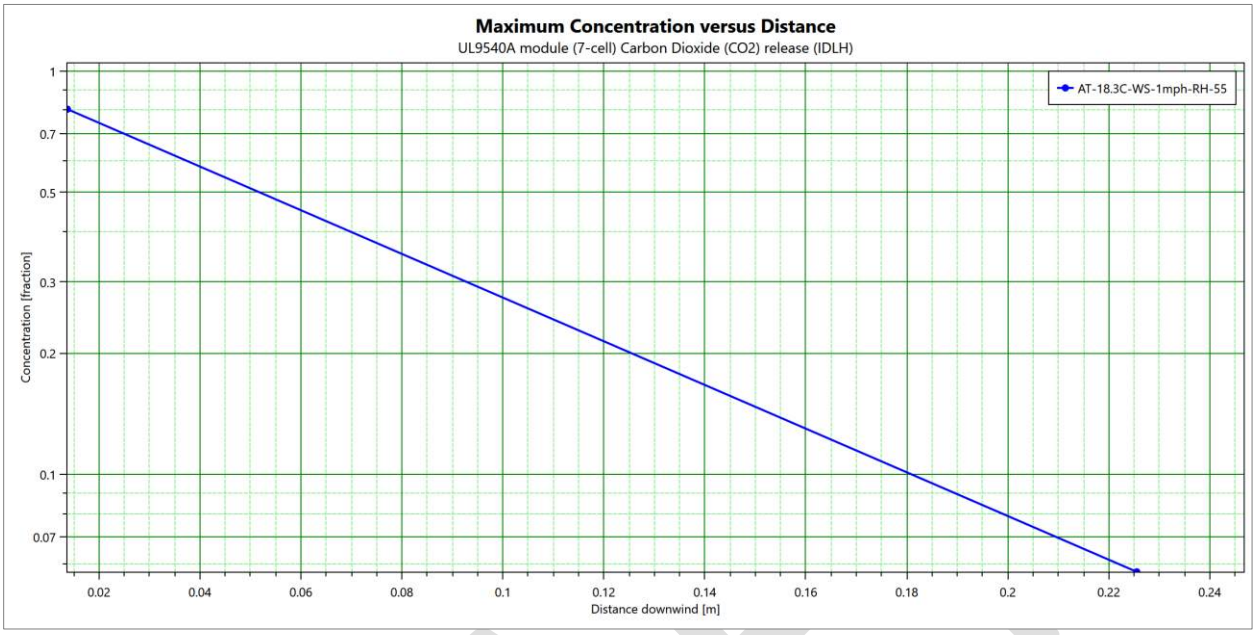

Figure 8 Maximum Concentration vs distance for CO2 gas component

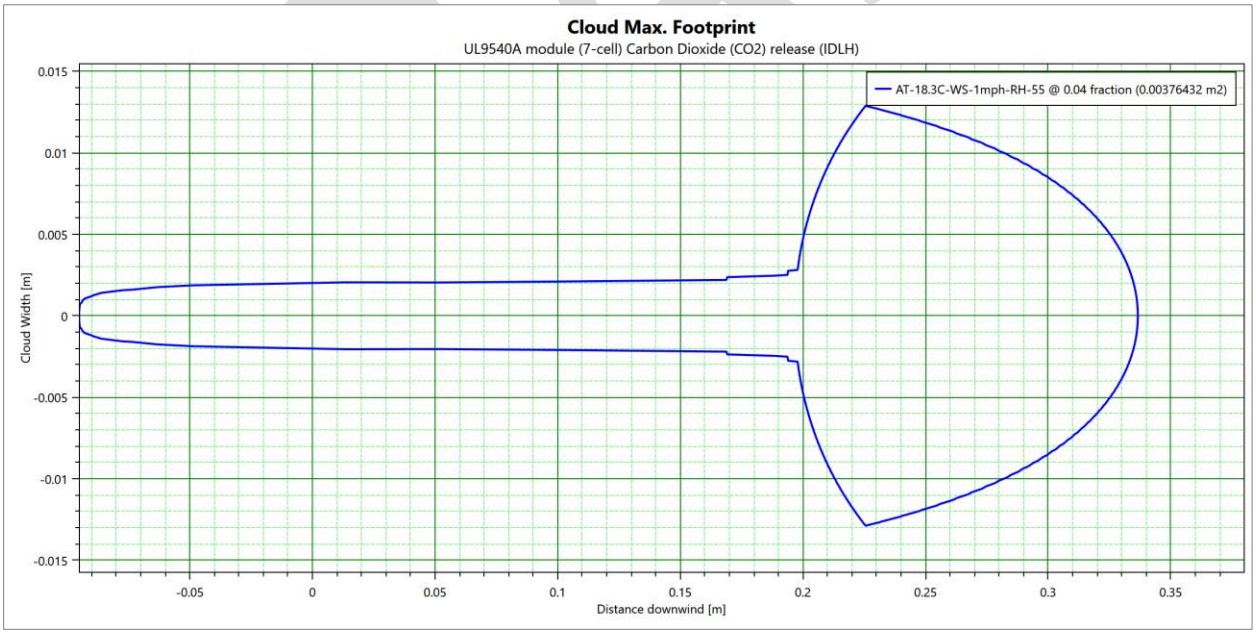

Figure 9 Maximum horizontal extent of vapor cloud for CO2 IDLH (40,000 ppm)

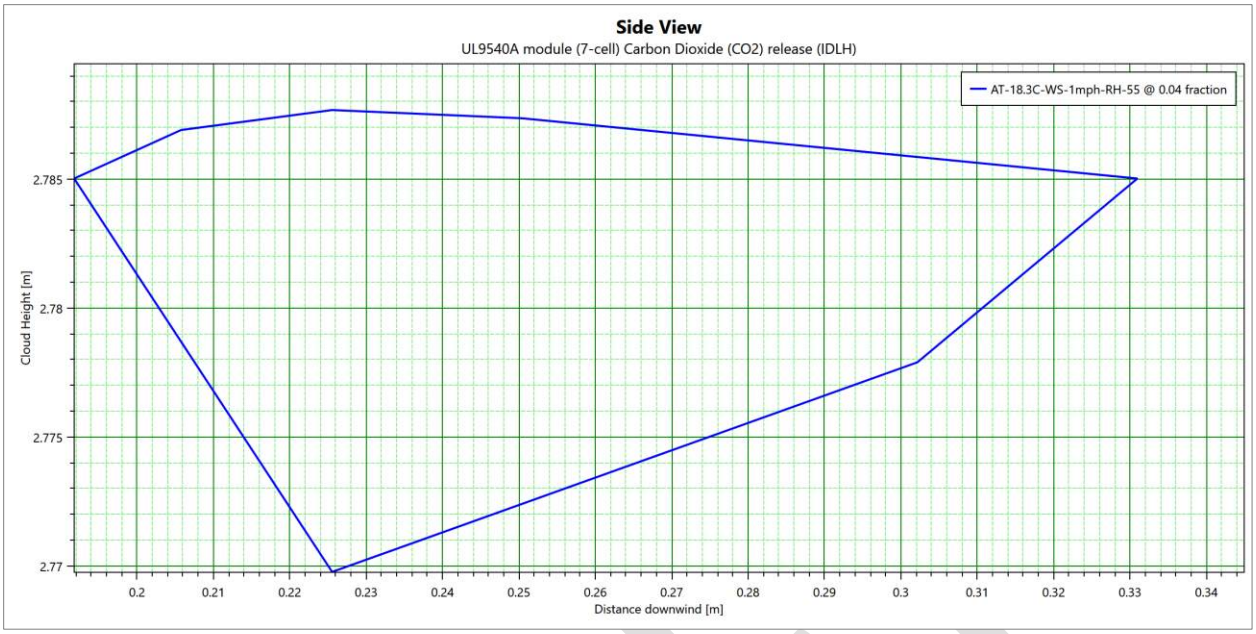

Figure 10 Maximum vertical extent of vapor cloud for CO2 IDLH (40,000 ppm)

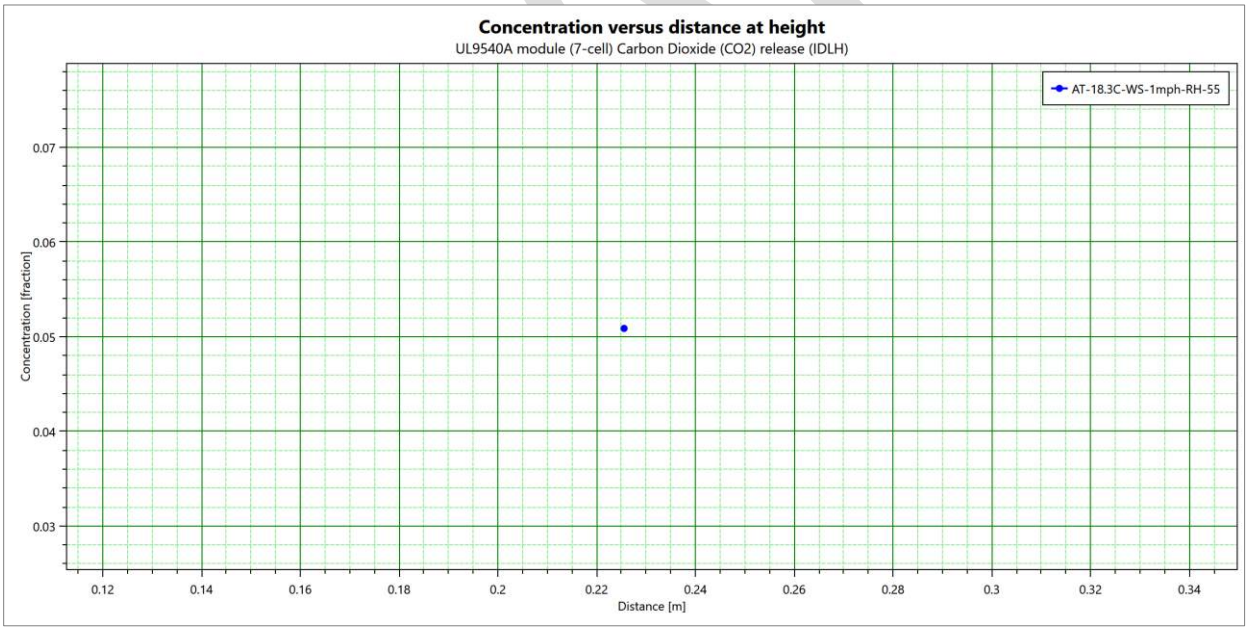

Figure 11 Concentration vs distance for CO2 IDLH (40,000 ppm)

1.1.4 TVG Flammable Vapor Cloud Extent (10 min Release)

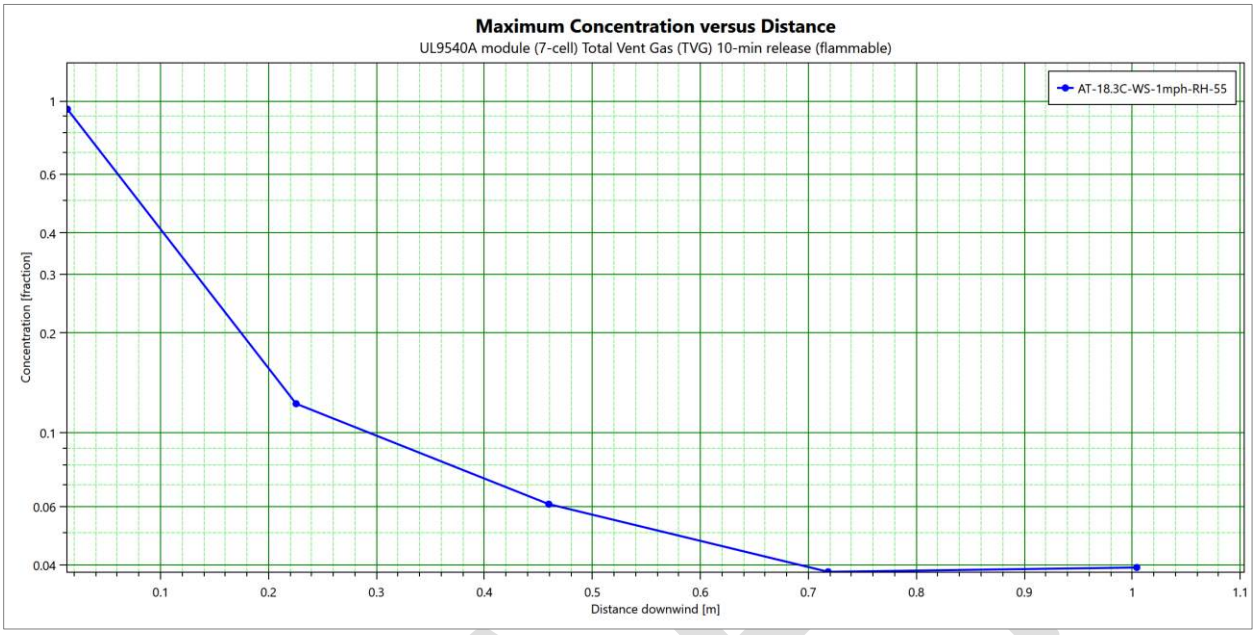

Figure 12 Maximum concentration vs distance for flammable vapor cloud

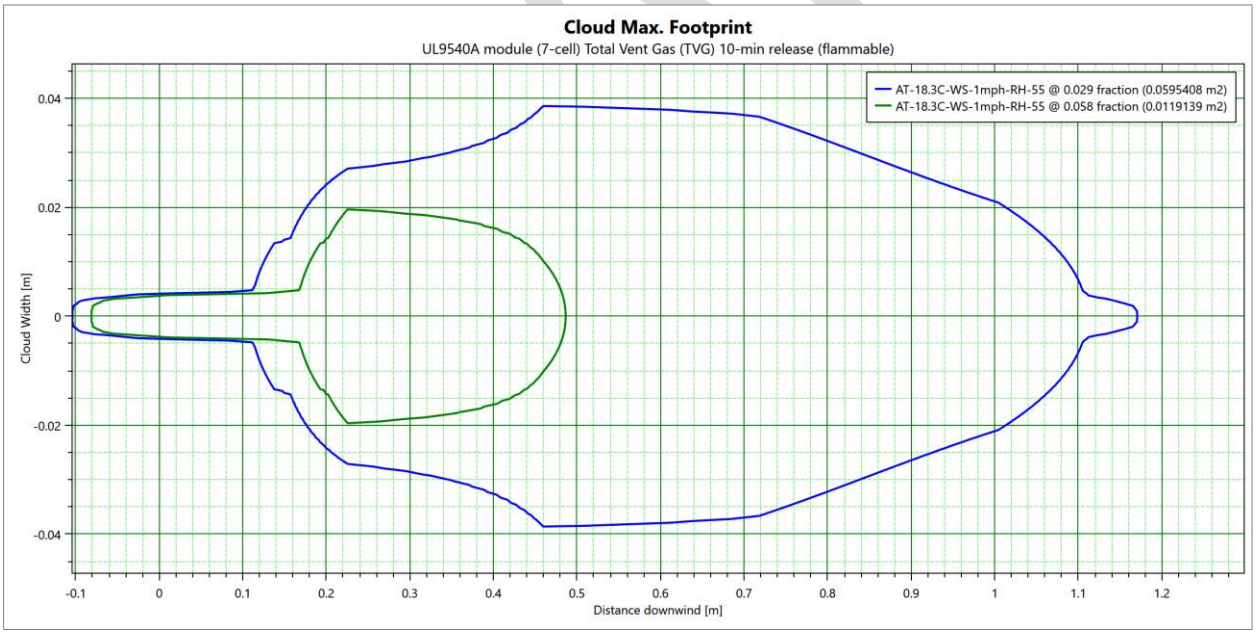

Figure 13 Maximum horizontal extent of vapor cloud for LFL (5.8%) and ½ LFL (2.9%)

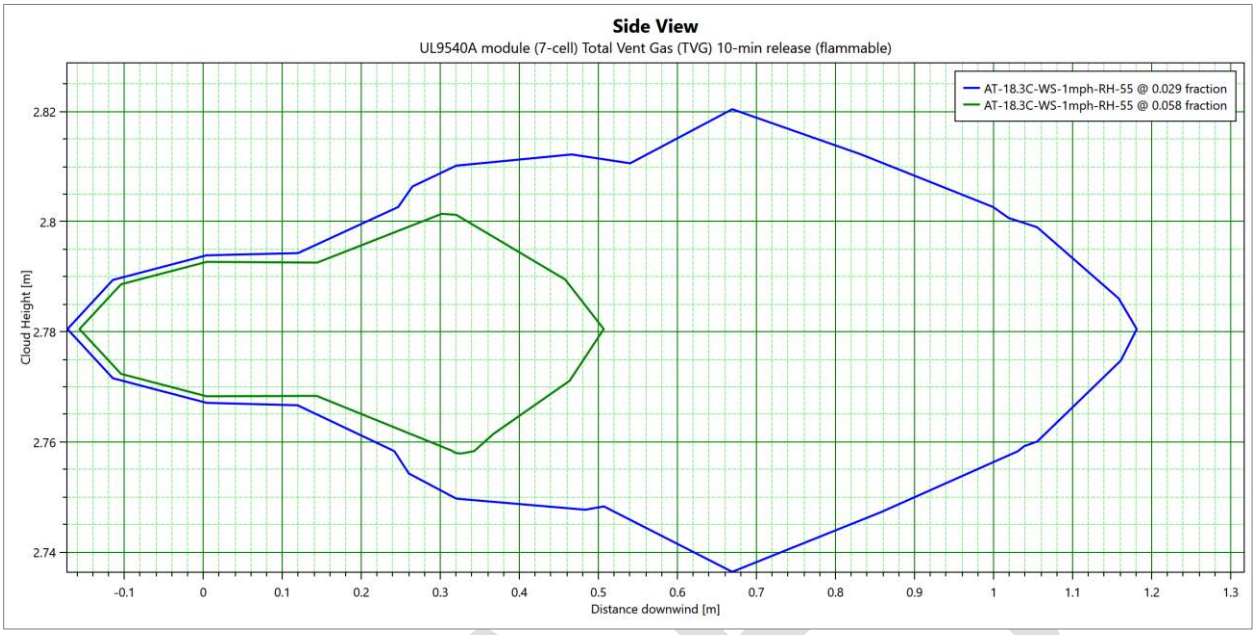

Figure 14 Maximum vertical extent of vapor cloud for LFL (5.8%) and ½ LFL (2.9%)

1.1.5 CO IDLH (1,200 ppm) Component Extent (10 min Release)

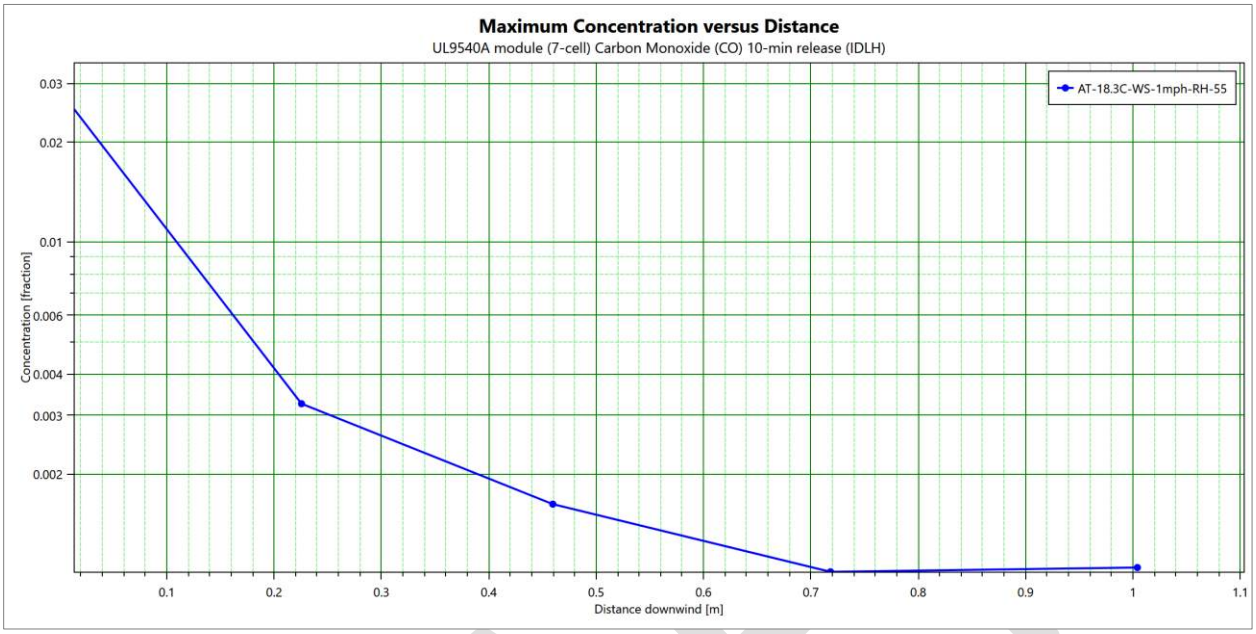

Figure 15 Maximum Concentration vs distance for CO gas component

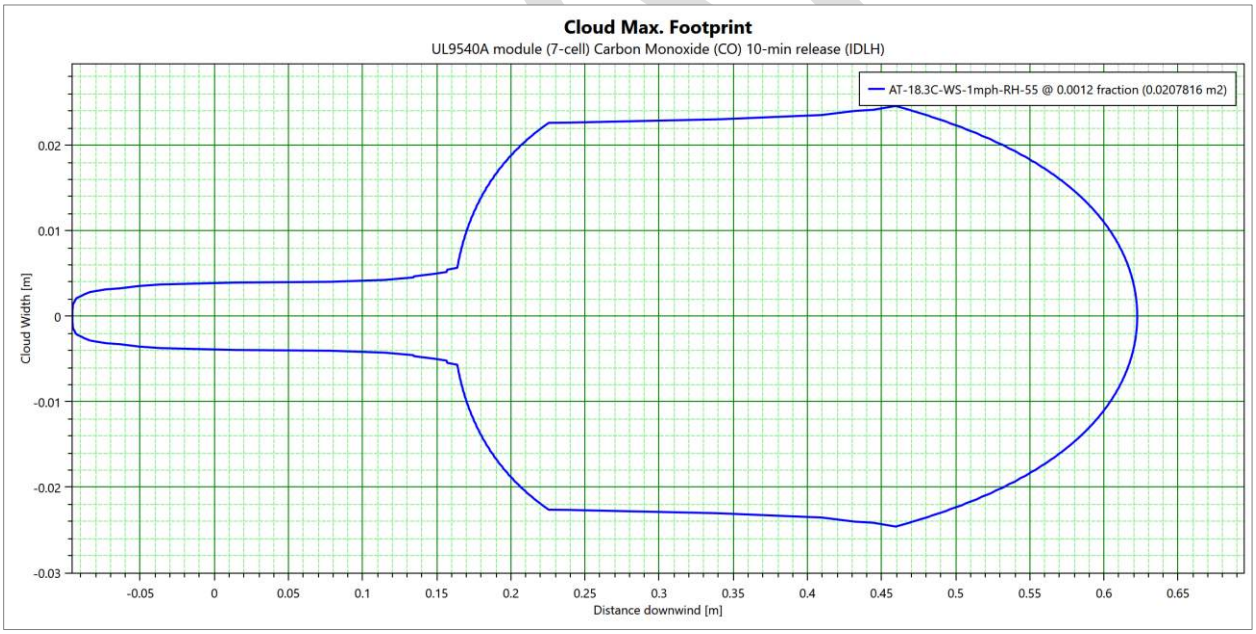

Figure 16 Maximum horizontal extent of vapor cloud for CO IDLH (1,200 ppm)

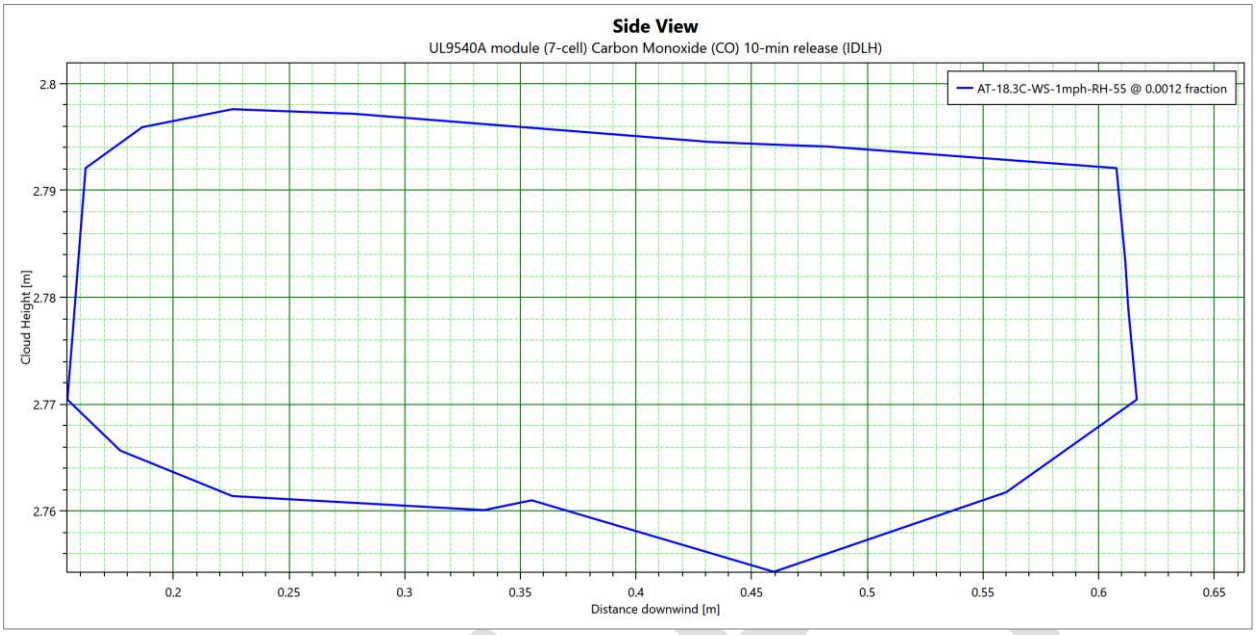

Figure 17 Maximum vertical extent of vapor cloud for CO IDLH (1,200 ppm)

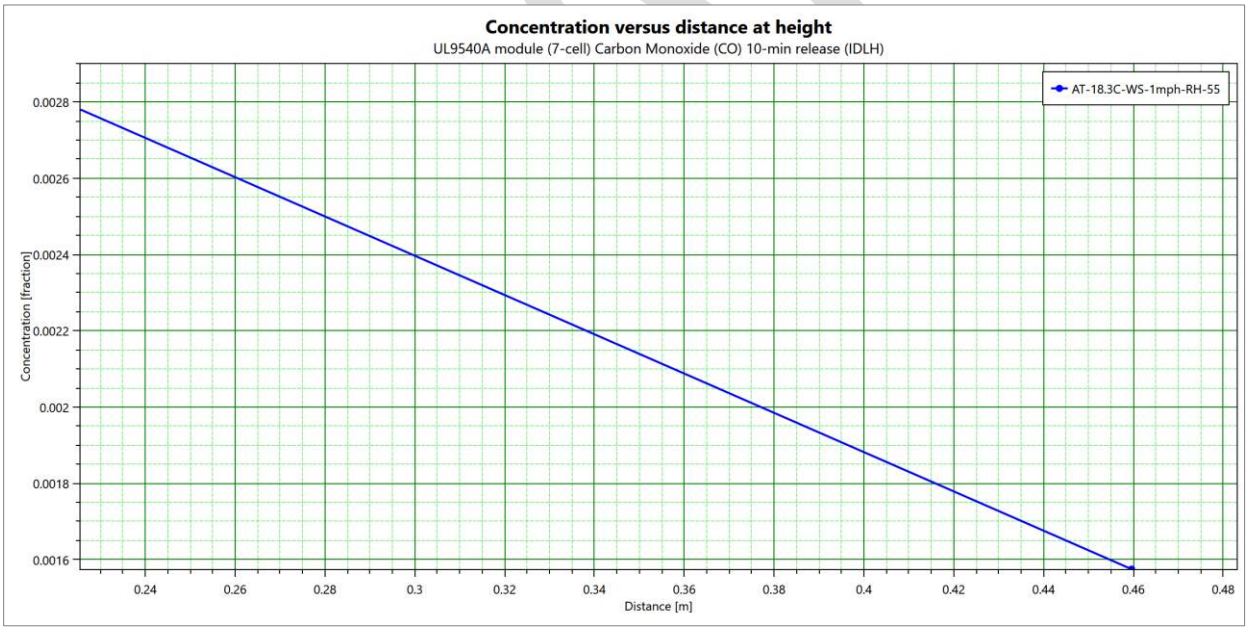

Figure 18 Concentration vs distance for CO IDLH (1,200 ppm)

1.1.6 CO2 IDLH (40,000 ppm) Component Extent (10 min Release)

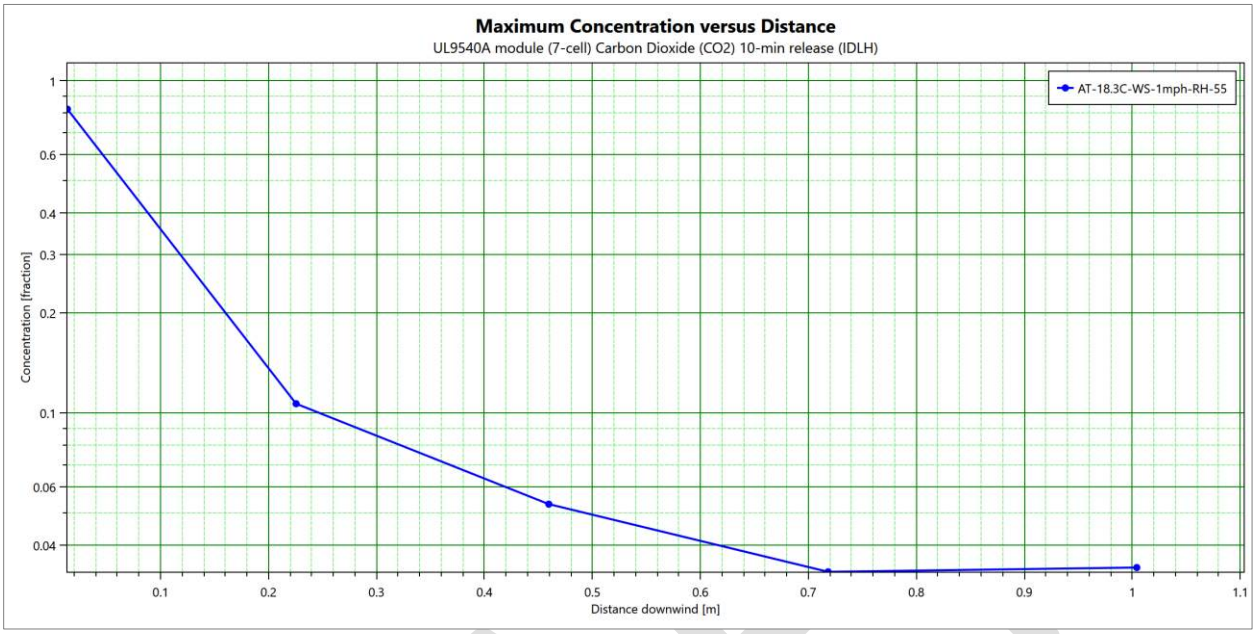

Figure 19 Maximum Concentration vs distance for CO2 gas component

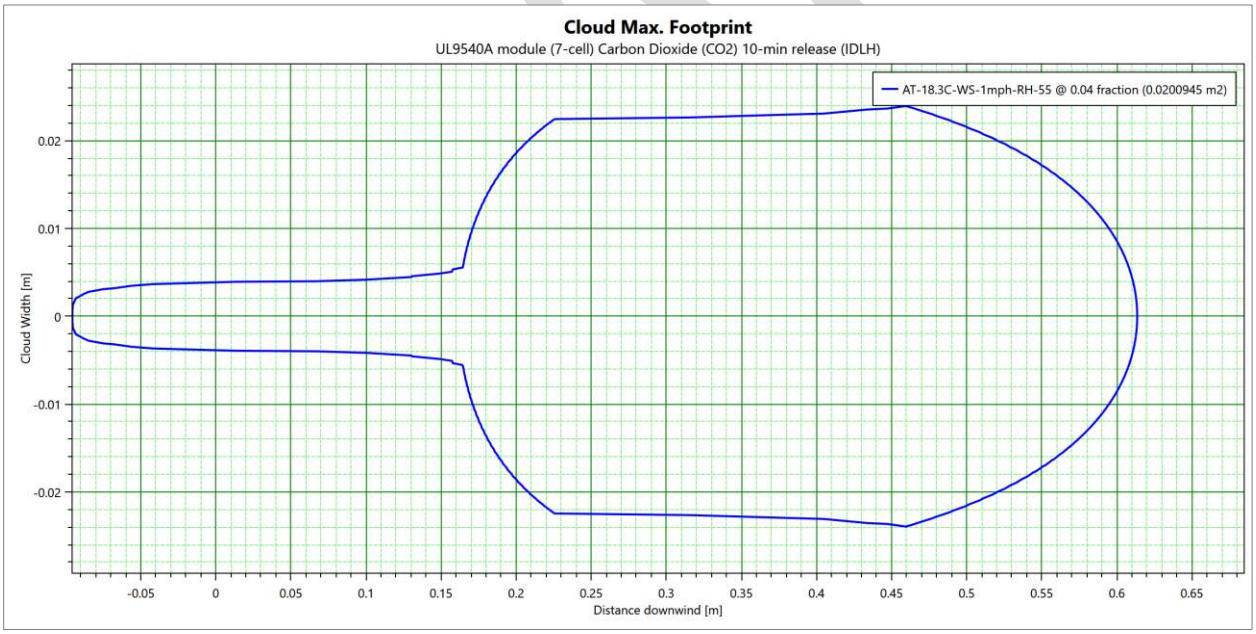

Figure 20 Maximum horizontal extent of vapor cloud for CO2 IDLH (40,000 ppm)

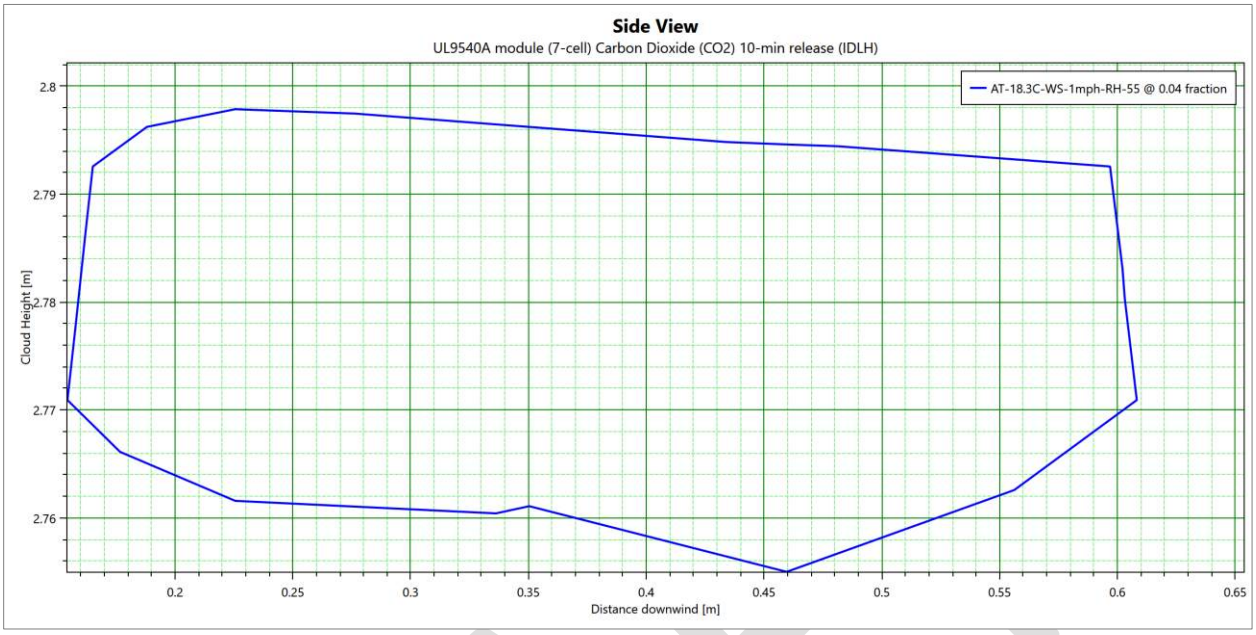

Figure 21 Maximum vertical extent of vapor cloud for CO2 IDLH (40,000 ppm)

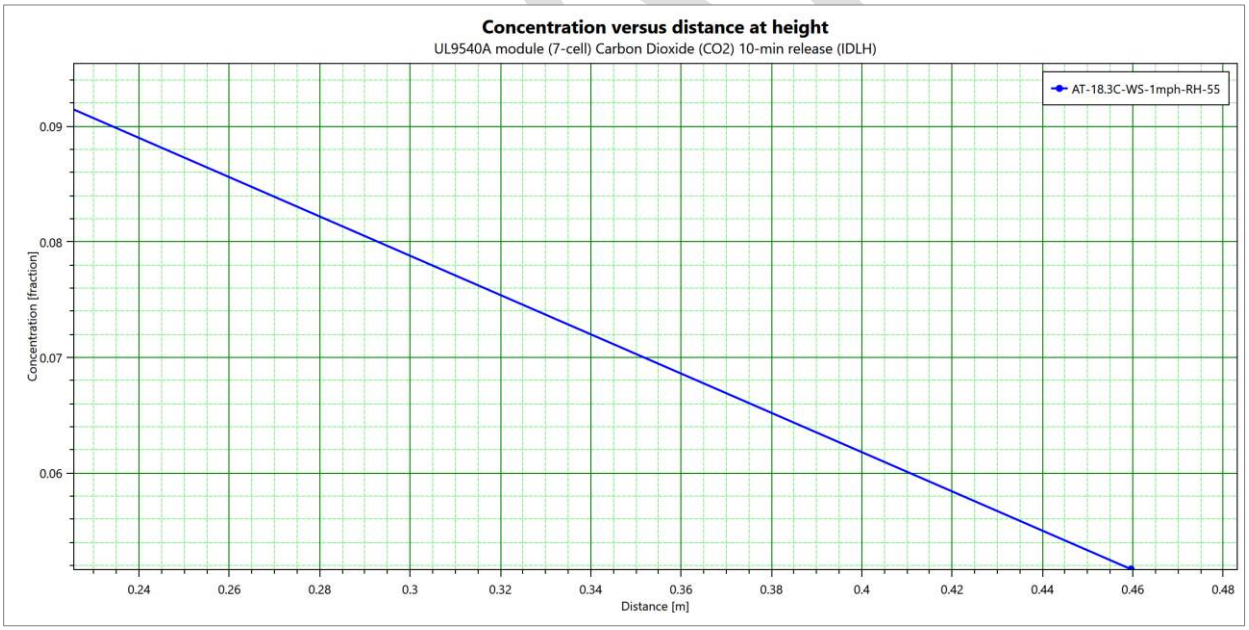

Figure 22 Concentration vs distance for CO2 IDLH (40,000 ppm)

1.2 Scenario 2: 1-Tray Release

1.2.1 TVG Flammable Vapor Cloud Extent (85.19min Release)

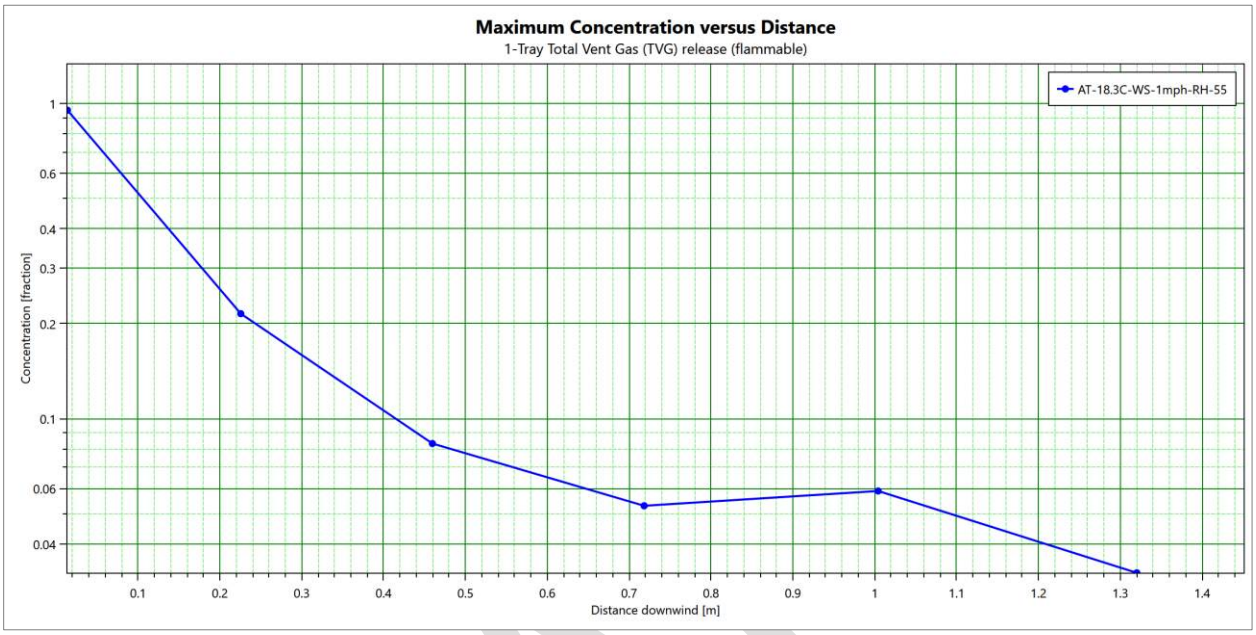

Figure 23 Maximum concentration vs distance for flammable vapor cloud

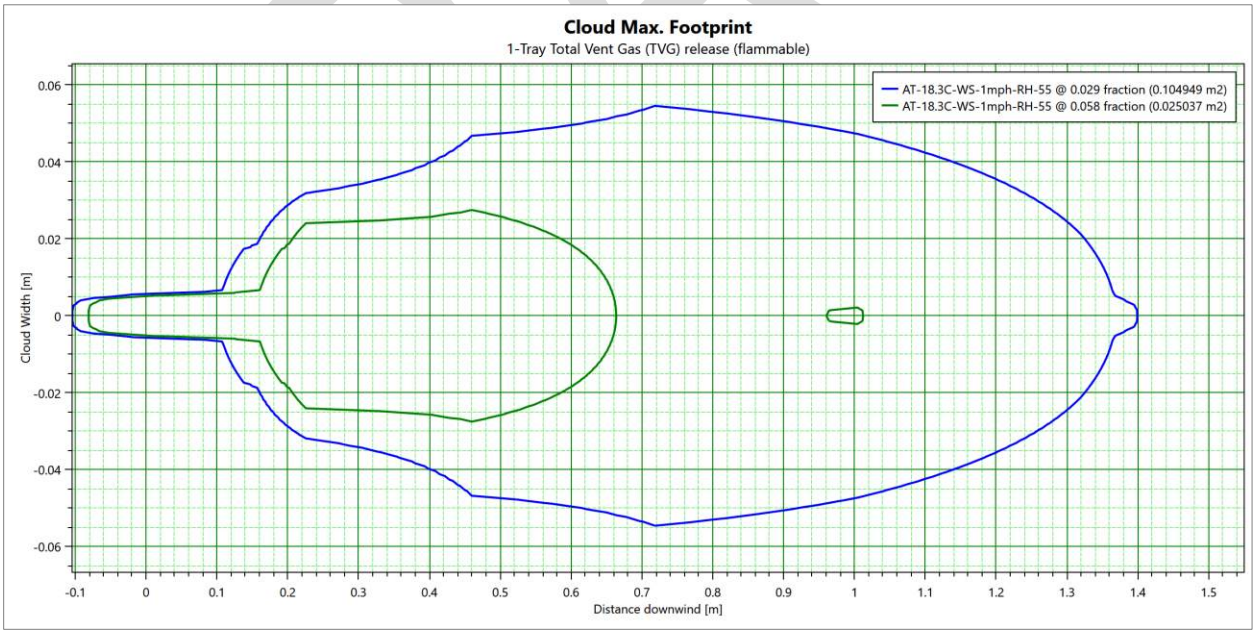

Figure 24 Maximum horizontal extent of vapor cloud for LFL (5.8%) and ½ LFL (2.9%)

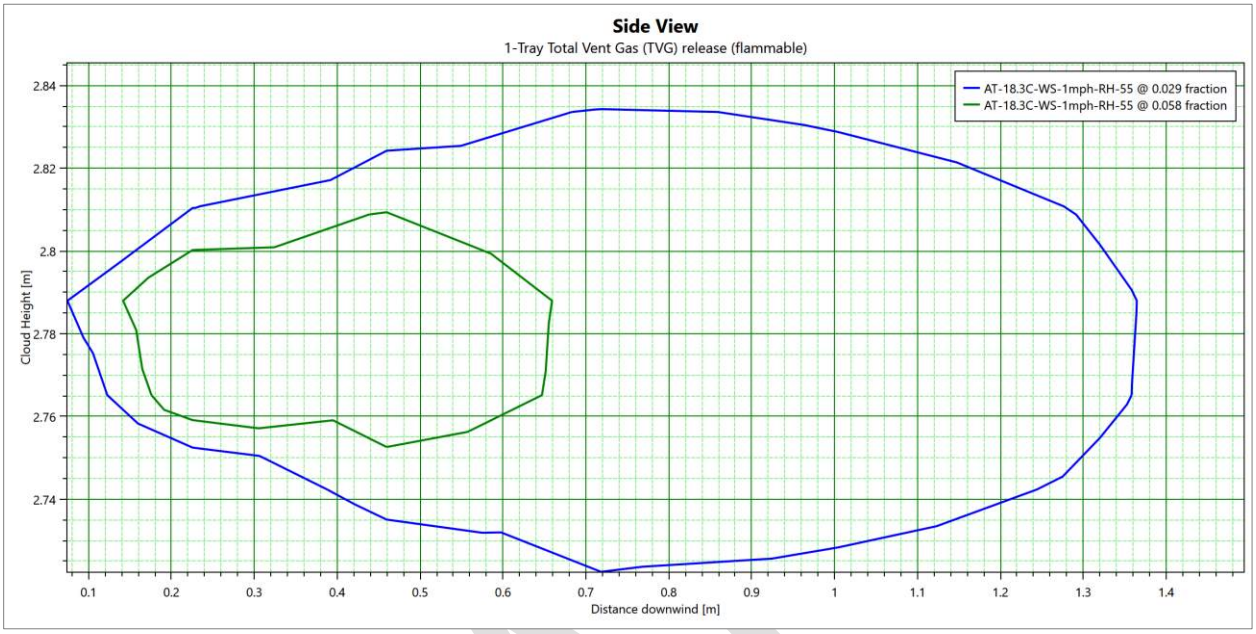

Figure 25 Maximum vertical extent of vapor cloud for LFL (5.8%) and ½ LFL (2.9%)

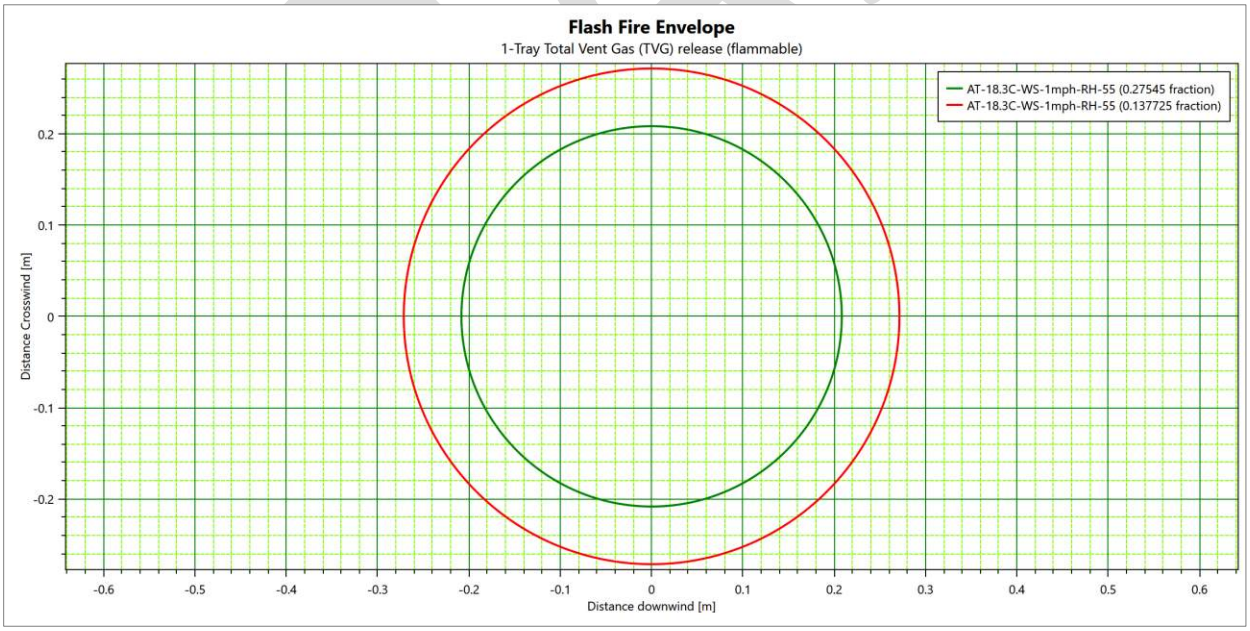

Figure 26 Flash Fire Envelope for LFL (5.8%) and ½ LFL (2.9%)

1.2.2 CO IDLH (1,200 ppm) Component Extent (85.19min Release)

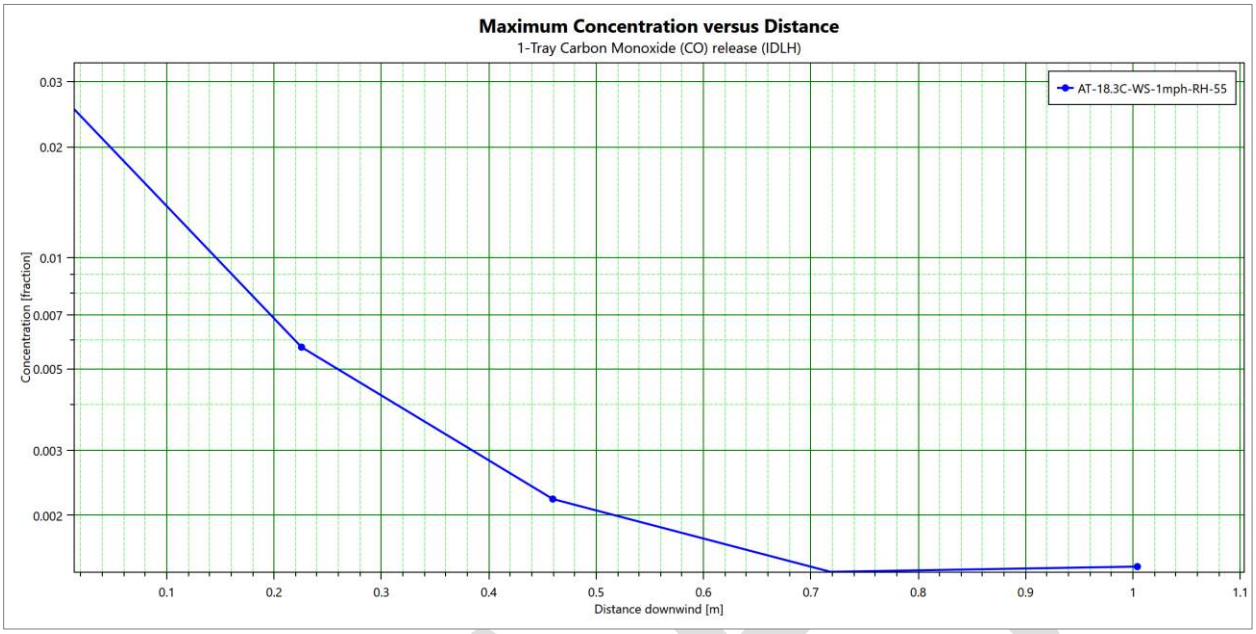

Figure 27 Maximum Concentration vs distance for CO gas component

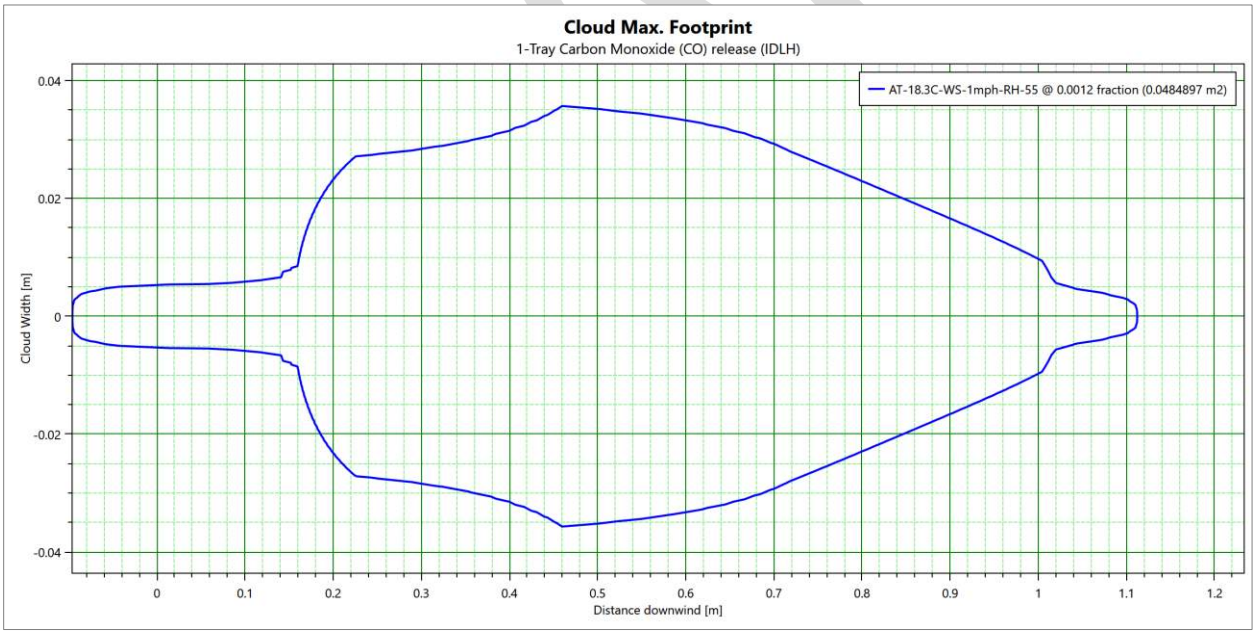

Figure 28 Maximum horizontal extent of vapor cloud for CO IDLH (1,200 ppm)

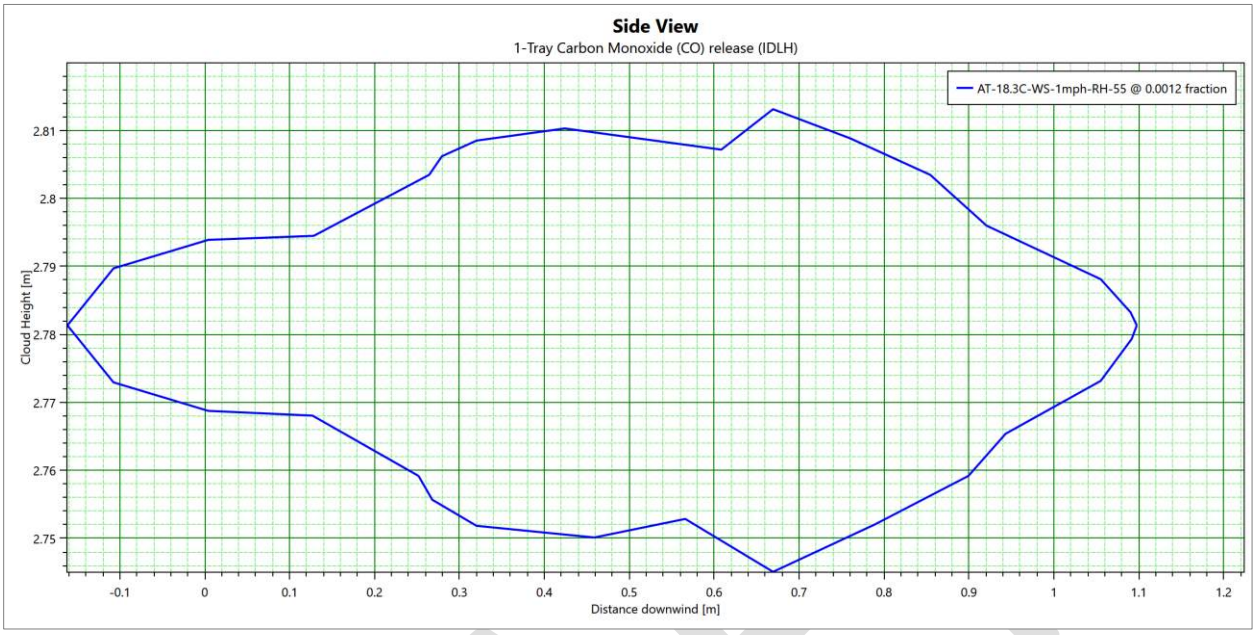

Figure 29 Maximum vertical extent of vapor cloud for CO IDLH (1,200 ppm)

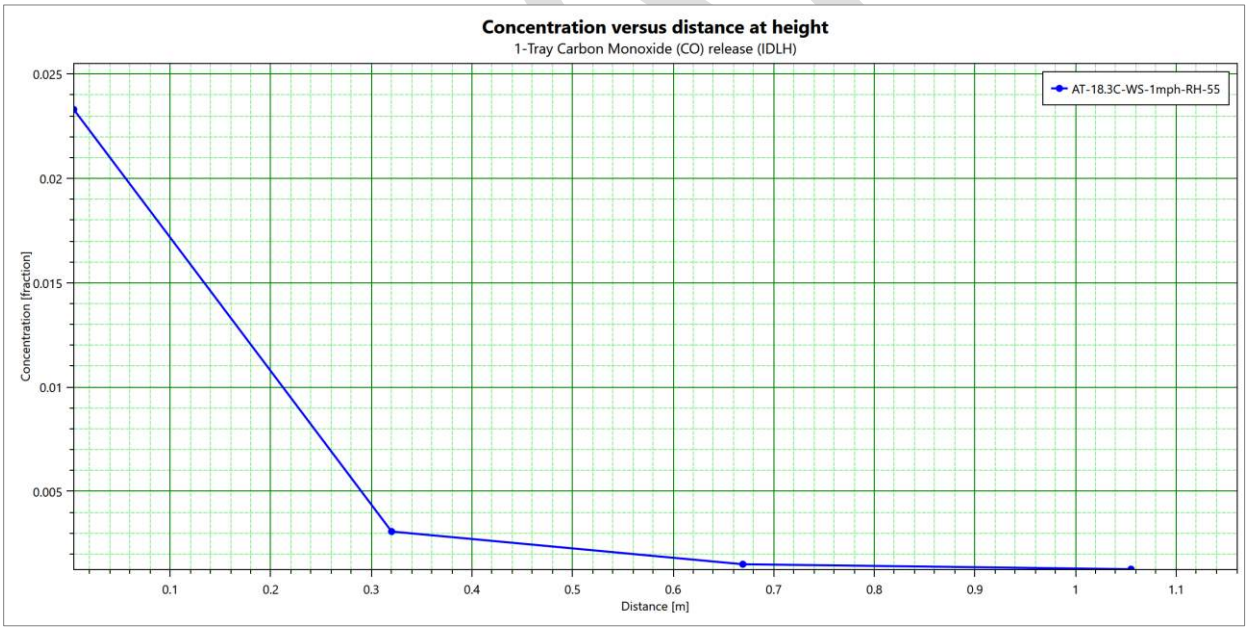

Figure 30 Concentration vs distance for CO IDLH (1,200 ppm)

1.2.3 CO2 IDLH (40,000 ppm) Component Extent (85.19min Release)

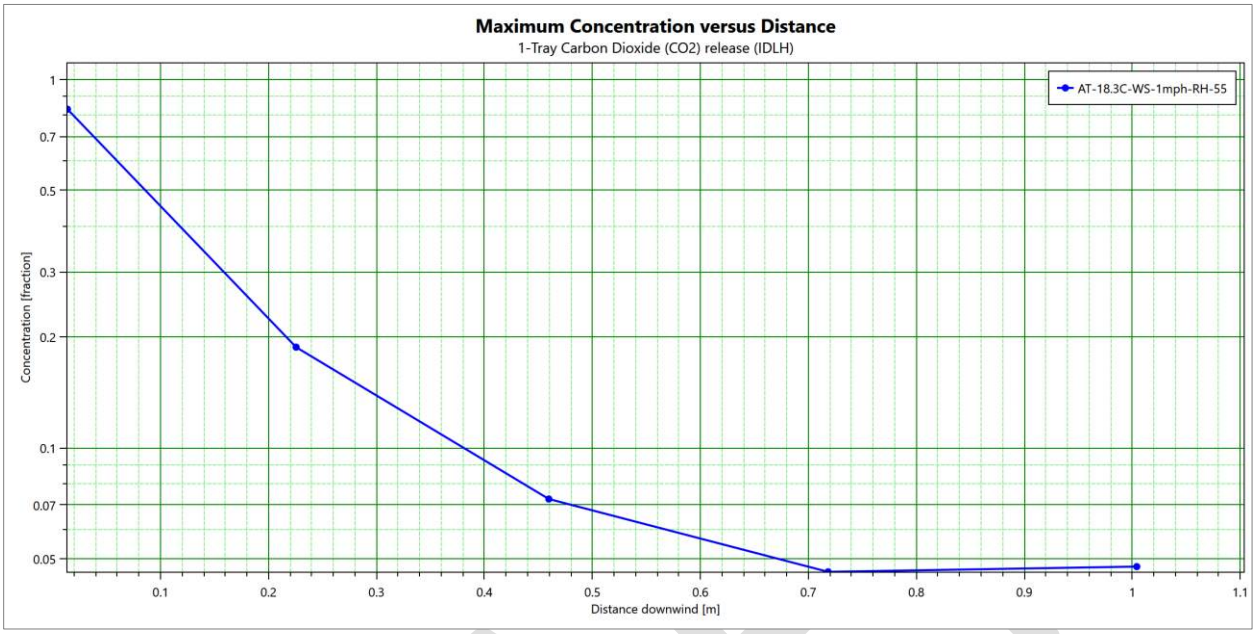

Figure 31 Maximum Concentration vs distance for CO gas component

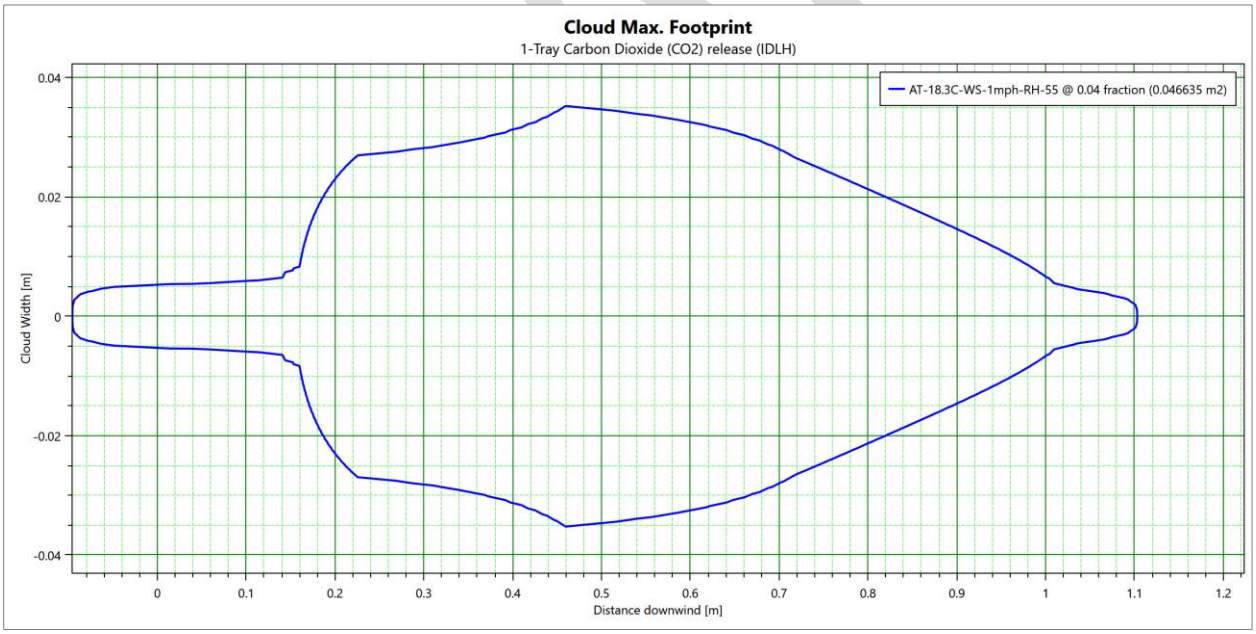

Figure 32 Maximum horizontal extent of vapor cloud for CO2 IDLH (40,000 ppm)

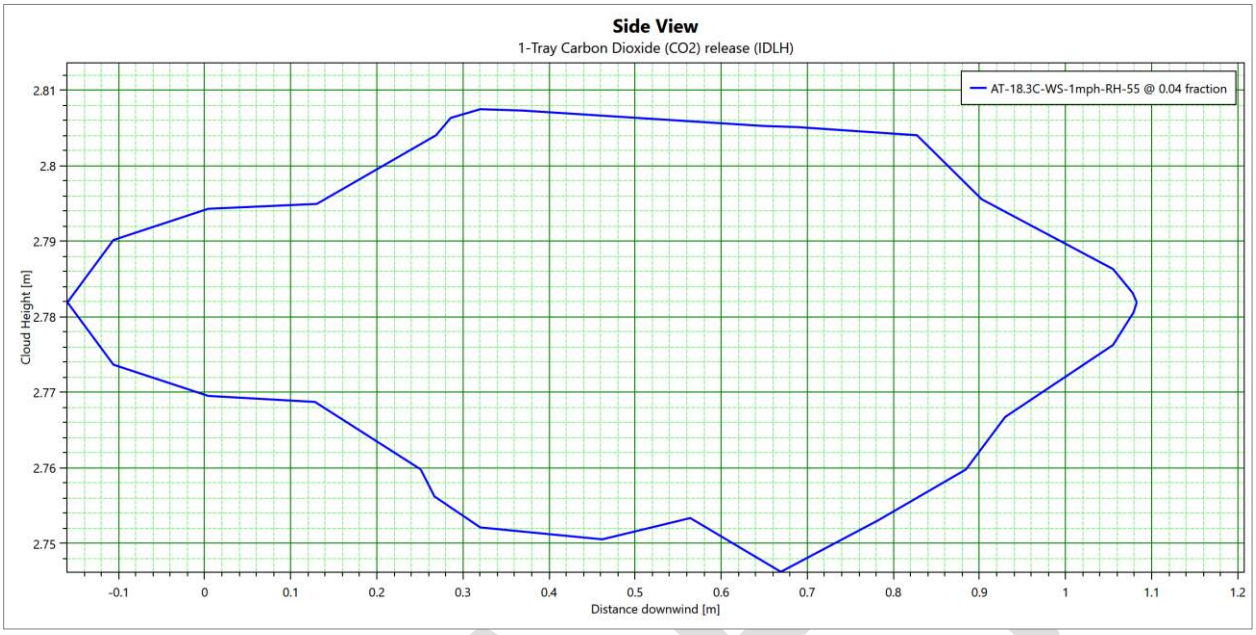

Figure 33 Maximum vertical extent of vapor cloud for CO2 IDLH (40,000 ppm)

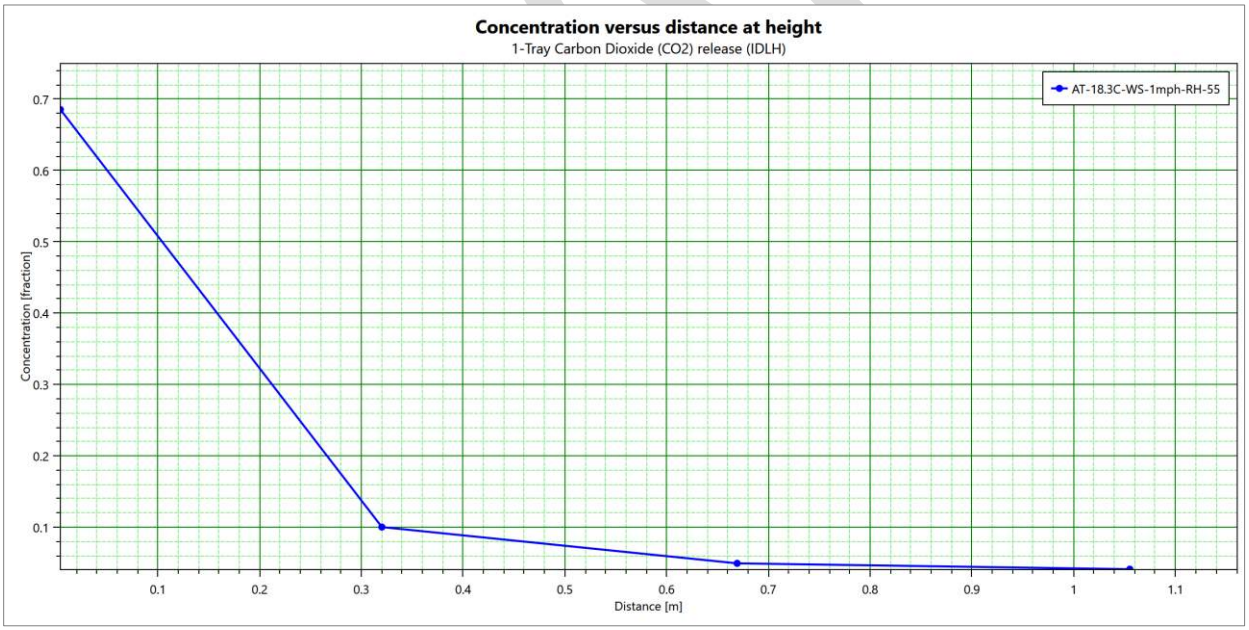

Figure 34 Concentration vs distance for CO2 IDLH (40,000 ppm)

1.2.4 TVG Flammable Vapor Cloud Extent (10 min Release)

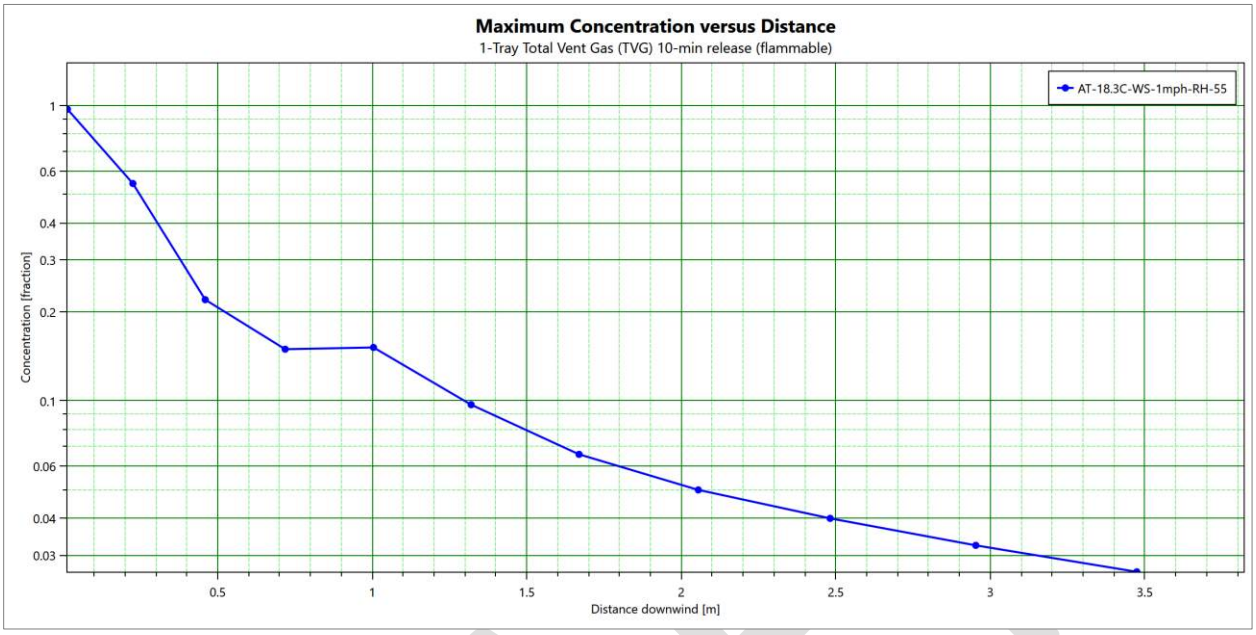

Figure 35 Maximum concentration vs distance for flammable vapor cloud

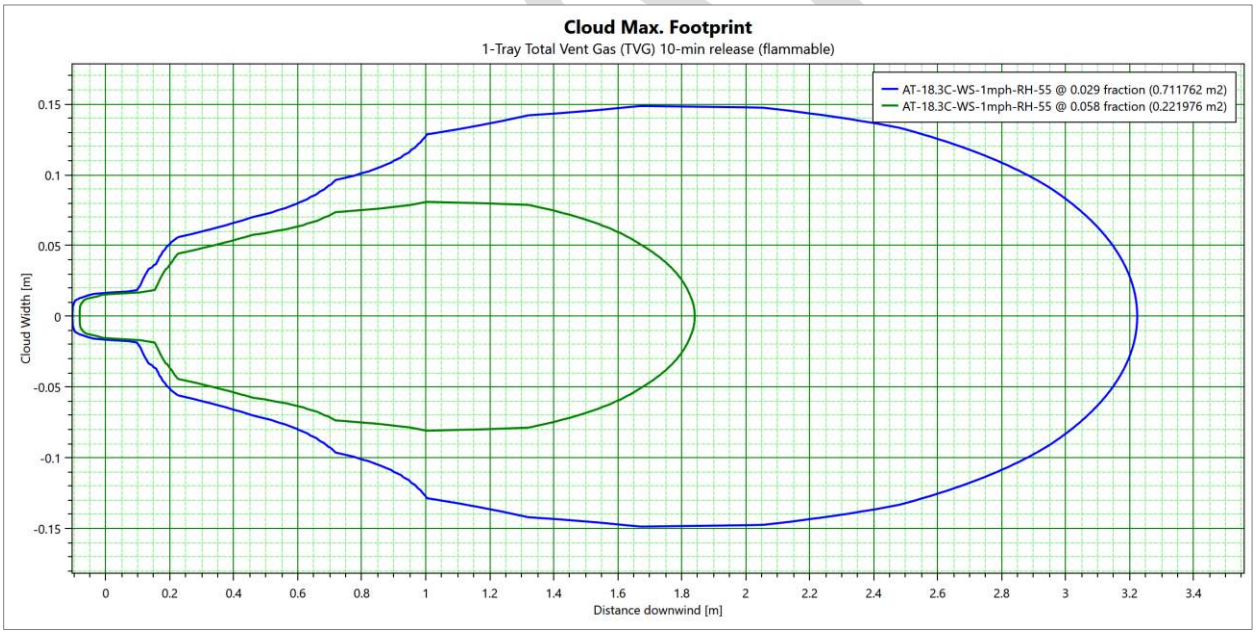

Figure 36 Maximum horizontal extent of vapor cloud for LFL (5.8%) and ½ LFL (2.9%)

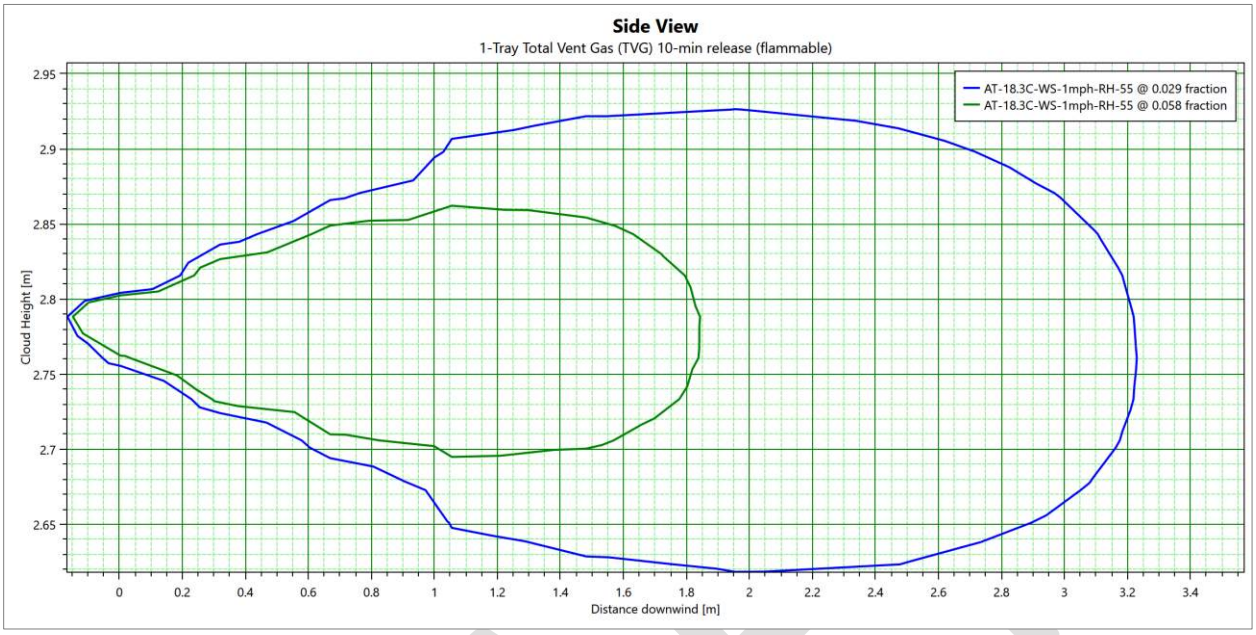

Figure 37 Maximum vertical extent of vapor cloud for LFL (5.8%) and ½ LFL (2.9%)

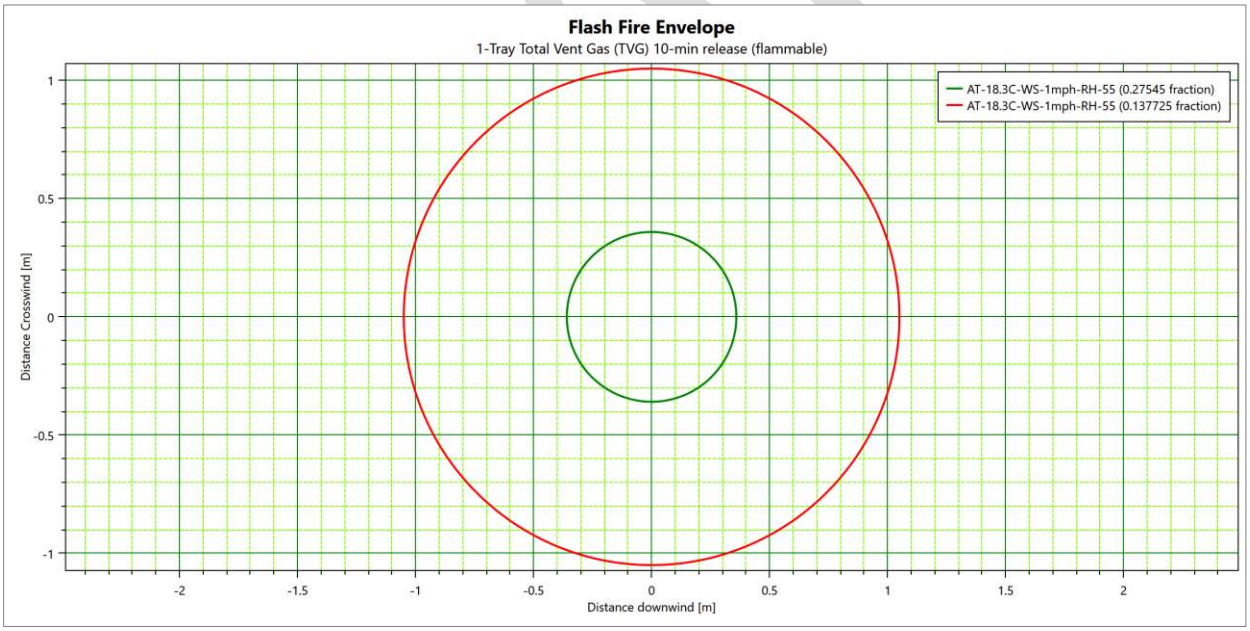

Figure 38 Flash Fire Envelope for LFL (5.8%) and ½ LFL (2.9%)

1.2.5 CO IDLH (1,200 ppm) Component Extent (10 min Release)

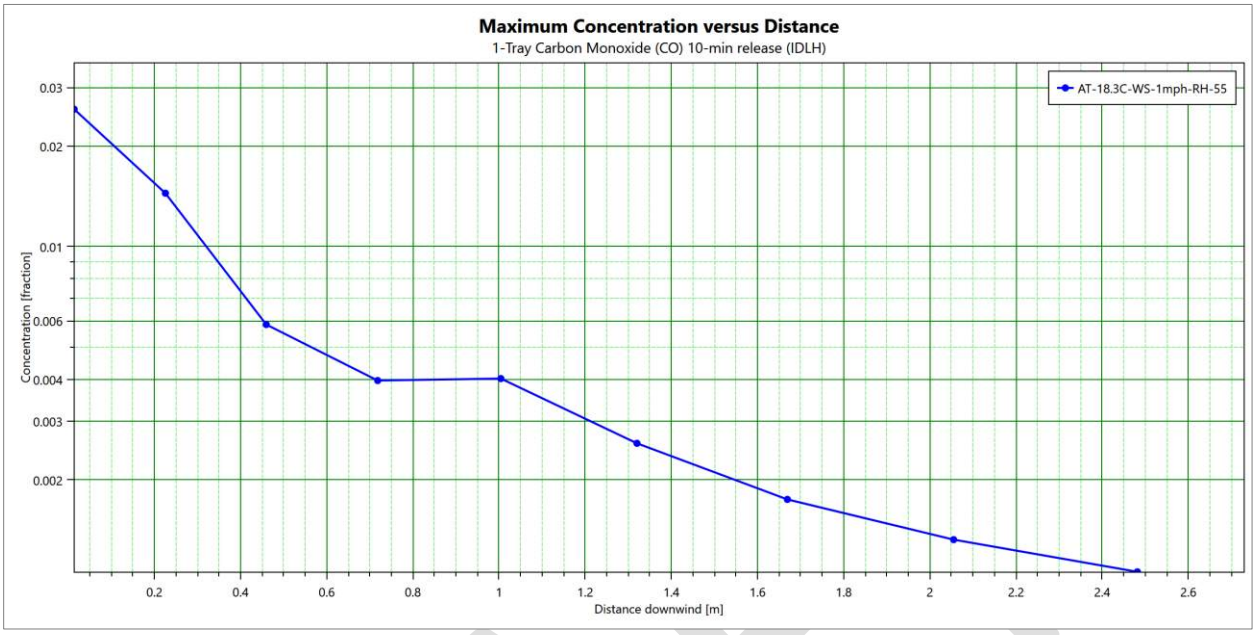

Figure 39 Maximum Concentration vs distance for CO gas component

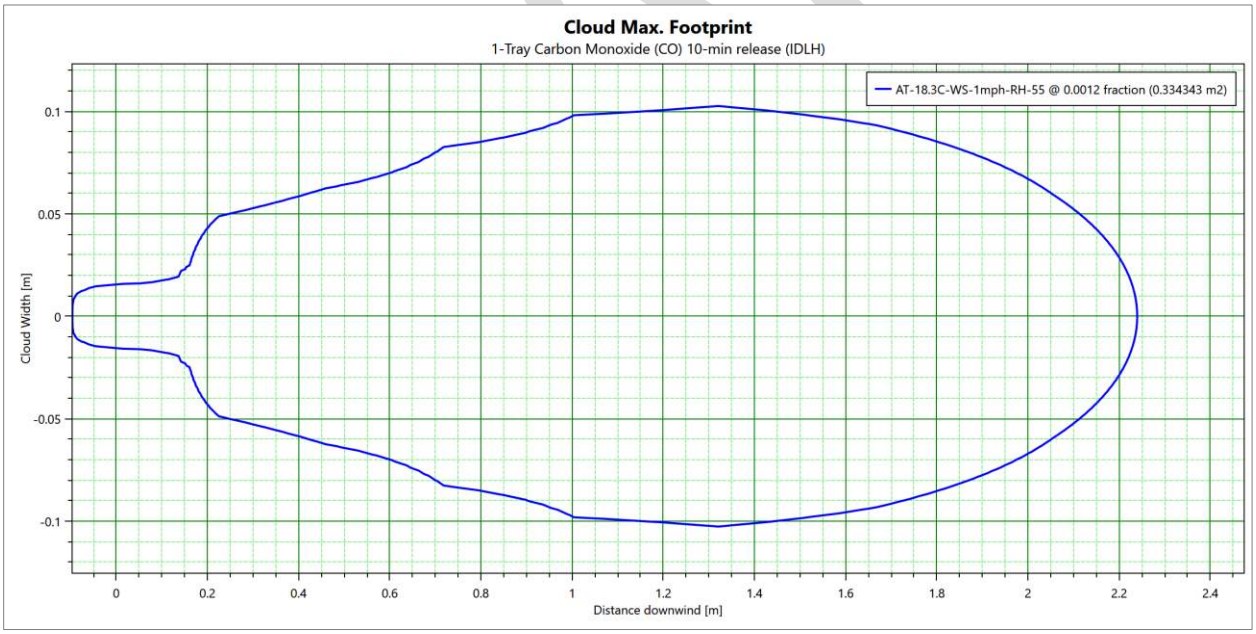

Figure 40 Maximum horizontal extent of vapor cloud for CO IDLH (1,200 ppm)

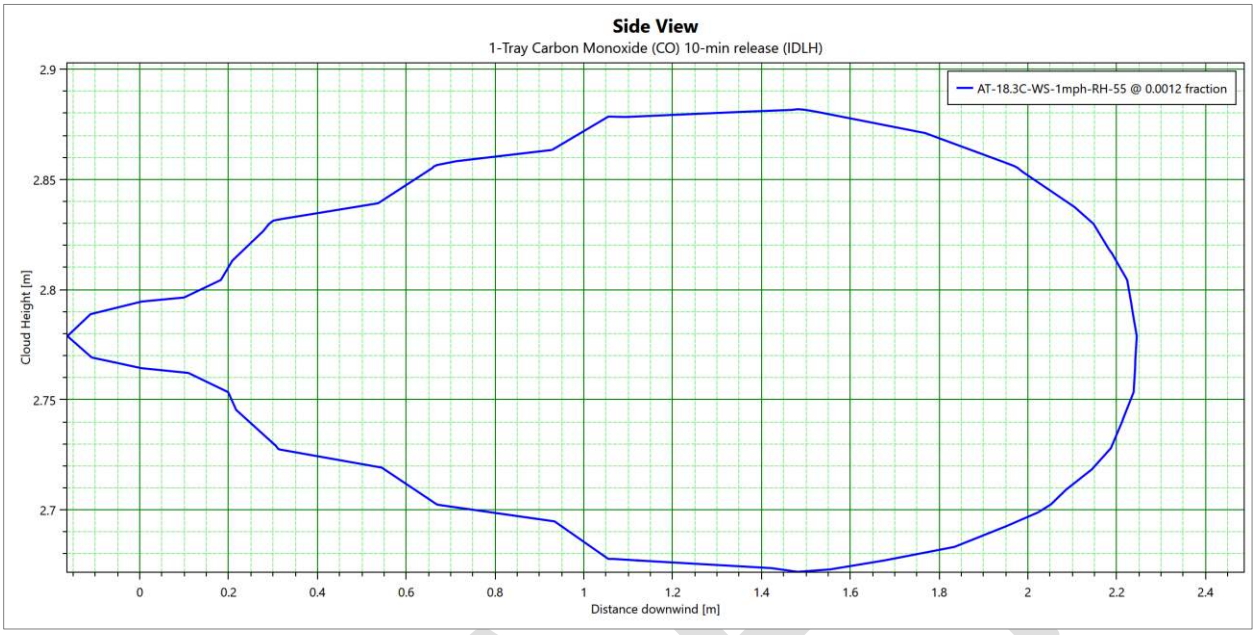

Figure 41 Maximum vertical extent of vapor cloud for CO IDLH (1,200 ppm)

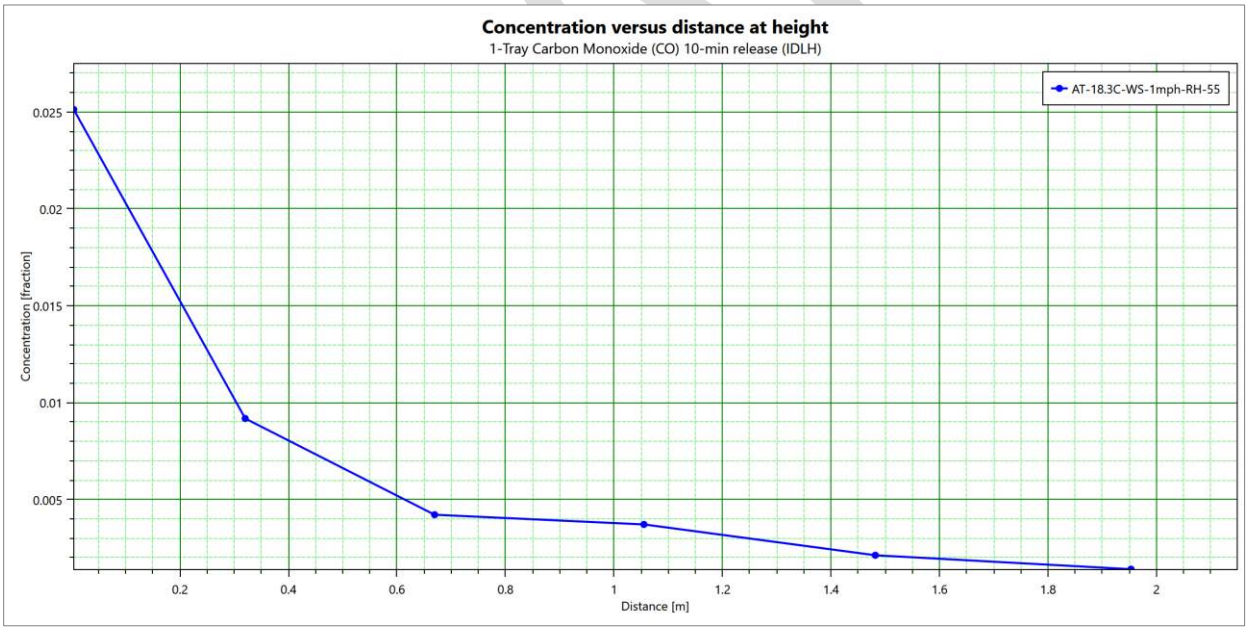

Figure 42 Concentration vs distance for CO IDLH (1,200 ppm)

1.2.6 CO2 IDLH (40,000 ppm) Component Extent (10 min Release)

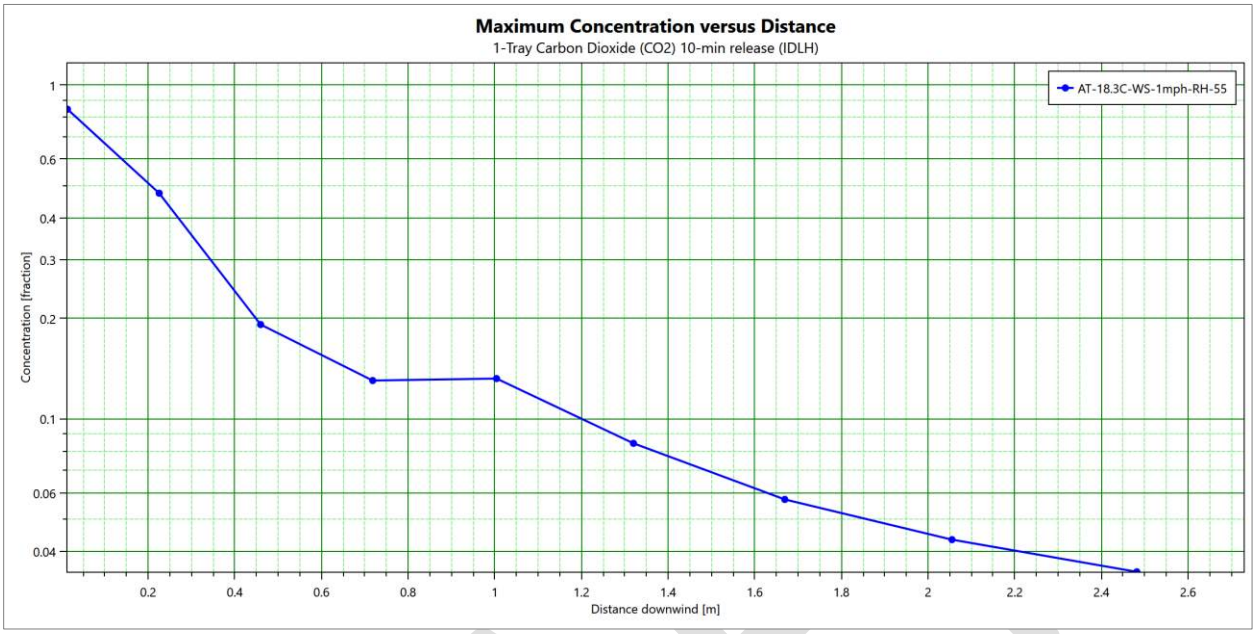

Figure 43 Maximum Concentration vs distance for CO2 gas component

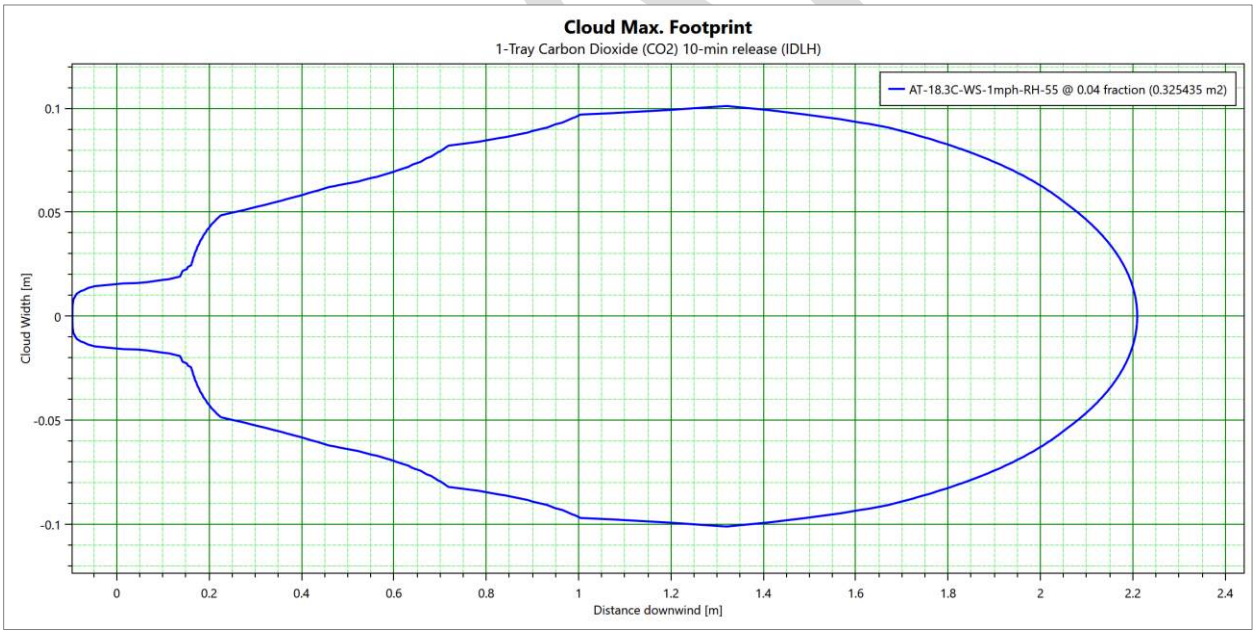

Figure 44 Maximum horizontal extent of vapor cloud for CO2 IDLH (40,000 ppm)

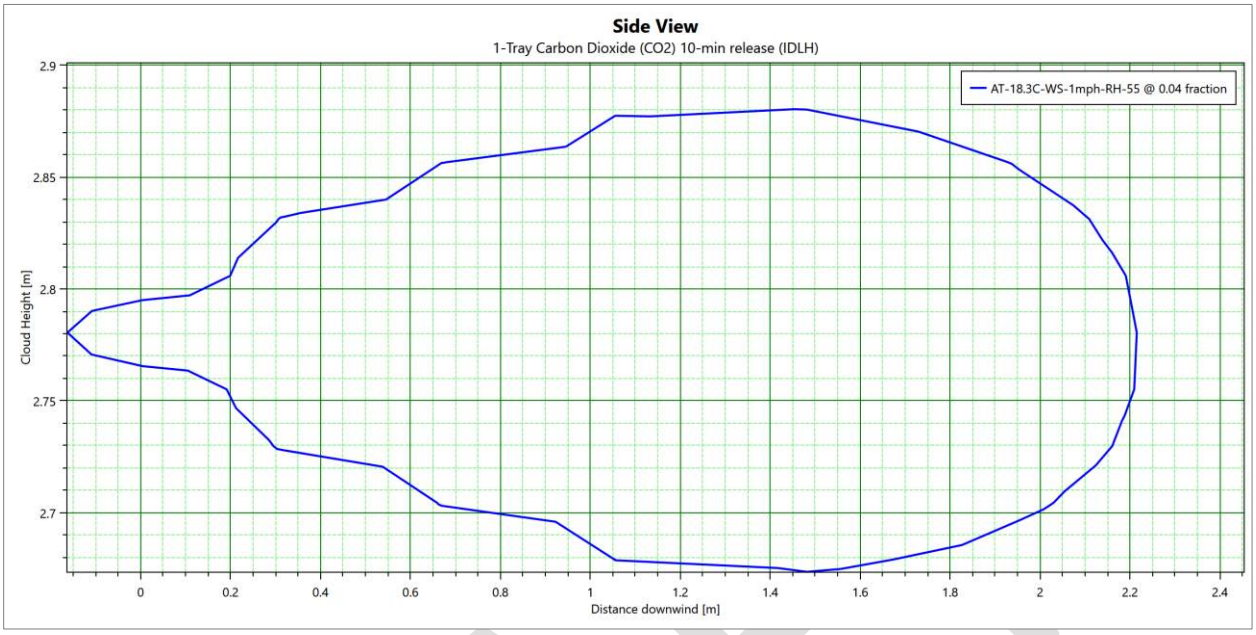

Figure 45 Maximum vertical extent of vapor cloud for CO2 IDLH (40,000 ppm)

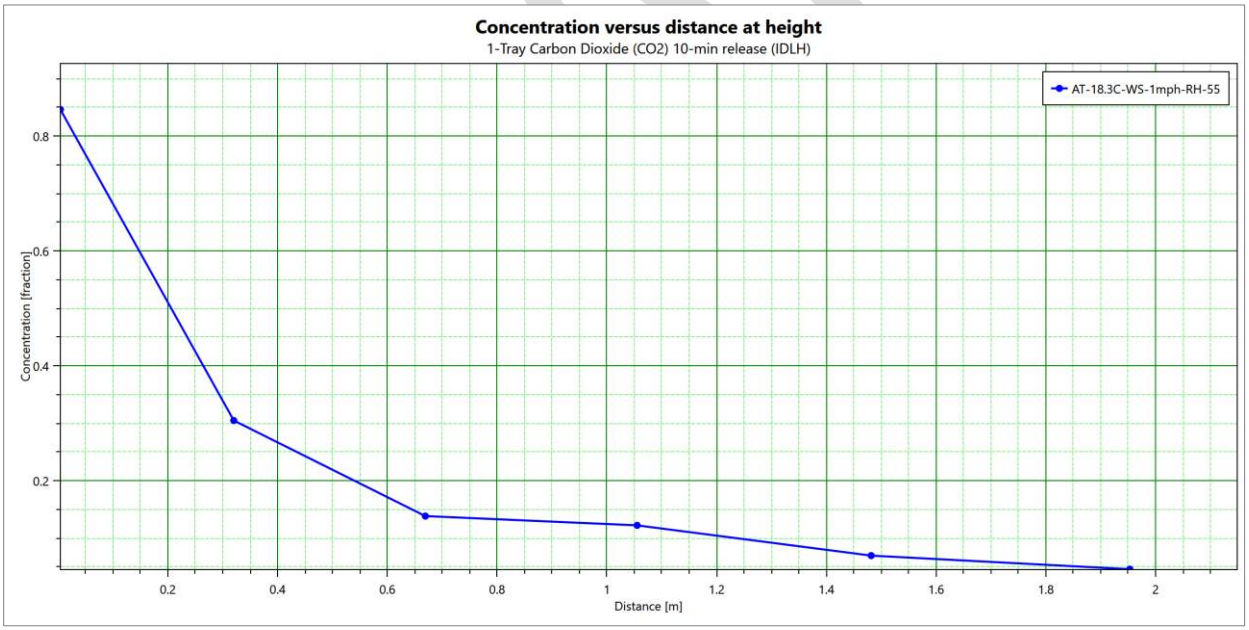

Figure 46 Concentration vs distance for CO2 IDLH (40,000 ppm)

1.3 Scenario 3: 1-Module (3-Tray) Release

1.3.1 TVG Flammable Vapor Cloud Extent (85.19min Release)

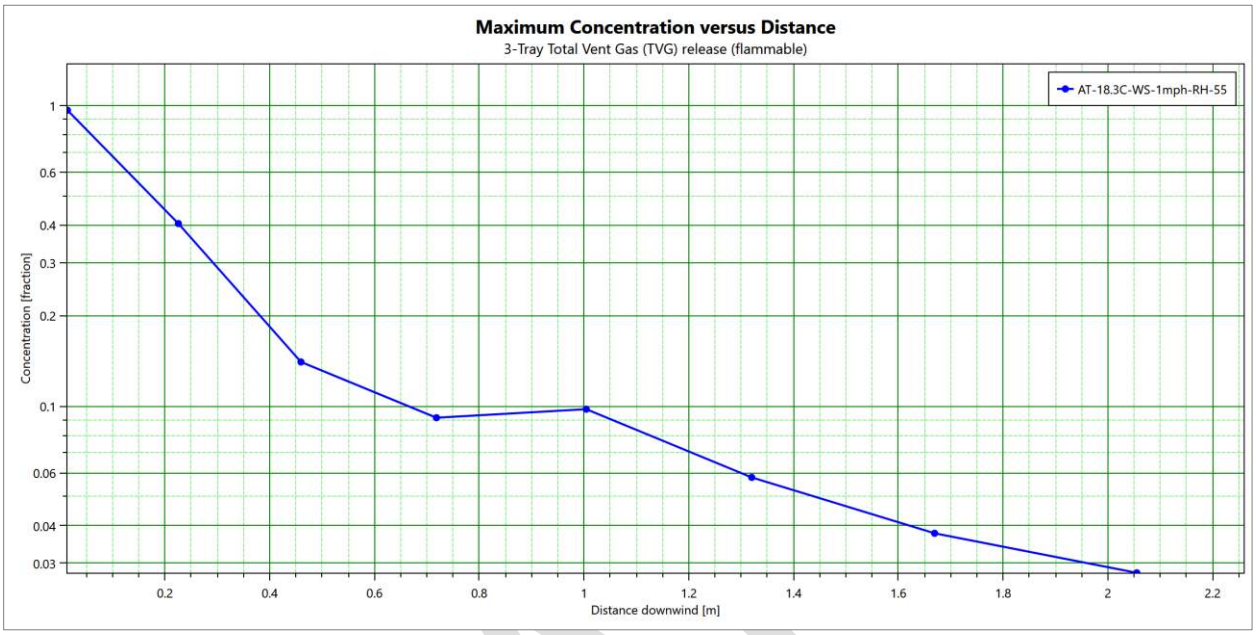

Figure 47 Maximum concentration vs distance for flammable vapor cloud

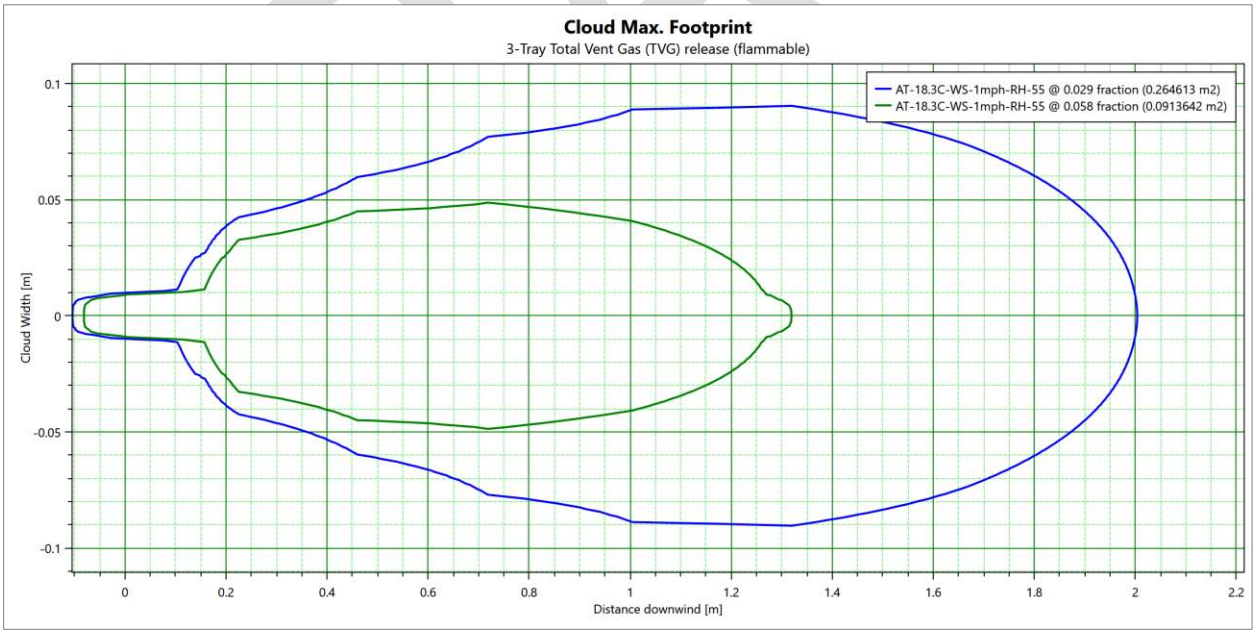

Figure 48 Maximum horizontal extent of vapor cloud for LFL (5.8%) and ½ LFL (2.9%)

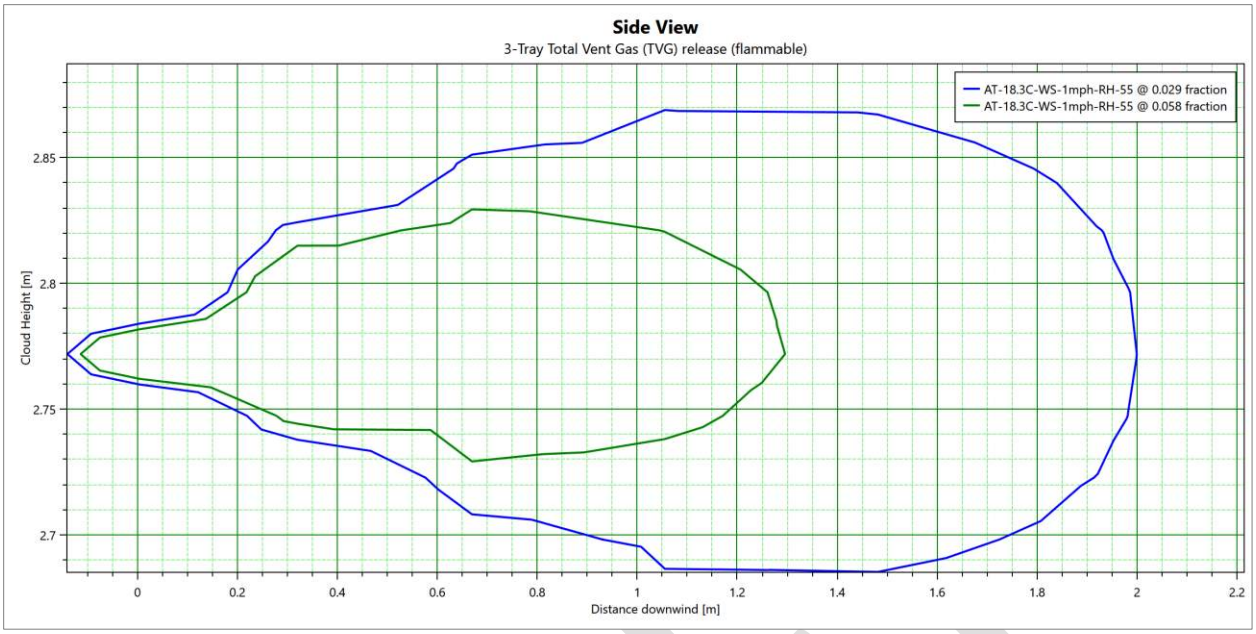

Figure 49 Maximum vertical extent of vapor cloud for LFL (5.8%) and ½ LFL (2.9%)

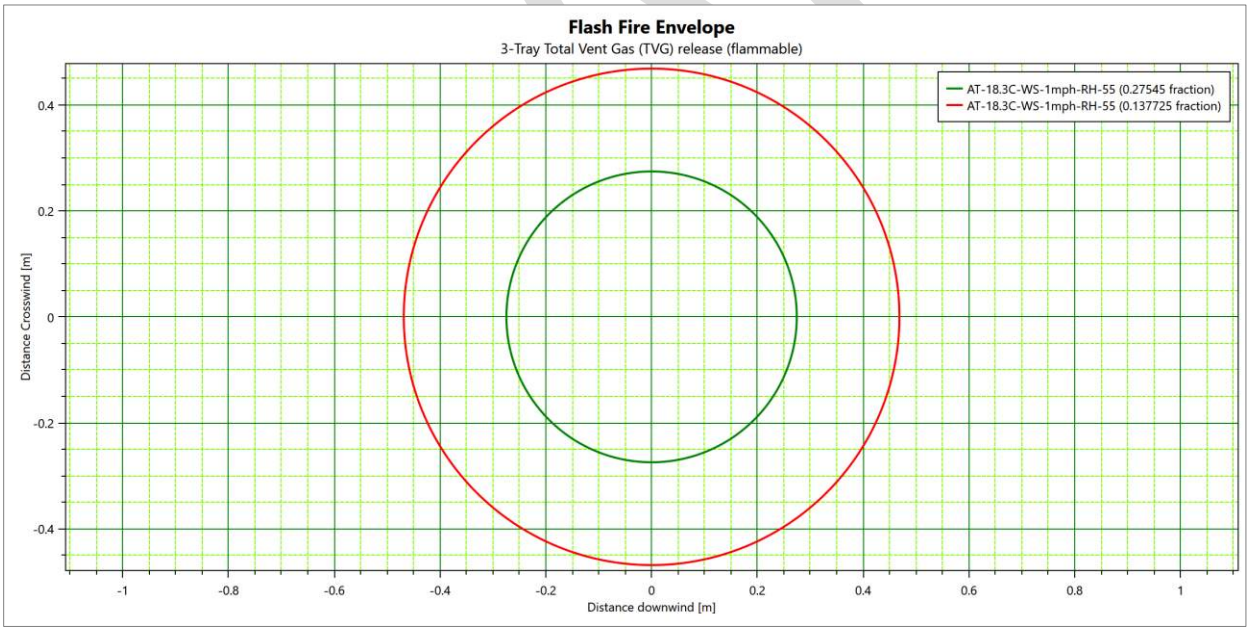

Figure 50 Flash Fire Envelope for LFL (5.8%) and ½ LFL (2.9%)

1.3.2 CO IDLH (1,200 ppm) Component Extent (85.19min Release)

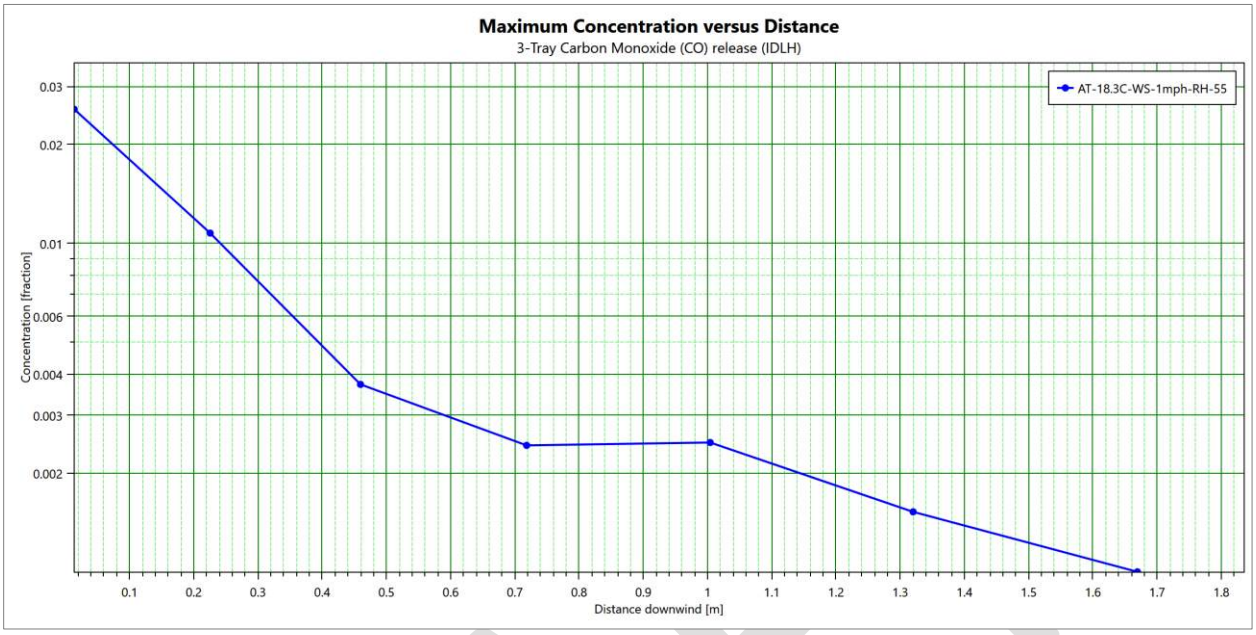

Figure 51 Maximum Concentration vs distance for CO gas component

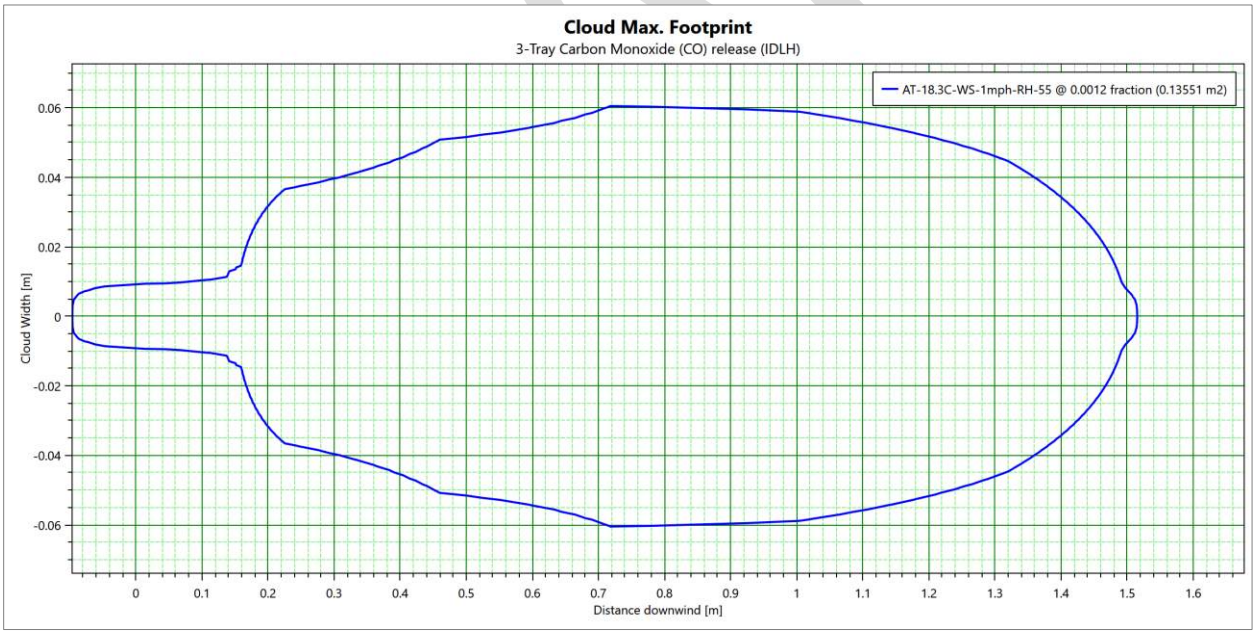

Figure 52 Maximum horizontal extent of vapor cloud for CO IDLH (1,200 ppm)

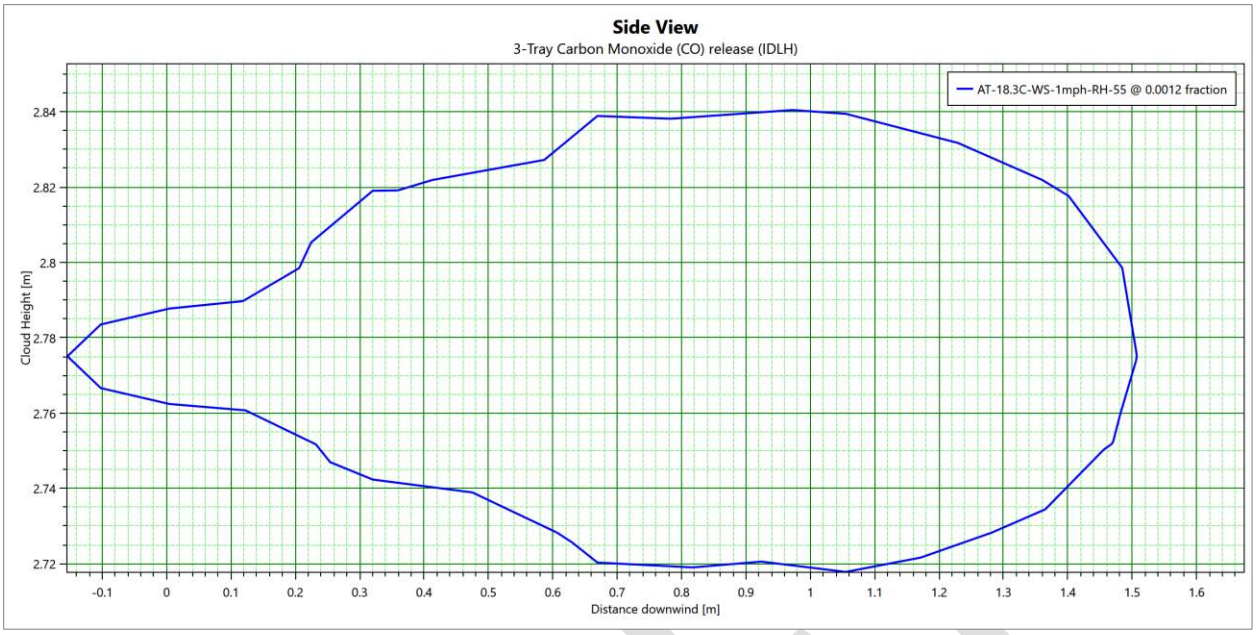

Figure 53 Maximum vertical extent of vapor cloud for CO IDLH (1,200 ppm)

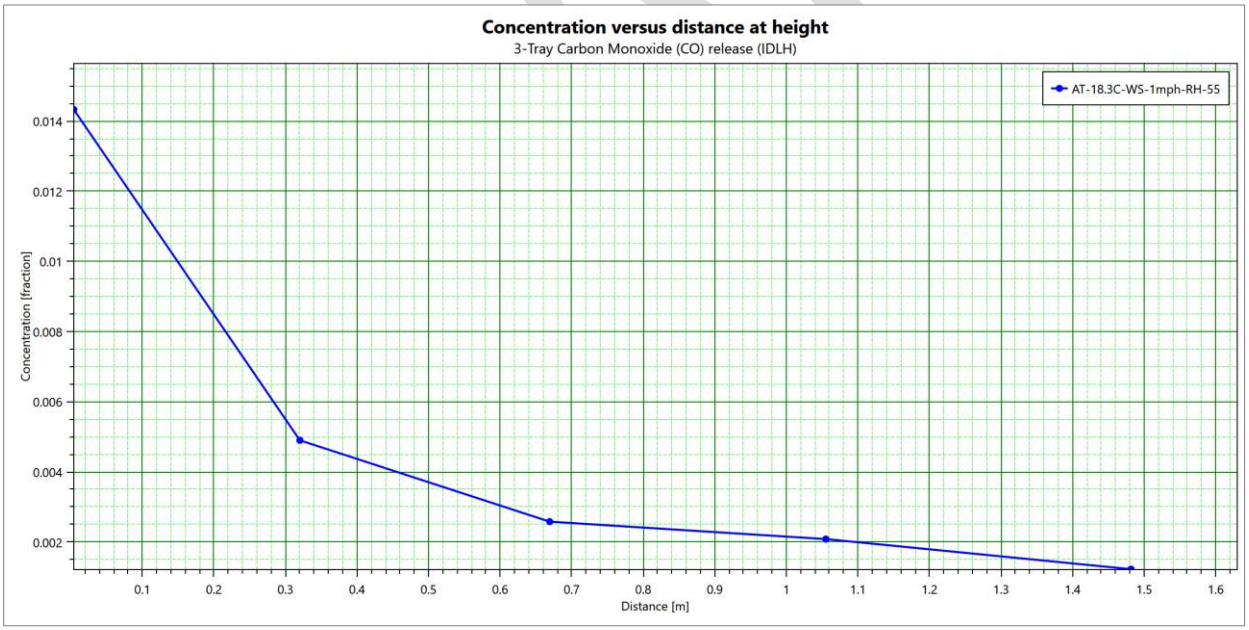

Figure 54 Concentration vs distance for CO IDLH (1,200 ppm)

1.3.3 CO2 IDLH (40,000 ppm) Component Extent (85.19min Release)

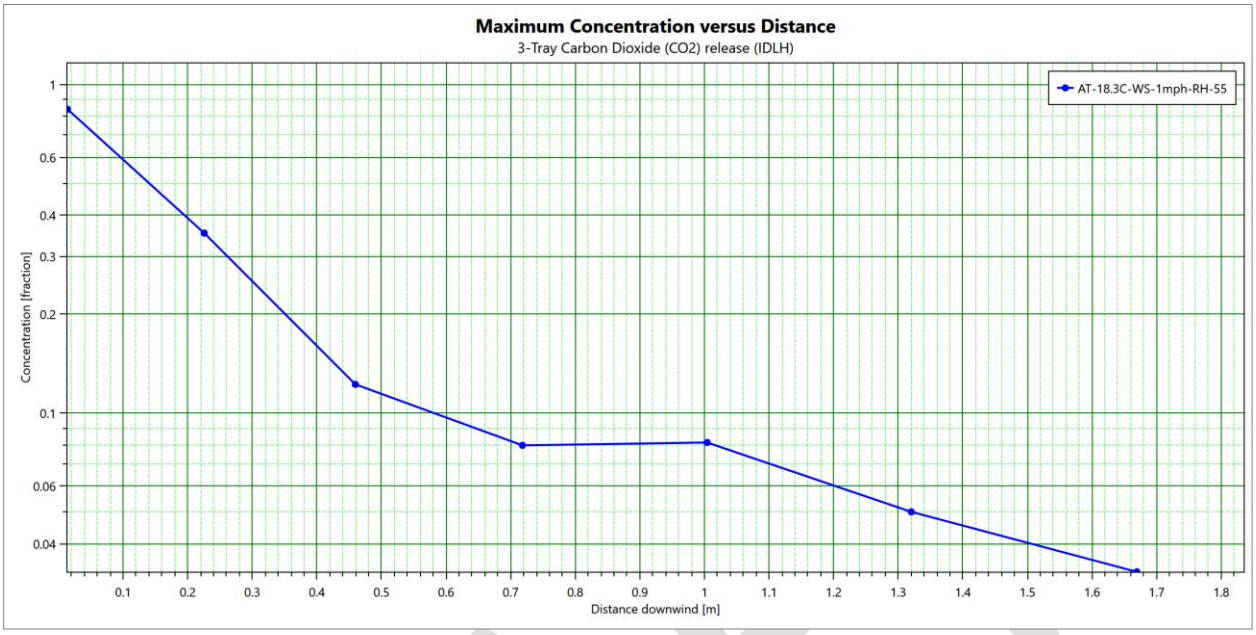

Figure 55 Maximum Concentration vs distance for CO2 gas component

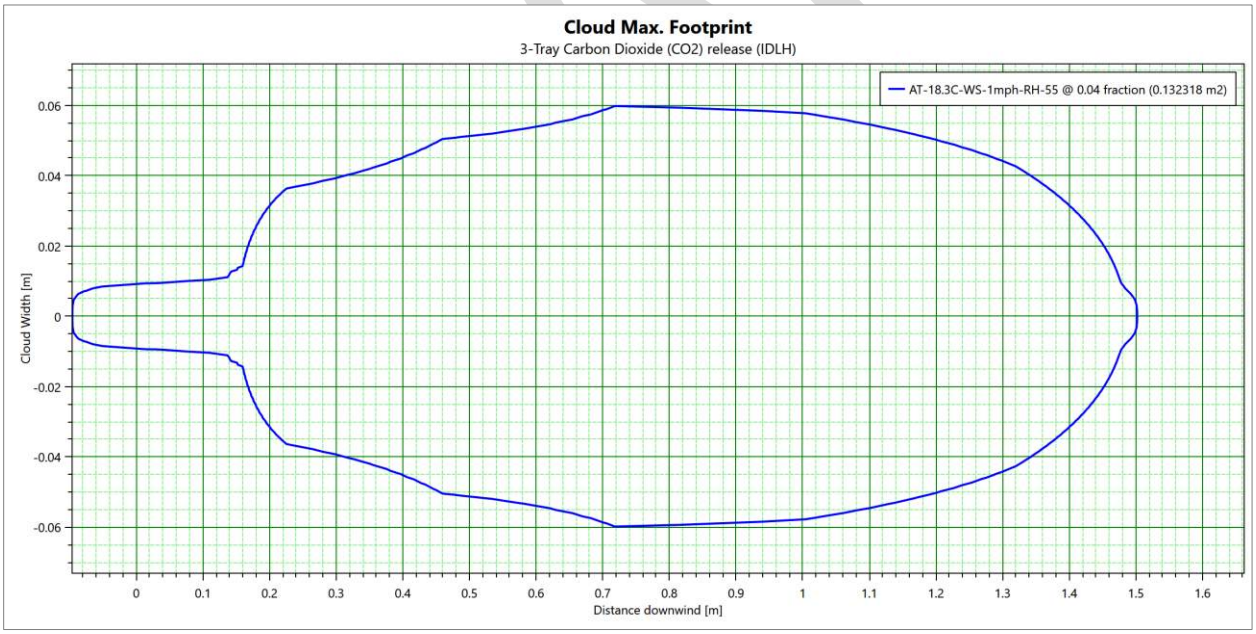

Figure 56 Maximum horizontal extent of vapor cloud for CO2 IDLH (40,000 ppm)

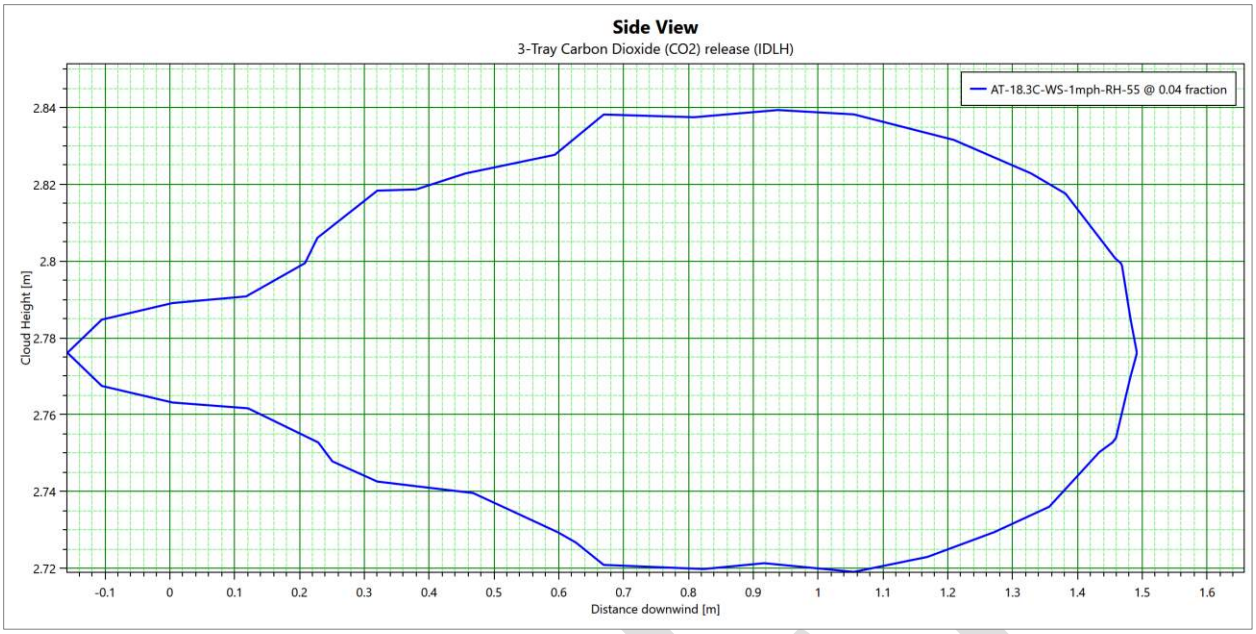

Figure 57 Maximum vertical extent of vapor cloud for CO2 IDLH (40,000 ppm)

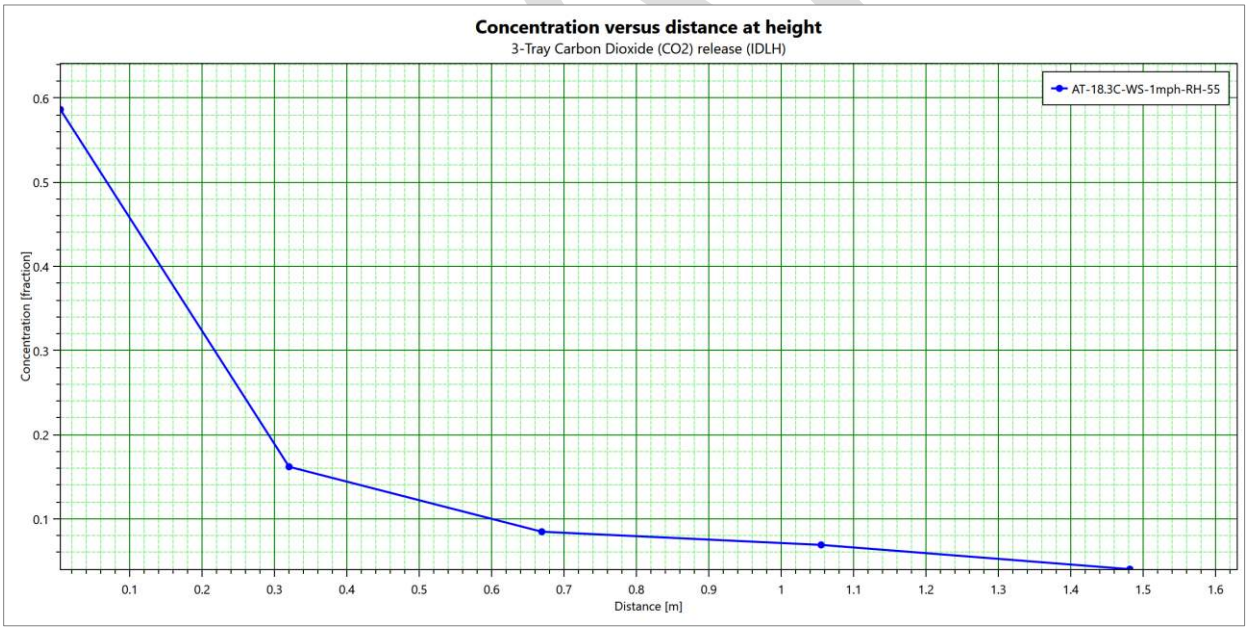

Figure 58 Concentration vs distance for CO2 IDLH (40,000 ppm)

1.3.4 TVG Flammable Vapor Cloud Extent (10 min Release)

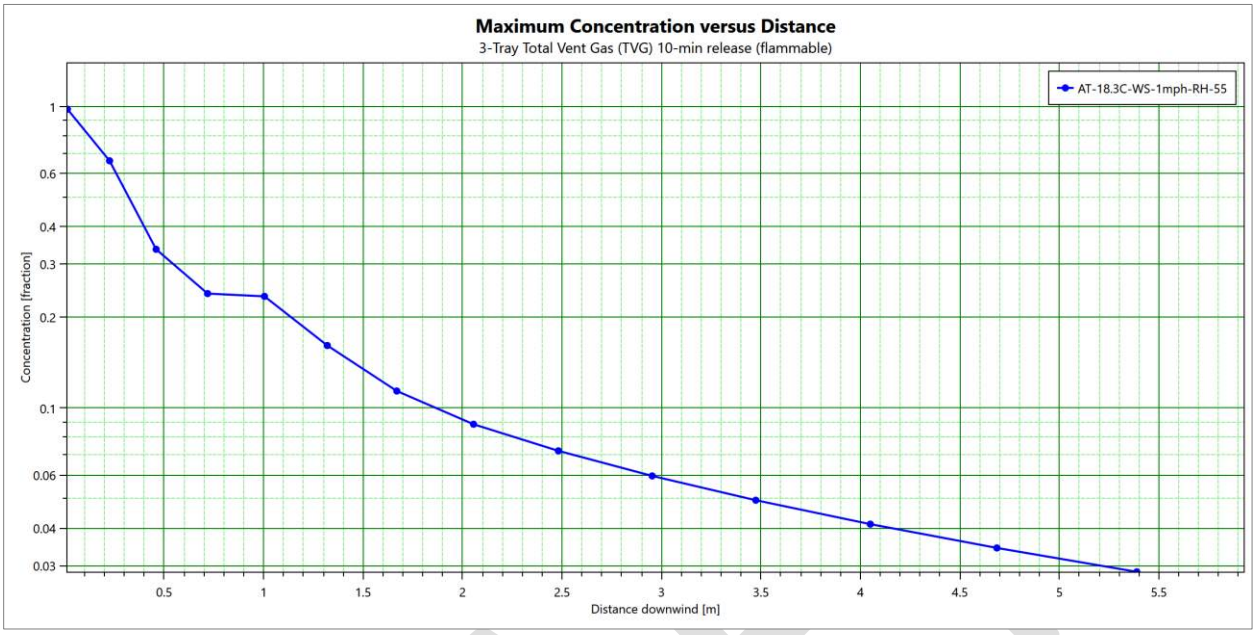

Figure 59 Maximum concentration vs distance for flammable vapor cloud

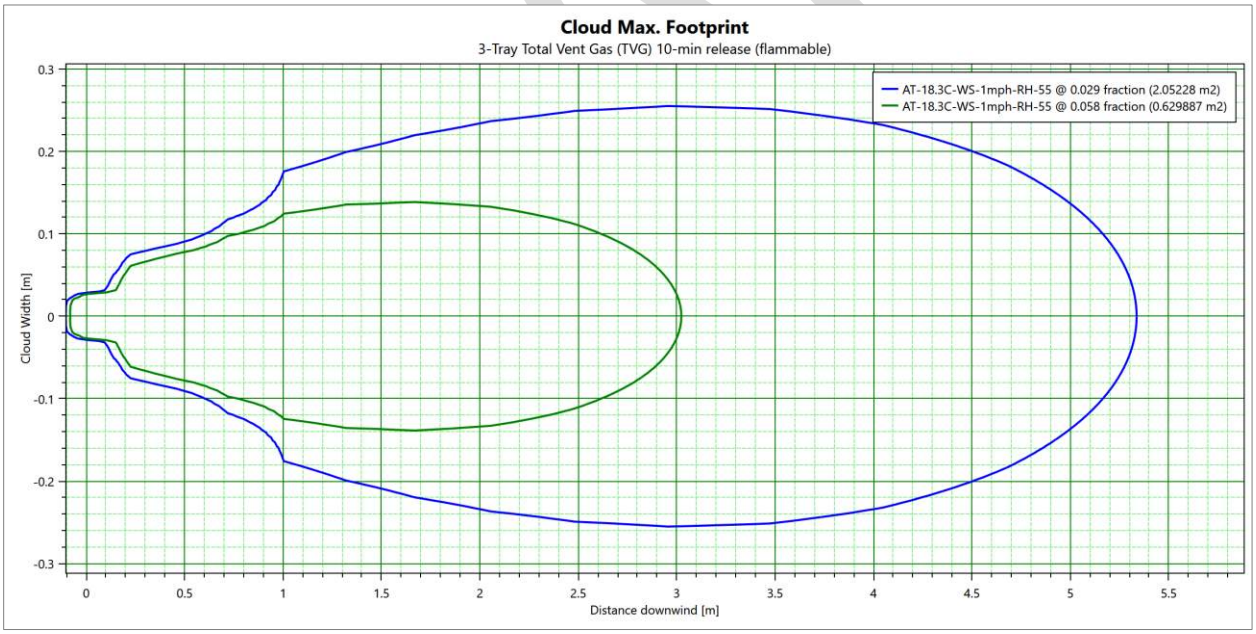

Figure 60 Maximum horizontal extent of vapor cloud for LFL (5.8%) and ½ LFL (2.9%)

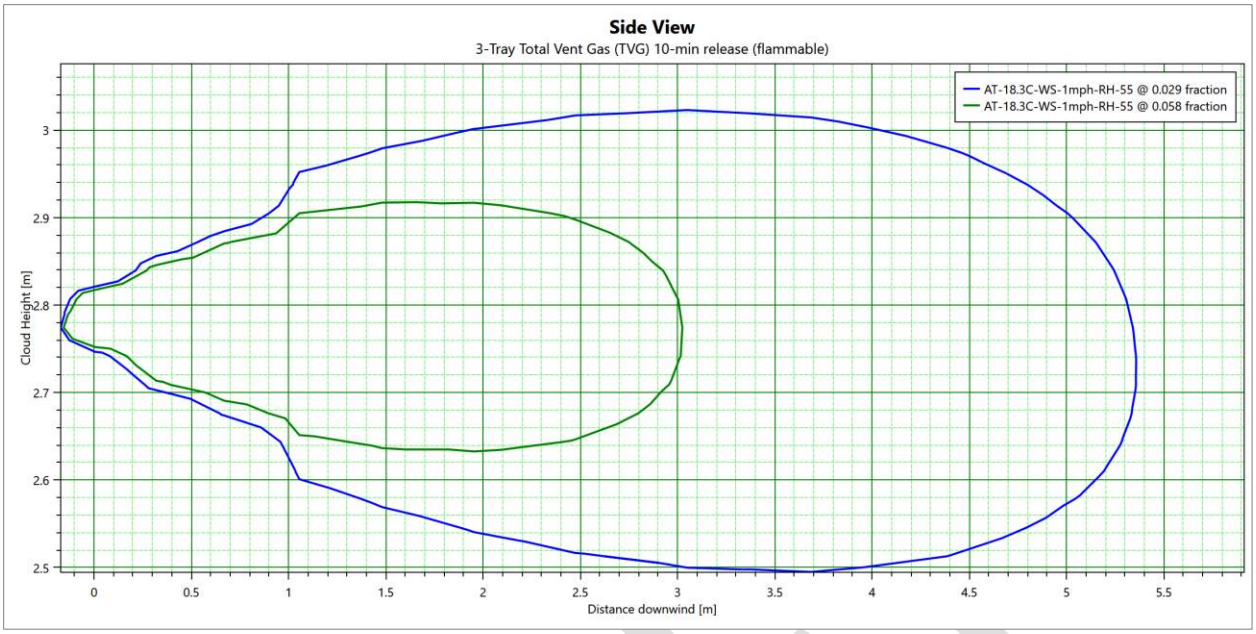

Figure 61 Maximum vertical extent of vapor cloud for LFL (5.8%) and ½ LFL (2.9%)

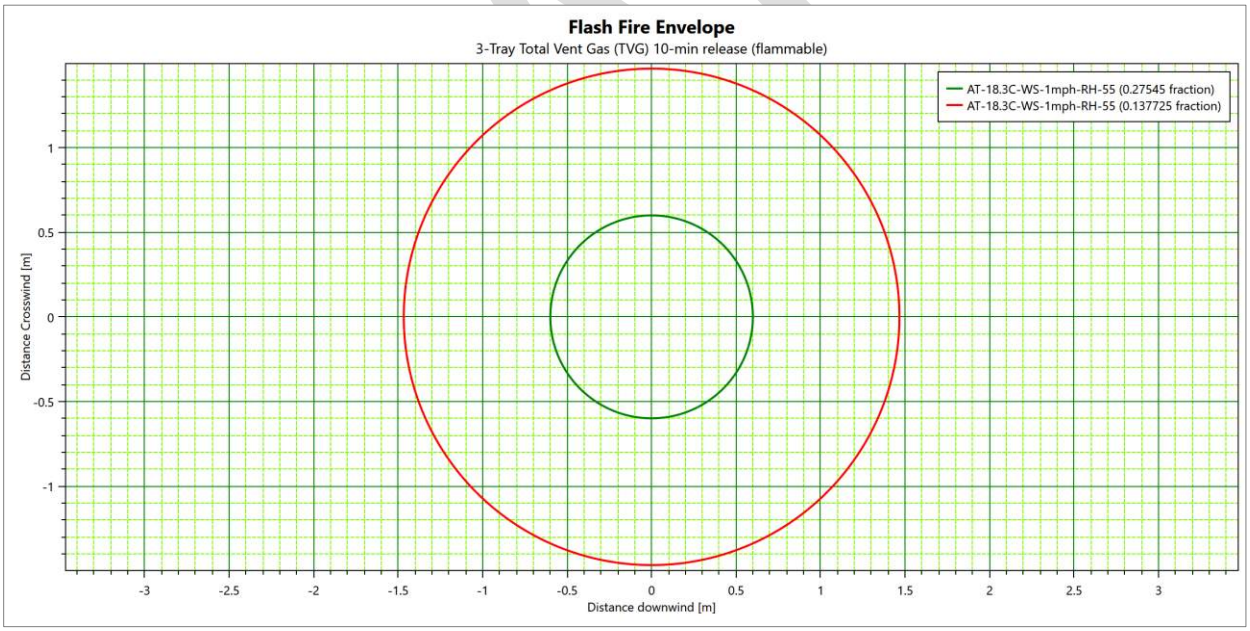

Figure 62 Flash Fire Envelope for LFL (5.8%) and ½ LFL (2.9%)

1.3.5 CO IDLH (1,200 ppm) Component Extent (10 min Release)

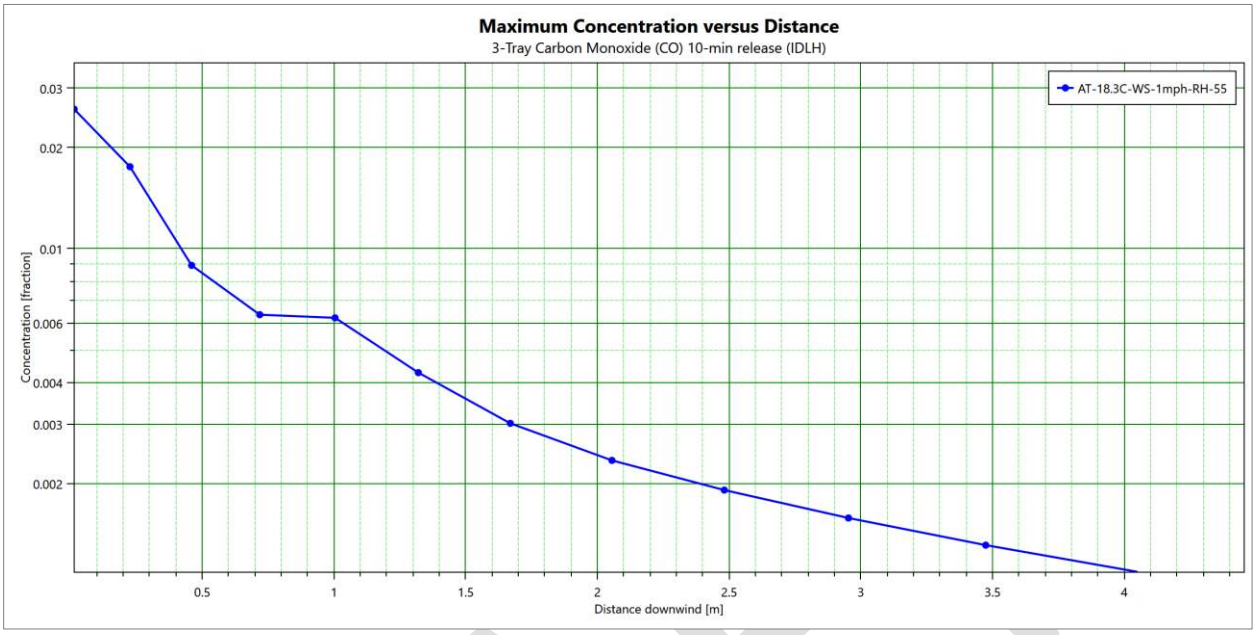

Figure 63 Maximum Concentration vs distance for CO gas component

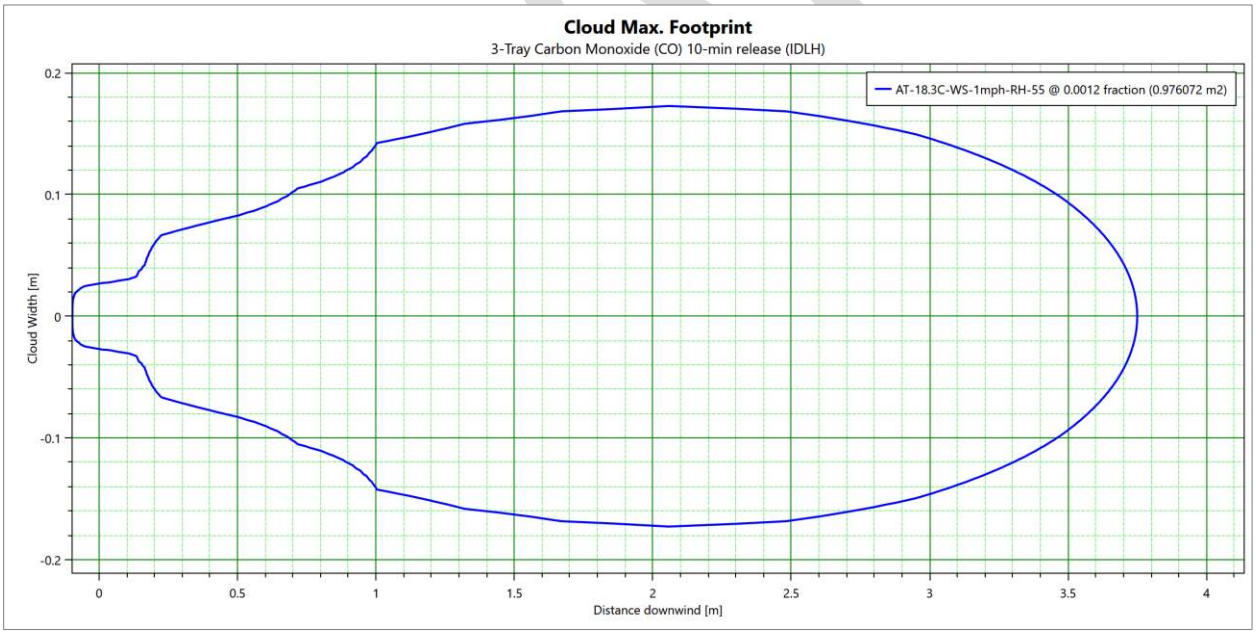

Figure 64 Maximum horizontal extent of vapor cloud for CO IDLH (1,200 ppm)

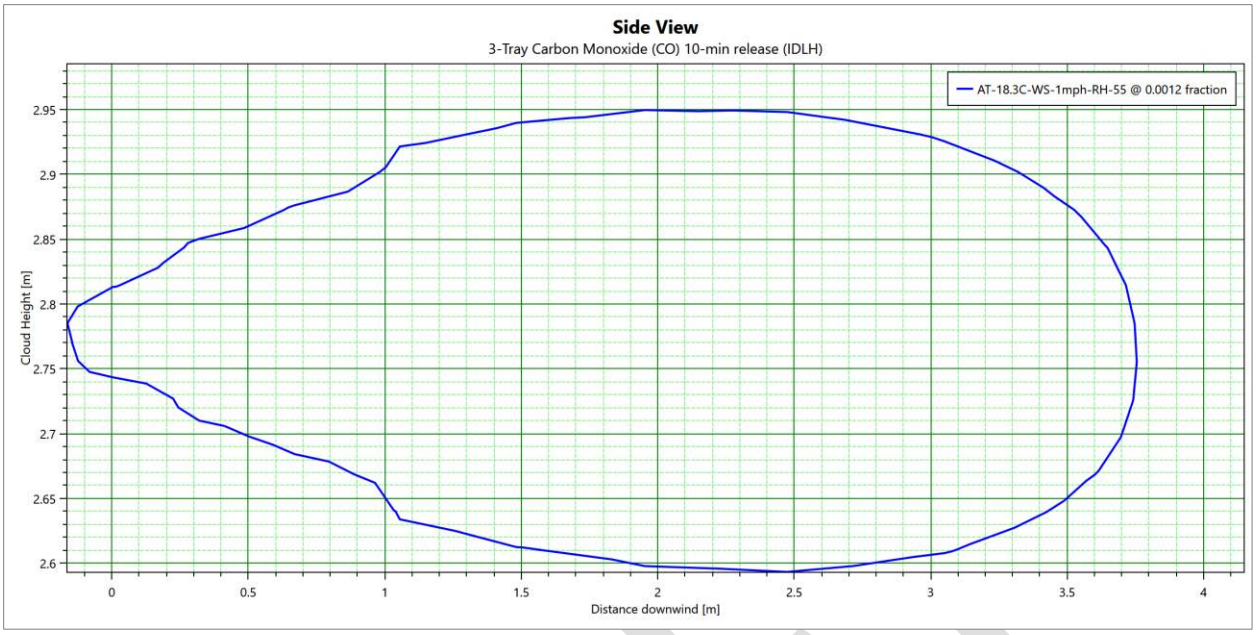

Figure 65 Maximum vertical extent of vapor cloud for CO IDLH (1,200 ppm)

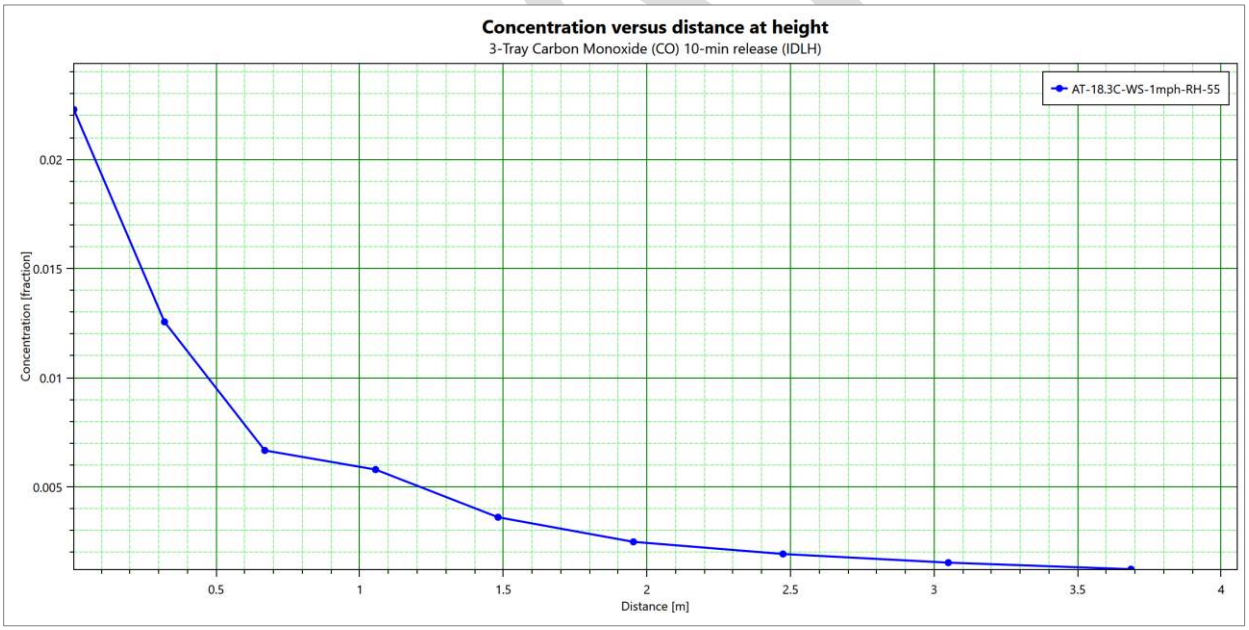

Figure 66 Concentration vs distance for CO IDLH (1,200 ppm)

1.3.6 CO2 IDLH (40,000 ppm) Component Extent (10 min Release)

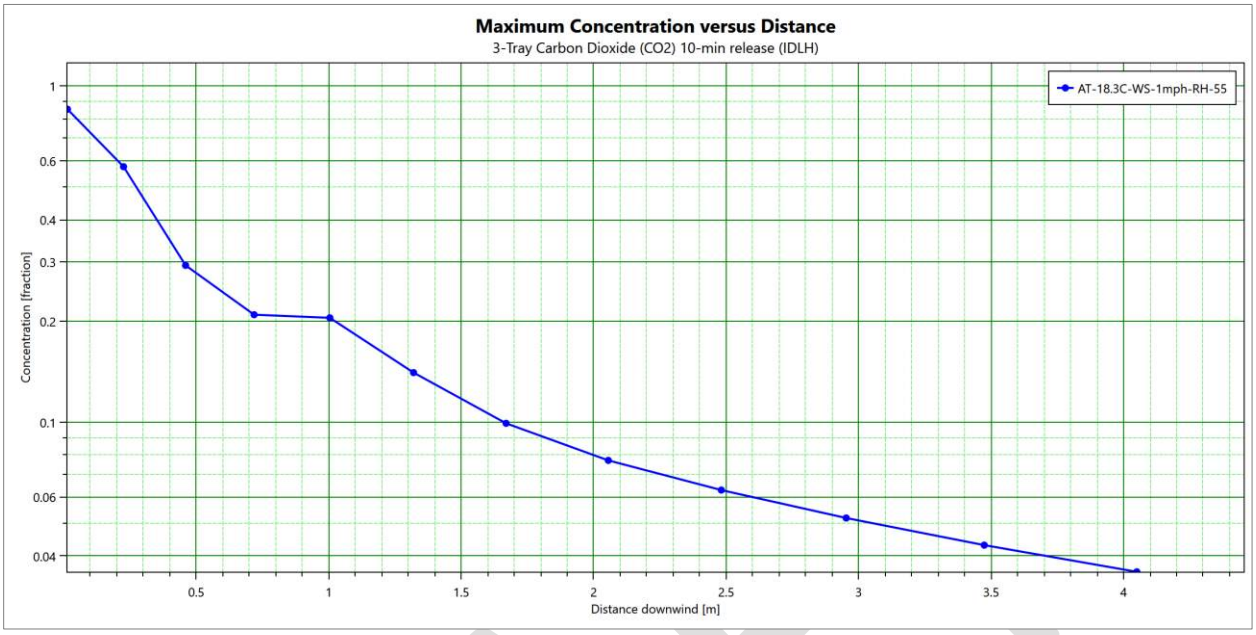

Figure 67 Maximum Concentration vs distance for CO2 gas component

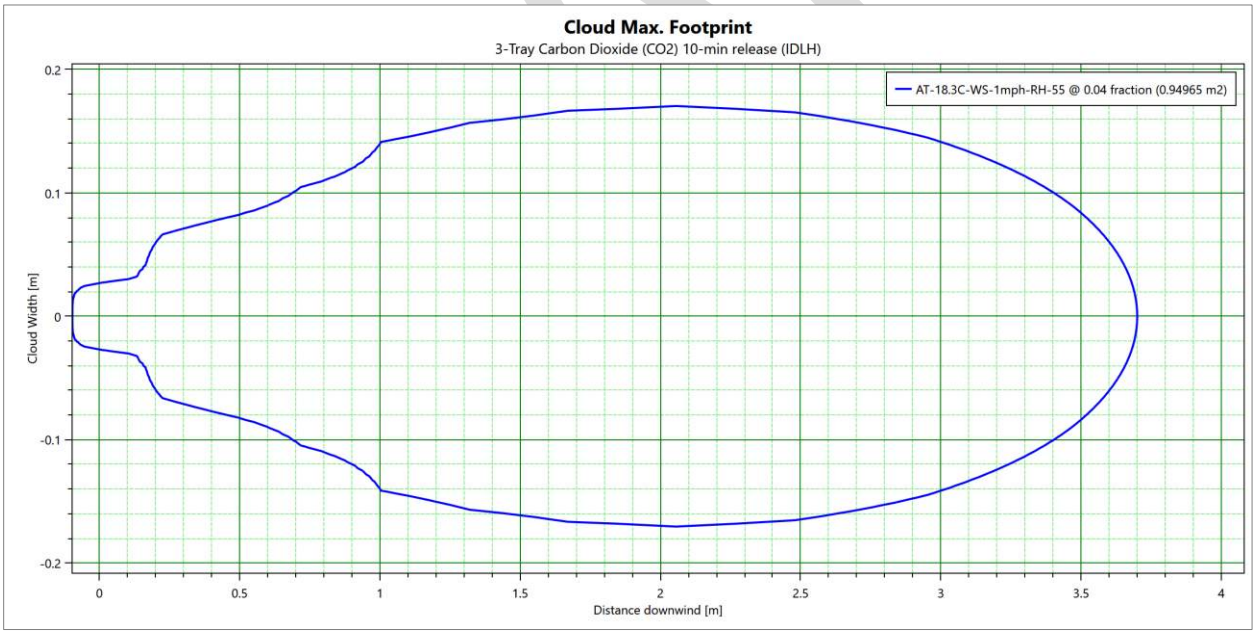

Figure 68 Maximum horizontal extent of vapor cloud for CO2 IDLH (40,000 ppm)

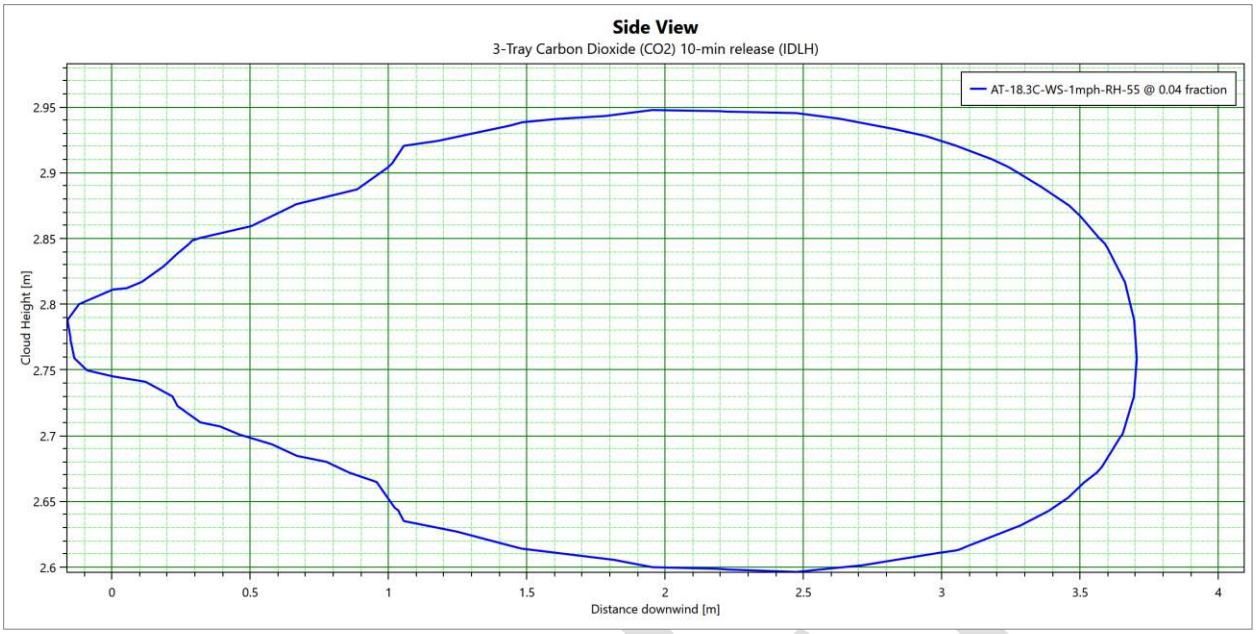

Figure 69 Maximum vertical extent of vapor cloud for CO2 IDLH (40,000 ppm)

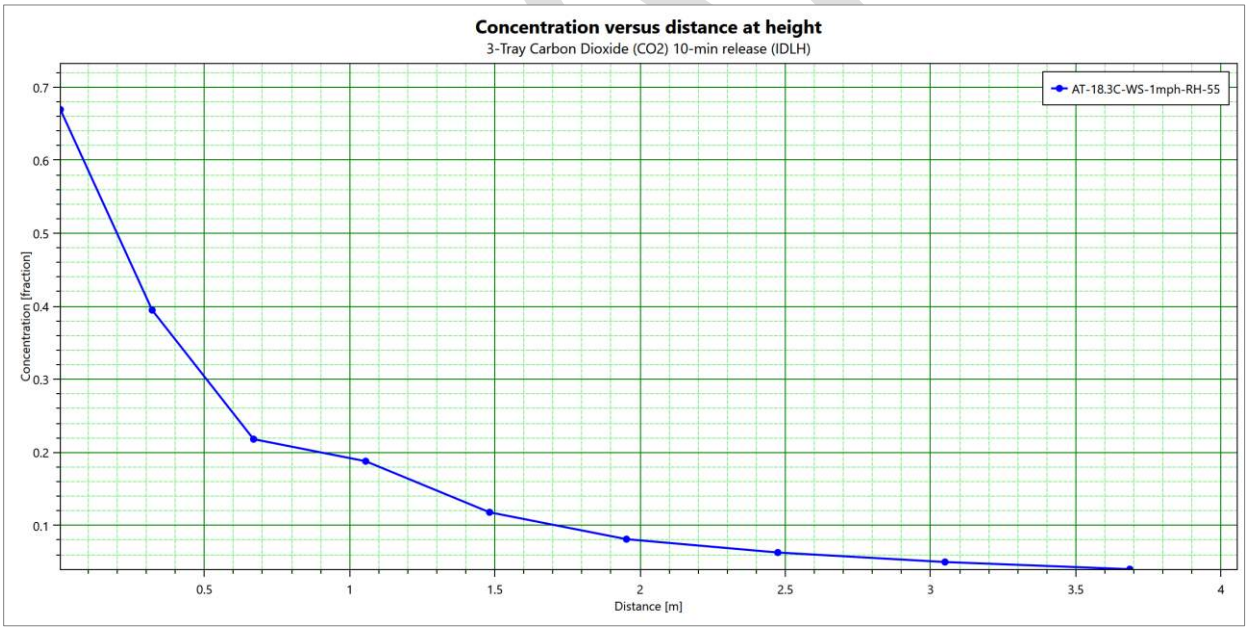

Figure 70 Concentration vs distance for CO2 IDLH (40,000 ppm)

1.4 Scenario 4: 1-MP2XL (24-Module) Release

1.4.1 TVG Flammable Vapor Cloud Extent (85.19min Release)

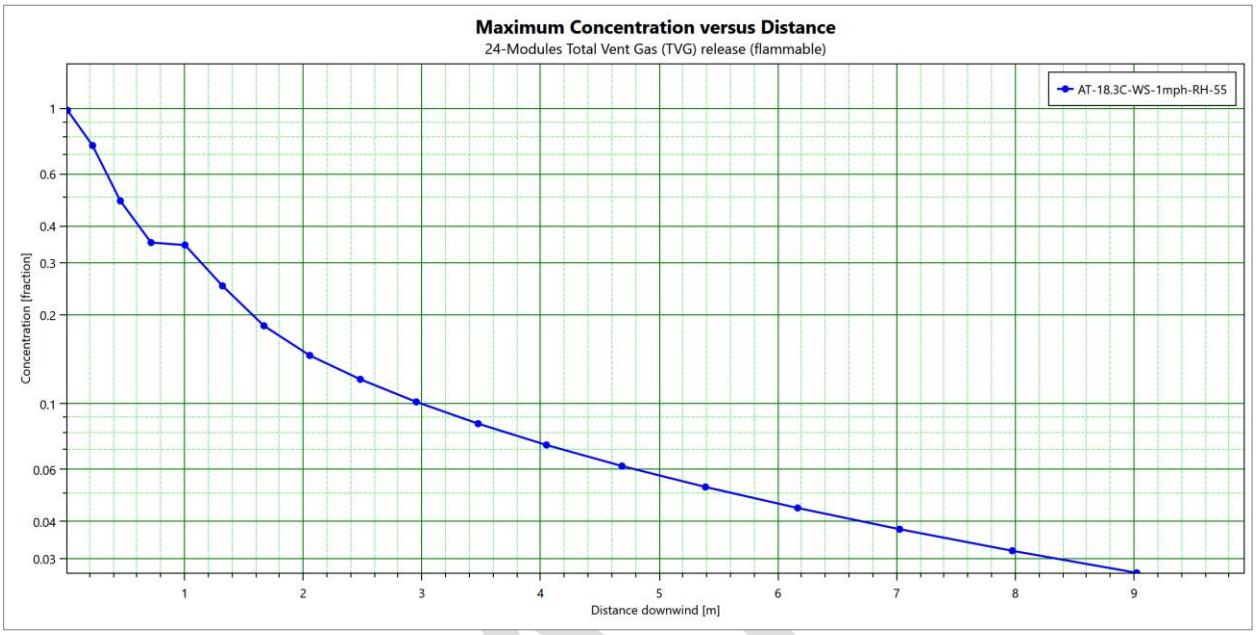

Figure 71 Maximum concentration vs distance for flammable vapor cloud

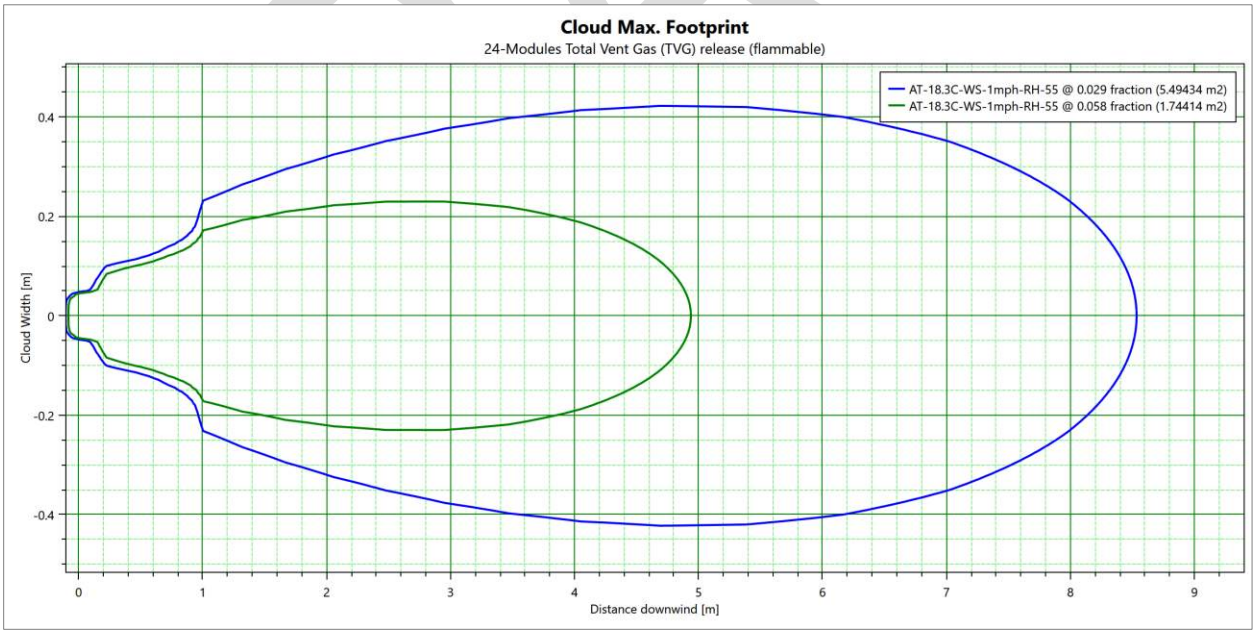

Figure 72 Maximum horizontal extent of vapor cloud for LFL (5.8%) and ½ LFL (2.9%)

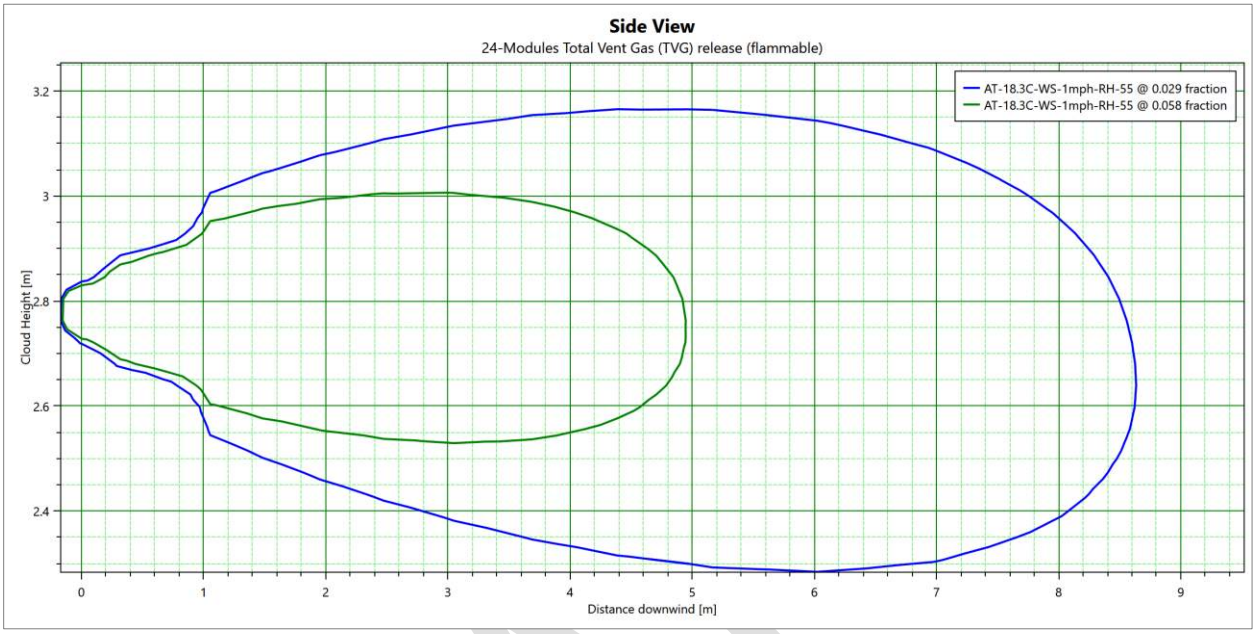

Figure 73 Maximum vertical extent of vapor cloud for LFL (5.8%) and ½ LFL (2.9%)

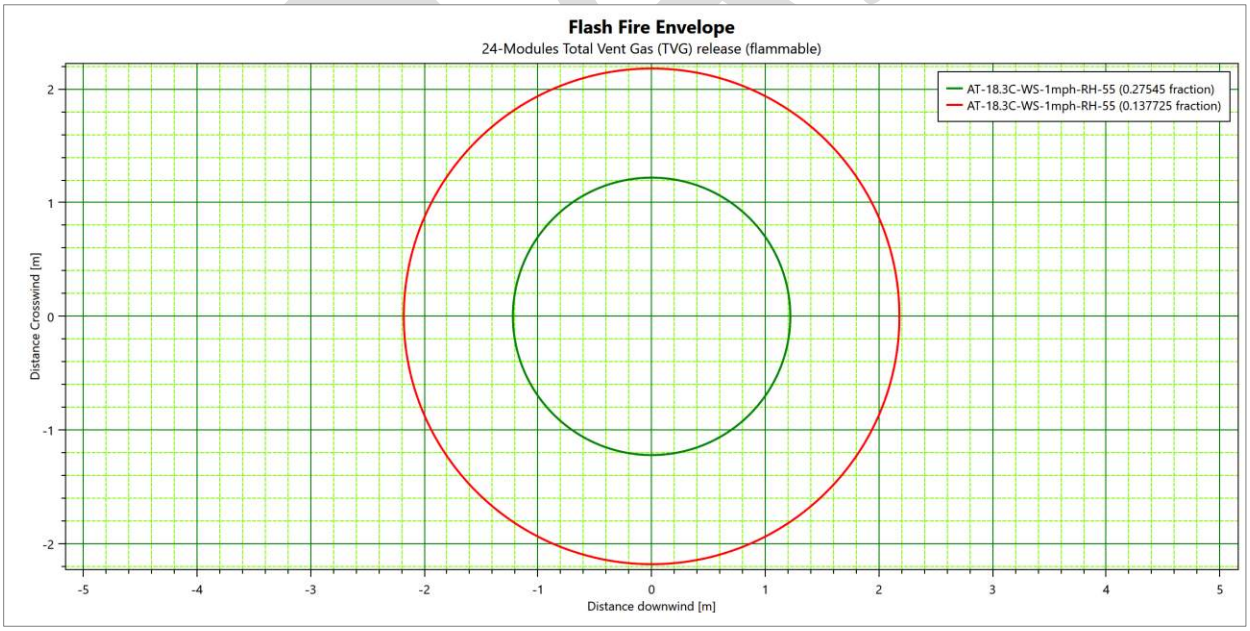

Figure 74 Flash Fire Envelope for LFL (5.8%) and ½ LFL (2.9%)

1.4.2 CO IDLH (1,200 ppm) Component Extent (85.19min Release)

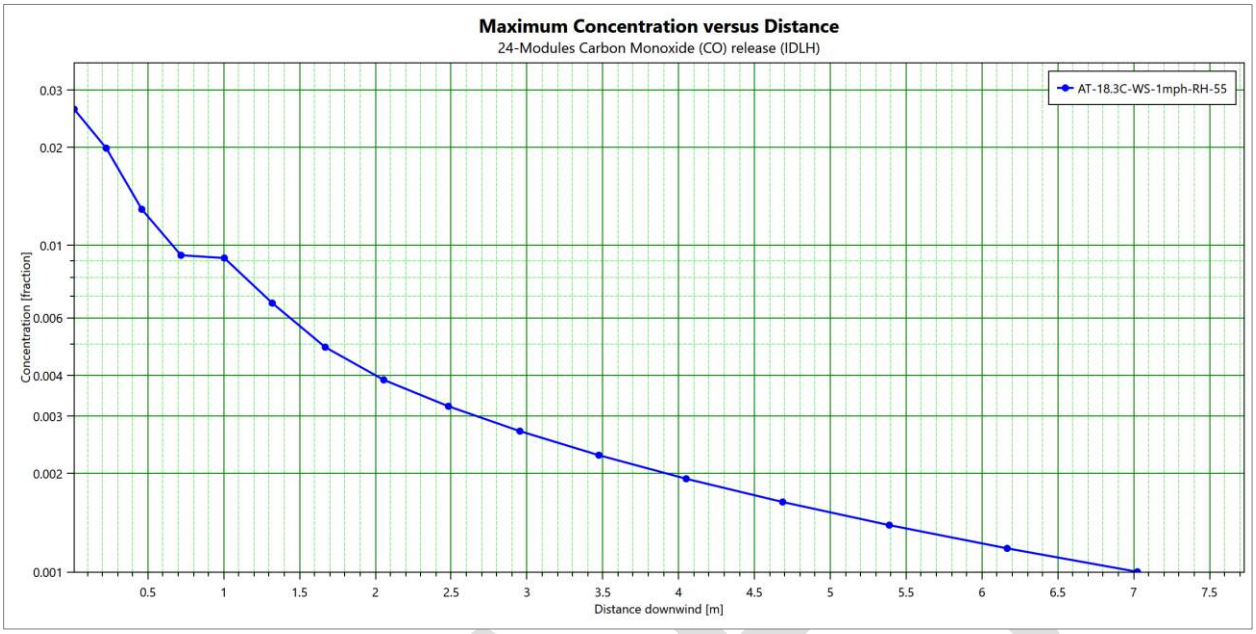

Figure 75 Maximum Concentration vs distance for CO gas component

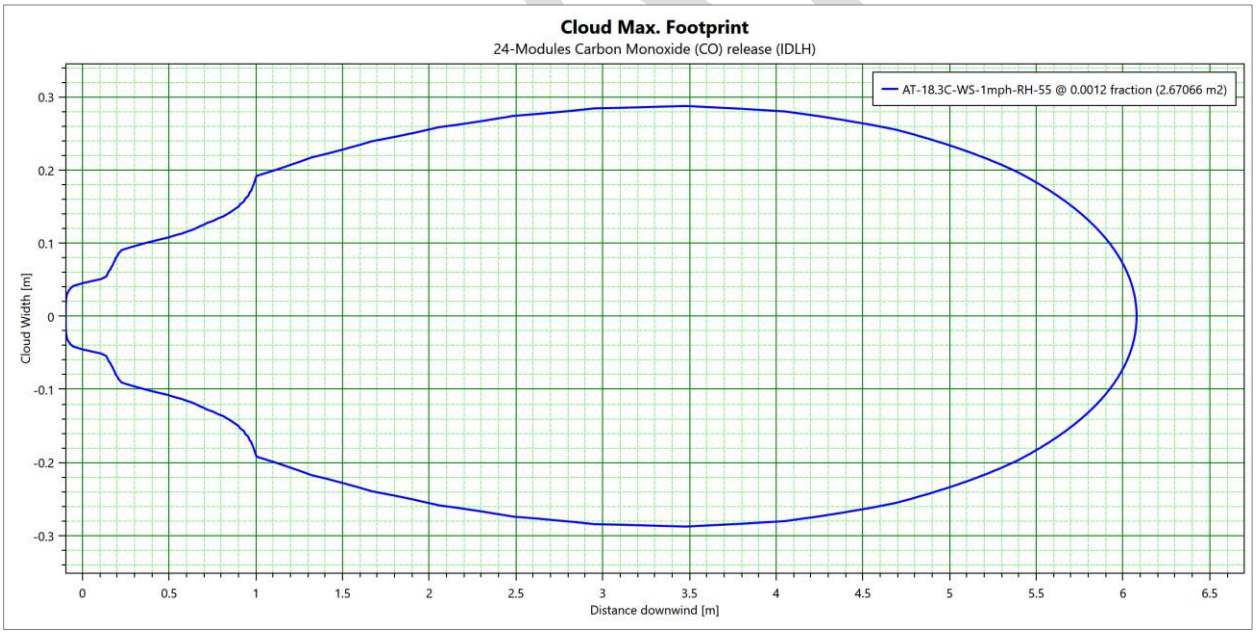

Figure 76 Maximum horizontal extent of vapor cloud for CO IDLH (1,200 ppm)

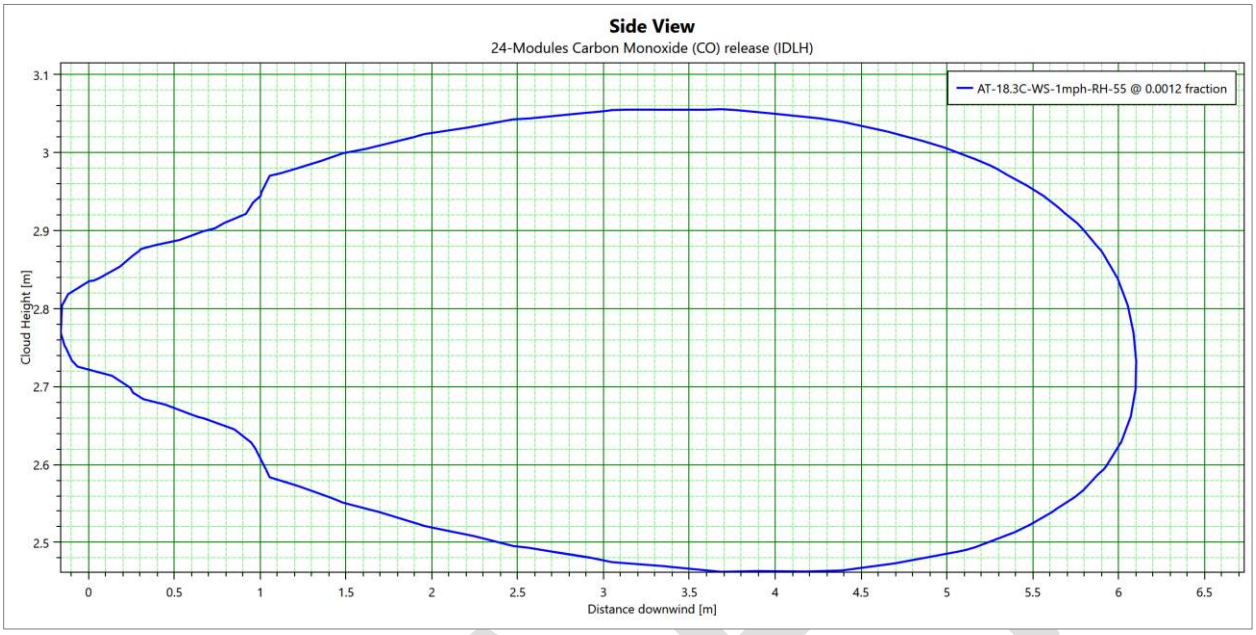

Figure 77 Maximum vertical extent of vapor cloud for CO IDLH (1,200 ppm)

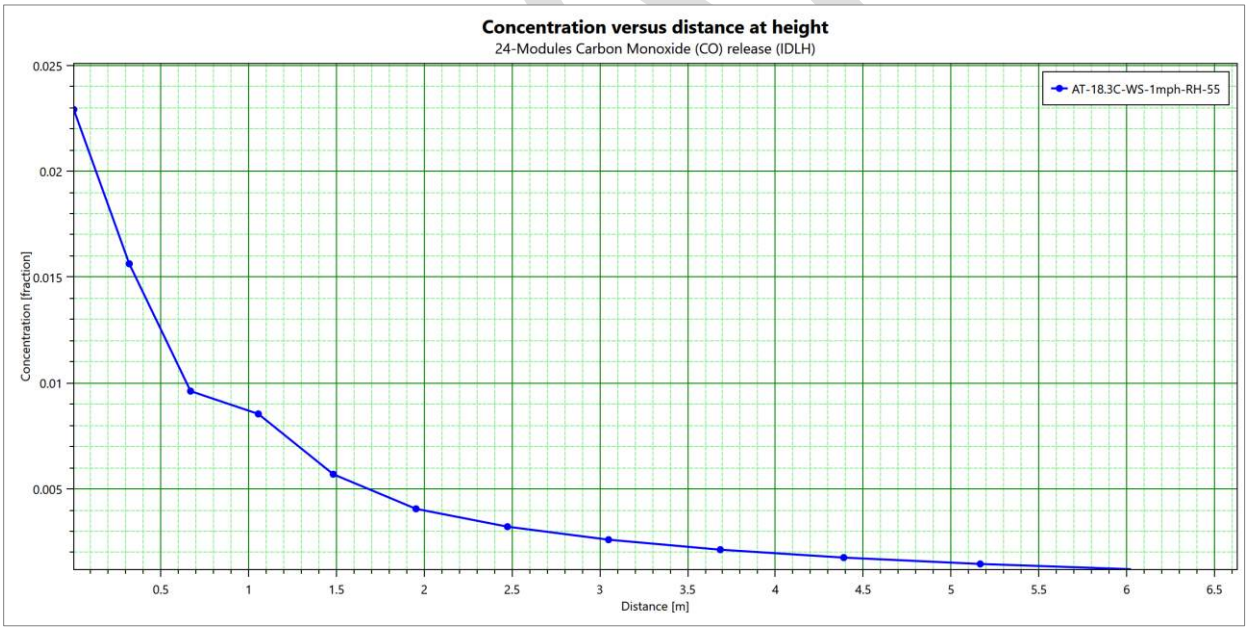

Figure 78 Concentration vs distance for CO IDLH (1,200 ppm)

1.4.3 CO2 IDLH (40,000 ppm) Component Extent (85.19min Release)

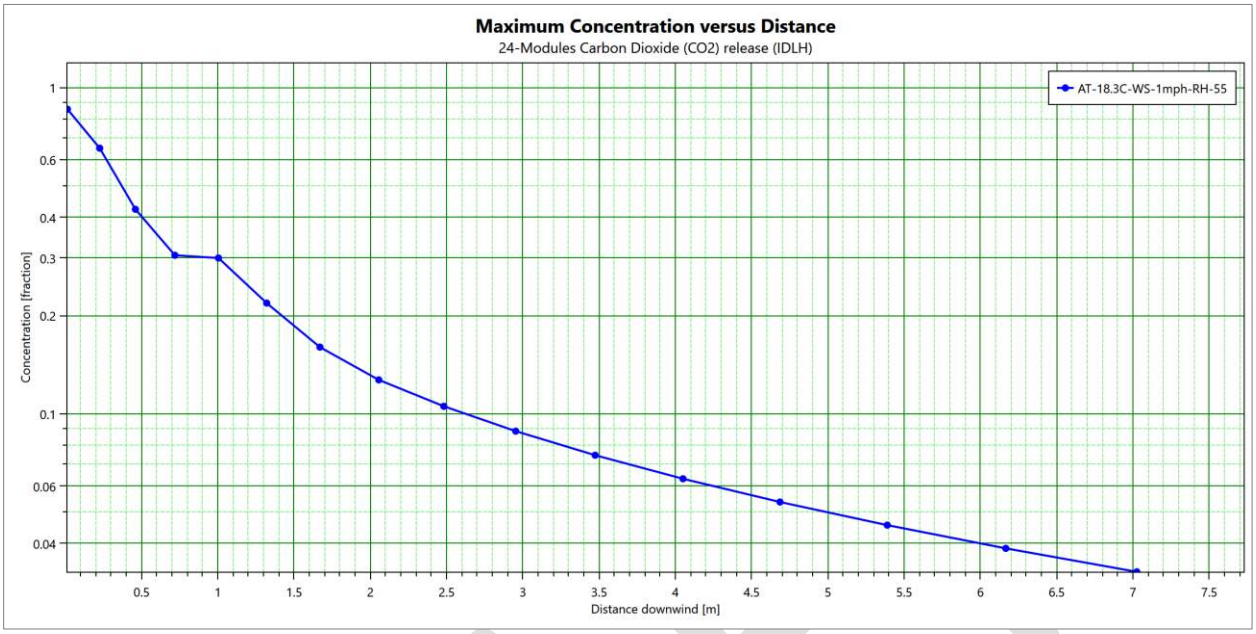

Figure 79 Maximum Concentration vs distance for CO2 gas component

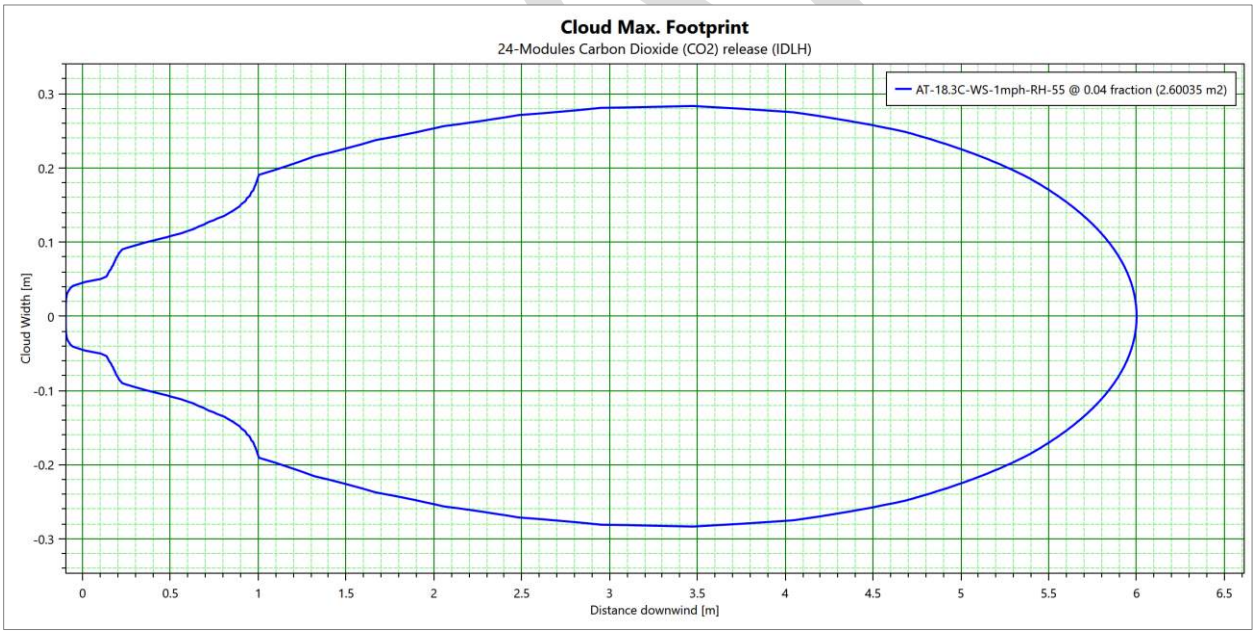

Figure 80 Maximum horizontal extent of vapor cloud for CO2 IDLH (40,000 ppm)

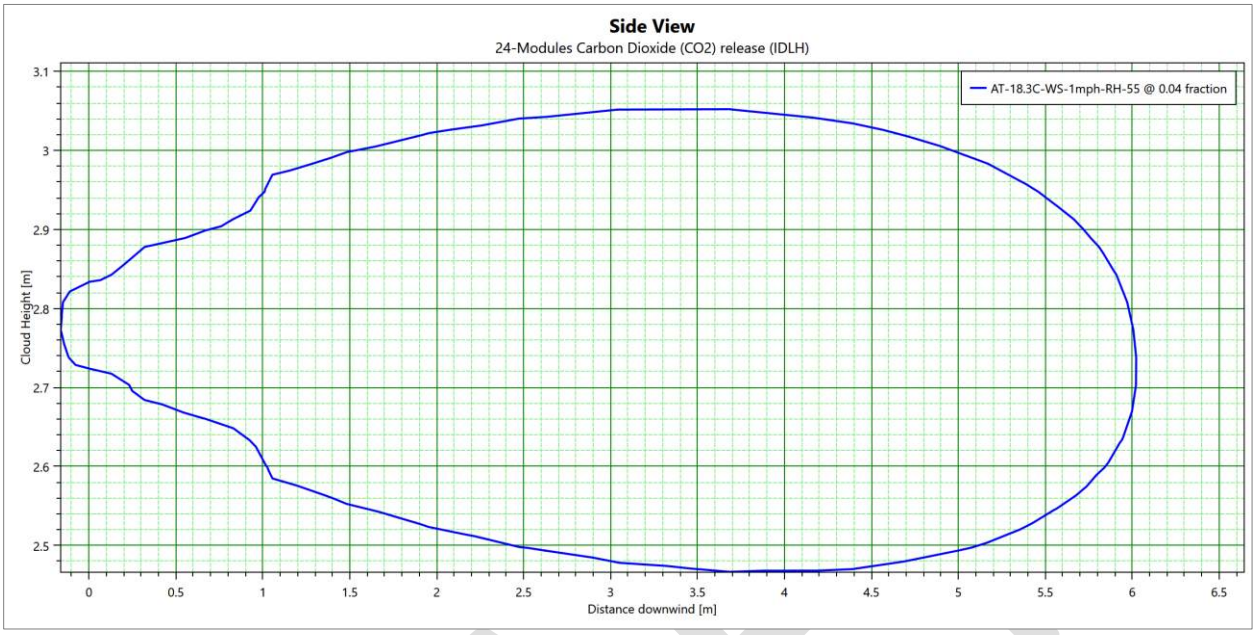

Figure 81 Maximum vertical extent of vapor cloud for CO2 IDLH (40,000 ppm)

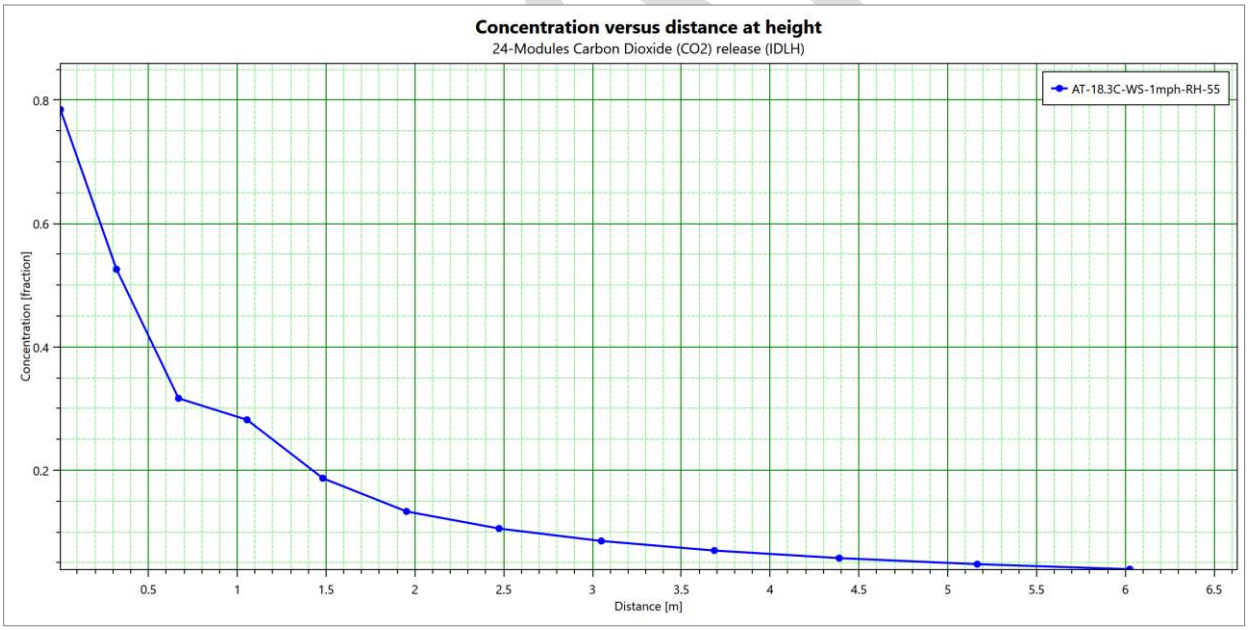

Figure 82 Concentration vs distance for CO2 IDLH (40,000 ppm)

1.4.4 TVG Flammable Vapor Cloud Extent (10 min Release)

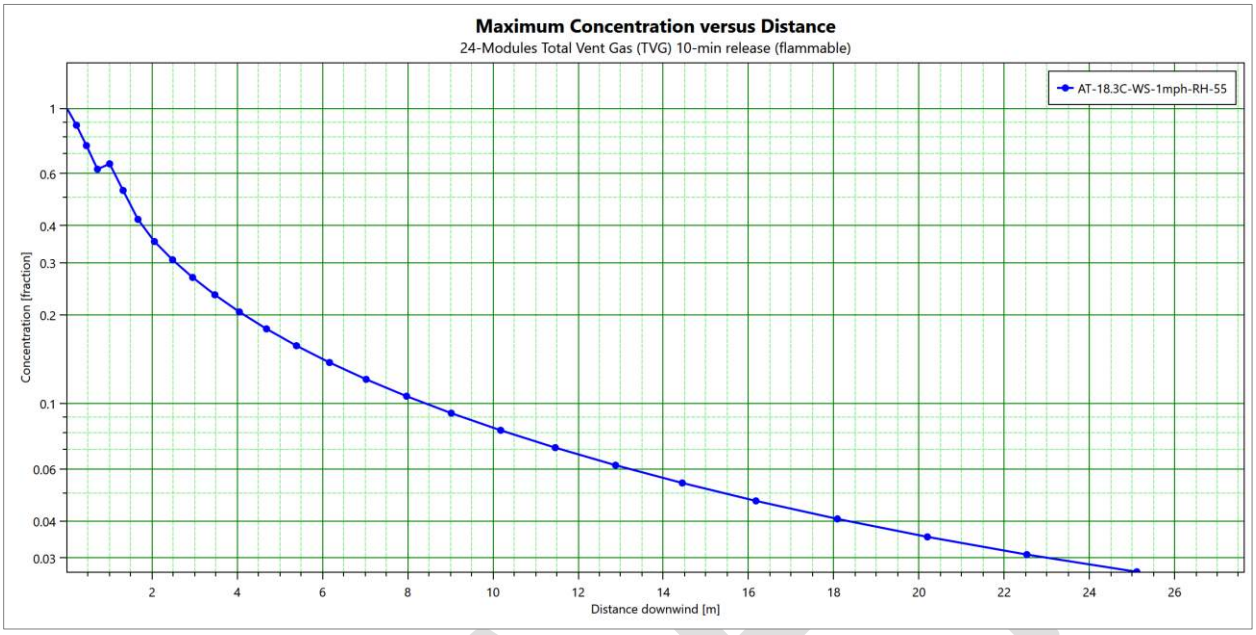

Figure 83 Maximum concentration vs distance for flammable vapor cloud

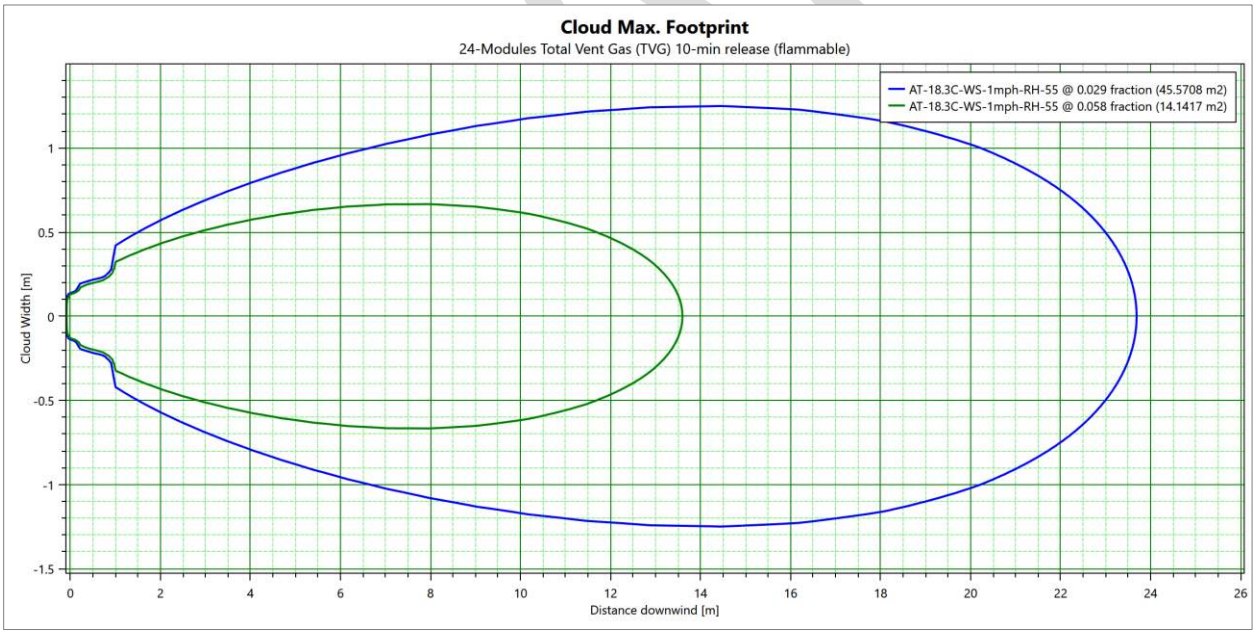

Figure 84 Maximum horizontal extent of vapor cloud for LFL (5.8%) and ½ LFL (2.9%)

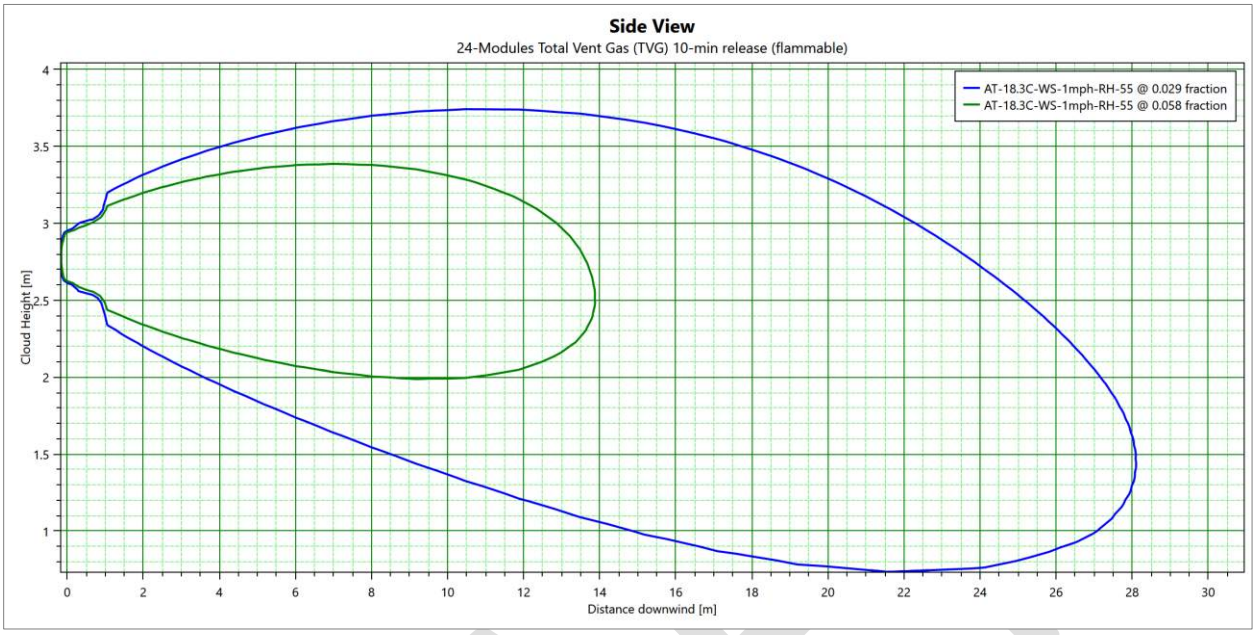

Figure 85 Maximum vertical extent of vapor cloud for LFL (5.8%) and ½ LFL (2.9%)

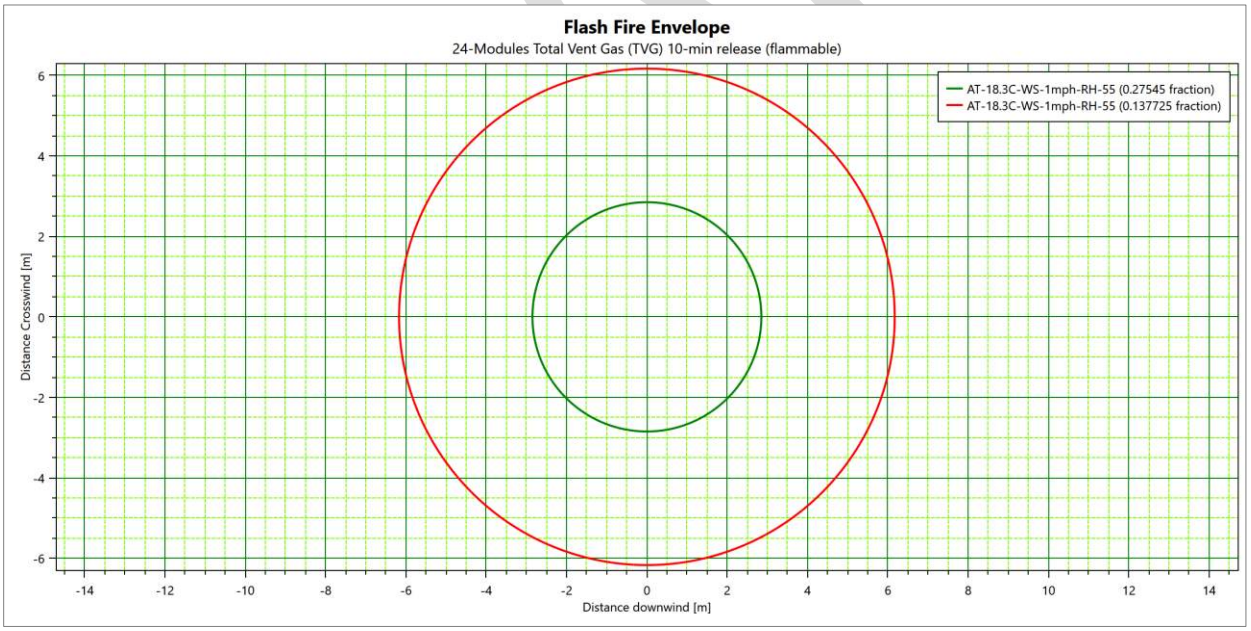

Figure 86 Flash Fire Envelope for LFL (5.8%) and ½ LFL (2.9%)

1.4.5 CO IDLH (1,200 ppm) Component Extent (10 min Release)

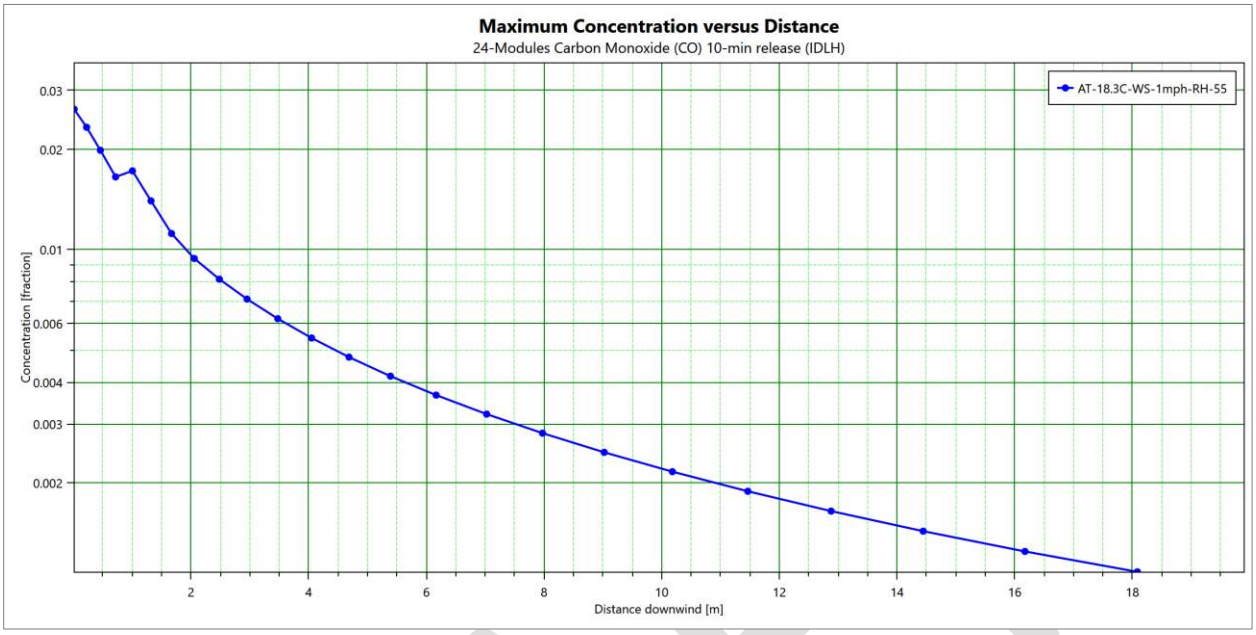

Figure 87 Maximum Concentration vs distance for CO gas component

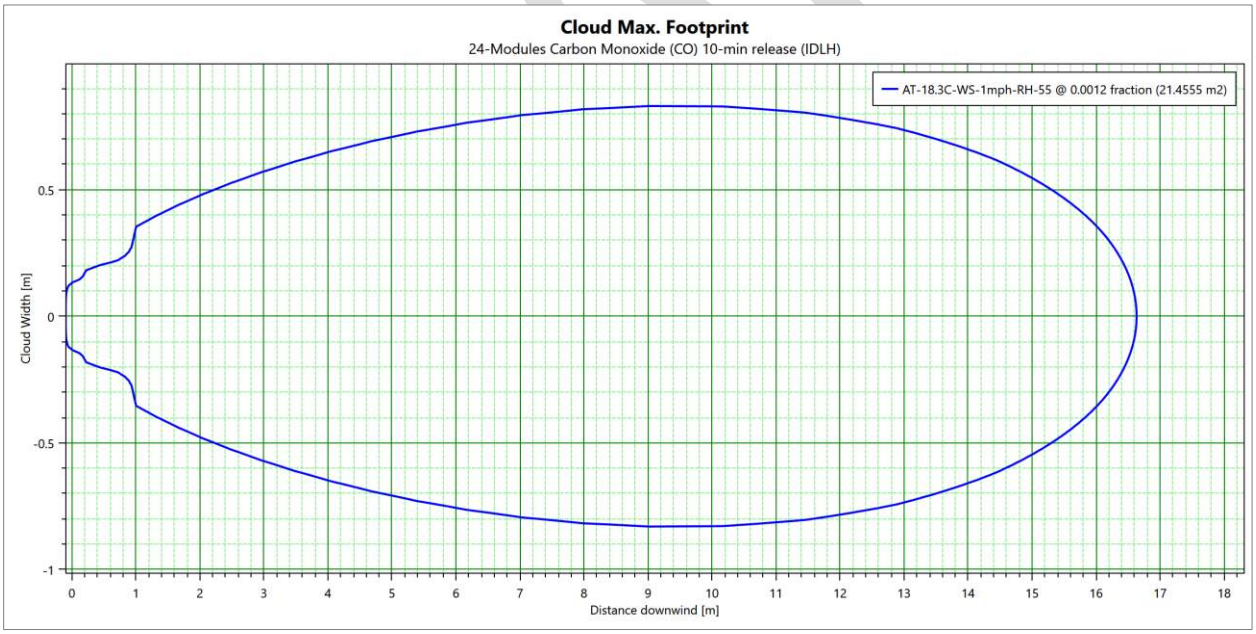

Figure 88 Maximum horizontal extent of vapor cloud for CO IDLH (1,200 ppm)

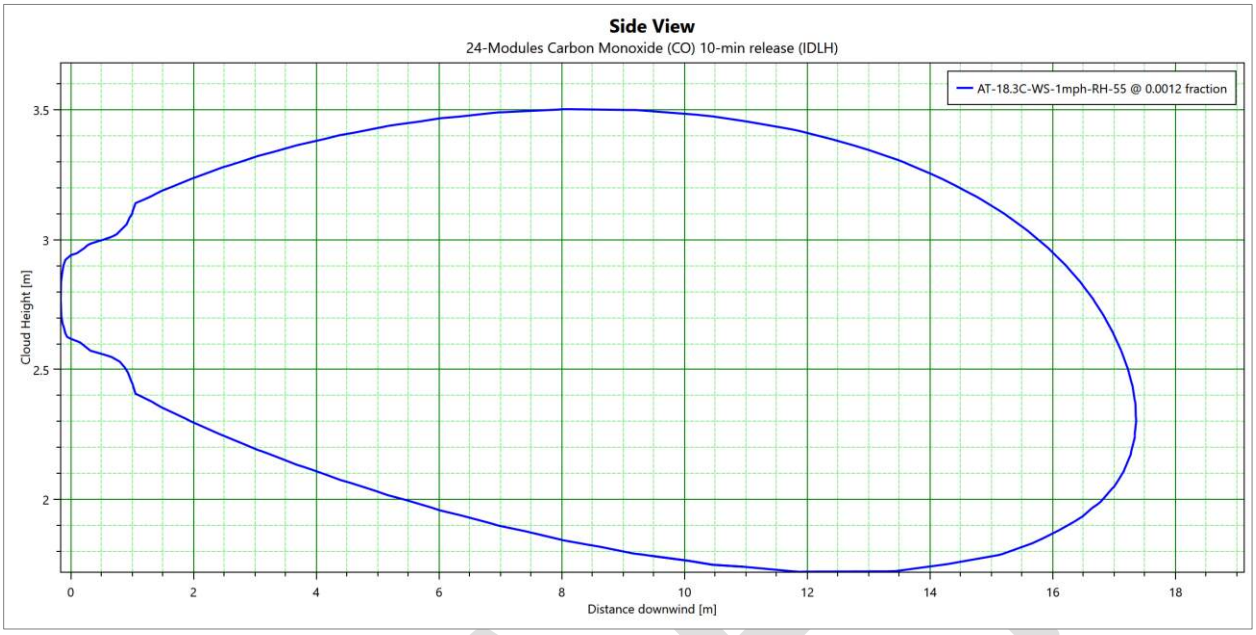

Figure 89 Maximum vertical extent of vapor cloud for CO IDLH (1,200 ppm)

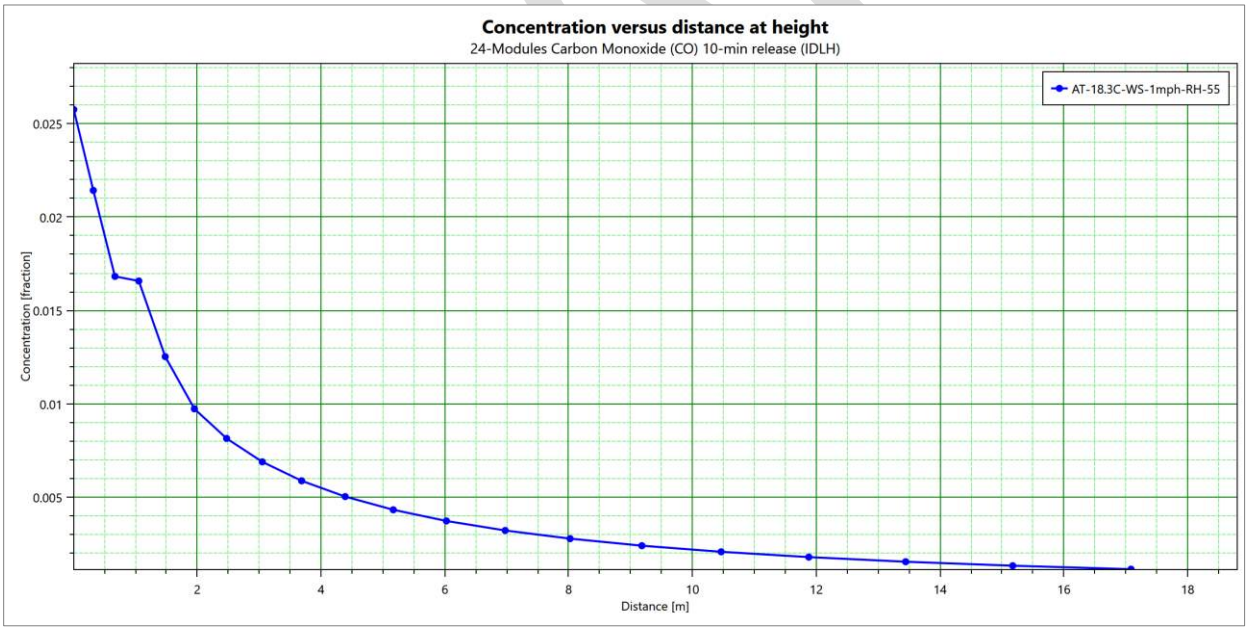

Figure 90 Concentration vs distance for CO IDLH (1,200 ppm)

1.4.6 CO2 IDLH (40,000 ppm) Component Extent (10 min Release)

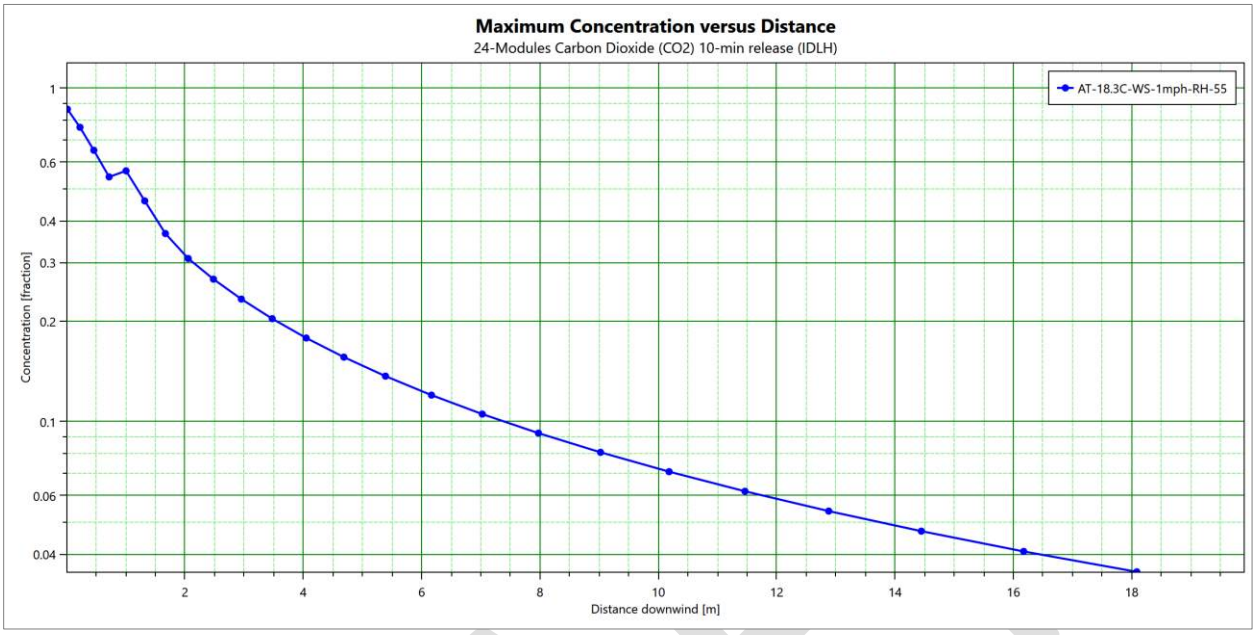

Figure 91 Maximum Concentration vs distance for CO2 gas component

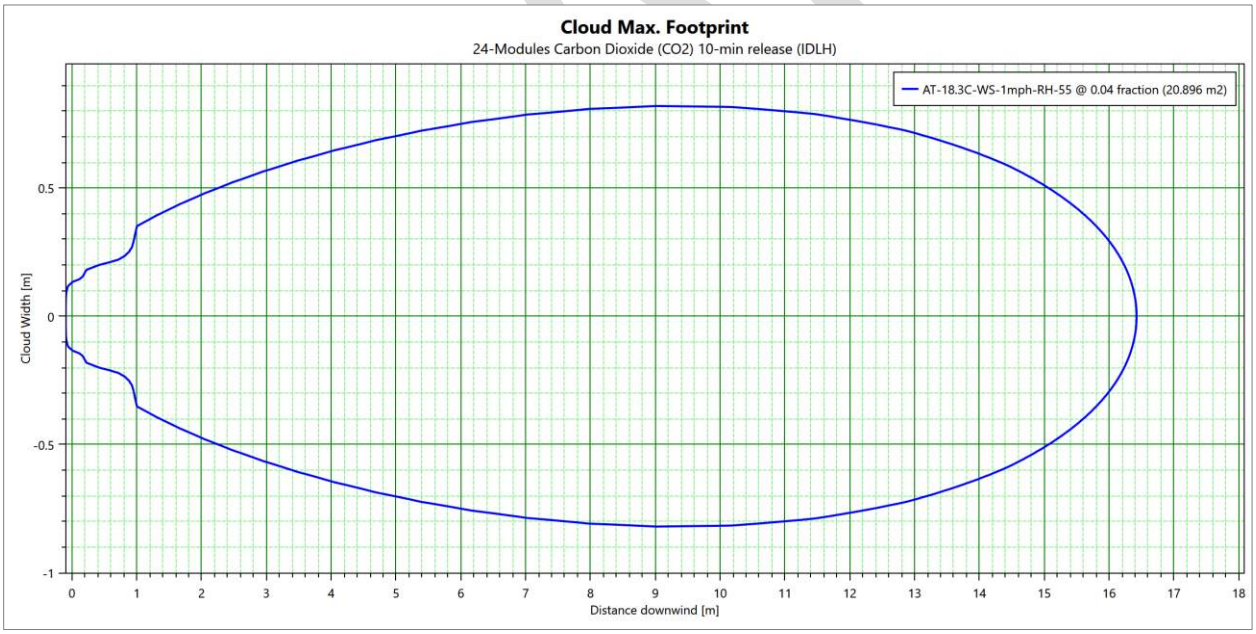

Figure 92 Maximum horizontal extent of vapor cloud for CO2 IDLH (40,000 ppm)

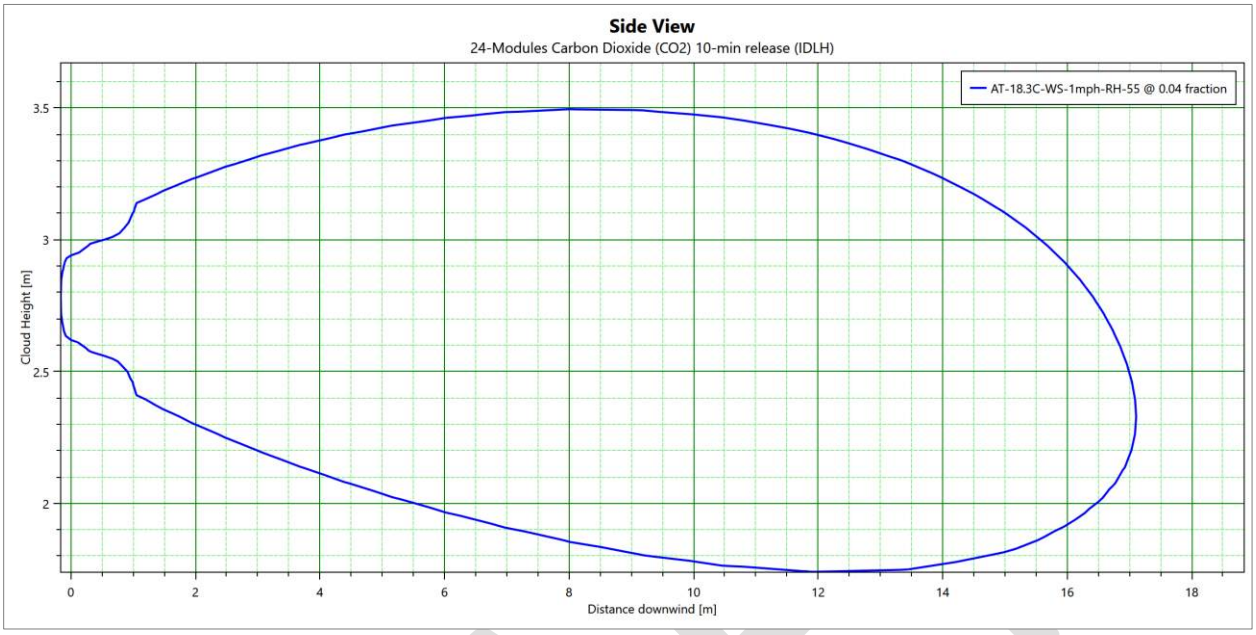

Figure 93 Maximum vertical extent of vapor cloud for CO2 IDLH (40,000 ppm)

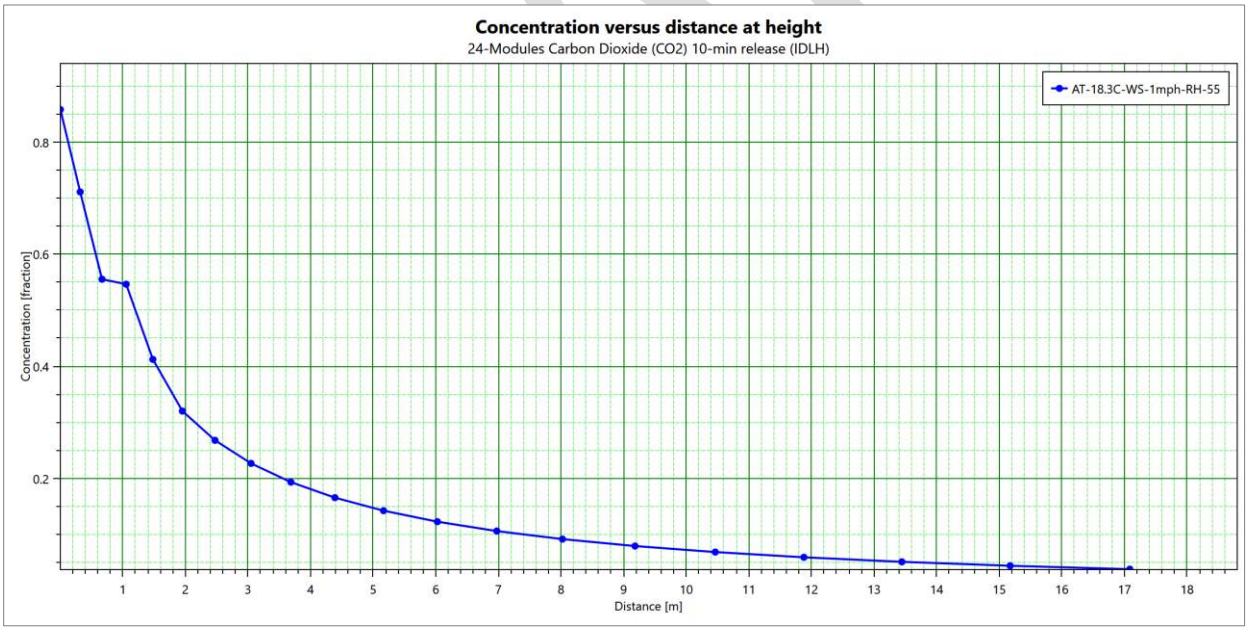

Figure 94 Concentration vs distance for CO2 IDLH (40,000 ppm)

1.5 Summary Results for Scaled Vent Gas LFL Extent

1.5.1 Scenario 1: UL9540A Thermal Runaway (7-Cells)

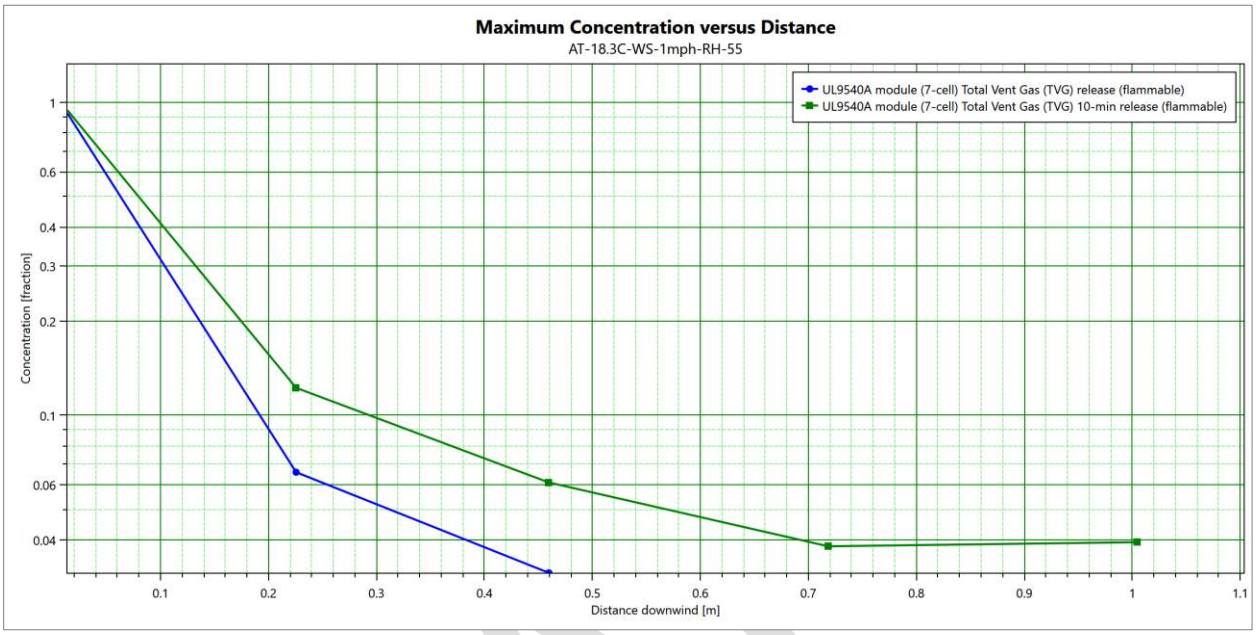

Figure 95 Maximum concentration vs distance for flammable vapor cloud for all sub-scenarios

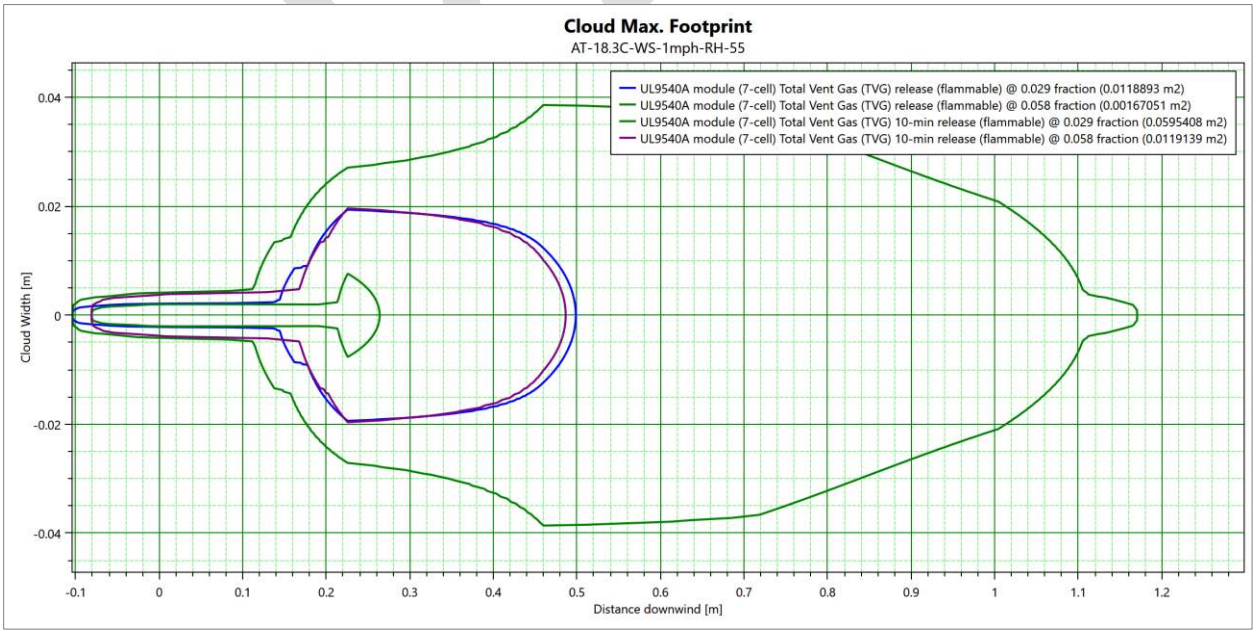

Figure 96 Maximum horizontal extent of vapor cloud for LFL (5.8%) for all sub-scenarios

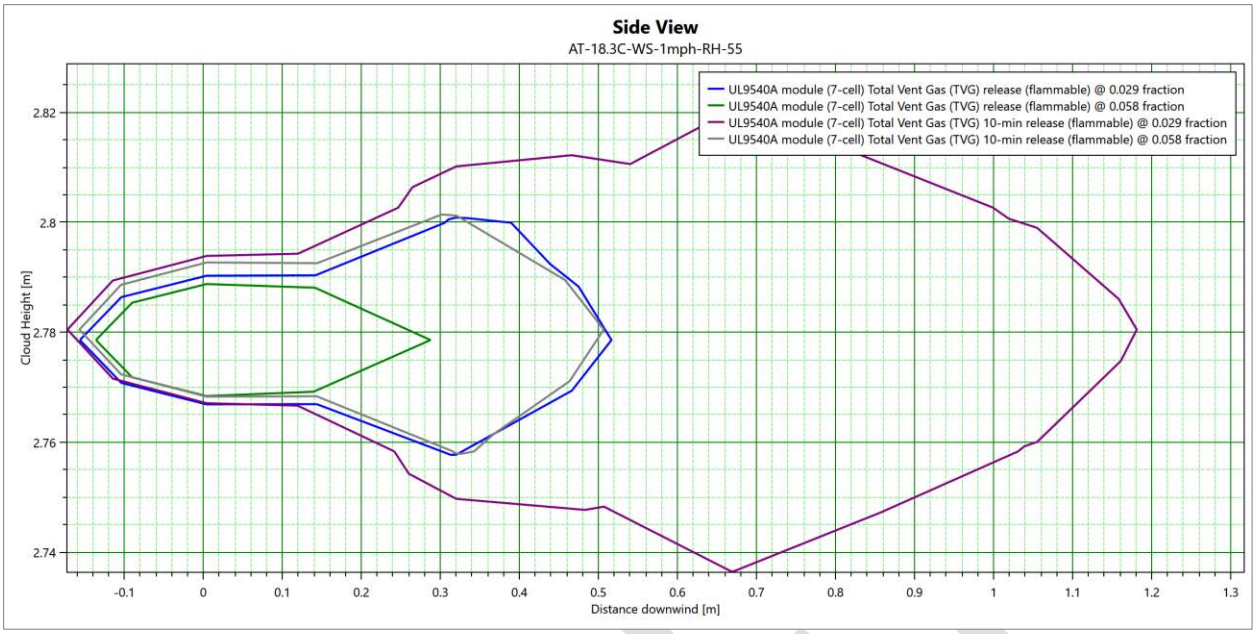

Figure 97 Maximum vertical extent of vapor cloud for LFL (5.8%) for all sub-scenarios

1.5.2 Scenario 2: 1-Tray Release

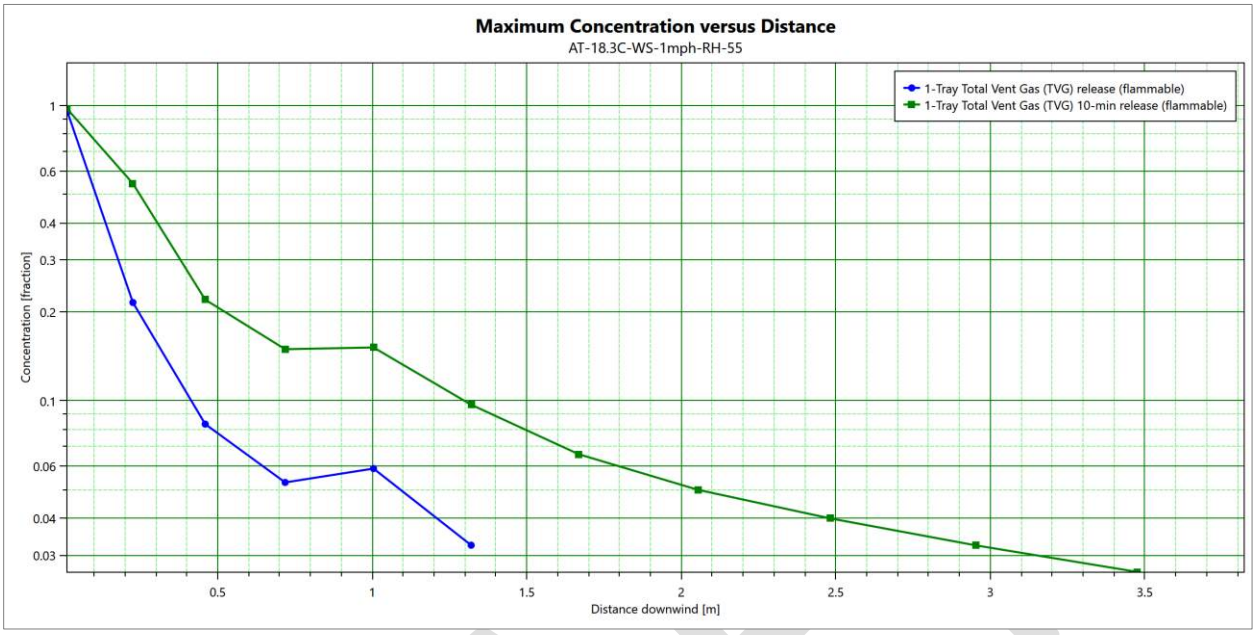

Figure 98 Maximum concentration vs distance for flammable vapor cloud for all sub-scenarios

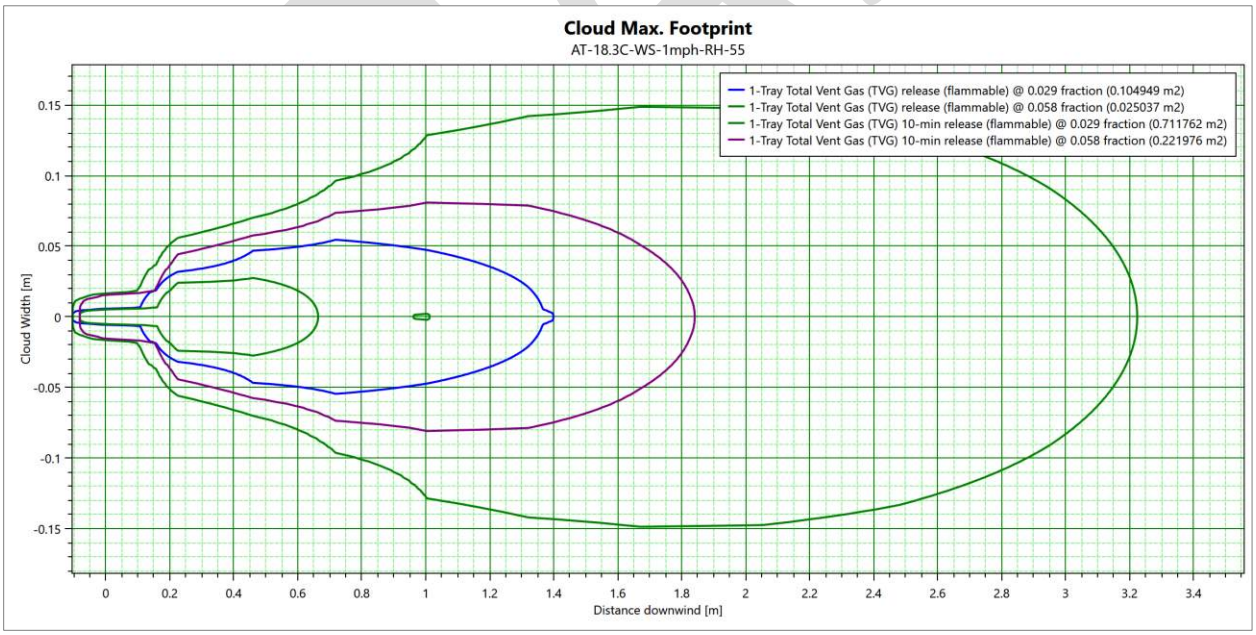

Figure 99 Maximum horizontal extent of vapor cloud for LFL (5.8%) for all sub-scenarios

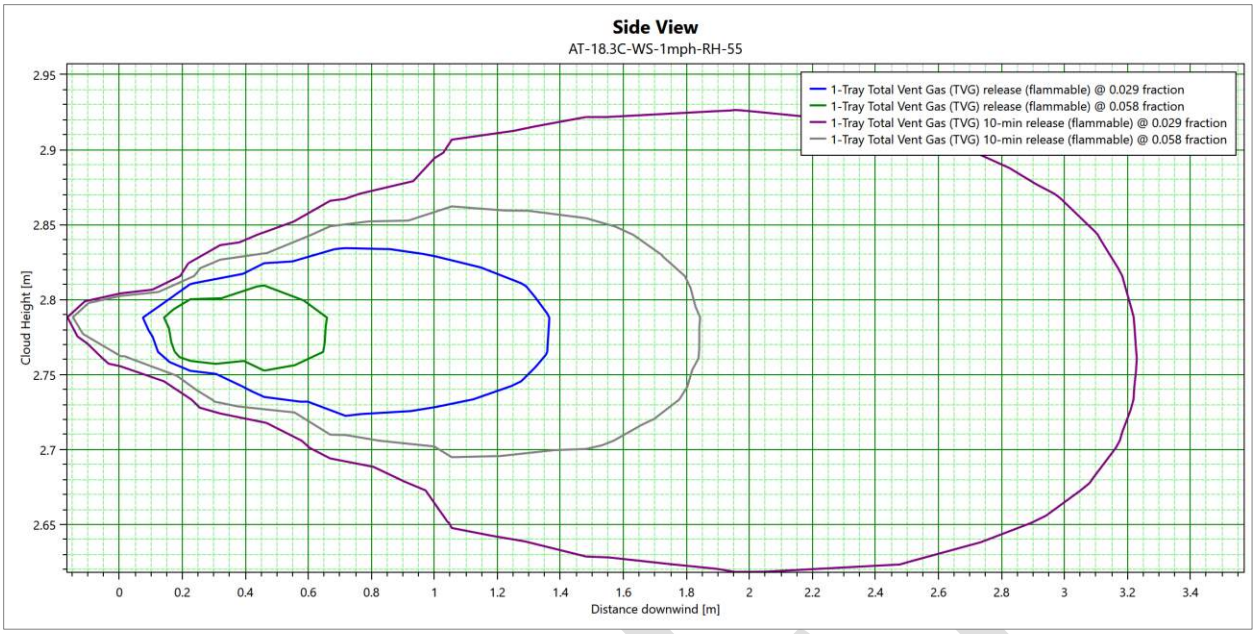

Figure 100 Maximum vertical extent of vapor cloud for LFL (5.8%) for all sub-scenarios

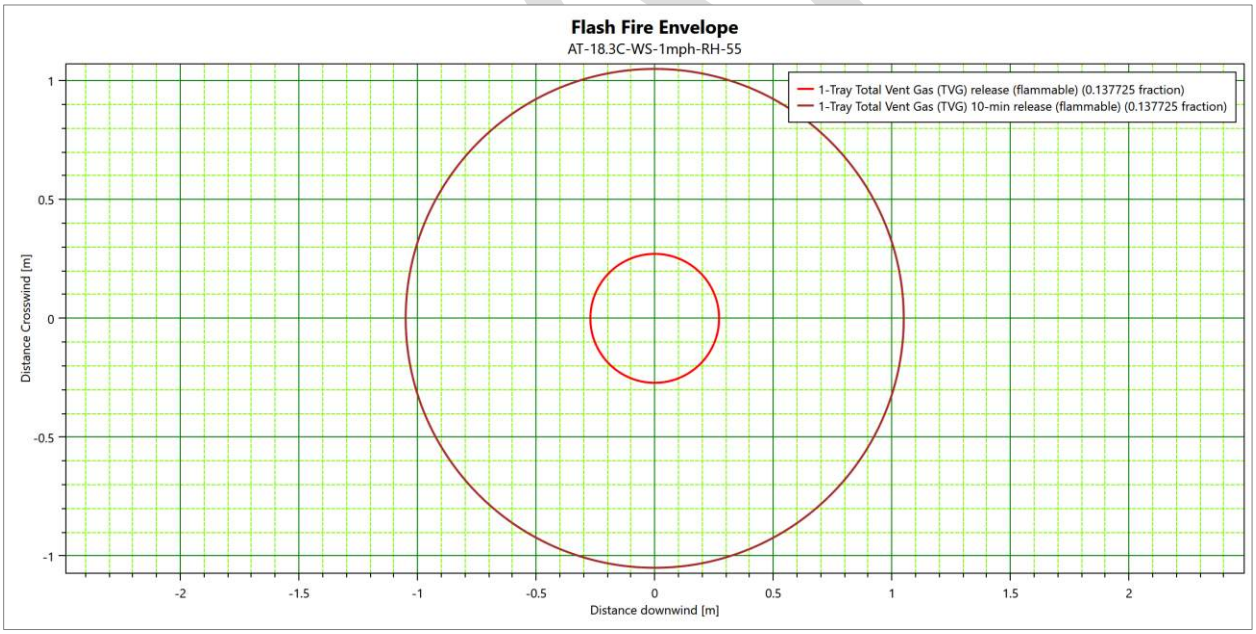

Figure 101 Flash Fire Envelope for ½ LFL (2.9%) for all sub-scenarios

1.5.3 Scenario 3: 1-Module (3-Tray) Release

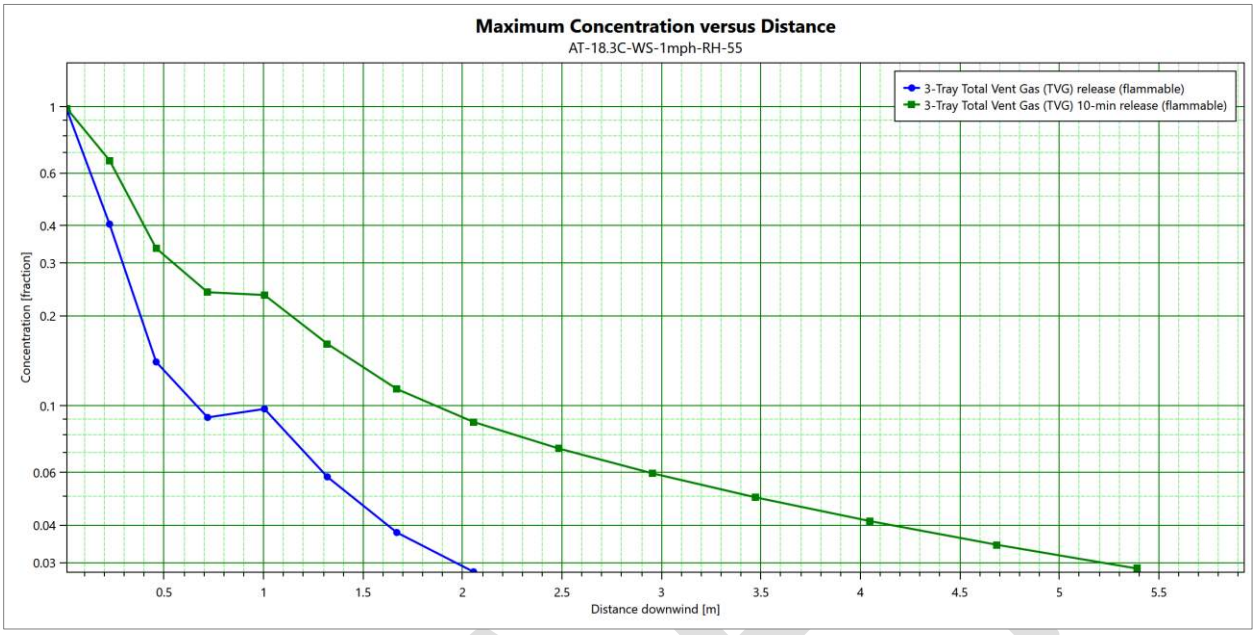

Figure 102 Maximum concentration vs distance for flammable vapor cloud for all sub-scenarios

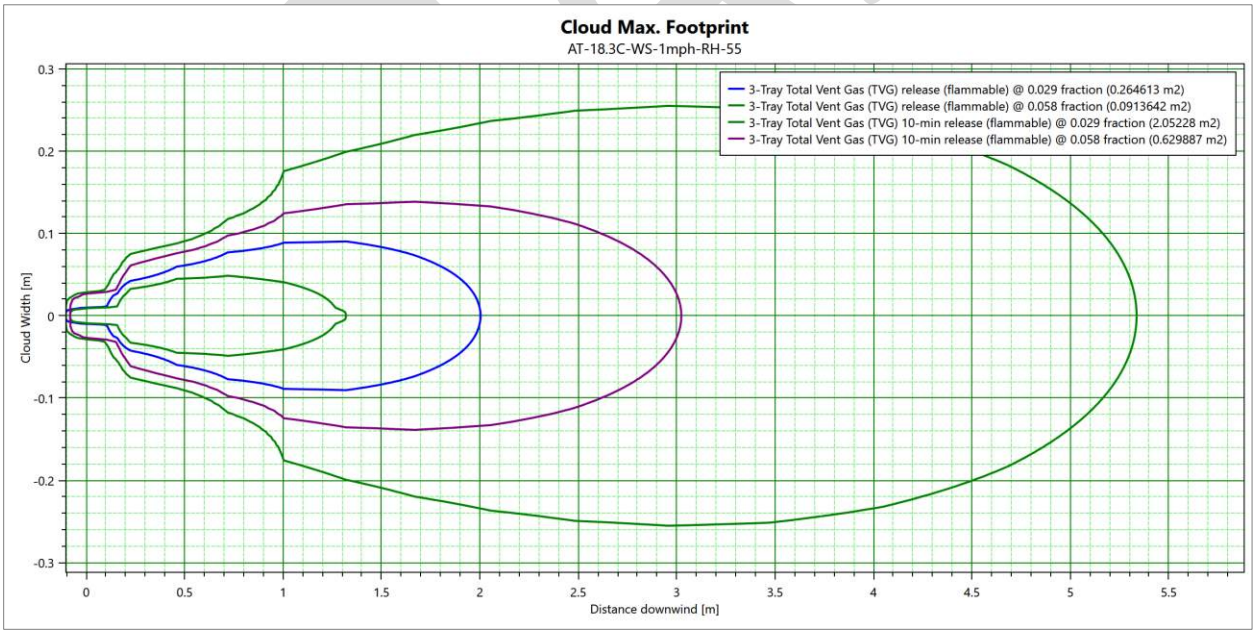

Figure 103 Maximum horizontal extent of vapor cloud for LFL (5.8%) for all sub-scenarios

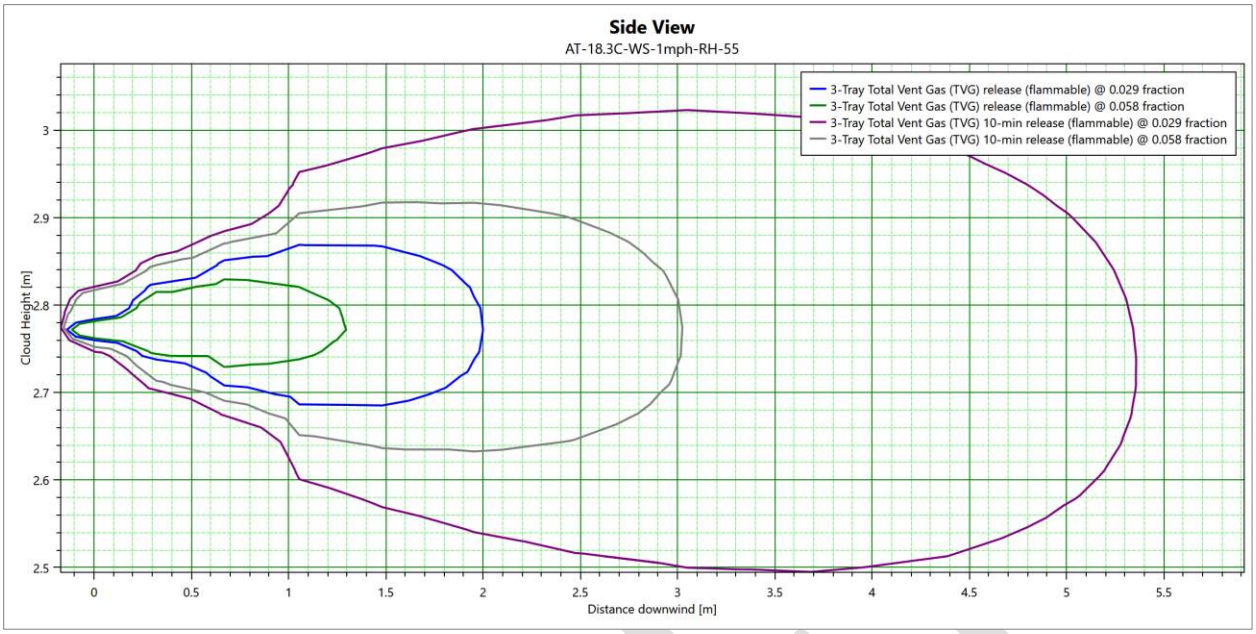

Figure 104 Maximum vertical extent of vapor cloud for LFL (5.8%) for all sub-scenarios

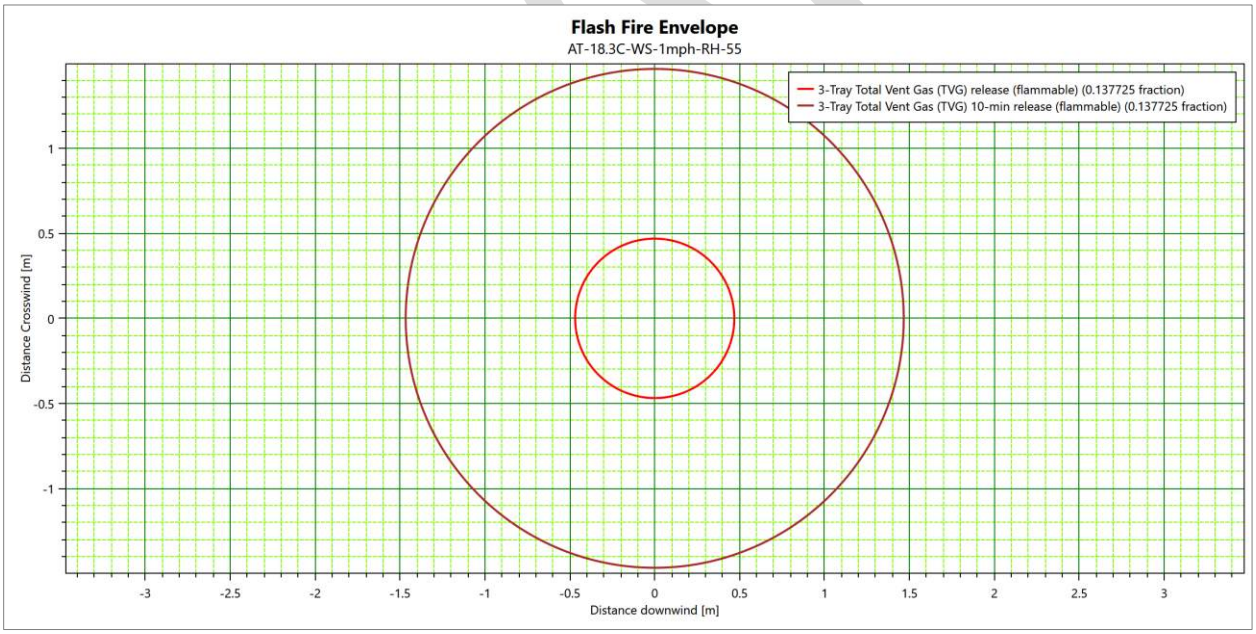

Figure 105 Flash Fire Envelope for ½ LFL (2.9%) for all sub-scenarios

1.5.4 Scenario 4: 1-MP2XL (24-Module) Release

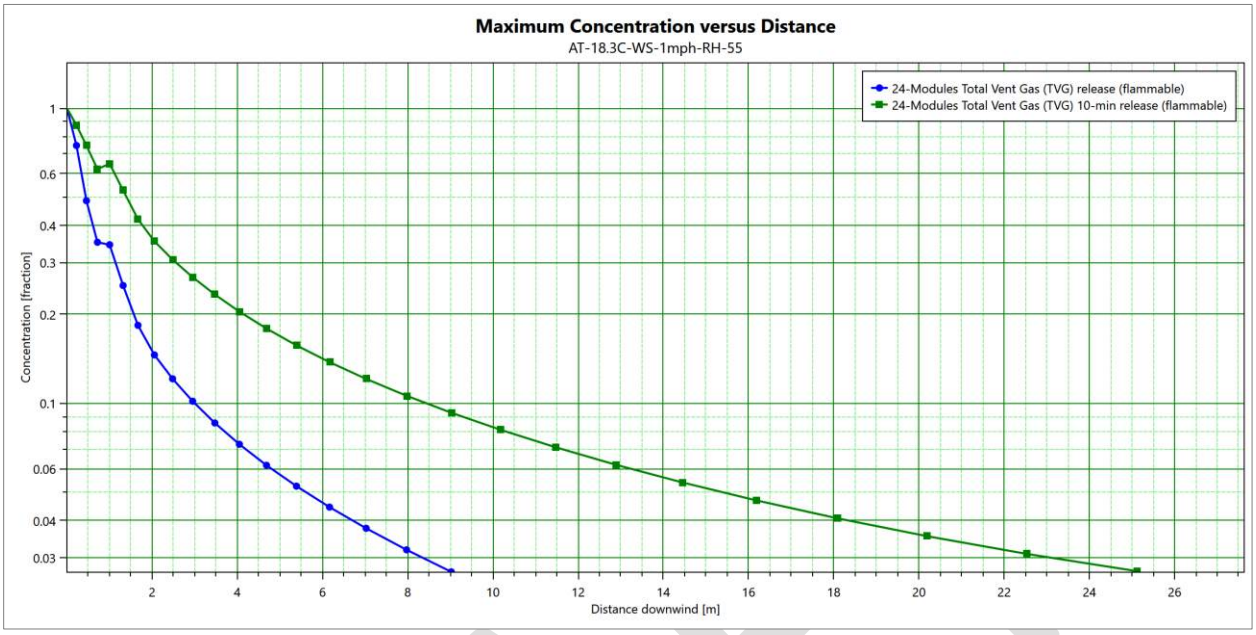

Figure 106 Maximum concentration vs distance for flammable vapor cloud for all sub-scenarios

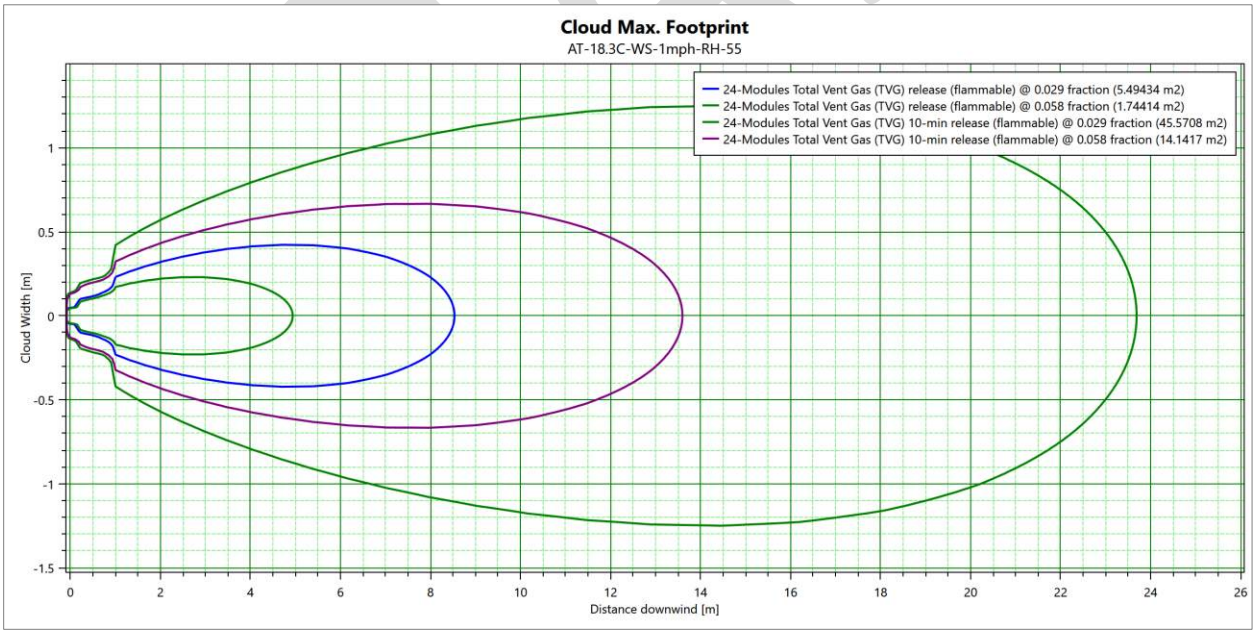

Figure 107 Maximum horizontal extent of vapor cloud for LFL (5.8%) for all sub-scenarios

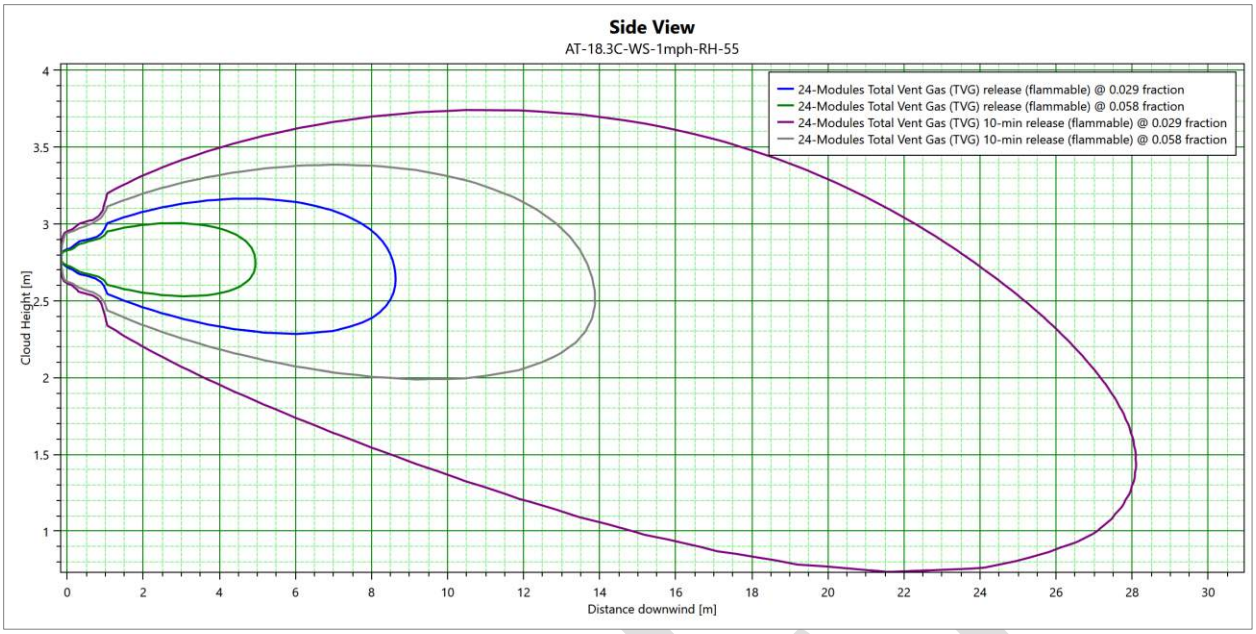

Figure 108 Maximum vertical extent of vapor cloud for LFL (5.8%) for all sub-scenarios

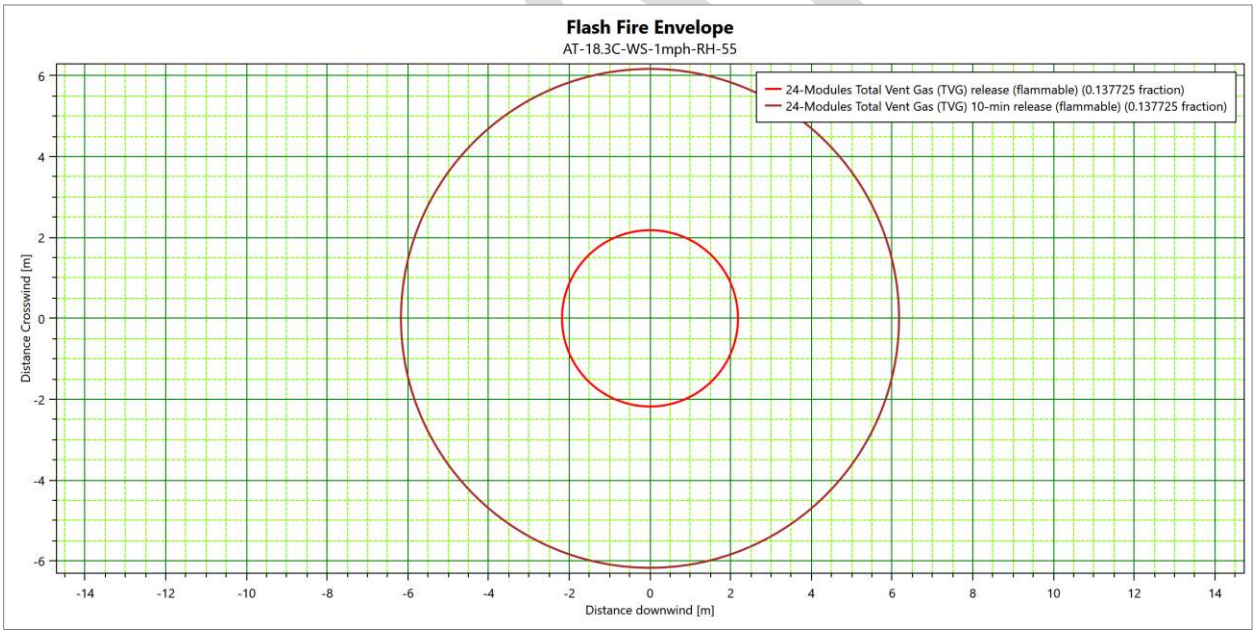

Figure 109 Flash Fire Envelope for ½ LFL (2.9%) for all sub-scenarios

1.6 Summary Results for Scaled Vent Gas CO IDLH (1,200ppm) Extent

1.6.1 Scenario 1: UL9540A Thermal Runaway (7-Cells)

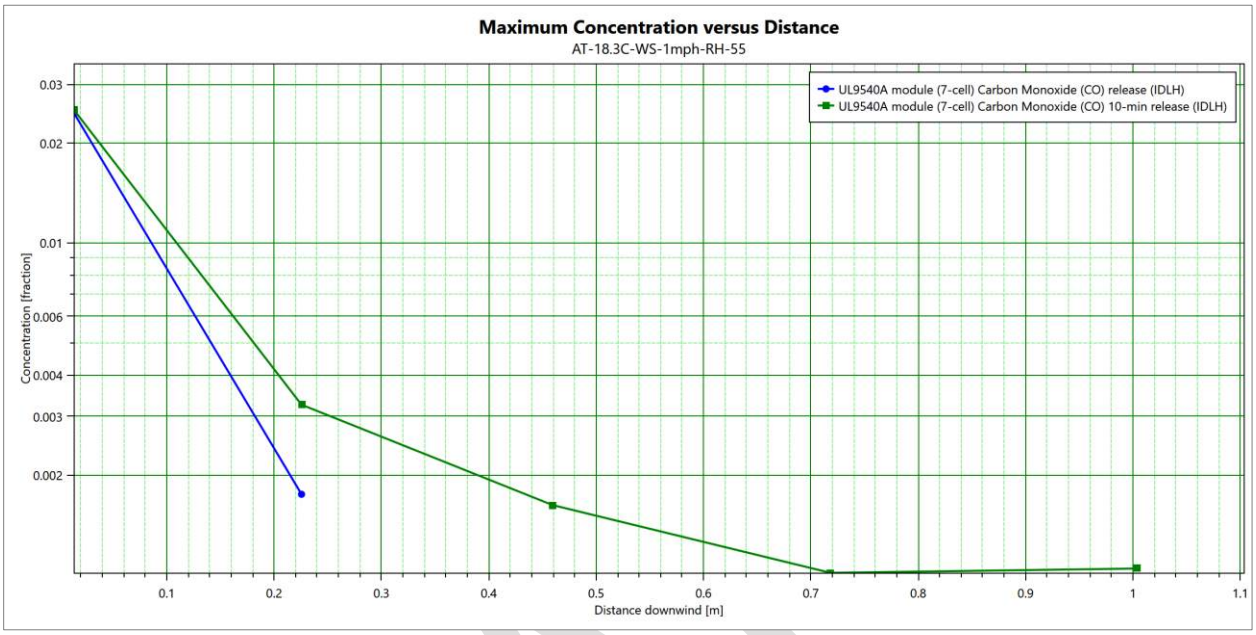

Figure 110 Maximum concentration vs distance at height (2.78m) for CO IDLH (1,200ppm) for all sub-scenarios

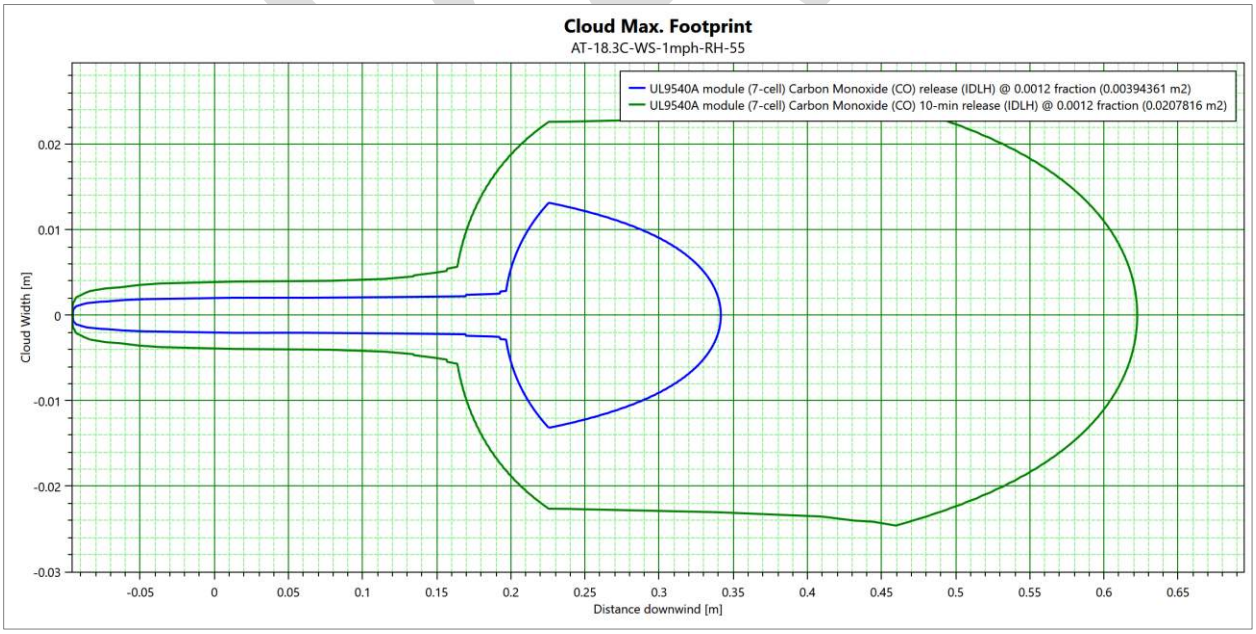

Figure 111 Maximum horizontal extent of vapor cloud for CO IDLH (1,200 ppm) for all sub-scenarios

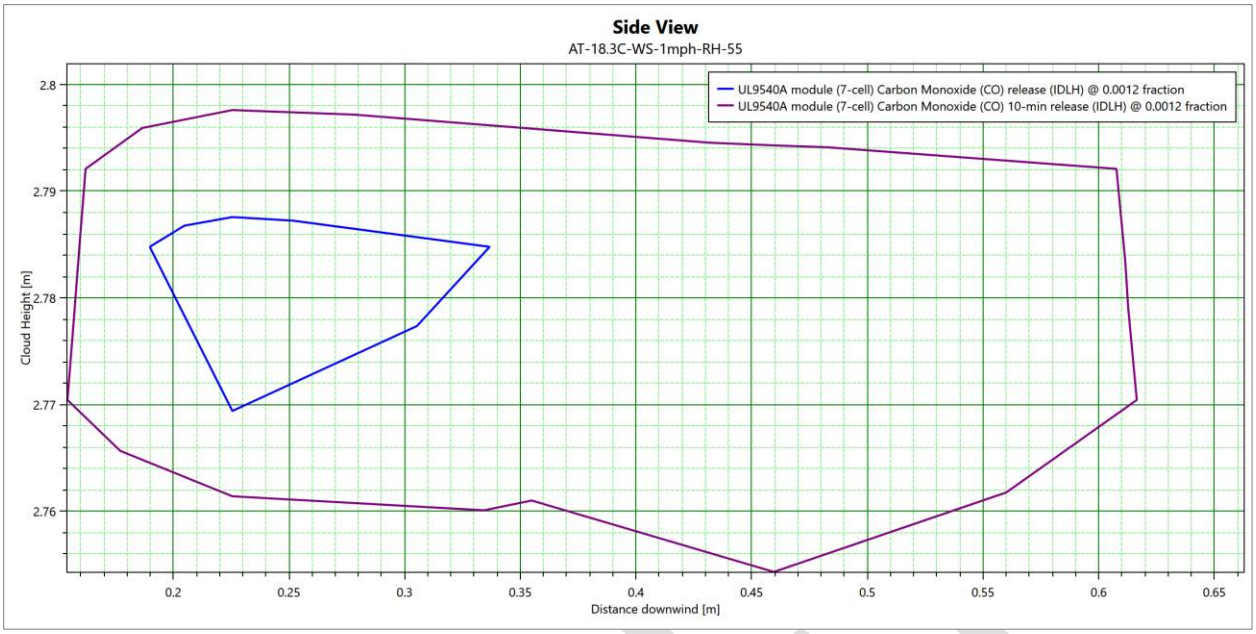

Figure 112 Maximum vertical extent of vapor cloud for CO IDLH (1,200 ppm) for all sub-scenarios

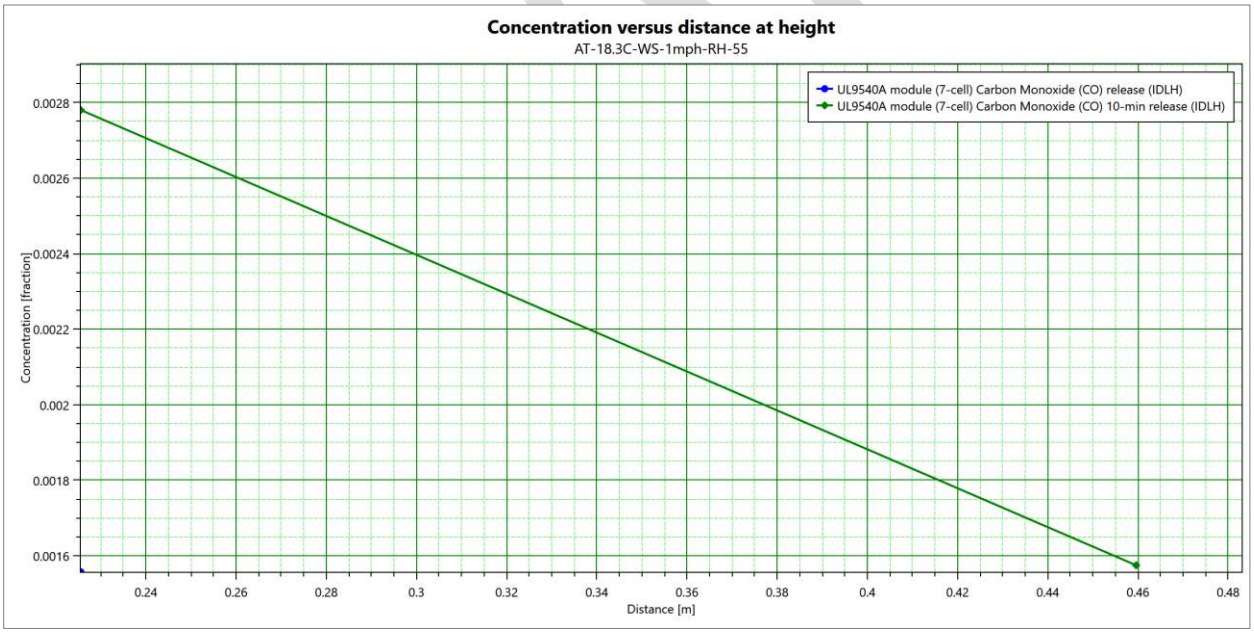

Figure 113 Concentration vs. distance for CO IDLH (1,200 ppm) for all sub-scenarios

1.6.2 Scenario 2: 1-Tray Release

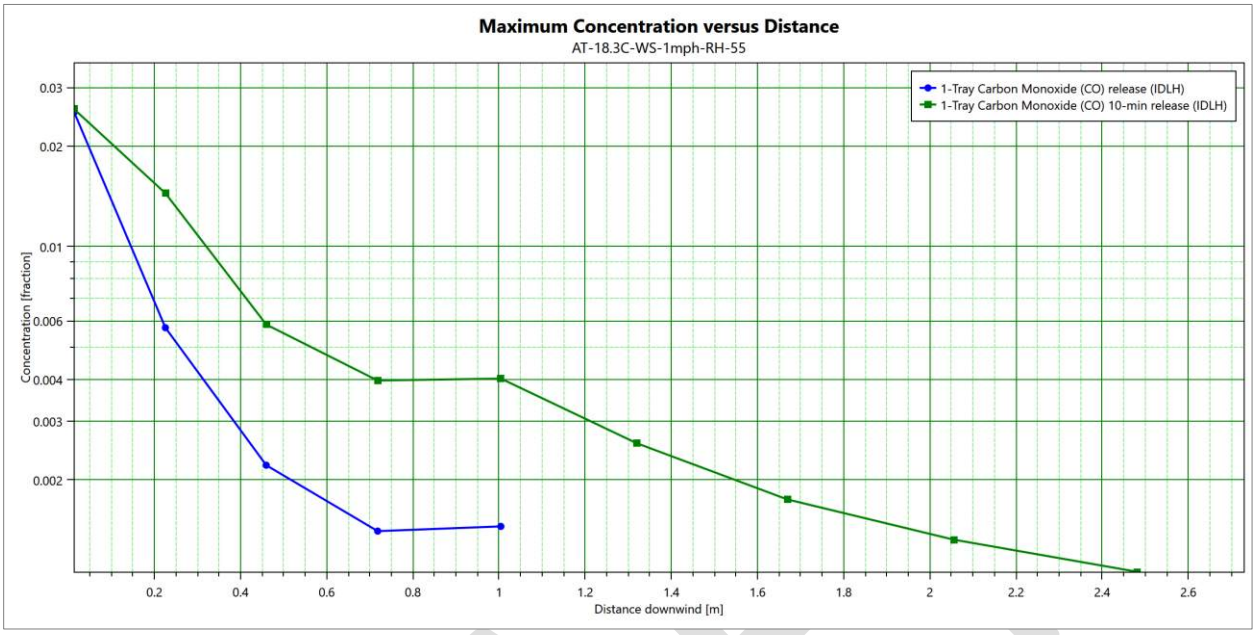

Figure 114 Maximum concentration vs distance at height (2.78m) for CO IDLH (1,200ppm) for all sub-scenarios

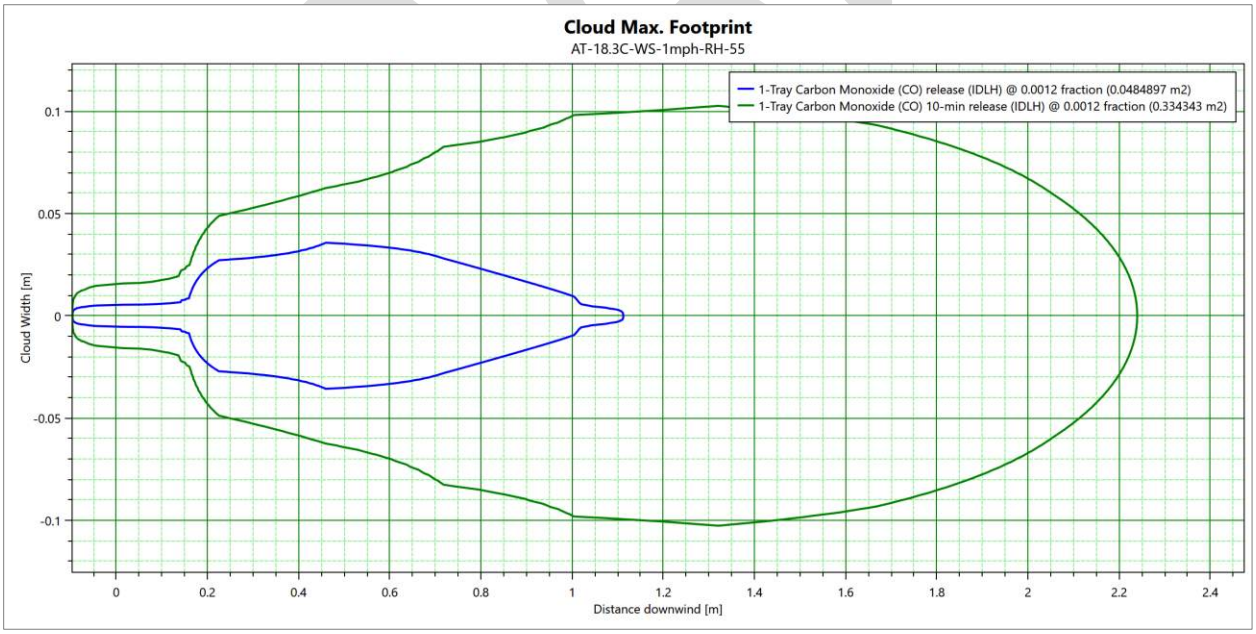

Figure 115 Maximum horizontal extent of vapor cloud for CO IDLH (1,200 ppm) for all sub-scenarios

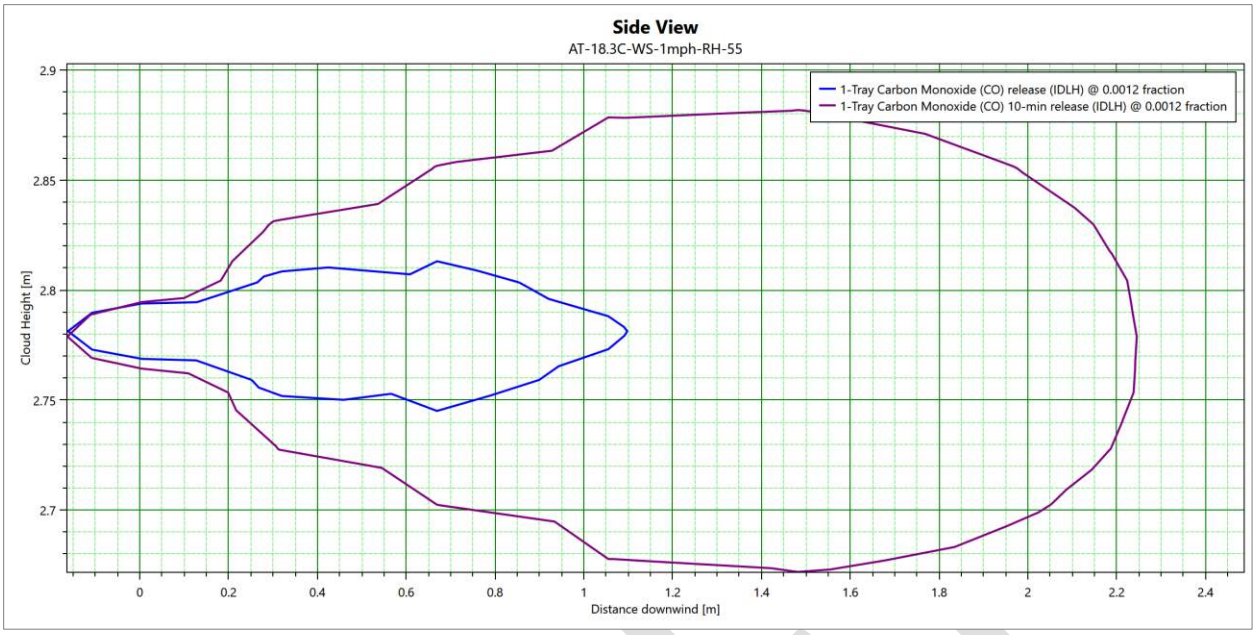

Figure 116 Maximum vertical extent of vapor cloud for CO IDLH (1,200 ppm) for all sub-scenarios

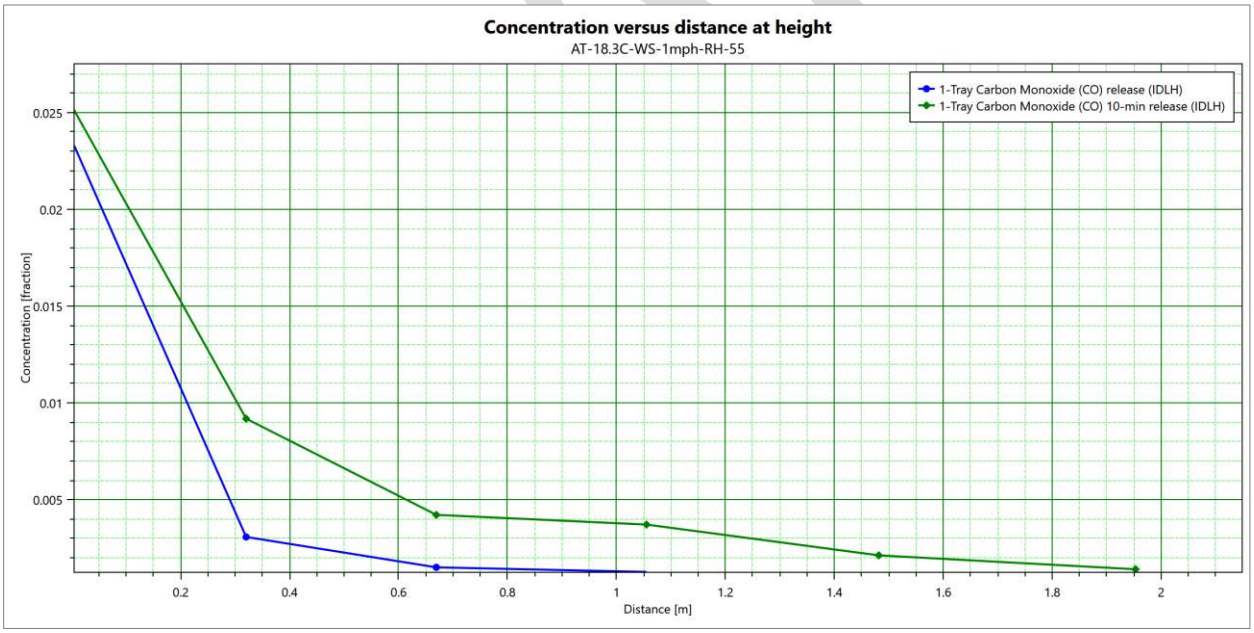

Figure 117 Concentration vs. distance for CO IDLH (1,200 ppm) for all sub-scenarios

1.6.3 Scenario 3: 1-Module (3-Tray) Release

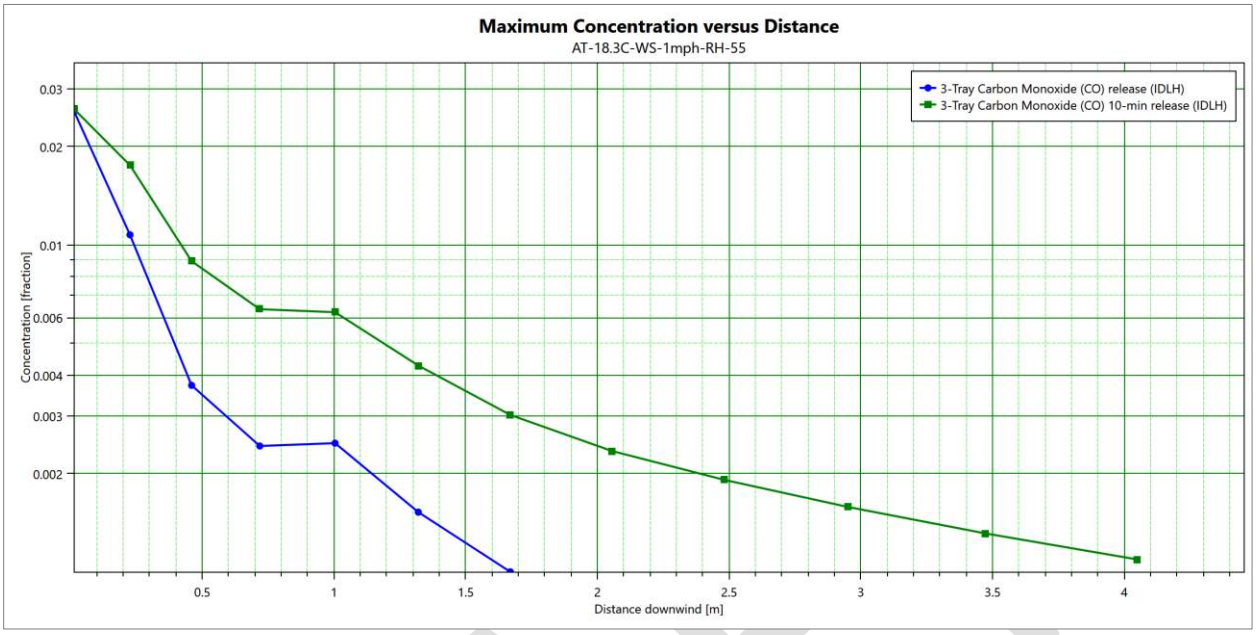

Figure 118 Maximum concentration vs distance at height (2.78m) for CO IDLH (1,200ppm) for all sub-scenarios

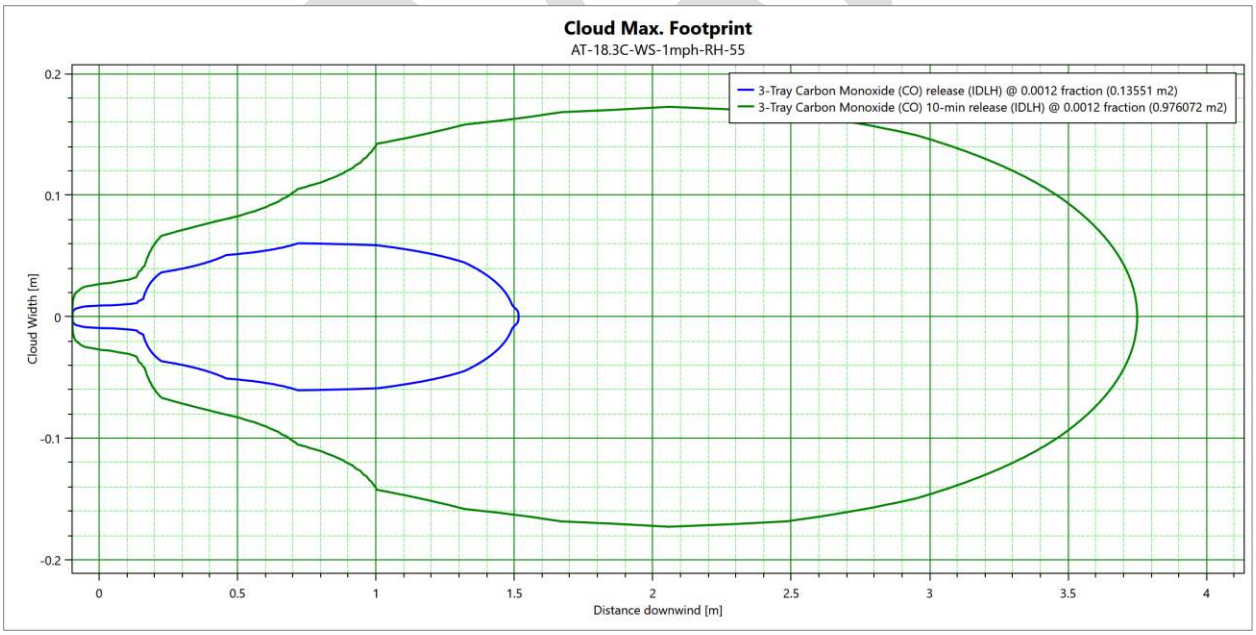

Figure 119 Maximum horizontal extent of vapor cloud for CO IDLH (1,200 ppm) for all sub-scenarios

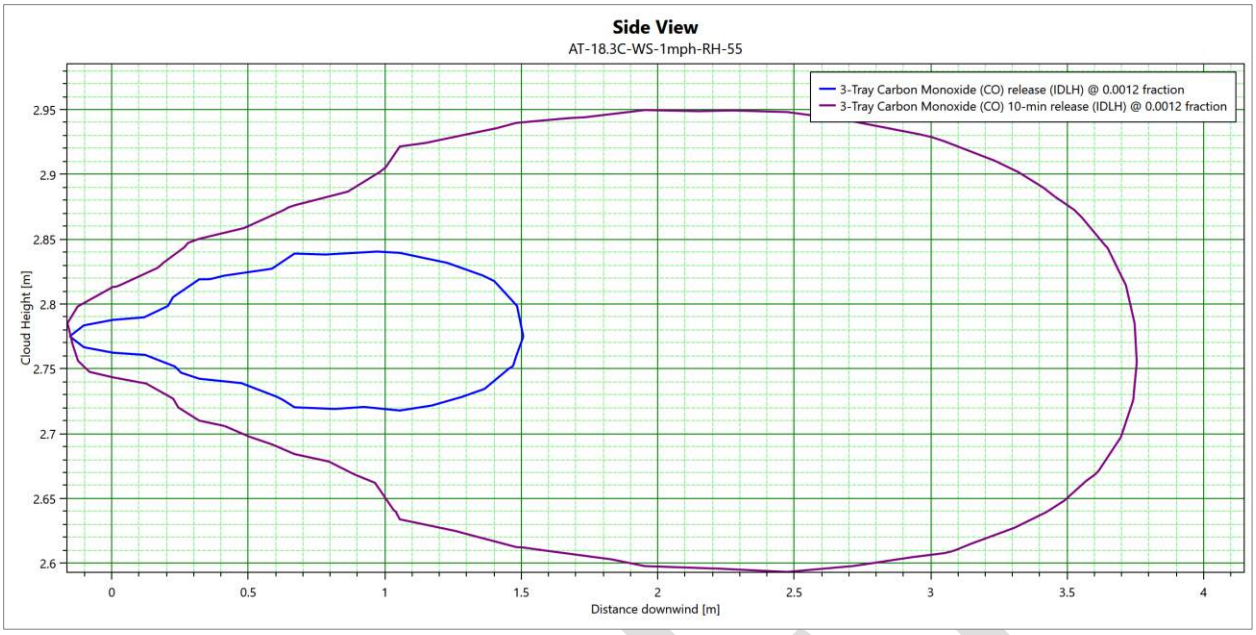

Figure 120 Maximum vertical extent of vapor cloud for CO IDLH (1,200 ppm) for all sub-scenarios

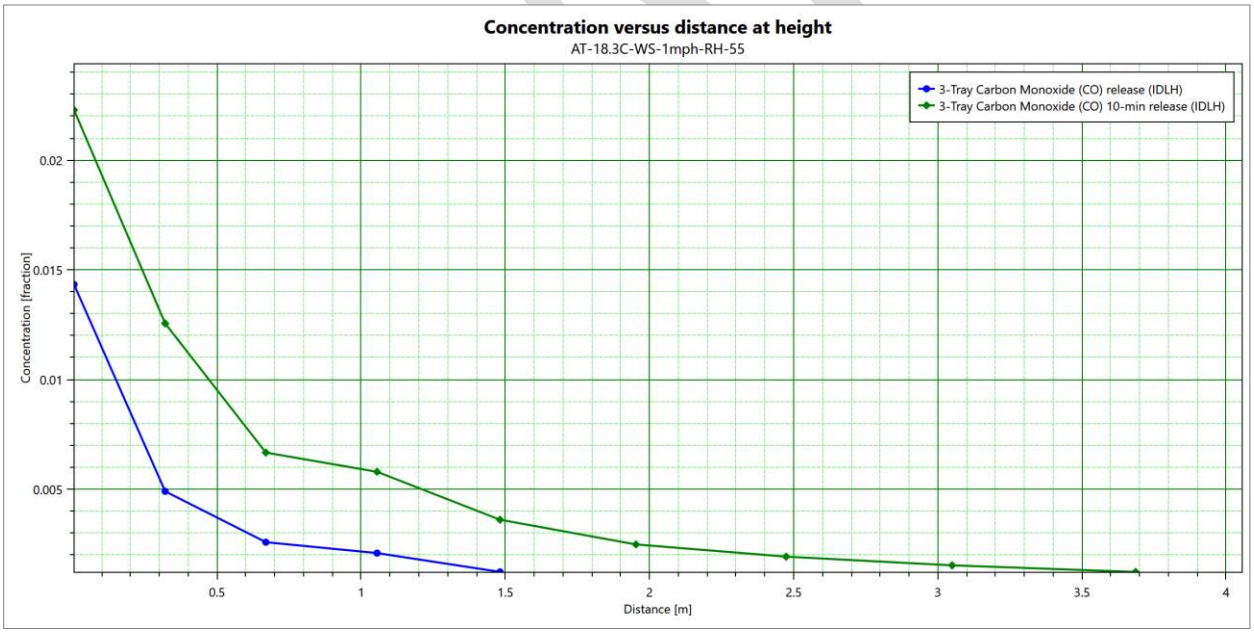

Figure 121 Concentration vs. distance for CO IDLH (1,200 ppm) for all sub-scenarios

1.6.4 Scenario 4: 1-MP2XL (24-Module) Release

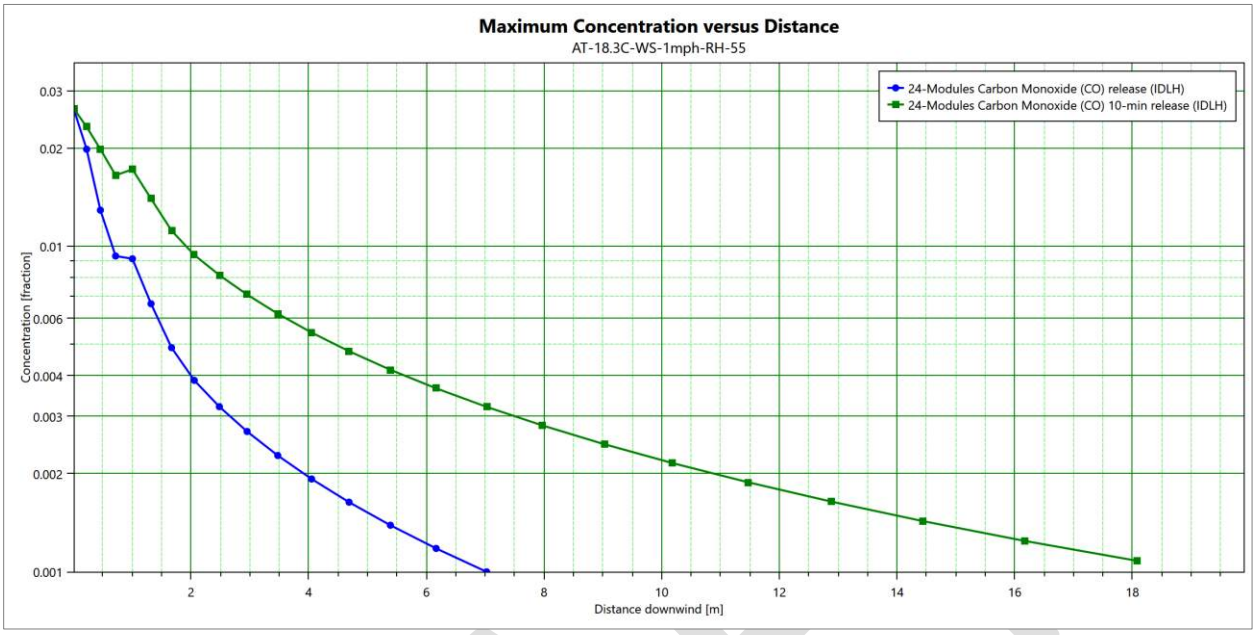

Figure 122 Maximum concentration vs distance at height (2.78m) for CO IDLH (1,200ppm) for all sub-scenarios

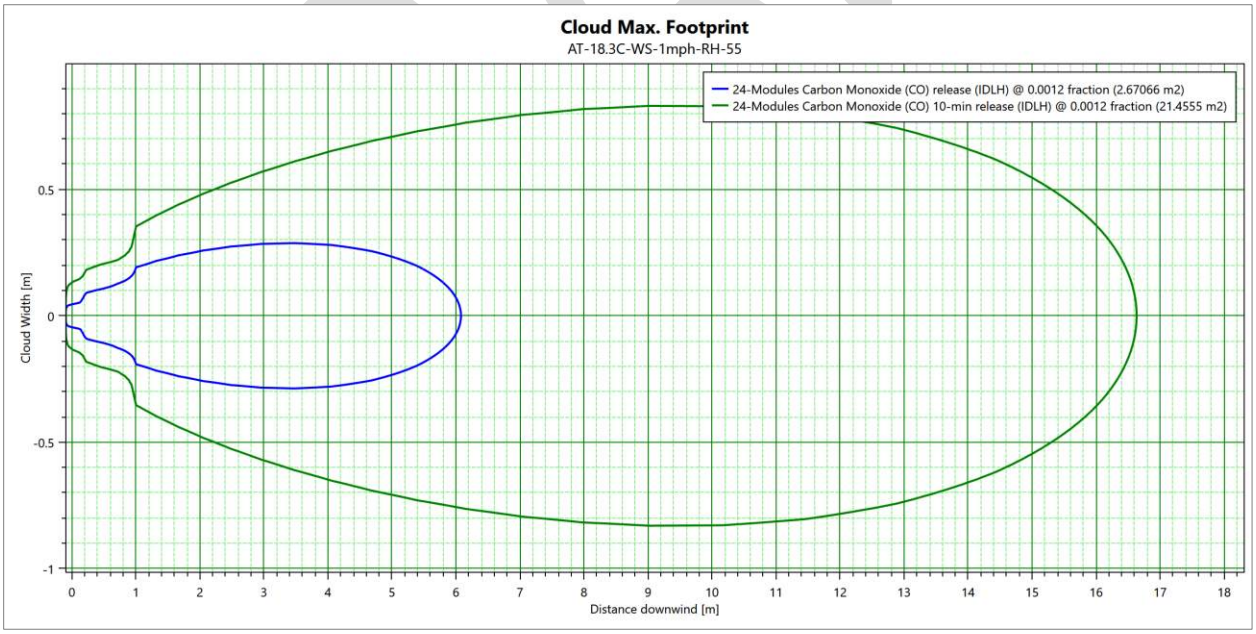

Figure 123 Maximum horizontal extent of vapor cloud for CO IDLH (1,200 ppm) for all sub-scenarios

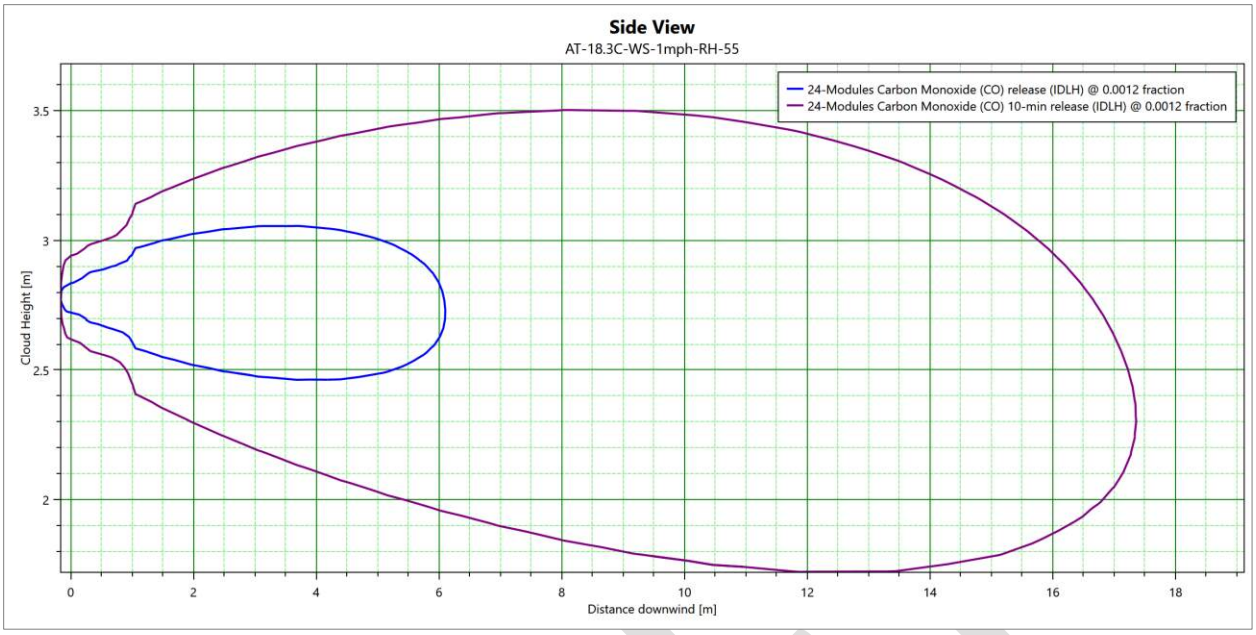

Figure 124 Maximum vertical extent of vapor cloud for CO IDLH (1,200 ppm) for all sub-scenarios

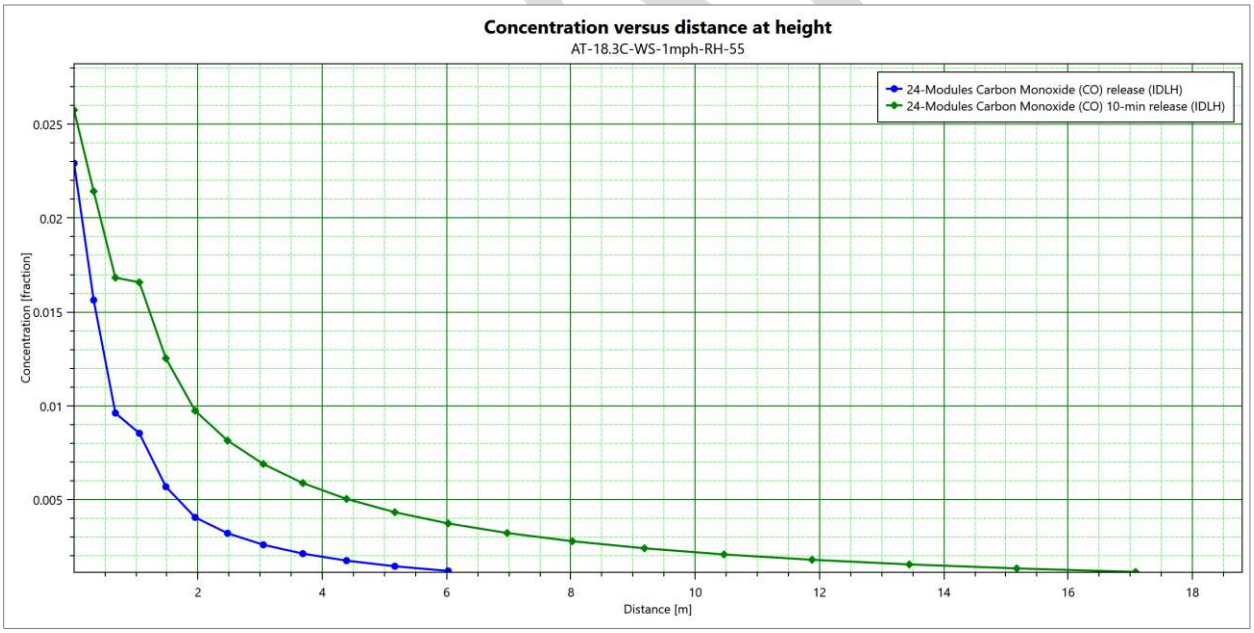

Figure 125 Concentration vs. distance for CO IDLH (1,200 ppm) for all sub-scenarios

1.7 Summary Results for Scaled Vent Gas CO2 IDLH (40,000ppm) Extent

1.7.1 Scenario 1: UL9540A Thermal Runaway (7-Cells)

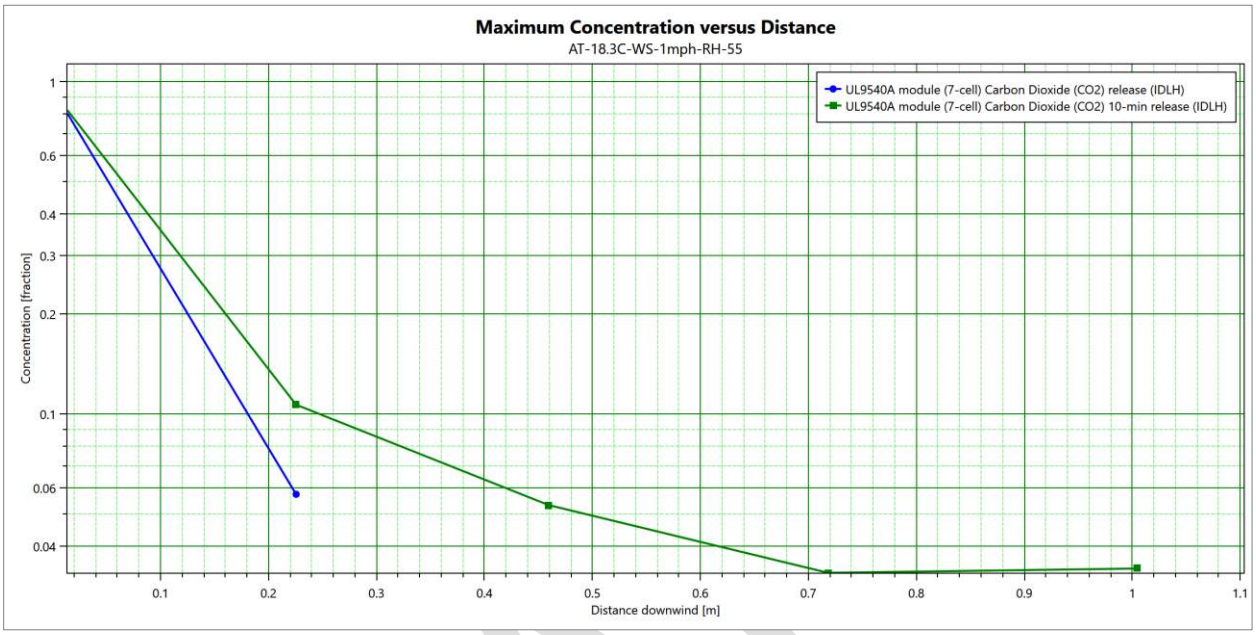

Figure 126 Maximum concentration vs distance at height (2.78m) for CO2 IDLH (40,000ppm) for all sub-scenarios

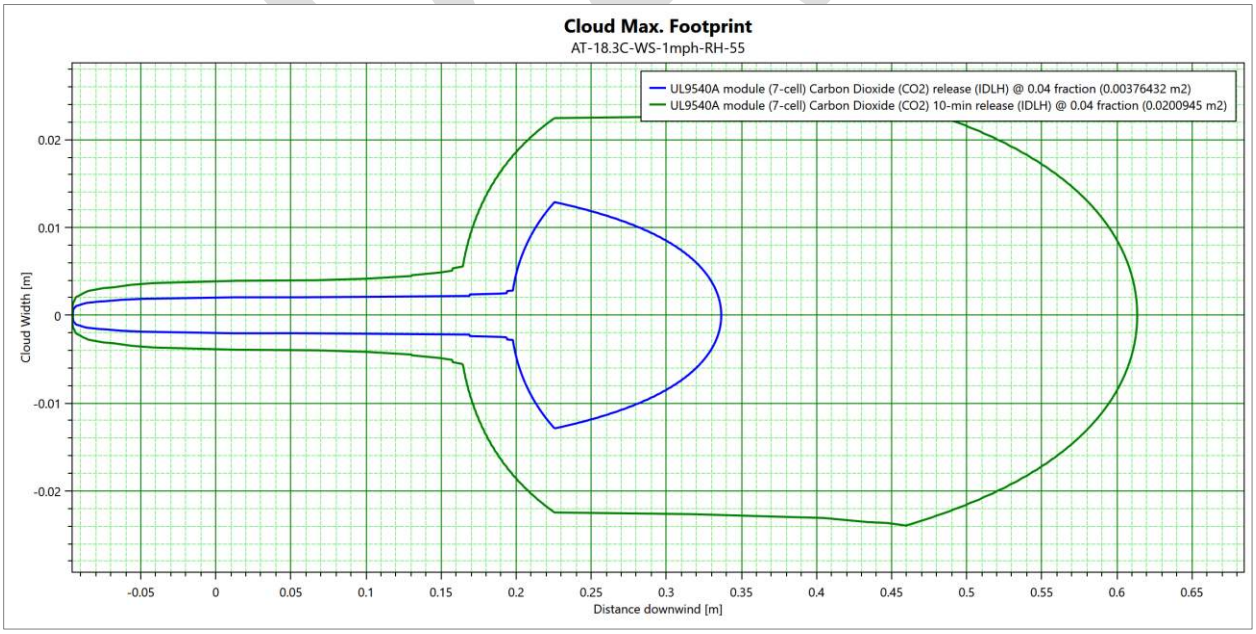

Figure 127 Maximum horizontal extent of vapor cloud for CO2 IDLH (40,000 ppm) for all sub-scenarios

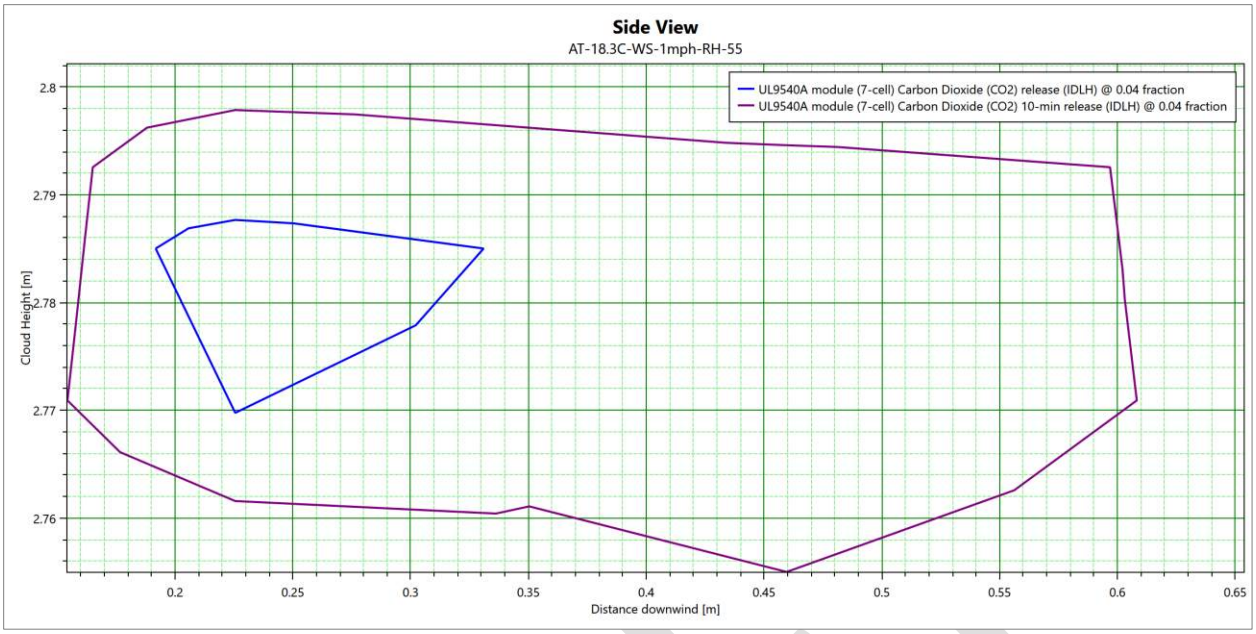

Figure 128 Maximum vertical extent of vapor cloud for CO2 IDLH (40,000 ppm) for all sub-scenarios

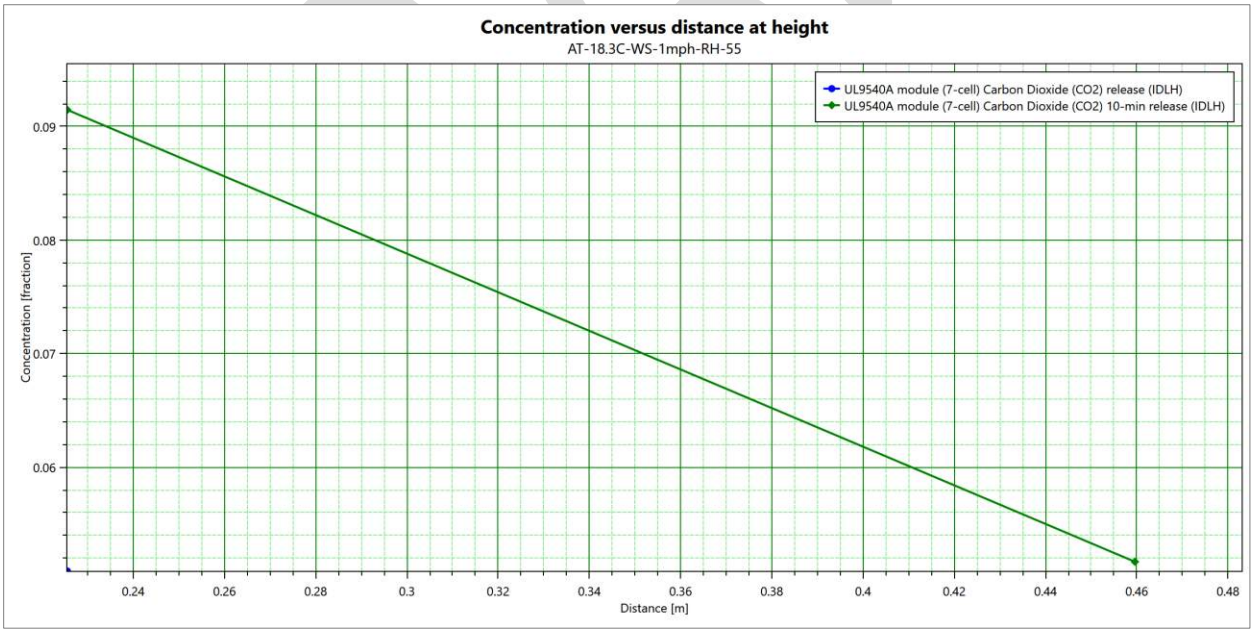

Figure 129 Concentration vs. distance for CO2 IDLH (40,000 ppm) for all sub-scenarios

1.7.2 Scenario 2: 1-Tray Release

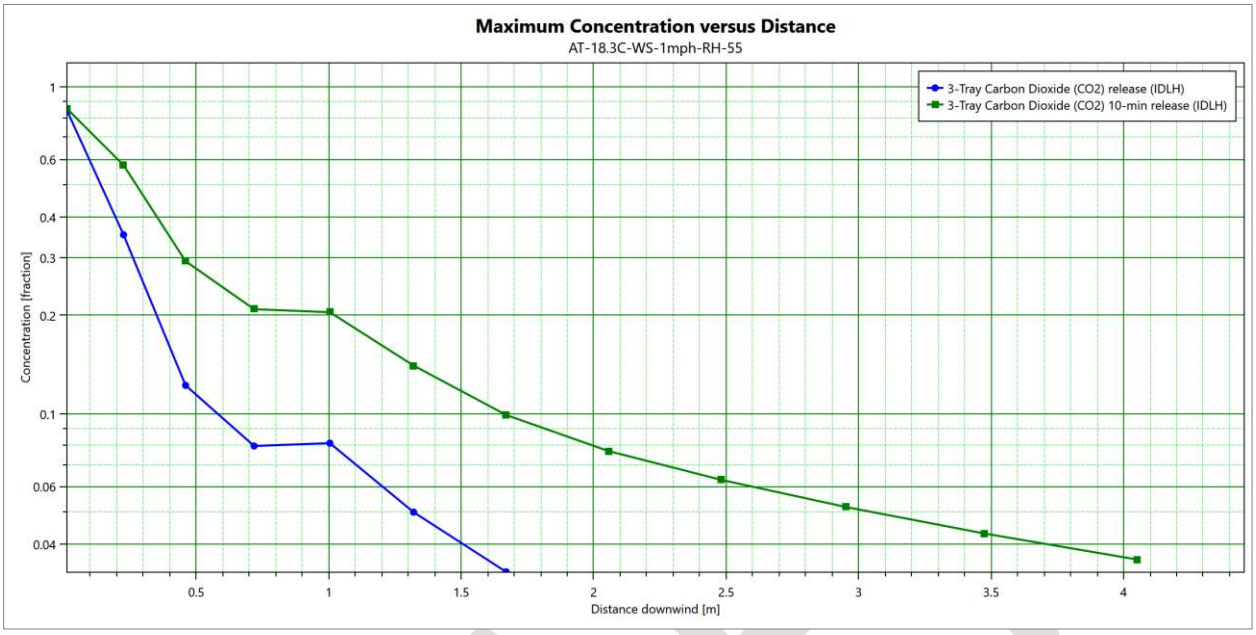

Figure 130 Maximum concentration vs distance at height (2.78m) for CO2 IDLH (40,000ppm) for all sub-scenarios

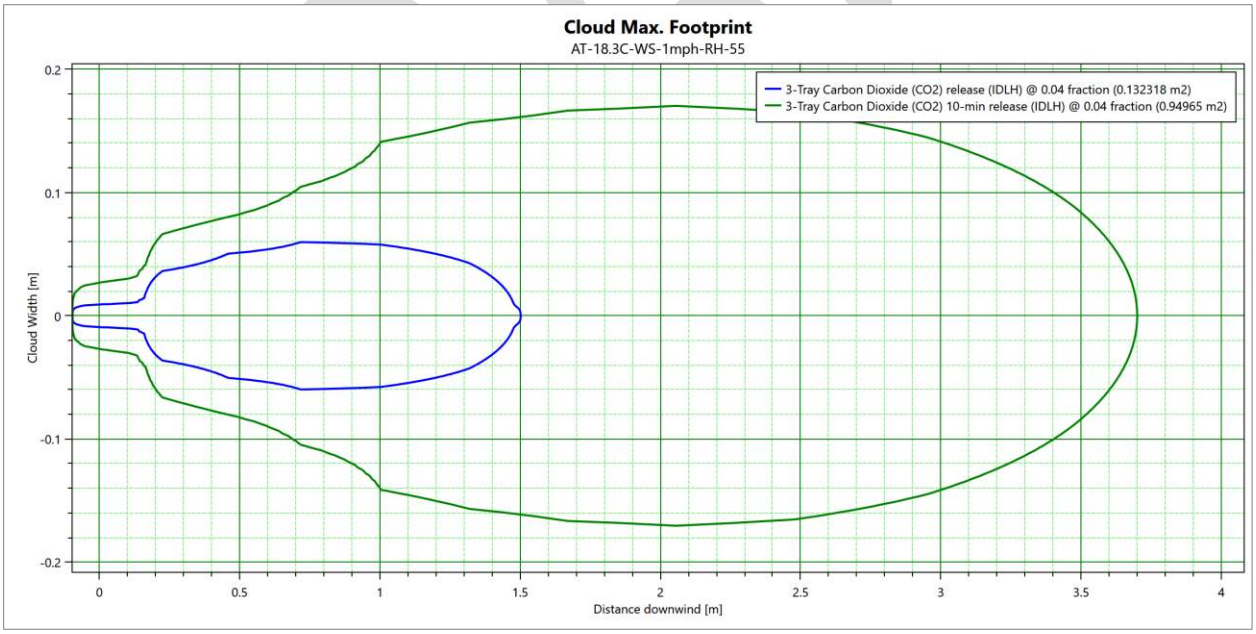

Figure 131 Maximum horizontal extent of vapor cloud for CO2 IDLH (40,000 ppm) for all sub-scenarios

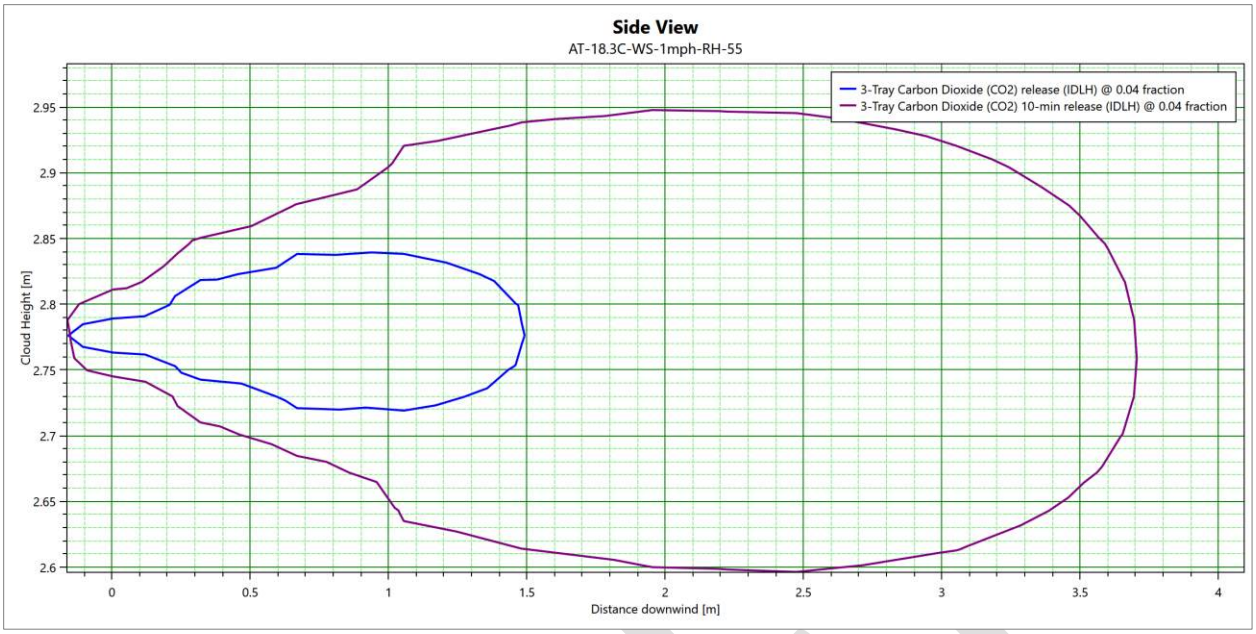

Figure 132 Maximum vertical extent of vapor cloud for CO2 IDLH (40,000 ppm) for all sub-scenarios

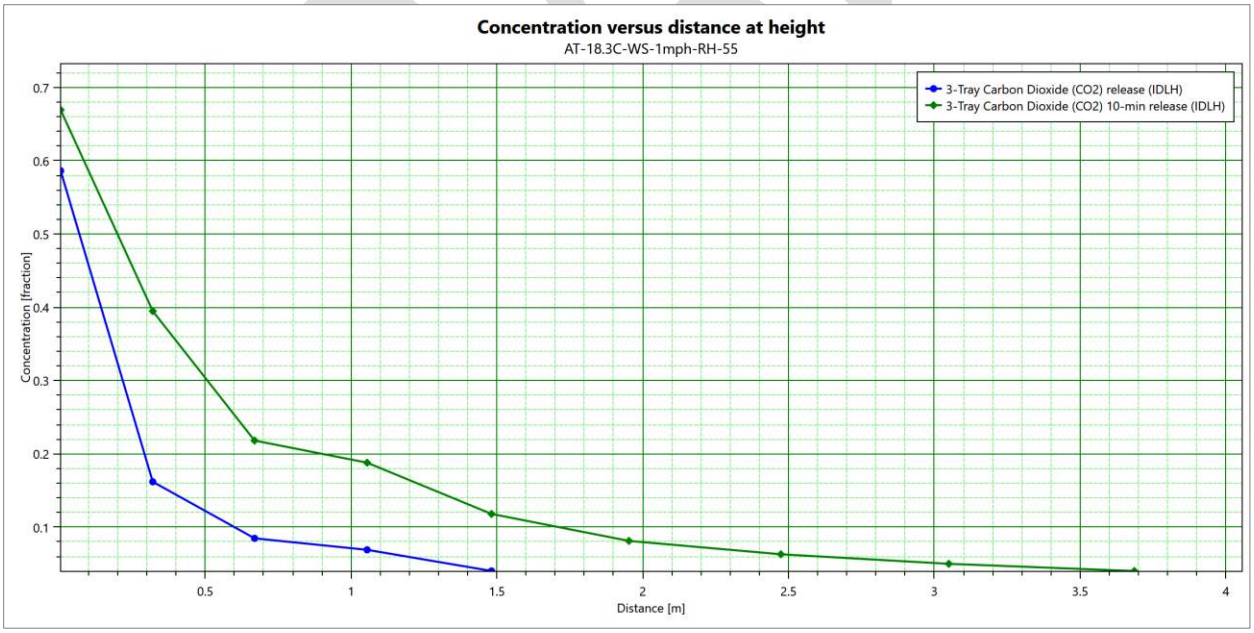

Figure 133 Concentration vs. distance for CO2 IDLH (40,000 ppm) for all sub-scenarios

1.7.3 Scenario 3: 1-Module (3-Tray) Release

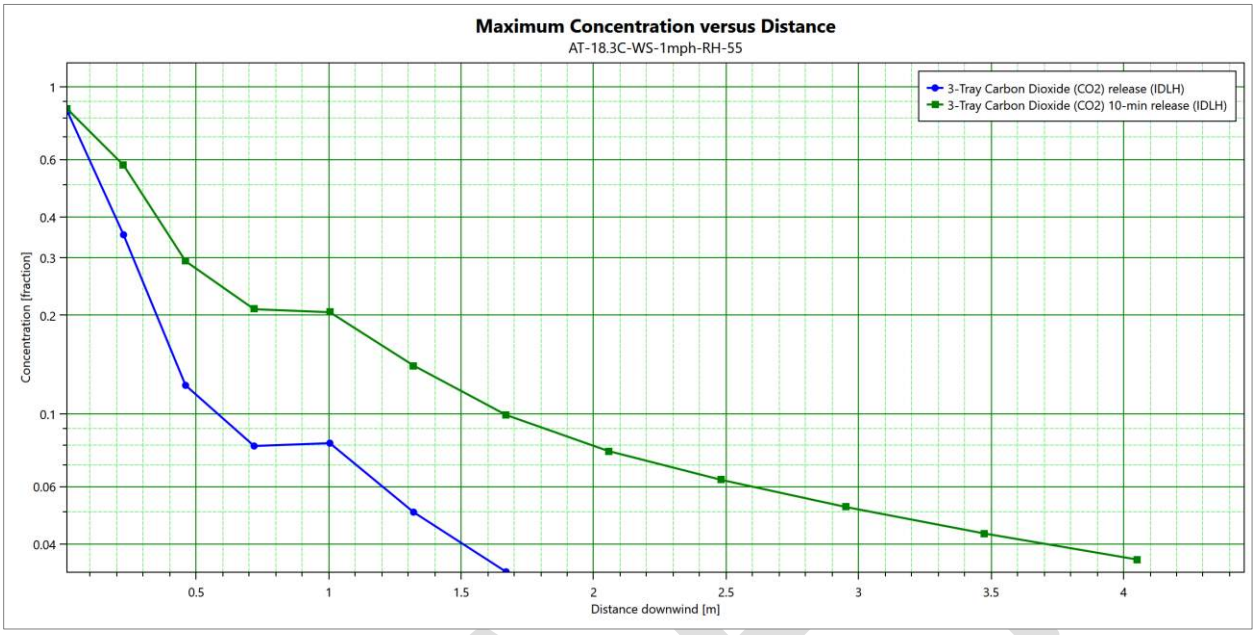

Figure 134 Maximum concentration vs distance at height (2.78m) for CO2 IDLH (40,000ppm) for all sub-scenarios

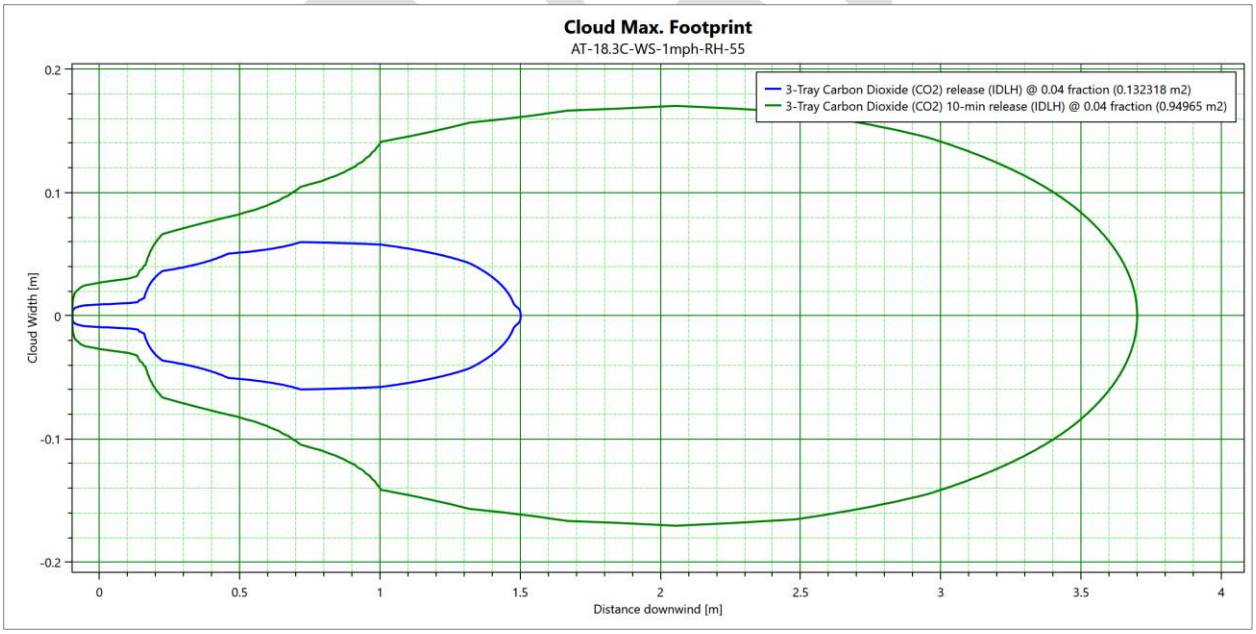

Figure 135 Maximum horizontal extent of vapor cloud for CO2 IDLH (40,000 ppm) for all sub-scenarios

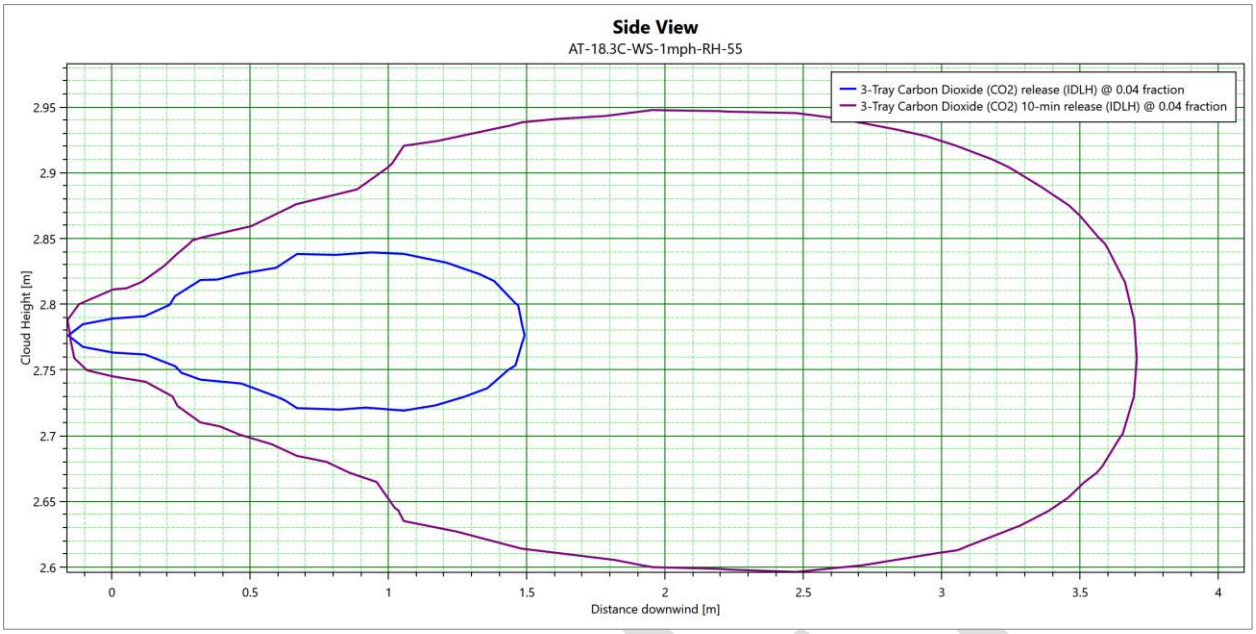

Figure 136 Maximum vertical extent of vapor cloud for CO2 IDLH (40,000 ppm) for all sub-scenarios

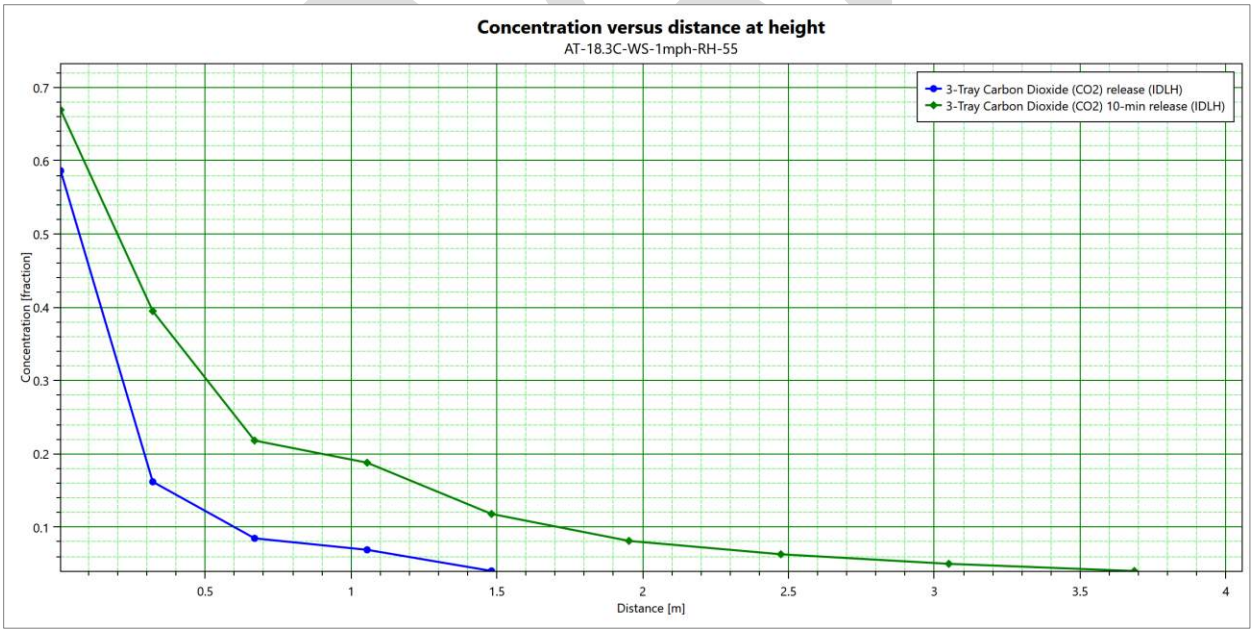

Figure 137 Concentration vs. distance for CO2 IDLH (40,000 ppm) for all sub-scenarios

1.7.4 Scenario 4: 1-MP2XL (24-Module) Release

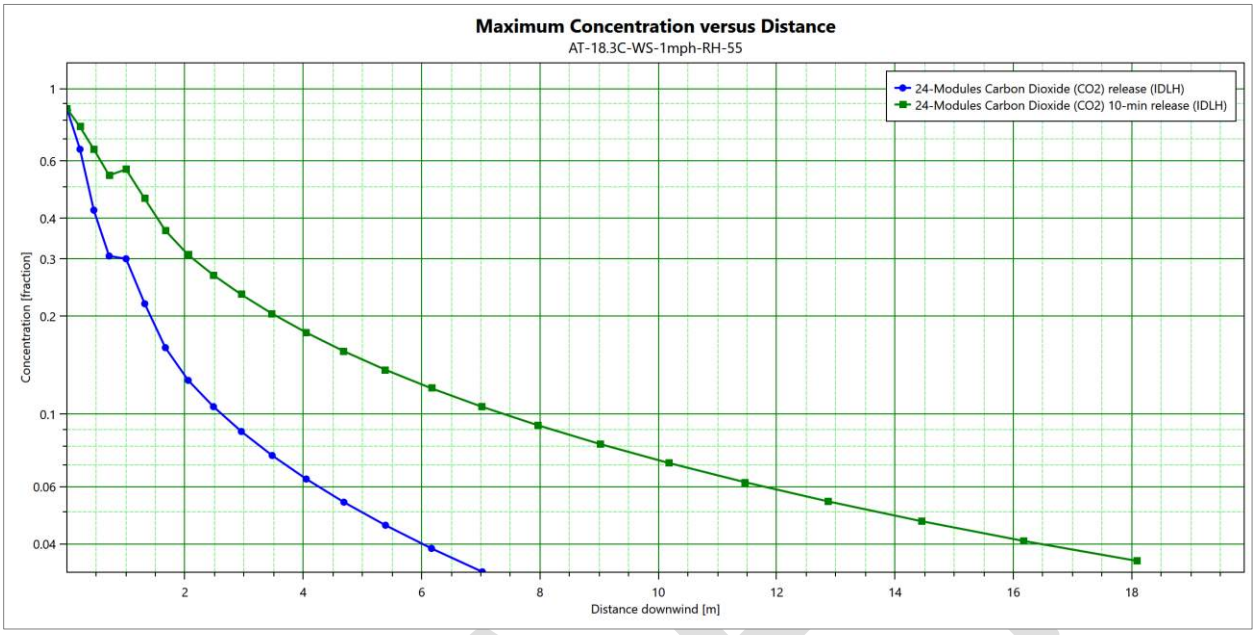

Figure 138 Maximum concentration vs distance at height (2.78m) for CO2 IDLH (40,000ppm) for all sub-scenarios

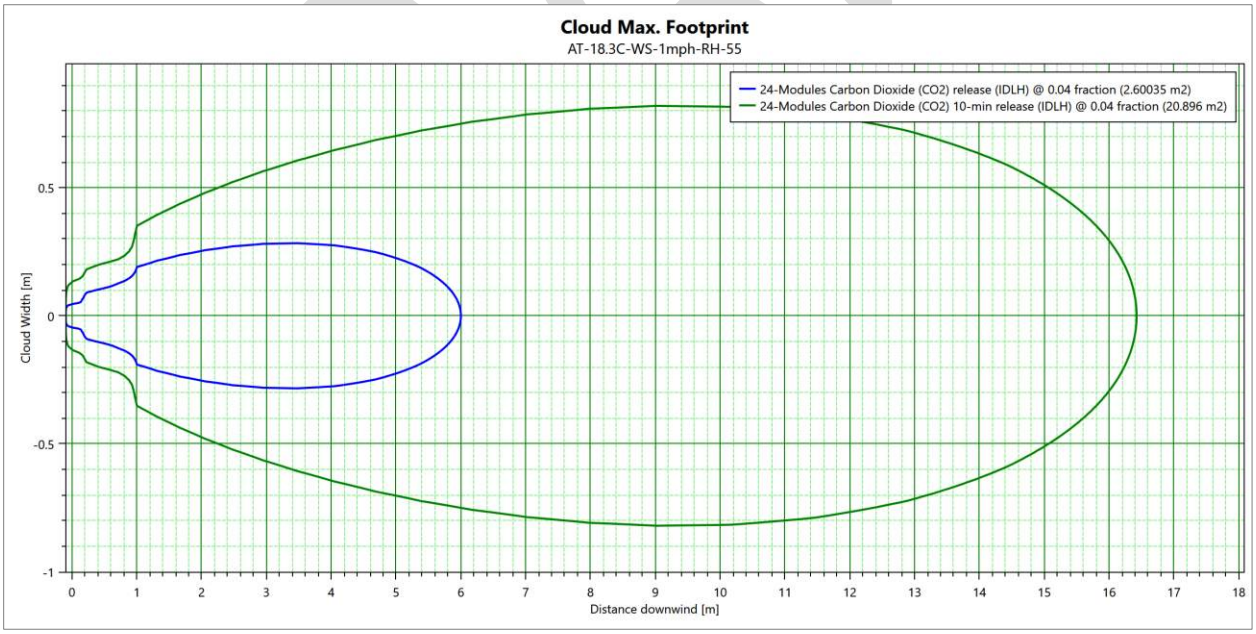

Figure 139 Maximum horizontal extent of vapor cloud for CO2 IDLH (40,000 ppm) for all sub-scenarios

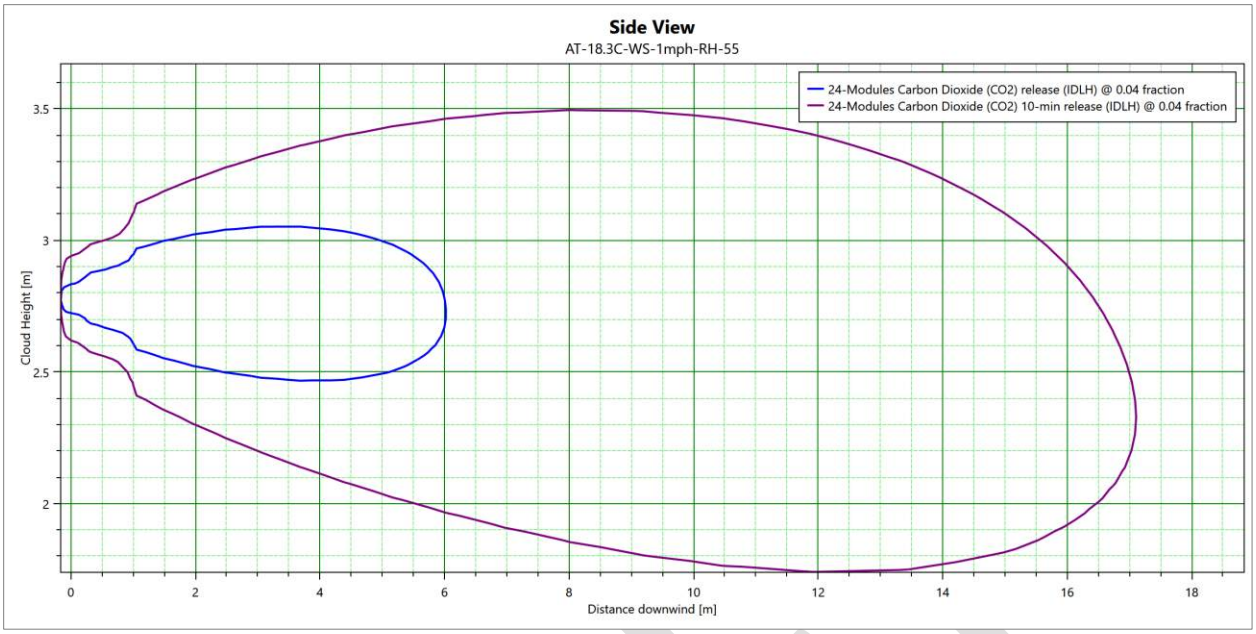

Figure 140 Maximum vertical extent of vapor cloud for CO2 IDLH (40,000 ppm) for all sub-scenarios

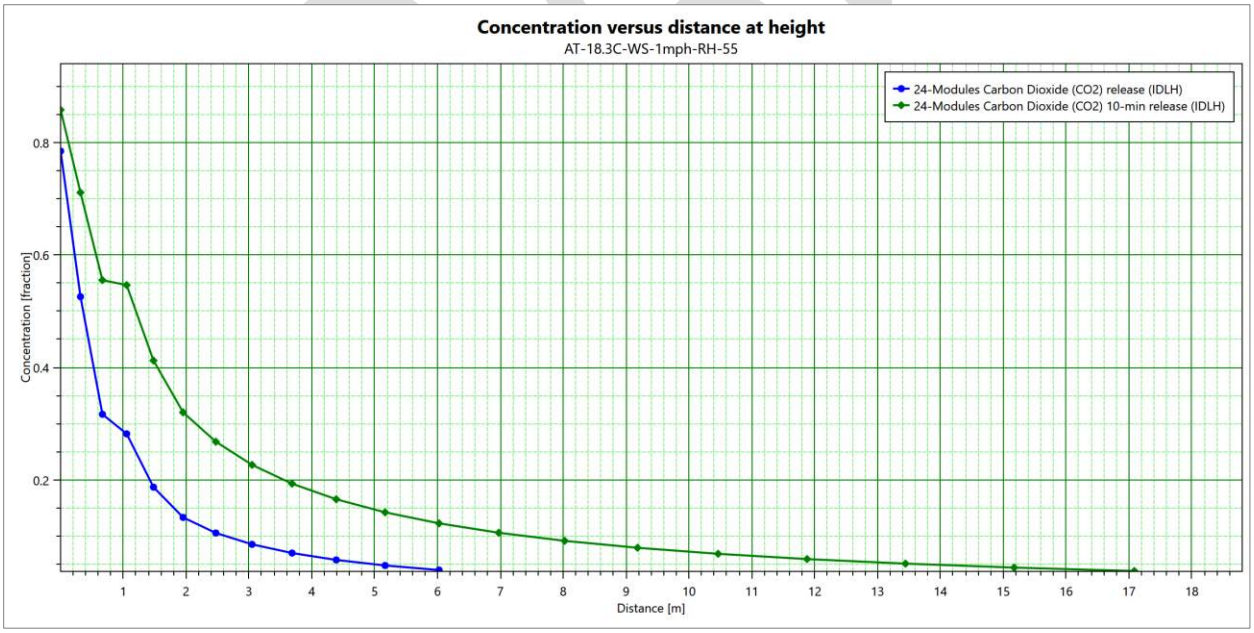

Figure 141 Concentration vs. distance for CO2 IDLH (40,000 ppm) for all sub-scenarios