

CORMIX SESSION REPORT:

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CORMIX MIXING ZONE EXPERT SYSTEM  
 CORMIX Version 9.0GTD  
 HYDR03: Version-9.0.0.0 September, 2014

SITE NAME/LABEL: Chi co Gas Plant - TX0000612  
 DESIGN CASE: Reconstruct outfall 001  
 FILE NAME: E:\Chi co\Chi co. prd  
 Using subsystem CORMIX3: Buoyant Surface Discharges  
 Start of session: 08/23/2016--13:34:10

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SUMMARY OF INPUT DATA:

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 AMBIENT PARAMETERS:

Cross-section	=	bounded
Width	BS	= 27.43 m
Channel regularity	ICHREG	= 1
Ambient flowrate	QA	= 0.04 m <sup>3</sup> /s
Average depth	HA	= 1.52 m
Depth at discharge	HD	= 1.22 m
Ambient velocity	UA	= 0.001 m/s
Darcy-Weisbach friction factor	F	= 0.0427
Calculated from Manning's n		= 0.025
Wind velocity	UW	= 2 m/s
Stratification Type	STRCND	= U
Surface temperature		= 12.9 degC
Bottom temperature		= 12.9 degC
Calculated FRESH-WATER DENSITY values:		
Surface density	RHOAS	= 999.3915 kg/m <sup>3</sup>
Bottom density	RHOAB	= 999.3915 kg/m <sup>3</sup>

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 DISCHARGE PARAMETERS:

	Surface Discharge	
Discharge located on		= left bank/shoreline
Discharge configuration		= flush discharge
Distance from bank to outlet	DI STB	= 0 m
Discharge angle	SI GMA	= 90 deg
Depth near discharge outlet	HDO	= 1.22 m
Bottom slope at discharge	SLOPE	= 0 deg
Circular pipe diameter		= 0.1219 m
Equivalent rectangular discharge:		
Discharge cross-section area	AO	= 0.011675 m <sup>2</sup>
Discharge channel width	BO	= 0.095756 m
Discharge channel depth	HO	= 0.12192 m
Discharge aspect ratio	AR	= 1.273240
Discharge flowrate	QO	= 0.000434 m <sup>3</sup> /s
Discharge velocity	UO	= 0.04 m/s
Discharge temperature (freshwater)		= 12.9 degC
Corresponding density	RHO0	= 999.3915 kg/m <sup>3</sup>
Density difference	DRHO	= 0 kg/m <sup>3</sup>
Buoyant acceleration	GPO	= 0 m/s <sup>2</sup>
Discharge concentration	CO	= 100 %
Surface heat exchange coeff.	KS	= 0 m/s
Coefficient of decay	KD	= 0 /s

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 DISCHARGE/ENVIRONMENT LENGTH SCALES:

LQ = 0.11 m                      Lm = 4.02 m                      Lbb = 0 m  
 LM = 99999 m

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 NON-DIMENSIONAL PARAMETERS:

Densimetric Froude number	FRO	= 99999 (based on LQ)
Channel densimetric Froude no.	FRCH	= 99999 (based on HO)
Velocity ratio	R	= 37.20

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MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:

Toxic discharge = no
Water quality standard specified = no
Regulatory mixing zone = yes
Regulatory mixing zone specification = distance
Regulatory mixing zone value = 13.72 m (m^2 if area)
Region of interest = 1800 m

HYDRODYNAMIC CLASSIFICATION:

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| FLOW CLASS = SA2 |
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Limiting Dilution S = (QA/Q0)+ 1.0 = 97.0

MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

X-Y-Z Coordinate system:

Origin is located at WATER SURFACE and at centerline of discharge channel:
0 m from the left bank/shore.
Number of display steps NSTEP = 50 per module.

NEAR-FIELD REGION (NFR) CONDITIONS :

Note: The NFR is the zone of strong initial mixing. It has no regulatory implication. However, this information may be useful for the discharge designer because the mixing in the NFR is usually sensitive to the discharge design conditions.

Pollutant concentration at NFR edge c = 1.8321 %
Dilution at edge of NFR s = 54.6
NFR Location: x = 144.15 m
(centerline coordinates) y = -5.84 m
z = 0 m

NFR plume dimensions: half-width (bh) = 5.79 m
thickness (bv) = 1.22 m

Cumulative travel time: 92127.5312 sec.

Buoyancy assessment:

The effluent density is equal or about equal to the surrounding ambient water density at the discharge level.
Therefore, the effluent behaves essentially as NEUTRALLY BUOYANT.

FAR-FIELD MIXING SUMMARY:

Plume becomes vertically fully mixed ALREADY IN NEAR-FIELD at 177.27 m downstream and continues as vertically mixed into the far-field.
Plume becomes laterally fully mixed at 342.05 m downstream.

PLUME BANK CONTACT SUMMARY:

Plume in bounded section contacts one bank only at 0 m downstream.

\*\*\*\*\* TOXIC DILUTION ZONE SUMMARY \*\*\*\*\*

No TDZ was specified for this simulation.

\*\*\*\*\* REGULATORY MIXING ZONE SUMMARY \*\*\*\*\*

The plume conditions at the boundary of the specified RMZ are as follows:

Pollutant concentration c = 4.729815 %
Corresponding dilution s = 21.1
Plume Location: x = 13.62 m
(centerline coordinates) y = -14.10 m
z = 0 m

Plume dimensions: half-width (bh) = 1.83 m
thickness (bv) = 1.22 m

Cumulative travel time < 92127.5312 sec. (RMZ is within NFR)

Note:

Plume concentration c and dilution s values are reported based on prediction file values - assuming linear interpolation between predicted points just before and just after the RMZ boundary has been detected.

Please ensure a small step size is used in the prediction file to account for this linear interpolation. Step size can be controlled by increasing (reduces the prediction step size) or decreasing (increases the prediction step size) the - Output Steps per Module - in CORMIX input.

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Regulatory Mixing Zone Analysis:

The RMZ specification occurs before the near-field mixing regime (NFR) has been completed. The specification of the RMZ is highly restrictive.

\*\*\*\*\* FINAL DESIGN ADVICE AND COMMENTS \*\*\*\*\*

REMI NDER: The user must take note that HYDRODYNAMIC MODELING by any known technique is NOT AN EXACT SCIENCE.

Extensive comparison with field and laboratory data has shown that the CORMIX predictions on dilutions and concentrations (with associated plume geometries) are reliable for the majority of cases and are accurate to within about +/-50% (standard deviation).

As a further safeguard, CORMIX will not give predictions whenever it judges the design configuration as highly complex and uncertain for prediction.