

# Sensitivity Studies Performed for Key Input Parameters

Table 1 - Sensitivity to Inlet temperature

Model/ Sensitivity Parameter	Value	Best Estimated Flow Rate (STBPD)	Minimum Flow Rate (STBPD)	Maximum Flow Rate (STBPD)
Base Case	176 °F	25400	21300	28400
Base + lower bound Inlet Temperature	149 °F		22500	29600
Base + Upper bound Inlet Temperature	203 °F		21300	27200

to riser pipe roughness.

Table 4 - Sensitivity to the roughness of riser pipe

Model/ Sensitivity Parameter	Value	Best Estimated Flow Rate (STBPD)	Minimum Flow Rate (STBPD)	Maximum Flow Rate (STBPD)
Base Case	0.0018 in	25400	21300	28400

Table 3 - Sensitivity to depth of the Riser End plume

Model/ Sensitivity Parameter	Value	Best Estimated Flow Rate (STBPD)	Minimum Flow Rate (STBPD)	Maximum Flow Rate (STBPD)
Base Case	-4990 ft	24800	21300	28400
Base + Riser End Depth	-4985 ft		23600	28400

discharge coefficient, the less energy is recovered and consequently the lower the temperature exiting the kink. I performed a sensitivity over a wide range of discharge coefficients 0.5 to 1. The flow rate estimates were not very sensitive to variation of discharge coefficient.

Table 5 - Results from Kink model base case and various sensitivity studies

Model/ Sensitivity Parameter	Value	Best Estimated Flow Rate (STBPD)	Minimum Flow Rate (STBPD)	Maximum Flow Rate (STBPD)
Base + Kink Discharge Coefficient	0.5	25000	21100	26700
Base + Kink Discharge Coefficient	0.61		21900	26700
Base + Kink Discharge Coefficient	0.84		22300	28900
Base + Kink Discharge Coefficient	1.0		23400	28100

Table 2 - Sensitivity to outer heat transfer coefficient

Model/ Sensitivity Parameter	Value	Best Estimated Flow Rate (STBPD)	Minimum Flow Rate (STBPD)	Maximum Flow Rate (STBPD)
Base Case	~1000 W/m <sup>2</sup> /K	25400	21300	28400
Base + Natural Convection	~200 W/m <sup>2</sup> /K		26000	28400
Base + Forced Convection (1 m/s)	~2500 W/m <sup>2</sup> /K		23600	29600

Table 4 - Sensitivity to the roughness of riser pipe

Model/ Sensitivity Parameter	Value	Best Estimated Flow Rate (STBPD)	Minimum Flow Rate (STBPD)	Maximum Flow Rate (STBPD)
Base Case	0.0018 in	24800	21300	28400
Base + 10 times Roughness	0.018 in		26000	27200
Base + 100 times Roughness	0.18 in		24800	26000