Appendix 7I

Air Emissions Calculations

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Construction

Direct emissions would result from both the construction or refurbishment of pipeline segments and the construction of the pump/electrical substation facilities. Construction impacts are expected to be temporary and transient, and the short-term exposure levels are considered minimal. The emissions from pipeline construction are expected to be similar along any section of the pipeline route. These emissions include exhaust from the construction equipment and vehicle engines and fugitive dust from the disturbed areas along the ROW. Table 7I-1 provides a summary of the constructions emissions inventory for a typical pipeline segment construction of the All-American pipeline. It is expected that the emissions from the Longhorn pipeline will be similar to these. Carbon monoxide emissions would be emitted in the largest quantities during construction, followed by NO_x, TSP, HC, and SO_2 emissions.

Construction has already been completed of an origin pump station at Galena Park and five booster pump stations at: Satsuma, Cedar Valley, Kimble, Crane, and El Paso. Ten booster pump stations will be built, and three existing stations will be reactivated and expanded in future phases at the following locations to achieve an ultimate capacity of 225,000 barrels/day (bpd): Buckhorn, Warda, Bastrop, Orotaga, Eckert, Llano, Cartman, Olson, Big Lake, Pecos, Utica, Cottonwood, and Harris.

The generic pump/electrical substation construction emissions inventory is presented in Table 7I-2. These construction emissions were also based on the estimates performed for the All-American pipeline, which were based on an average total disturbed area per station of 4.88 acres.

Operational Impacts

Operational emissions would consist primarily of the pollutants emitted from the pump stations along the pipeline route. Additional fugitive emissions will be generated from valves and fittings along the route. Since all the pump stations will be using electrically powered pumps, the only emissions generated will be fugitive VOC emissions from the pumps, fittings, and valves. The emission data for Crane and El Paso stations were taken from TNRCC Air Quality Application for the El Paso Terminal- Longhorn Pipeline (1997), and from the Permitting Exemption request for Crane Station (1998). For the rest of the fittings, valves, and pumps along the pipeline, AP-42 emission factors for light liquids were used. Table 7I-3 presents all the estimated emissions for the pipeline operation under the worst-case scenario (operating at a full capacity of 225,000 barrels/day). Table 7I-4 shows the background factors for those emissions on a component by component basis.

Calculations of the air quality impacts from the operation of the pumping stations and terminals (including the fugitive emissions throughout the pipeline) were performed using the SCREEN3 model (version 96043). SCREEN3 uses Gaussian plume calculations that incorporate source-related and meteorological factors to estimate pollutant concentration from continuous sources. The model assumes that the pollutant does not undergo any chemical reactions, and that

no other removal processes, such as wet or dry deposition, act on the plume during its transport from the source. The Gaussian model equations and the interactions of the source-related and meteorological factors are described in Volume II of the ISC user's guide (EPA, 1995b), and in the Workbook of Atmospheric Dispersion Estimates (Turner, 1970).

The screening model accounts for the worst-case scenario. Since the results of the screening model did not exceed the state thresholds, no refined dispersion modeling was conducted.

Three main SCREEN model runs were performed using a 1.0 lb/hr unit emission rate:

- Pseudo Point Source- represents the impacts of each of the pumping stations and each of the points of fugitive emissions from valves and flanges along the pipeline;
- El Paso Area Source- represents the tank farm area and the pumping station at El Paso; and
- Crane Area Source- represents the emissions from the tank farm area and the pumping station at Crane.

All the pump stations and fugitive emissions from valves and flanges along the pipeline were modeled with standard TNRCC pseudo-point parameters of 1 m height, 0.001 m diameter, 0.001m/s velocity and 0 K temperature. Building downwash from local maintenance shed was considered. Rural dispersion coefficients were assumed and unit impacts were obtained from the source out 10 km. Unit impacts were then multiplied by the combined emission rates for each source to obtain overall site impacts. As Table 7I-3 shows, none of the impacts exceed the ESL for gasoline.

Area Sources—Assumptions for El Paso and Crane Runs

Unlike the pump stations and valves/flanges along the route, El Paso and Crane tank farms were modeled as area sources using actual tank heights and the dimensions of the tank farm areas, rural dispersion coefficients for Crane and urban coefficients for El Paso. Unit impacts were obtained from the tank farm out to 10 km. Unit impacts were multiplied by the actual area emission rates to obtain overall site impacts. As Table 7I-3 shows, none of the impacts of the area sources exceed the ESL for gasoline.

Transfer and Storage

Indirect or secondary air quality impacts from the operation of the pipeline are primarily associated with “beyond the pipeline” emissions from the distribution of the refined products. The distribution emissions are mainly in the form of fugitive hydrocarbons that escape into the atmosphere from the transfer and tank storage of the final product. They are generally very localized and impact only the immediate transfer area. The emissions generated by storage of product at the stations were already accounted for in the operations section.

Abandonment

The air quality impacts associated with abandonment of the pipeline and the booster pump stations would be limited to short-term, transient, construction type impacts if the pipeline and facilities were removed. Emissions could be expected to be similar to the construction

emissions described earlier, and the impacts would also be similar. If the pipelines and facilities were not removed, there would be no air quality impacts associated with abandonment.

Table 7I-1. Typical Emissions from the Construction of a Pipeline Segment

Emissions (lb/day)					
Source	**CO**	**HC**	**NO_x**	**SO_2**	**TSP**
Diesel Track-Type Tractors	233.7	81.6	849.5	32.8	30.1
Diesel Wheel-Type Tractor	396.7	20.8	140.2	3.5	6
Miscellaneous Equipment-Diesel	51.6	11.6	129.4	3.9	4.2
Miscellaneous Equipment- Gasoline	7,058	237.2	170.8	3.3	4.3
Heavy Duty Diesel Vehicles	62.6	24.7	90.4	4.2	3.4
Heavy Duty Gasoline Vehicles	540.4	44.8	20.1	NA	0.2
Light Duty Diesel Trucks	33.3	18.3	29.8	3.7	3.7
Light Duty Gasoline Vehicles	10.1	1.8	1.8	NA	<0.1
Light Duty Gasoline Trucks I	437.9	55	29.8	NA	0.1
Fugitive Dust from Disturbed Acreage	NA	NA	NA	NA	773.0
TOTAL	8,824.3	495.8	1,461.8	51.4	825.1

Source: ERT and All-American Pipeline.
NA - Not applicable.

Table 7I-2. Emissions Inventory for Pump/Electrical Substation Construction

Emissions (lbs/day)					
Source	**CO**	**HC**	**NO_x**	**SO_2**	**PM**
Track-Type Diesel Tractors	23.5	8.2	85.7	3.3	3
Wheel-type Diesel Tractors	30.5	1.6	10.8	0.3	0.5
Misc. Equipment-Gasoline	556.6	18.2	13.5	0.3	0.3
Heavy Duty Diesel Vehicles	4.7	1.9	6.8	0.3	0.3
Ligh Duty Gasoline Trucks	16.8	2.1	1.2	NA	<0.1
Fugitive Dust from Disturbed Acreage	NA	NA	NA	NA	155.6
TOTAL	632.1	32	118	4.2	159.8

Source: ERT- Estimates from All-American Pipeline Environmental Impact Study.
NA - Not applicable.

Table 7I-3. Air Emission Impacts on Air Quality (Operation Impacts)

MP	Location	Total Emissions (ton/year)	Total Emissions (lb/hr)	Unit impact (ug/m3)*	Total Impact (ug/m3)	Percent of ESL
0	Galena Park	0.0241	0.0055	5742	31.55	0.90%
5	Value	0.0008	0.0002	5742	1.05	0.03%
12	Mesa Boulevard	0.0004	0.0001	5742	0.52	0.01%
21	Value	0.0004	0.0001	5742	0.52	0.01%
34	Satsuma Station	0.0197	0.0045	5742	25.79	0.74%
64	Value	0.0004	0.0001	5742	0.52	0.01%
68	Buckhorn Station	0.0131	0.0030	5742	17.15	0.49%
113	Warda Station	0.0131	0.0030	5742	17.15	0.49%
134	Colorado River	0.0012	0.0003	5742	1.57	0.04%
142	Bastrop Station	0.0131	0.0030	5742	17.15	0.49%
167	Edwards Aquifer - East	0.0008	0.0002	5742	1.05	0.03%
182	Cedar Valley Station	0.0183	0.0042	5742	23.96	0.68%
199	Pedernales River	0.0004	0.0001	5742	0.52	0.01%
212	Pedernales River	0.0012	0.0003	5742	1.57	0.04%
209	Orotaga Station	0.0131	0.0030	5742	17.15	0.49%
228	Eckert Station	0.0131	0.0030	5742	17.15	0.49%
270	Llano Station	0.0131	0.0030	5742	17.15	0.49%
295	Kimble County Station	0.0183	0.0042	5742	23.96	0.68%
322	Old Fort Mckavetee Station	0.0012	0.0003	5742	1.57	0.04%
359	Value	0.0004	0.0001	5742	0.52	0.01%
339	Cartman Station	0.0135	0.0031	5742	17.67	0.50%
415	Olson Station	0.0131	0.0030	5742	17.15	0.49%
374	Big Lake Station	0.0131	0.0030	5742	17.15	0.49%
458	Crane Station/Odessa meter	14.63	3.3356	55	183.46	5.24%
492	Value	0.0017	0.0004	5742	2.23	0.06%
521	Pecos	0.0095	0.0022	5742	12.44	0.36%
549	Utica Station	0.0131	0.0030	5742	17.15	0.49%
576	Cottonwood Station to Odessa	0.0008	0.0002	5742	1.05	0.03%
576	Cottonwood Station	0.0131	0.0030	5742	17.15	0.49%
607	Value	0.0012	0.0003	5742	1.57	0.04%
639	Value	0.0004	0.0001	5742	0.52	0.01%
648	Harris	0.0131	0.0030	5742	17.15	0.49%
668	Value	0.0004	0.0001	5742	0.52	0.01%
694	El Paso Terminal	66	15,048	13.64	205.25	5.86%

Notes:

* Value from the SCREEN3 model.

None of the sources exceed the ESL for gasoline.

Table does not reflect additional valves referenced in Longhorn Mitigation Plan

Table 7I-4. Component by Component Emissions

MP	Station Name/ Pipeline Segment	Emissions Sources	Qty.	Emission Factor Assumed (lb/hr-source)	VOC Emission Rates (ton/yr)	NOx Emissions (ton/yr)	CO Emissions (ton/yr)	HAP Emissions (ton/yr)	Source of Information
0	Galena Park (originating pump station)	Pumps (2)/electrical substation	2	1.19E-03	0.0104	0	0		(E)
		Valves	17	9.48E-05	0.0071	0	0		(E)
		Flanges	86	1.76E-05	0.0066				
		Subtotal			**0.0241**				
5	Valve Location	Manual block valves (2)	2	9.48E-05	0.0008	0	0		(E)
12	Mesa Boulevard	Remote-controlled block valve (1)	1	9.48E-05	0.0004	0	0		(E)
21	Valve Location	Manual block valves (1)	1	9.48E-05	0.0004	0	0		(E)
34	Satsuma Station	Pressure relief/control system	1	0.000264	0.0012	0	0		(E)
		Valves	19	9.48E-05	0.0079	0	0		(E)
		Pump (1)	1	1.19E-03	0.0052	0	0		(E)
		Flanges	71	1.76E-05	0.0055				
		Subtotal			**0.0198**				
64	Valve Location	Remote-controlled block valves (1)	1	9.48E-05	0.0004	0	0		(E)
67.5 - 77.5	Buckhorn Station, Brazos River East	Pump (1)	1	1.19E-03	0.0052	0	0		(E)
		Valves	10	9.48E-05	0.0042	0	0		(E)
		Flanges	48	1.76E-05	0.0037				
		Subtotal			**0.0131**				
113	Warda Station	Valves	10	9.48E-05	0.0042	0	0		(E)
		Pump (1)	1	1.19E-03	0.0052	0	0		(E)
		Flanges	48	1.76E-05	0.0037				
		Subtotal			**0.0131**				

MP	Station Name/ Pipeline Segment	Emissions Sources	Qty.	Emission Factor Assumed (lb/hr-source)	VOC Emission Rates (ton/yr)	NOx Emissions (ton/yr)	CO Emissions (ton/yr)	HAP Emissions (ton/yr)	Source of Information
134	Colorado River	Remote-controlled block valve (1)	1	9.48E-05	0.0004	0	0		(E)
		Check valve and manual block valve (2)	2	9.48E-05	0.0008	0	0		(E)
		Subtotal			**0.0012**				
142	Bastrop Station	Pump (1)	1	1.19E-03	0.0052	0	0		(E)
		Flanges	48	1.76E-05	0.0037				
		Valves	10	9.48E-05	0.0042				
		Subtotal			**0.0131**				
167	Edwards Aquifer - East	Remote-controlled block valve (1)	1	9.48E-05	0.0004	0	0		(E)
172	Edwards Aquifer-West	Remote-controlled block valve (1)	1	9.48E-05	0.0004	0	0		(E)
182	Cedar Valley Station	Valves	10	9.48E-05	0.0042	0	0		(E)
		Pumps (2)/electrical substation	2	1.19E-03	0.0104	0	0		(E)
		Flanges	48	1.76E-05	0.0037				
		Subtotal			**0.0183**				
199	Valve Location	Remote-controlled block valve (1)	1	9.48E-05	0.0004	0	0		(E)
212	Pedernales River	Check valve and manual block valve (2)	2	9.48E-05	0.0008	0	0		(E)
		Manual Block Valve (1)	1	9.48E-05	0.0004	0	0		(E)
		Subtotal			**0.0012**				
209	Orotaga Station	Pump (1)	1	1.19E-03	0.0052	0	0		(E)
		Flanges	48	1.76E-05	0.0037				
		Valves	10	9.48E-05	0.0042				
		Subtotal			**0.0131**				

MP	Station Name/ Pipeline Segment	Emissions Sources	Qty.	Emission Factor Assumed (lb/hr-source)	VOC Emission Rates (ton/yr)	NOx Emissions (ton/yr)	CO Emissions (ton/yr)	HAP Emissions (ton/yr)	Source of Information
228	Eckert Station	Valves	10	9.48E-05	0.0042	0	0		(E)
		Pump (1)	1	1.19E-03	0.0052	0	0		(E)
		Flanges	48	1.76E-05	0.0037				
		Subtotal			**0.0131**				
270	Llano River Llano Station	Valves	10	9.48E-05	0.0042	0	0		(E)
		Pump (1)	1	1.19E-03	0.0052	0	0		(E)
		Flanges	48	1.76E-05	0.0037				
		Subtotal			**0.0131**				
295	Kimble County Station	Pumps (2)/electrical substation	2	1.19E-03	0.0104	0	0		(E)
		Valves	10	9.48E-05	0.0042	0	0		(E)
		Flanges	48	1.76E-05	0.0037				
		Subtotal			**0.0183**				
322	Old Fort Mckavetee Station	Manual block valve (1)	1	9.48E-05	0.0004	0	0		(E)
		Gate valve (2)	2	9.48E-05	0.0008	0	0		(E)
		Subtotal			**0.0012**				
359	Valve Location	Manual block valve (1)	1	9.48E-05	0.0004	0	0		(E)
334 - 344	Cartman Station	Pump (1)	1	1.19E-03	0.0052	0	0		(E)
		Valves	10	9.48E-05	0.0042	0	0		(E)
		Flanges	48	1.76E-05	0.0037				
		Subtotal			**0.0131**				
415	Olson Station	Pump (1)	1	1.19E-03	0.0052	0	0		(E)
		Flanges	48	1.76E-05	0.0037				
		Valves	10	9.48E-05	0.0042				
		Subtotal			**0.0131**				
374	Big Lake Station	Valves	10	9.48E-05	0.0042	0	0		(E)
		Pump (1)	1	1.19E-03	0.0052	0	0		(E)
		Flanges	48	1.76E-05	0.0037				
		Subtotal			**0.0131**				
458	Crane Station	Valves	85	9.48E-05	0.0353	0	0		(E)

MP	Station Name/ Pipeline Segment	Emissions Sources	Qty.	Emission Factor Assumed (lb/hr-source)	VOC Emission Rates (ton/yr)	NOx Emissions (ton/yr)	CO Emissions (ton/yr)	HAP Emissions (ton/yr)	Source of Information
		Remote-controlled block valve (1)	1	9.48E-05	0.0004	0	0		(E)
		Breakout storage tanks (4 new tanks)			14.45	0	0		(F)
		Pumps (2)	2	1.19E-03	0.0104	0	0		(E)
		Station fugitive emissions			0.1618	0	0		(F)
		Flanges	310	1.76E-05	0.0239				
	Odessa meter station	Loop style prover	1	0.000264	0.0012	0	0		(E)
		4-inch turbine meter	1	0.000264	0.0012	0	0		(E)
		Densitometer	1	0.000264	0.0012	0	0		(E)
		8-inch basket strainer	1	0.000264	0.0012	0	0		(E)
		350 barrel relief tank	1	0.000264	0.0012	0	0		(E)
		1000-gal product sump	1	0.000264	0.0012	0	0		
		8-inch pig trap receiver	1	0.000264	0.0012	0	0		(E)
		8-inch main block valve (1)	1	0.000264	0.0012	0	0		(E)
		Low pressure manifold relief protection	1	0.000264	0.0012	0	0		(E)
		Subtotal			**14.6926**				
492	Valve Location	Manual block Valves(4)	4	9.48E-05	0.0017	0	0		(E)
516 - 526	Pecos Station	Pump (1)	1	1.19E-03	#REF!	0	0		(E)
		Valves	10	9.48E-05	0.0042	0	0		(E)
		Subtotal			**#REF!**				
543.6 - 553.6	Utica Station	Pump (1)	1	1.19E-03	0.0052	0	0		(E)
		Valves	10	9.48E-05	0.0042	0	0		(E)
		Flanges	48	1.76E-05	0.0037				
		Subtotal			**0.0131**				
607	Valve Location	Manual block valve (1)	1	9.48E-05	0.0004	0	0		(E)
639	Valve Location	Manual block valve (1)	1	9.48E-05	0.0004	0	0		(E)
668	Valve Location	Manual block valve (1)	1	9.48E-05	0.0004	0	0		(E)

MP	Station Name/ Pipeline Segment	Emissions Sources	Qty.	Emission Factor Assumed (lb/hr-source)	VOC Emission Rates (ton/yr)	NOx Emissions (ton/yr)	CO Emissions (ton/yr)	HAP Emissions (ton/yr)	Source of Information
576	Cottonwood Station	Valves	10	9.48E-05	0.0042	0	0		(E)
		Flanges	48	1.76E-05	0.0037	0	0		(E)
		Pump (1)	1	1.19E-03	0.0052	0	0		(E)
		Subtotal			**0.0131**				
642.6 - 652.6	Harris	Pump (1)	1	1.19E-03	0.0052	0	0		(E)
		Valves	10	9.48E-05	0.0042	0	0		(E)
		Flanges	48	1.76E-05	0.0037				
		Subtotal			**0.0131**				
694	El Paso Terminal	Storage tanks*			20.702	0	0	1.03	(C)
		Loading losses			23.05	0	0	2.53	(D)
		Vapor combustion unit (VCU)			15.1	5.3	10.63	1.66	(D)
		Equipment fugitives (valves, flanges, etc.)			0.7658	0	0	0.0418	(D)
		Oil/water separator and water tank			0.2	0	0	0.022	(D)
		Additive tanks			1.74	0	0		(D)
		Valves	240	2.86E-05	0.0301	0	0		(D)
		Flanges	900	1.76E-05	0.0694				(E)
		Subtotal			**61.6573**	**5.3000**	**10.6300**	**5.2838**	

Note:
(A) Pumps are electrically operated and therefore, no NO_x or CO emissions are expected.
(B) (Approximate capacity = 2,000,000 barrels for 225,000 tpy).
(C) TNRCC AQ Permit application, 9/26/97: Since storage capacity is expected to double, the emissions doubled as well from 75,000 tpy baseline.
(D) TNRCC AQ Permit application, 9/26/97.
(E) Marketing Terminal emission factors- EPA Protocol for Equipment Leak Emission Estimates.
(F) Crane Station Exemption from Permit.
Table does not reflect additional valves referenced in Longhorn Mitigation Plan