Grain Belt Express Transmission Line
Environmental Impact Statement
Appendix 3.2: Air Emissions Tables

Grain Belt Express RAR - Air Resources - Emission Calculations
Table A-1: Construction and Operational Emissions Summary

Total Project Construction Emissions Summary								
Construction Emission Source	**Emissions, tons**							**Emissions, mtons**
	CO	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**VOC**	**HAPs**	**CO_2e**
Construction Equipment (Off-Road)	236.56	70.05	0.08	3.49	3.38	9.65	3.77	23,316.67
Helicopter Use	6.58	60.41	0.71	1.02	1.02	5.46	0.59	10,735.97
Worker Commute & Equipment/ Material Delivery (On-Road)	68.93	14.95	0.09	0.53	0.49	0.68	0.05	11,138
Fugitive Dust From Construction Operations	NA	NA	NA	170.07	17.01	NA	NA	NA
Concrete Batch Plants	9.63	44.68	2.95	20.38	5.81	3.62	0.07	1,503.80
Total:	**312.07**	**145.41**	**0.88**	**175.11**	**21.89**	**15.80**	**4.41**	**45,190.82**

Annual Construction Emissions Summary								
Construction Emission Source	**Emissions, tpy**							**Emissions, mtpy**
	CO	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**VOC**	**HAPs**	**CO_2e**
Construction Equipment (Off-Road)	78.85	23.35	0.03	1.16	1.13	3.22	1.26	7,772.22
Helicopter Use	3.73	30.74	0.37	0.52	0.52	3.08	0.33	5,580.40
Worker Commute & Equipment/ Material Delivery (On-Road)	22.98	4.98	0.03	0.18	0.16	0.23	0.02	3,712.73
Fugitive Dust From Construction Operations	NA	NA	NA	56.69	5.67	NA	NA	NA
Concrete Batch Plants	4.81	22.34	1.48	10.19	2.90	1.81	0.03	751.90
Total:	**110.37**	**81.41**	**1.90**	**68.75**	**10.39**	**8.34**	**1.64**	**17,817.25**

Annual Operational Emissions Summary								
Operational Emission Source	**Emissions, tpy**							**Emissions, mtpy**
	CO	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**VOC**	**HAPs**	**CO_2e**
Worker Commute & Equipment/ Material Delivery (On-Road)	1.46	0.07	0.00	0.00	0.00	0.00	0.00	126.94
Helicopter Use	0.45	0.56	0.01	0.02	0.02	0.36	0.04	220.90
Fugitive Dust From Vehicles (Off-Road)	NA	NA	NA	7.47	0.72	NA	NA	NA
Substation Emissions from Circuit Breakers	NA	NA	NA	NA	NA	NA	NA	413.68
Total:	**1.91**	**0.63**	**0.02**	**7.49**	**0.74**	**0.36**	**0.04**	**761.52**

CO: carbon monoxide, NO_x: nitrogen oxides, SO_2: sulfur dioxide, PM_{10}: particulate matter with an aerodynamic diameter of 10 microns or less, $PM_{2.5}$: particulate matter with an aerodynamic diameter of 2.5 microns or less, VOC: volatile organic compound, HAP: hazardous air pollutant, tpy: tons per year, mtons: metric tons, mtpy: metric tons per year, CO_2e: carbon dioxide equivalent, N/A: not applicable

Grain Belt Express RAR - Air Resources - Emission Calculations
Table A-2: Construction Equipment Emissions (Off-Road)

Construction Activity	Equipment					Emissions, tons										Emissions, mtons		1,3-Butadiene	2,2,4-Trimethylpentane	Acetaldehyde	Acrolein	Arsenic Compounds	Benzene
	Equipment Type	Quantity	Hours per Day	Hours of Use	Total Cumulative Hours of Use	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	HAPs	CH_4	N_2O	CO_2	CO_2e	HAP's:						
Right-of-Way	Grader	1	8	6000	6,000	0.1308	0.3775	0.0012	0.0271	0.0263	0.0225	0.0115	0.0019	0.0000	428.8700	389.12		0.0000	0.0002	0.0021	0.0004	0.0000	0.0010
	Pickup Trucks	2	8	6000	12,000	22.2572	0.5675	0.0011	0.0204	0.0188	0.5868	0.1874	0.0721	0.0001	200.84	184.16		0.0053	0.0297	0.0038	0.0002	0.0000	0.0247
	Bulldozers	2	8	6000	12,000	0.5669	1.8808	0.0030	0.0948	0.0920	0.0858	0.0448	0.0070	0.0000	1094.55	993.15		0.0001	0.0006	0.0083	0.0015	0.0000	0.0040
Excavation for Foundations	Backhoe	1	8	6000	6,000	0.2737	0.3580	0.0003	0.0447	0.0434	0.0584	0.0281	0.0026	0.0000	86.29	78.35		0.0001	0.0004	0.0051	0.0012	0.0000	0.0020
	Auger	2	8	6000	12,000	0.2266	0.7737	0.0020	0.0444	0.0430	0.0385	0.0200	0.0034	0.0000	723.89	656.80		0.0001	0.0003	0.0037	0.0007	0.0000	0.0018
	Backhoe	2	8	6000	12,000	0.5475	0.7160	0.0005	0.0894	0.0867	0.1168	0.0562	0.0052	0.0000	172.57	156.70		0.0002	0.0009	0.0102	0.0024	0.0000	0.0040
	Pickup Trucks	2	8	6000	12,000	22.2572	0.5675	0.0011	0.0204	0.0188	0.5868	0.1874	0.0721	0.0001	200.84	184.16		0.0053	0.0297	0.0038	0.0002	0.0000	0.0247
Foundation Installation	Flat-Bed Truck	2	8	6000	12,000	1.0305	9.3945	0.0089	0.1931	0.1873	0.2442	0.1332	0.0210	0.0000	3279.34	2,975.54		0.0004	0.0019	0.0246	0.0044	0.0000	0.0125
	Pickup Trucks	2	8	6000	12,000	22.2572	0.5675	0.0011	0.0204	0.0188	0.5868	0.1874	0.0721	0.0001	200.84	184.16		0.0053	0.0297	0.0038	0.0002	0.0000	0.0247
	Mixer Trucks	15	8	6000	90,000	2.0110	4.8526	0.0024	0.3218	0.3122	0.5062	0.2418	0.0217	0.0000	745.11	676.54		0.0009	0.0039	0.0441	0.0109	0.0000	0.0172
Structure Assembly & Installation	Hydro-Cranes	2	8	6000	12,000	0.3174	1.2892	0.0020	0.0568	0.0551	0.0710	0.0366	0.0054	0.0000	700.27	635.42		0.0001	0.0005	0.0067	0.0013	0.0000	0.0031
	Tractors	2	8	6000	12,000	0.5475	0.7160	0.0005	0.0894	0.0867	0.1168	0.0562	0.0052	0.0000	172.57	156.70		0.0002	0.0009	0.0102	0.0024	0.0000	0.0040
	Pickup Trucks	2	8	6000	12,000	22.2572	0.5675	0.0011	0.0204	0.0188	0.5868	0.1874	0.0721	0.0001	200.84	184.16		0.0053	0.0297	0.0038	0.0002	0.0000	0.0247
	Pullers	2	8	6000	12,000	0.5475	0.7160	0.0005	0.0894	0.0867	0.1168	0.0562	0.0052	0.0000	172.57	156.70		0.0002	0.0009	0.0102	0.0024	0.0000	0.0040
	Tensioners	2	8	6000	12,000	1.7731	4.3834	0.0041	0.2460	0.2386	0.2502	0.1237	0.0143	0.0000	1378.21	1,250.68		0.0005	0.0019	0.0227	0.0051	0.0000	0.0097
	Bulldozers	2	8	6000	12,000	0.5669	1.8808	0.0030	0.0948	0.0920	0.0858	0.0448	0.0070	0.0000	1094.55	993.15		0.0001	0.0006	0.0083	0.0015	0.0000	0.0040
Conductor Stringing	Reel Trailers	4	8	6000	24,000	3.5462	8.7668	0.0082	0.4920	0.4773	0.5005	0.2474	0.0286	0.0000	2756.41	2,501.36		0.0009	0.0038	0.0453	0.0102	0.0000	0.0193
	Materials Truck	1	8	6000	6,000	0.3150	0.5381	0.0004	0.0535	0.0519	0.0819	0.0390	0.0035	0.0000	111.86	101.57		0.0002	0.0006	0.0071	0.0018	0.0000	0.0027
	Pickup Trucks	5	8	6000	30,000	55.6429	1.4186	0.0028	0.0511	0.0470	1.4670	0.4684	0.1802	0.0002	502.09	460.40		0.0132	0.0743	0.0095	0.0005	0.0000	0.0616
	Light Truck	1	8	6000	6,000	5.1037	0.0728	0.0002	0.0065	0.0060	0.1815	0.0580	0.0221	0.0000	28.26	26.24		0.0016	0.0092	0.0012	0.0001	0.0000	0.0076
	Bulldozers	1	8	6000	6,000	0.2835	0.9404	0.0015	0.0474	0.0460	0.0429	0.0224	0.0035	0.0000	547.27	496.57		0.0001	0.0003	0.0041	0.0007	0.0000	0.0020
Disturbance Area Restoration	Blader	1	8	6000	6,000	0.2835	0.9404	0.0015	0.0474	0.0460	0.0429	0.0224	0.0035	0.0000	547.27	496.57		0.0001	0.0003	0.0041	0.0007	0.0000	0.0020
	Front-End Loader	1	8	6000	6,000	0.2737	0.3580	0.0003	0.0447	0.0434	0.0584	0.0281	0.0026	0.0000	86.29	78.35		0.0001	0.0004	0.0051	0.0012	0.0000	0.0020
	tractor/harow/disc	1	8	6000	6,000	0.8866	2.1917	0.0021	0.1230	0.1193	0.1251	0.0618	0.0072	0.0000	689.10	625.34		0.0002	0.0010	0.0113	0.0025	0.0000	0.0048
	Light Truck	1	8	6000	6,000	5.1037	0.0728	0.0002	0.0065	0.0060	0.1815	0.0580	0.0221	0.0000	28.26	26.24		0.0016	0.0092	0.0012	0.0001	0.0000	0.0076
	Flat-Bed Truck	2	8	6000	12,000	1.0305	9.3945	0.0089	0.1931	0.1873	0.2442	0.1332	0.0210	0.0000	3279.34	2,975.54		0.0004	0.0019	0.0246	0.0044	0.0000	0.0125
	Bulldozers	2	8	6000	12,000	0.5669	1.8808	0.0030	0.0948	0.0920	0.0858	0.0448	0.0070	0.0000	1094.55	993.15		0.0001	0.0006	0.0083	0.0015	0.0000	0.0040
	Cranes	2	8	6000	12,000	0.3174	1.2892	0.0020	0.0568	0.0551	0.0710	0.0366	0.0054	0.0000	700.27	635.42		0.0001	0.0005	0.0067	0.0013	0.0000	0.0031
	Excavator	2	8	6000	12,000	0.2266	0.7737	0.0020	0.0444	0.0430	0.0385	0.0200	0.0034	0.0000	723.89	656.80		0.0001	0.0003	0.0037	0.0007	0.0000	0.0018
	Pickup Trucks	5	8	6000	30,000	55.6429	1.4186	0.0028	0.0511	0.0470	1.4670	0.4684	0.1802	0.0002	502.09	460.40		0.0132	0.0743	0.0095	0.0005	0.0000	0.0616
Converter Station Construction	Fuel Truck	1	8	6000	6,000	5.1037	0.0728	0.0002	0.0065	0.0060	0.1815	0.0580	0.0221	0.0000	28.26	26.24		0.0016	0.0092	0.0012	0.0001	0.0000	0.0076
	Pullers	1	8	6000	6,000	0.2737	0.3580	0.0003	0.0447	0.0434	0.0584	0.0281	0.0026	0.0000	86.29	78.35		0.0001	0.0004	0.0051	0.0012	0.0000	0.0020
	Tensioners	1	8	6000	6,000	0.8866	2.1917	0.0021	0.1230	0.1193	0.1251	0.0618	0.0072	0.0000	689.10	625.34		0.0002	0.0010	0.0113	0.0025	0.0000	0.0048
	Reel Trailers	2	8	6000	12,000	1.7731	4.3834	0.0041	0.2460	0.2386	0.2502	0.1237	0.0143	0.0000	1378.21	1,250.68		0.0005	0.0019	0.0227	0.0051	0.0000	0.0097
	Tractors	1	8	6000	6,000	0.2737	0.3580	0.0003	0.0447	0.0434	0.0584	0.0281	0.0026	0.0000	86.29	78.35		0.0001	0.0004	0.0051	0.0012	0.0000	0.0020
	Materials Truck	2	8	6000	12,000	0.6299	1.0761	0.0007	0.1070	0.1037	0.1637	0.0779	0.0069	0.0000	223.72	203.14		0.0003	0.0013	0.0142	0.0036	0.0000	0.0055
	Blader	1	8	6000	6,000	0.2835	0.9404	0.0015	0.0474	0.0460	0.0429	0.0224	0.0035	0.0000	547.27	496.57		0.0001	0.0003	0.0041	0.0007	0.0000	0.0020
	Mixer Trucks	2	8	6000	12,000	0.2681	0.6470	0.0003	0.0429	0.0416	0.0675	0.0322	0.0029	0.0000	99.35	90.21		0.0001	0.0005	0.0059	0.0015	0.0000	0.0023
	Front-End Loader	1	8	6000	6,000	0.2737	0.3580	0.0003	0.0447	0.0434	0.0584	0.0281	0.0026	0.0000	86.29	78.35		0.0001	0.0004	0.0051	0.0012	0.0000	0.0020
					Total:	***236.5571***	***70.0502***	***0.0785***	***3.4929***	***3.3779***	***9.6547***	***3.7719***	***0.9434***	***0.0009***	***25673.8512***	***23316.6719***		***0.0593***	***0.3243***	***0.3884***	***0.0777***	***0.0001***	***0.3968***

Notes:

[1] Assumes days of use would be approximately 750 days through the duration of construction.

[2] Emission factors derived from national averages from USEPA MOVES 2014b Model for equipment expected to be used during construction.

[3] Emissions in units of metric ton = (Total Miles/Year x Emission Factor (lb/mile) / 2,000 (lb/ton) * 0.907185

[4] CO_2e was calculated by summing the emissions for CO_2, N_2O, and CH_4. N_2O and CH_4 were both multiplied by their relative global warming potential factor first. N_2O has a global warming potential factor equivalent to 273 times that of CO_2, and CH_4 has a global warming potential equivalent to 29.8 times CO_2.

Highest Individual HAP: ***1.0496*** **Formaldehyde**

CO: carbon monoxide, NO_x: nitrogen oxides, SO_2: sulfur dioxide, PM_{10}: particulate matter with an aerodynamic diameter of 10 microns or less, $PM_{2.5}$: particulate matter with an aerodynamic diameter of 2.5 microns or less, VOC: volatile organic compound, HAP: hazardous air pollutant, CH_4: methane, N_2O: dinitrogen oxide, CO_2: carbon dioxide, mtons: metric tons, CO_2e: carbon dioxide equivalent

Grain Belt Express RAR - Air Resources - Emission Calculations
Table A-2: Construction Equipment Emissions (Off-Road)

Individual HAP's, tons													
Chromium 6+	**Ethyl Benzene**	**Formaldehyde**	**Hexane**	**Manganese Compounds**	**Mercury Compounds**	**Naphthalene gas**	**Naphthalene particle**	**Nickel Compounds**	**Propionaldehyde**	**Styrene**	**Toluene**	**Xylene**	**Polycyclic Organic Matter**
0.0000	0.0001	0.0057	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0004	0.0000	0.0008	0.0005	0.0001
0.0000	0.0098	0.0075	0.0065	0.0000	0.0000	0.0009	0.0000	0.0000	0.0002	0.0030	0.0560	0.0399	0.0000
0.0000	0.0004	0.0227	0.0000	0.0000	0.0000	0.0004	0.0000	0.0000	0.0019	0.0000	0.0030	0.0015	0.0004
0.0000	0.0003	0.0144	0.0001	0.0000	0.0000	0.0002	0.0000	0.0000	0.0015	0.0000	0.0015	0.0009	0.0002
0.0000	0.0002	0.0100	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0008	0.0000	0.0014	0.0008	0.0002
0.0000	0.0006	0.0288	0.0002	0.0000	0.0000	0.0004	0.0000	0.0000	0.0031	0.0000	0.0030	0.0019	0.0005
0.0000	0.0098	0.0075	0.0065	0.0000	0.0000	0.0009	0.0000	0.0000	0.0002	0.0030	0.0560	0.0399	0.0000
0.0000	0.0012	0.0681	0.0000	0.0000	0.0000	0.0011	0.0000	0.0000	0.0051	0.0000	0.0090	0.0037	0.0011
0.0000	0.0098	0.0075	0.0065	0.0000	0.0000	0.0009	0.0000	0.0000	0.0002	0.0030	0.0560	0.0399	0.0000
0.0000	0.0030	0.1238	0.0008	0.0000	0.0000	0.0018	0.0000	0.0000	0.0123	0.0000	0.0126	0.0084	0.0021
0.0000	0.0004	0.0186	0.0000	0.0000	0.0000	0.0003	0.0000	0.0000	0.0016	0.0000	0.0023	0.0012	0.0003
0.0000	0.0006	0.0288	0.0002	0.0000	0.0000	0.0004	0.0000	0.0000	0.0031	0.0000	0.0030	0.0019	0.0005
0.0000	0.0098	0.0075	0.0065	0.0000	0.0000	0.0009	0.0000	0.0000	0.0002	0.0030	0.0560	0.0399	0.0000
0.0000	0.0006	0.0288	0.0002	0.0000	0.0000	0.0004	0.0000	0.0000	0.0031	0.0000	0.0030	0.0019	0.0005
0.0000	0.0014	0.0630	0.0003	0.0000	0.0000	0.0010	0.0000	0.0000	0.0057	0.0000	0.0071	0.0043	0.0011
0.0000	0.0004	0.0227	0.0000	0.0000	0.0000	0.0004	0.0000	0.0000	0.0019	0.0000	0.0030	0.0015	0.0004
0.0000	0.0028	0.1261	0.0005	0.0000	0.0000	0.0019	0.0000	0.0000	0.0114	0.0000	0.0142	0.0086	0.0022
0.0000	0.0005	0.0199	0.0001	0.0000	0.0000	0.0003	0.0000	0.0000	0.0019	0.0000	0.0020	0.0014	0.0003
0.0000	0.0245	0.0187	0.0162	0.0000	0.0000	0.0022	0.0000	0.0000	0.0004	0.0076	0.1399	0.0997	0.0000
0.0000	0.0031	0.0023	0.0020	0.0000	0.0000	0.0003	0.0000	0.0000	0.0001	0.0009	0.0174	0.0124	0.0000
0.0000	0.0002	0.0114	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0010	0.0000	0.0015	0.0008	0.0002
0.0000	0.0002	0.0114	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0010	0.0000	0.0015	0.0008	0.0002
0.0000	0.0003	0.0144	0.0001	0.0000	0.0000	0.0002	0.0000	0.0000	0.0015	0.0000	0.0015	0.0009	0.0002
0.0000	0.0007	0.0315	0.0001	0.0000	0.0000	0.0005	0.0000	0.0000	0.0028	0.0000	0.0035	0.0021	0.0006
0.0000	0.0031	0.0023	0.0020	0.0000	0.0000	0.0003	0.0000	0.0000	0.0001	0.0009	0.0174	0.0124	0.0000
0.0000	0.0007	0.0315	0.0001	0.0000	0.0000	0.0005	0.0000	0.0000	0.0028	0.0000	0.0035	0.0021	0.0006
0.0000	0.0031	0.0023	0.0020	0.0000	0.0000	0.0003	0.0000	0.0000	0.0001	0.0009	0.0174	0.0124	0.0000
0.0000	0.0012	0.0681	0.0000	0.0000	0.0000	0.0011	0.0000	0.0000	0.0051	0.0000	0.0090	0.0037	0.0011
0.0000	0.0004	0.0227	0.0000	0.0000	0.0000	0.0004	0.0000	0.0000	0.0019	0.0000	0.0030	0.0015	0.0004
0.0000	0.0004	0.0186	0.0000	0.0000	0.0000	0.0003	0.0000	0.0000	0.0016	0.0000	0.0023	0.0012	0.0003
0.0000	0.0002	0.0100	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0008	0.0000	0.0014	0.0008	0.0002
0.0000	0.0245	0.0187	0.0162	0.0000	0.0000	0.0022	0.0000	0.0000	0.0004	0.0076	0.1399	0.0997	0.0000
0.0000	0.0031	0.0023	0.0020	0.0000	0.0000	0.0003	0.0000	0.0000	0.0001	0.0009	0.0174	0.0124	0.0000
0.0000	0.0003	0.0144	0.0001	0.0000	0.0000	0.0002	0.0000	0.0000	0.0015	0.0000	0.0015	0.0009	0.0002
0.0000	0.0007	0.0315	0.0001	0.0000	0.0000	0.0005	0.0000	0.0000	0.0028	0.0000	0.0035	0.0021	0.0006
0.0000	0.0014	0.0630	0.0003	0.0000	0.0000	0.0010	0.0000	0.0000	0.0057	0.0000	0.0071	0.0043	0.0011
0.0000	0.0003	0.0144	0.0001	0.0000	0.0000	0.0002	0.0000	0.0000	0.0015	0.0000	0.0015	0.0009	0.0002
0.0000	0.0010	0.0399	0.0003	0.0000	0.0000	0.0006	0.0000	0.0000	0.0039	0.0000	0.0040	0.0028	0.0007
0.0000	0.0002	0.0114	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0010	0.0000	0.0015	0.0008	0.0002
0.0000	0.0004	0.0165	0.0001	0.0000	0.0000	0.0002	0.0000	0.0000	0.0016	0.0000	0.0017	0.0011	0.0003
0.0000	0.0003	0.0144	0.0001	0.0000	0.0000	0.0002	0.0000	0.0000	0.0015	0.0000	0.0015	0.0009	0.0002
0.0000	***0.1182***	***1.0496***	***0.0680***	***0.0001***	***0.0000***	***0.0237***	***0.0000***	***0.0001***	***0.0910***	***0.0302***	***0.6677***	***0.4601***	***0.0165***

Grain Belt Express RAR - Air Resources - Emission Calculations
Table A-3: Construction Equipment Emissions (On-Road)

Duration of Construction Activities	3	years

Project On-Road Emissions

Equipment Type	Fuel	Source Category	Total Mileage/ Round Trip [1]	Number of Vehicles [2]	Number of Round Trips/ Vehicle per Year [3]	Total Miles/ Year	Emission Factors (lb/mile)[4]									
							PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	NO_X	HAPs	CO_2	N_2O	CH_4
General Construction Commuter Passenger Truck	Gasoline	Passenger Truck	60	225	250	3,375,000	1.09E-05	9.63E-06	1.75E-05	9.11E-03	5.76E-06	4.62E-04	5.08E-06	0.87	3.48E-06	1.07E-05
Ford County, KS Substation Commuter Passenger Truck	Gasoline	Passenger Truck	60	48	250	712,500	1.09E-05	9.63E-06	1.75E-05	9.11E-03	5.76E-06	4.62E-04	5.08E-06	0.87	3.48E-06	1.07E-05
Callaway County, MS Substation Commuter Passenger Truck	Gasoline	Passenger Truck	60	48	250	712,500	1.09E-05	9.63E-06	1.75E-05	9.11E-03	5.76E-06	4.62E-04	5.08E-06	0.87	3.48E-06	1.07E-05
Heavy Duty Construction	Diesel	Combination Long-Haul Truck	60	66	250	990,000	3.05E-04	2.81E-04	3.74E-04	2.25E-03	3.42E-05	7.83E-03	8.32E-06	4.04	4.01E-06	8.08E-05

	Emissions (tpy)										
	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	NO_X	HAPs	CO_2	N_2O	CH_4	CO_2e[5,6]
	1.84E-02	1.63E-02	2.95E-02	1.54E+01	9.72E-03	7.80E-01	8.57E-03	1.47E+03	5.87E-03	1.81E-02	1.33E+03
	3.88E-03	3.43E-03	6.23E-03	3.25E+00	2.05E-03	1.65E-01	1.81E-03	3.10E+02	1.24E-03	3.81E-03	2.82E+02
	3.88E-03	3.43E-03	6.23E-03	3.25E+00	2.05E-03	1.65E-01	1.81E-03	3.10E+02	1.24E-03	3.81E-03	2.82E+02
	1.51E-01	1.39E-01	1.85E-01	1.11E+00	1.69E-02	3.88E+00	4.12E-03	2.00E+03	1.98E-03	4.00E-02	1.82E+03
Annual Total:	**0.18**	**0.16**	**0.23**	**22.98**	**0.03**	**4.98**	**0.02**	**4,087.80**	**0.01**	**0.07**	**3,712.73**
Total Excluding Substations:	**0.17**	**0.16**	**0.21**	**16.49**	**0.03**	**4.66**	**0.01**	**3,467.93**	**0.01**	**0.06**	**3,149.56**
Total Project (total tons):	**0.53**	**0.49**	**0.68**	**68.93**	**0.09**	**14.95**	**0.05**	**12,263.40**	**0.03**	**0.20**	**11,138.18**
Total Project Excluding Substations (total tons):	**0.51**	**0.47**	**0.64**	**49.46**	**0.08**	**13.97**	**0.04**	**10,403.78**	**0.02**	**0.17**	**9,448.69**

Notes:

[1] This assumes that each vehicle makes one round trip to the site once each day. It is assumed workers will originate from the vicinity of the construction sites, no further than 30 miles.

[2] Number of vehicles based on planned workforce size. Assumes an average of 450 workers (3 segments x 150 workers per segment) would be commuting to the transmission line work areas at any given time for 3 years, with the assumption that there would be 2 people per car.

[3] Based on anticipated construction schedule of 5 days a week, 50 weeks a year.

[4] Emissions were calculated based on emission factors derived from national averages from USEPA MOVES 2014b Model.

[5] Emissions in units of metric ton = (Total Miles/Year x Emission Factor (lb/mile) / 2,000 (lb/ton) * 0.907185

[6] CO_2e was calculated by summing the emissions for CO_2, N_2O, and CH_4. N_2O and CH_4 were both multiplied by their relative global warming potential factor first. N_2O has a global warming potential factor equivalent to 273 times that of CO_2, while CH_4 has a global warming potential equivalent to 29.8 times CO_2.

CO: carbon monoxide, NO_x: nitrogen oxides, SO_2: sulfur dioxide, PM_{10}: particulate matter with an aerodynamic diameter of 10 microns or less, $PM_{2.5}$: particulate matter with an aerodynamic diameter of 2.5 microns or less, VOC: volatile organic compound, HAP: hazardous air pollutant, CH4: methane, N_2O: dinitrogen oxide, CO_2: carbon dioxide, mtons: metric tons, CO_2e: carbon dioxide equivalent, tpy: tons per year, lb: pounds

Tables A-4: Helicopter Emission Calculations

Helicopter	Maximum SHP Engine	Number of Engines	Landing/Takeoff Cycle (LTO) Emissions (g)										
			Fuel Usage (kg)	Fuel Usage (gal)	NOx	VOCs [2]	CO	PM / PM10 / PM2.5	SO2 [3]	HAPs [4]	CO2 [5]	CH4 [6]	N2O [6]
Boeing CH-47	4800	2	153.80	50.63	2,380.20	319.60	385.10	51.80	0.03	34.37	493,768.54	20.76	4.05
Sikorsky UH-60	1622	2	73.00	24.03	575.30	571.00	724.90	16.90	1.46E-02	61.40	234,363.48	9.85	1.92
Bell 407	650	1	23.60	7.77	130.50	286.50	365.50	4.20	4.72E-03	30.81	75,766.82	3.19	0.62
Hughes 500	317	1	16.40	5.40	59.50	438.20	571.20	2.30	3.28E-03	47.12	52,651.52	2.21	0.43

Landing/Takeoff Cycle (LTO) Emissions								
NOx	VOCs [2]	CO	PM / PM10 / PM2.5	SO2 [3]	HAPs [4]	CO2 [5]	CH4 [6]	N2O [6]
5.25	0.70	0.85	0.11	6.78E-05	0.08	1,088.57	0.05	8.93E-03
1.27	1.26	1.60	0.04	3.22E-05	0.14	516.68	0.02	4.24E-03
0.29	0.63	0.81	0.01	1.04E-05	0.07	167.04	7.02E-03	1.37E-03
0.13	0.97	1.26	0.01	7.23E-06	0.10	116.08	4.88E-03	9.52E-04

One Hour Emissions									
Fuel Usage (kg)	NOx	VOCs [2]	CO	PM / PM10 / PM2.5	SO2 [3]	HAPs [4]	CO2 [5]	CH4 [6]	N2O [6]
1,223.60	24.23	0.83	0.98	0.47	0.24	0.09	3,928.32	0.17	3.22E-02
507.60	5.43	1.11	1.32	0.02	0.10	0.12	1,629.63	0.07	1.34E-02
149.40	1.11	0.66	0.82	0.03	0.03	0.07	479.64	0.02	3.93E-03
98.80	0.48	0.96	1.20	0.02	0.02	0.10	317.19	1.33E-02	2.60E-03

One Hour Emissions										
Fuel Usage (lb)	Fuel Usage (gal)	NOx	VOCs [2]	CO	PM / PM10 / PM2.5	SO2 [3]	HAPs [4]	CO2 [5]	CH4 [6]	N2O [6]
2,697.58	402.81	53.42	1.83	2.16	1.04	0.54	0.20	8,660.46	0.36	7.10E-02
1,119.07	167.10	11.97	2.45	2.91	0.03	0.22	0.26	3,592.72	0.15	2.95E-02
329.37	49.18	2.45	1.46	1.81	0.07	0.07	0.16	1,057.43	0.04	8.67E-03
217.82	32.53	1.06	2.12	2.65	0.04	0.04	0.23	699.29	0.03	5.74E-03

Notes:

[1] Helicopter specifications, fuel usage, and emission factors for NO_x, VOCs, CO, and PM are from Swiss Confederation, Guidance on the Determination of Helicopter Emissions, Edition 2 (Reference: COO.2207.111.2.2015750), December 2015.

2 Assumes that total hydrocarbons are equal to VOCs.

3 SO2 emission factor from USEPA's Air Pollutant Emission Factors for Military and Civil Aircraft. Assumes 0.01 wt% sulfur content in fuel. SO_x emission factor calculated according to footnote C of Table 5-2, where SO_x emission rate = fuel rate * (2x10^-4). Available at: https://nepis.epa.gov/Exe/ZyPDF.cgi/91010NB6.PDF?Dockey=91010NB6.PDF.

4 Calculation of total HAPs fraction of VOC emissions is provided in HAP Emission Factor Calculation table below. Fraction of VOCs is multiplied by VOCs emission factor to produce HAP emission factor.

5 Based on the assumption that 21.5 lbs of CO_2 is emitted per gallon of aviation fuel burned. Value obtained from EIA's Carbon Dioxide Emissions Coefficients. Available at https://www.eia.gov/environment/emissions/co2_vol_mass.php.

6 Based on the assumption that 0.41 g of CH_4 and 0.08 g of N_2O is emitted per gallon of aviation fuel burned. Value obtained from EPA's Emission Factors for Greenhouse Gas Inventories. Available at https://www.epa.gov/sites/default/files/2015-07/documents/emission-factors_2014.pdf

SHP: shaft horsepower, CO: carbon monoxide, NO_x: nitrogen oxides, SO_2: sulfur dioxide, PM: particulate matter, PM_{10}: particulate matter with an aerodynamic diameter of 10 microns or less, $PM_{2.5}$: particulate matter with an aerodynamic diameter of 2.5 microns or less, VOC: volatile organic compound, HAP: hazardous air pollutant, CH_4: methane, N_2O: dinitrogen oxide, CO_2: carbon dioxide, kg: kilograms, gal: gallons, g: grams, lb: pounds, LTO: landing and take off cycle

Helicopter Emission Calculations

Phase	Helicopter Model Assumption	Project LTO Emissions (lbs)								
		NOx	VOCs	CO	PM / PM10 / PM2.5	SO2	HAPs	CO2	CH4	N2O
Tower Erection	Boeing CH-47	2,518.77	338.21	407.52	54.82	0.03	36.37	522,515.2	21.97	4.29
	Sikorsky UH-60	608.79	604.24	767.10	17.88	0.02	64.98	248,007.9	10.43	2.03
Tower Stringing	Hughes 500	20.99	154.57	201.48	0.81	0.00	16.62	18,572.3	0.78	0.15
Marker Ball Placement, hanging glass, skid transfer	Bell 407	43.16	94.74	120.87	1.39	0.00	10.19	25,055.6	1.05	0.21
Aerial Inspection	Bell 407	34.52	75.79	96.69	1.11	0.00	8.15	20,044.5	0.84	0.16
Total		**3,226.23**	**1,267.56**	**1,593.67**	**76.01**	**0.05**	**136.31**	**834,195.4**	**35.07**	**6.84**
Phase	**Helicopter Model Assumption**	**Project Hours of Use Emissions (lbs)**								
		NOx	**VOCs**	**CO**	**PM / PM10 / PM2.5**	**SO2**	**HAPs**	**CO2**	**CH4**	**N2O**
Tower Erection	Boeing CH-47	94,015.69	3,220.51	3,802.53	1,827.54	949.55	346.33	15,242,404.2	640.82	125.04
	Sikorsky UH-60	21,069.14	4,306.95	5,121.78	58.20	393.91	463.16	6,323,181.1	265.84	51.87
Tower Stringing	Hughes 500	451.51	903.01	1,128.77	15.05	18.59	97.11	298,364.4	12.54	2.45
Marker Ball Placement, hanging glass, skid transfer	Bell 407	978.85	582.02	723.12	28.22	26.35	62.59	422,972.3	17.78	3.47
Aerial Inspection	Bell 407	1,076.74	640.22	795.43	31.04	28.98	68.85	465,269.5	19.56	3.82
Total		**117,591.93**	**9,652.72**	**11,571.62**	**1,960.06**	**1,417.38**	**1,038.04**	**22,752,191.5**	**956.54**	**186.64**
Phase	**Helicopter Model Assumption**	**Project LTO Emissions (tons)**								
		NOx	**VOCs**	**CO**	**PM / PM10 / PM2.5**	**SO2**	**HAPs**	**CO2**	**CH4**	**N2O**
Tower Erection	Boeing CH-47	1.26	0.17	0.20	0.03	1.63E-05	0.02	261.26	1.10E-02	2.14E-03
	Sikorsky UH-60	0.30	0.30	0.38	8.94E-03	7.72E-06	0.03	124.00	5.21E-03	1.02E-03
Tower Stringing	Hughes 500	1.05E-02	0.08	0.10	4.06E-04	5.78E-07	8.31E-03	9.29	3.90E-04	7.62E-05
Marker Ball Placement, hanging glass, skid transfer	Bell 407	0.02	0.05	0.06	6.94E-04	7.80E-07	5.09E-03	12.53	5.27E-04	1.03E-04
Aerial Inspection	Bell 407	0.02	0.04	0.05	5.56E-04	6.24E-07	4.08E-03	10.02	4.21E-04	8.22E-05
Total		**1.61**	**0.63**	**0.80**	**0.04**	**2.60E-05**	**0.07**	**417.10**	**0.02**	**3.42E-03**
Phase	**Helicopter Model Assumption**	**Project Hours of Use Emissions (tons)**								
		NOx	**VOCs**	**CO**	**PM / PM10 / PM2.5**	**SO2**	**HAPs**	**CO2**	**CH4**	**N2O**
Tower Erection	Boeing CH-47	47.01	1.61	1.90	0.91	0.47	0.17	7,621.20	0.32	0.06
	Sikorsky UH-60	10.53	2.15	2.56	0.03	0.20	0.23	3,161.59	0.13	0.03
Tower Stringing	Hughes 500	0.23	0.45	0.56	7.53E-03	9.29E-03	0.05	149.18	6.27E-03	1.22E-03
Marker Ball Placement, hanging glass, skid transfer	Bell 407	0.49	0.29	0.36	1.41E-02	1.32E-02	0.03	211.49	8.89E-03	1.73E-03
Aerial Inspection	Bell 407	0.54	0.32	0.40	0.02	1.45E-02	0.03	232.63	9.78E-03	1.91E-03
Total		**58.80**	**4.83**	**5.79**	**0.98**	**0.71**	**0.52**	**11,376.10**	**0.48**	**0.09**

CO: carbon monoxide, NOx: nitrogen oxides, SO2: sulfur dioxide, PM: particulate matter, PM10: particulate matter with an aerodynamic diameter of 10 microns or less, PM2.5: particulate matter with an aerodynamic diameter of 2.5 microns or less, VOC: volatile organic compound, HAP: hazardous air pollutant, CH4: methane, N2O: dinitrogen oxide, LTO: landing and take off cycles, lb: pound

Project Emission Summary

Phase	Helicopter Model Assumption	Total Emissions (lbs)								
		NOx	VOCs	CO	PM / PM10 / PM2.5	SO2	HAPs	CO2	CH4	N2O
Tower Erection	Boeing CH-47	96,534.46	3,558.72	4,210.05	1,882.36	949.58	382.70	15,764,919.4	662.78	129.32
	Sikorsky UH-60	21,677.93	4,911.19	5,888.88	76.09	393.93	528.14	6,571,188.9	276.26	53.91
Tower Stringing	Hughes 500	472.49	1,057.58	1,330.25	15.86	18.59	113.73	316,936.7	13.32	2.60
Marker Ball Placement, hanging glass, skid transfer	Bell 407	1,022.01	676.76	843.98	29.61	26.35	72.78	448,027.9	18.84	3.68
Aerial Inspection	Bell 407	1,111.26	716.02	892.12	32.15	28.99	77.00	485,314.0	20.40	3.98
Total		**120,818.16**	**10,920.28**	**13,165.29**	**2,036.07**	**1,417.43**	**1,174.35**	**23,586,386.8**	**991.61**	**193.48**
Phase	**Helicopter Model Assumption**	**Total Emissions (tons)**								
		NOx	**VOCs**	**CO**	**PM / PM10 / PM2.5**	**SO2**	**HAPs**	**CO2** [1]	**CH4**	**N2O**
Tower Erection	Boeing CH-47	48.27	1.78	2.11	0.94	0.47	0.19	7,150.85	0.33	0.06
	Sikorsky UH-60	10.84	2.46	2.94	0.04	0.20	0.26	2,980.64	0.14	0.03
Tower Stringing	Hughes 500	0.24	0.53	0.67	7.93E-03	9.29E-03	0.06	143.76	6.66E-03	1.30E-03
Marker Ball Placement, hanging glass, skid transfer	Bell 407	0.51	0.34	0.42	1.48E-02	1.32E-02	0.04	203.22	9.42E-03	1.84E-03
Aerial Inspection	Bell 407	0.56	0.36	0.45	0.02	1.45E-02	0.04	220.13	1.02E-02	1.99E-03
Total		**60.41**	**5.46**	**6.58**	**1.02**	**0.71**	**0.59**	**10,698.61**	**0.50**	**0.10**

[1] CO_2 emissions are in units of metric tons per year.

CO: carbon monoxide, NOx: nitrogen oxides, SO2: sulfur dioxide, PM: particulate matter, PM10: particulate matter with an aerodynamic diameter of 10 microns or less, PM2.5: particulate matter with an aerodynamic diameter of 2.5 microns or less, VOC: volatile organic compound, HAP: hazardous air pollutant, CH4: methane, N2O: dinitrogen oxide, lbs: pounds

Worst-Case Annual Emission Summary - Construction [1]

Phase	Helicopter Model Assumption	Total Emissions (lbs)								
		NOx	VOCs	CO	PM / PM10 / PM2.5	SO2	HAPs	CO2	CH4	N2O
Tower Erection	Boeing CH-47	48,267.23	1,779.36	2,105.03	941.18	474.79	191.35	7,882,459.7	331.39	64.66
	Sikorsky UH-60	10,838.97	2,455.60	2,944.44	38.04	196.96	264.07	3,285,594.5	138.13	26.95
Tower Stringing	Hughes 500	236.25	528.79	665.13	7.93	9.29	56.87	158,468.3	6.66	1.30
Marker Ball Placement, hanging glass, skid transfer	Bell 407	1,022.01	676.76	843.98	29.61	26.35	72.78	448,027.9	18.84	3.68
Aerial Inspection	Bell 407	1,111.26	716.02	892.12	32.15	28.99	77.00	485,314.0	20.40	3.98
Total		**61,475.71**	**6,156.53**	**7,450.70**	**1,048.91**	**736.38**	**662.06**	**12,259,864.4**	**515.42**	**100.57**
Phase	**Helicopter Model Assumption**	**Total Emissions (tons)**								
		NOx	**VOCs**	**CO**	**PM / PM10 / PM2.5**	**SO2**	**HAPs**	**CO2** [2]	**CH4**	**N2O**
Tower Erection	Boeing CH-47	24.13	0.89	1.05	0.47	0.24	0.10	3,575.42	0.17	0.03
	Sikorsky UH-60	5.42	1.23	1.47	0.02	0.10	0.13	1,490.32	0.07	1.35E-02
Tower Stringing	Hughes 500	0.12	0.26	0.33	3.97E-03	4.65E-03	0.03	71.88	3.33E-03	6.50E-04
Marker Ball Placement, hanging glass, skid transfer	Bell 407	0.51	0.34	0.42	1.48E-02	1.32E-02	0.04	203.22	9.42E-03	1.84E-03
Aerial Inspection	Bell 407	0.56	0.36	0.45	0.02	1.45E-02	0.04	220.13	1.02E-02	1.99E-03
Total		**30.74**	**3.08**	**3.73**	**0.52**	**0.37**	**0.33**	**5,560.98**	**0.26**	**0.05**

Notes

[1] Worst-Case Annual Emission Summary for construction assumes one year of tower erection, one year of tower stringing, and all marker ball placement, hanging glass, skid transformers phases could overlap in same year. This also assumes that three months of aerial inspections may occur as a part of construction activities.

[2] CO_2 emissions are in units of metric tons per year

CO: carbon monoxide, NOx: nitrogen oxides, SO2: sulfur dioxide, PM: particulate matter, PM10: particulate matter with an aerodynamic diameter of 10 microns or less, PM2.5: particulate matter with an aerodynamic diameter of 2.5 microns or less, VOC: volatile organic compound, HAP: hazardous air pollutant, CH4: methane, N2O: dinitrogen oxide, lbs: pounds

Worst-Case Annual Emission Summary - Operation [1]

Phase	Helicopter Model Assumption	Total Emissions (lbs)								
		NOx	VOCs	CO	PM / PM10 / PM2.5	SO2	HAPs	CO2	CH4	N2O
Aerial Inspection	Bell 407	1,111.26	716.02	892.12	32.15	28.99	77.00	485,314.0	20.40	3.98
Total		**1,111.26**	**716.02**	**892.12**	**32.15**	**28.99**	**77.00**	**485,314.0**	**20.40**	**3.98**
Phase	**Helicopter Model Assumption**	**Total Emissions (tons)**								
		NOx	**VOCs**	**CO**	**PM / PM10 / PM2.5**	**SO2**	**HAPs**	**CO2 [2]**	**CH4**	**N2O**
Aerial Inspection	Bell 407	0.56	0.36	0.45	0.02	1.45E-02	0.04	220.13	1.02E-02	1.99E-03
Total		**0.56**	**0.36**	**0.45**	**0.02**	**1.45E-02**	**0.04**	**220.13**	**1.02E-02**	**1.99E-03**

Notes:

[1] It is assumed that aerial inspections will occur three months each year for the life of the project's operation.

[2] CO_2 emissions are in units of metric tons per year

CO: carbon monoxide, NOx: nitrogen oxides, SO2: sulfur dioxide, PM: particulate matter, PM10: particulate matter with an aerodynamic diameter of 10 microns or less, PM2.5: particulate matter with an aerodynamic diameter of 2.5 microns or less, VOC: volatile organic compound, HAP: hazardous air pollutant, CH4: methane, N2O: dinitrogen oxide, lbs: pounds

HAP Emission Factor Calculation

Pollutant	Fraction of VOCs [1]
1,3 Butadiene	0.0098
Acetaldehyde	0.0062
Acrolein	0.0006
Benzene	0.0405
Ethylbenzene	0.0015
Formaldehyde	0.0269
POM as 7-PAH	9.06E-06
POM as 16-PAH	2.95E-05
Propionaldehyde	0.009
Styrene	0.0037
Toluene	0.0049
Xylene	0.0044
Total	**0.1075**

Notes:

[1] HAP emissions as a fraction of VOCs are based on the general aviation factors in Table 6 - Aircraft-Related HAPs Emission Factors (Fraction of Total Organic Gases or Volatile Organic Compounds), located in "Select Resource Materials and Annotated Bibliography on the Topic of Hazardous Air Pollutants (HAPs) Associated with Aircraft, Airports and Aviation." Prepared by URS Corporation, for Federal Aviation Administration, Office of Environment and Energy. July 1, 2003. Available at https://www.faa.gov/sites/faa.gov/files/about/office_org/headquarters_offices/apl/HAPs_rpt.pdf

VOC: volatile organic compound, HAP: hazardous air pollutant, POM: polycyclic organic matter, PAH: polycyclic aromatic hydrocarbons

Operational Assumptions [1]

Phase	Helicopter Model Assumption	Maximum Phase Duration (months)	Number of Days Operational	Operational Hours per Day	Project Operational Hours	LTO Cycles per Day [2]	Project LTO Hours [2]	Non LTO Project Operational Hours [2]
Tower Erection	Boeing CH-47	24	240	8	1920	2	160	1760
	Sikorsky UH-60		240	8	1920	2	160	1760
Tower Stringing	Hughes 500	24	160	3	480	1	53.3	426.7
Marker Ball Placement, H	Bell 407	4	75	6	450	2	50	400
Aerial Inspection	Bell 407	3	120	4	480	1	40	440

[1] Based on email communication from Aaron White at Invenergy. RE: GBX - AQ and GHG RAR Final Revisions. Received 6/13/2023

[2] It is assumed each LTO each takes approximately 20 minutes (10 minutes during take-off and 10 minutes during landing). Non-LTO Project operational hours are the total Project Operational Hours, minus the hours spent in LTO. One LTO is assumed for phases in which operational hours per day are equal to or less than four hours and two LTO are assumed for phases in which operational hours per day exceeds 4 hours.

LTO: landing and take off cycle

Grain Belt Express RAR - Air Resources - Emission Calculations

Table A-5: Construction Fugitive Dust Emissions

Fugitive Dust From Construction Operations: General Construction and Cut/Fill Assumptions and Emission Factors		
Parameter	**Value**	**Source / Notes**
Total Acres Affected During Construction	1,101	*Disturbance Estimate Tables*
Total Months of Construction	36	*Based on 3 years*
General Construction PM_{10} Emission Factor, ton/acre-month	0.011	*WRAP Fugitive Dust Handbook, Table 3-2, "Level 1"*
Project Duration in Days	1096	*= months * 30.44 days per month on average*
Assumed Control Efficiency, %	61%	*WRAP Fugitive Dust Handbook, Table 3-7, for applying water at various intervals (3.2hr watering interval).*

Source: Based on WRAP Fugitive Dust Handbook, Table 3-2, "Recommended PM_{10} Emission Factors for Construction Operations," Level 1. http://www.wrapair.org/forums/dejf/fdh/content/final-handbook.pdf

Fugitive Dust Emissions From Construction Operations, in Tons - Full Project										
Source	**CO**	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**VOC**	**HAPs**	**CH_4**	**CO_2**	**CO_2e**
General Construction	-	-	-	170.07	17.01	-	-	-	-	-
Total Fugitive Dust Emissions, tons	-	-	-	**170.07**	**17.01**	-	-	-	-	-

Fugitive Dust Emissions From Construction Operations, in Tons - Average Annual										
Source	**CO**	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**VOC**	**HAPs**	**CH_4**	**CO_2**	**CO_2e**
General Construction	-	-	-	56.69	5.67	-	-	-	-	-
Total Fugitive Dust Emissions, tons	-	-	-	**56.69**	**5.67**	-	-	-	-	-

Notes:

$PM_{2.5}/PM_{10}$ ratio of 0.10 used from the WRAP Fugitive Dust Handbook, Section 3.3.1. On-site cut-fill emissions do not assume controls.

Example Calculation, General Construction: [Emission Factor, ton/acre-month] * [# of acres affected] * [# of months of construction/project] * [1 - Control Efficiency] = Tons of pollutant for duration of project.

Example Calculation, On-Site Cut/Fill: [Emission Factor, ton/1,000 cu yds] * [total cu yds of material/1,000] = Tons of pollutant for duration of project

CO: carbon monoxide, NO_x: nitrogen oxides, SO_2: sulfur dioxide, PM_{10}: particulate matter with an aerodynamic diameter of 10 microns or less, $PM_{2.5}$: particulate matter with an aerodynamic diameter of 2.5 microns or less, VOC: volatile organic compound, HAP: hazardous air pollutant, CH_4: methane, lbs: pounds, CO_2: carbon dioxide, CO_2e: carbon dioxide equivalent

Table A-6: Concrete Batch Plants

Maximum Number of Concrete Batch Plants	12
Duration of Concrete Batch Plant Operation (years)	2

Operating Year	hours/day	days/week	weeks/year	hours/year
Year 1	12	5	52	3,120
Year 2	12	5	52	3,120

Concrete Production Rate	yd^3/ hour	yd^3/ year
Year 1	4.67	14,583
Year 2	4.67	14,583

yd^3: cubic yards

Inputs into TCEQ Concrete Batch Plant Emission Calculation Workbook	
Type of Batch Plant	Truck
Enter the number of Aggregate Transfer Points	3
Enter the number of Sand Transfer Points	3
Stockpile Area (acres)	5
Number of Active Days per Year 1	365
Number of Active Days per Year 2	365
How many cement silos?	1
How many supplement silos?	1
Is there a cement/supplement weigh hopper?	yes
Is it equipped with its own dust collector?	yes
What is the central baghouse efficiency? (%)	98
Is it equipped with its own dust collector?	yes

Generator	Engine Rating [1] (hp)	Emission Factor (lb/hp-hr)							Emissions (ton/yr)						
		CO	NOx	SOx	PM10	VOC	HAPs	CO2	CO	NOx	SOx	PM10	VOC	HAPs	CO2
30kVA Diesel Generator	38.5	6.68E-03	0.031	2.05E-03	2.20E-03	0.002514	4.57E-05	1.15E+00	0.401201	1.86186	0.123123	0.132132	0.150997	0.002743	69.069

Notes:

hp: horsepower, CO: carbon monoxide, NO_x: nitrogen oxides, SO_2: sulfur dioxide, PM_{10}: particulate matter with an aerodynamic diameter of 10 microns or less, $PM_{2.5}$: particulate matter with an aerodynamic diameter of 2.5 microns or less, VOC: volatile organic compound, HAP: hazardous air pollutant, CH_4: methane, lbs: pounds, CO_2: carbon dioxide, CO_2e: carbon dioxide equivalent, lb/hp-hr: pounds per horsepower-hour, yr: year

Engine Assumptions

Parameter	Value
Fuel Consumption (gal/hr) [1]	1.968082
HHV Diesel (MMBtu/gal) [2]	0.138412

Notes:

[1] Fuel consumption obtained from Cummins X2.7 Series Diesel Generator Set Specification Sheet. 30 kilovolt-amp generator is similar to what is expected to be used for concrete batch plants.

gal/hr: gallons per hour, MMBtu/gal: metric million British thermal units per gallon, HHV: higher heating value

Grain Belt Express RAR - Air Resources - Emission Calculations
Table A-6: Concrete Batch Plants

Pollutant	Emission Factor [1] (lb/MMBtu)	Emission Factor (lb/hr)
Benzene	9.33E-04	2.54E-04
Toluene	4.09E-04	1.11E-04
Xylenes	2.85E-04	7.76E-05
Propylene	2.58E-03	7.03E-04
1,3-Butadiene	3.91E-05	1.07E-05
Formaldehyde	1.18E-03	3.21E-04
Acetaldehyde	7.67E-04	2.09E-04
Acrolein	9.25E-05	2.52E-05
Naphthalene	8.48E-05	2.31E-05
Acenaphthylene	5.06E-06	1.38E-06
Acenaphthene	1.42E-06	3.87E-07
Fluorene	2.92E-05	7.95E-06
Phenanthrene	2.94E-05	8.01E-06
Anthracene	1.87E-06	5.09E-07
Fluoranthene	7.61E-06	2.07E-06
Pyrene	4.78E-06	1.30E-06
Benzo(a)anthracene	1.68E-06	4.58E-07
Chrysene	3.53E-07	9.62E-08
Benzo(b)fluoranthene	9.91E-08	2.70E-08
Benzo(k)fluoranthene	1.55E-07	4.22E-08
Benzo(a)pyrene	1.88E-07	5.12E-08
Indeno(1,2,3-cd)pyrene	3.75E-07	1.02E-07
Dibenz(a,h)anthracene	5.83E-07	1.59E-07
Benzo(g,h,l)perylene	4.89E-07	1.33E-07
Total	6.45E-03	1.76E-03

Notes

[1] Emission factors obtained from Table 3.3-2 of USEPA's AP-42 Chapter 3.3 - Gasoline and Diesel Industrial Engines. Emissions for non-engine related emissions are calculated using Texas Commission on Environmental Quality Emission Calculation Workbook for Concrete Batch Plants per year. Summarized results are presented below.

lb/hr: pounds per hour, lb/MMBtu: pounds per metric million British thermal units

Name	Emissions (tpy)							
	CO	NOx	SOx	PM_{10}	$PM_{2.5}$	VOC	HAPs	CO_2 [1]
Material Handling	-	-	-	0.08	0.01	-	-	-
Stockpiles	-	-	-	0.60	0.09	-	-	-
Central Baghouse Stack	-	-	-	0.01	0.00	-	-	-
Loading Fugitives	-	-	-	0.02	0.00	-	-	-
Cement Silo	-	-	-	0.00	0.00	-	-	-
Supplement Silo	-	-	-	0.00	0.00	-	-	-
Generator Engine	0.40	1.86	0.12	0.13	0.13	0.15	0.00	62.66
Total:	**0.40**	**1.86**	**0.12**	**0.85**	**0.24**	**0.15**	**0.00**	**62.66**

Notes:

[1] CO_2 emissions are in units of metric tons per year

Emissions Summary Table - Single Year, 12 Batch Plants

Name	Emissions (tpy)							
	CO	NOx	SOx	PM_{10}	$PM_{2.5}$	VOC	HAPs	CO2 [1]
Material Handling	-	-	-	0.99	0.15	-	-	-
Stockpiles	-	-	-	7.23	1.08	-	-	-
Central Baghouse Stack	-	-	-	0.15	0.03	-	-	-
Loading Fugitives	-	-	-	0.21	0.04	-	-	-
Cement Silo	-	-	-	0.01	0.01	-	-	-
Supplement Silo	-	-	-	0.02	0.01	-	-	-
Generator Engine	4.81	22.34	1.48	1.59	1.59	1.81	0.03	751.90
Total:	**4.81**	**22.34**	**1.48**	**10.19**	**2.90**	**1.81**	**0.03**	**751.90**

Notes:

[1] CO_2 emissions are in units of metric tons per year

CO: carbon monoxide, NO_x: nitrogen oxides, SO_x: sulfur oxides, PM_{10}: particulate matter with an aerodynamic diameter of 10 microns or less, $PM_{2.5}$: particulate matter with an aerodynamic diameter of 2.5 microns or less, VOC: volatile organic compound, HAP: hazardous air pollutant, CO_2: carbon dioxide, tpy: tons per year

Emissions Summary Table - Total Construction Duration, 12 Batch Plants

Name	Emissions (tons)							
	CO	NOx	SOx	PM_{10}	$PM_{2.5}$	VOC	HAPs	CO2 [1]
Material Handling	-	-	-	1.99	0.30	-	-	-
Stockpiles	-	-	-	14.45	2.17	-	-	-
Central Baghouse Stack	-	-	-	0.30	0.05	-	-	-
Loading Fugitives	-	-	-	0.41	0.07	-	-	-
Cement Silo	-	-	-	0.02	0.02	-	-	-
Supplement Silo	-	-	-	0.03	0.02	-	-	-
Generator Engine	9.63	44.68	2.95	3.17	3.17	3.62	0.07	1503.80
Total:	**9.63**	**44.68**	**2.95**	**20.38**	**5.81**	**3.62**	**0.07**	**1503.80**

Notes:

[1] CO_2 emissions are in units of metric tons per year

CO: carbon monoxide, NO_x: nitrogen oxides, SO_x: sulfur oxides, PM_{10}: particulate matter with an aerodynamic diameter of 10 microns or less, $PM_{2.5}$: particulate matter with an aerodynamic diameter of 2.5 microns or less, VOC: volatile organic compound, HAP: hazardous air pollutant, CO_2: carbon dioxide, tpy: tons per year

Grain Belt Express RAR - Air Resources - Emission Calculations

Table A-7: Operational Emissions (On-Road)

Equipment Type	Fuel	Source Category	Total Mileage/ Round Trip	Number of Vehicles	Number of Round Trips/ Vehicle[1]	Total Miles/ Year
Commuter Passenger Truck	Gasoline	Passenger Truck	20	40	365	292,000
Light Duty Construction	Gasoline	Passenger Truck	20	4	365	29,200

Emission Factors (lb/mile)[2]									
PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	NO_X	HAPs	CO_2	N_2O	CH_4
1.09E-05	9.63E-06	1.75E-05	9.11E-03	5.76E-06	4.62E-04	5.08E-06	0.87	3.48E-06	1.07E-05
1.09E-05	9.63E-06	1.75E-05	9.11E-03	5.76E-06	4.62E-04	5.08E-06	0.87	3.48E-06	1.07E-05

	Emissions (tpy)[3]										
	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	NO_X	HAPs	CO_2	N_2O	CH_4	CO_2e[4]
	1.59E-03	1.41E-03	2.56E-03	1.33E+00	8.41E-04	6.75E-02	7.42E-04	1.27E+02	5.08E-04	1.56E-03	1.15E+02
	1.59E-04	1.41E-04	2.56E-04	1.33E-01	8.41E-05	6.75E-03	7.42E-05	1.27E+01	5.08E-05	1.56E-04	1.15E+01
Total:	**0.00**	**0.00**	**0.00**	**1.46**	**0.00**	**0.07**	**0.00**	**139.72**	**0.00**	**0.00**	**126.94**

Notes:

[1] Number of Trips / Vehicle = This assumes that each vehicle makes one round trip to each site once each day, and 20 passenger vehicles per site plus 2 maintenance vehicles. It is assumed workers will originate from the nearest population centers (Dodge City, KS; Centralia, MO)

[2] Emissions were calculated based on emission factors derived from USEPA MOVES 2014b Model.

[3] Emissions (ton/yr) = (Total Miles/Year x Emission Factor (lb/mile) / 2,000 (lb/ton)

[4] CO_2e is in units of metric tons per year. CO_2e was calculated by summing the emissions for CO_2, N_2O, and CH_4. N_2O and CH_4 were both multiplied by their relative global warming potential factor first. N_2O has a global warming potential factor equivalent to 273 times that of CO_2, while CH_4 has a global warming potential equivalent to 29.8. times CO_2.

CO: carbon monoxide, NO_x: nitrogen oxides, SO_2: sulfur dioxide, PM_{10}: particulate matter with an aerodynamic diameter of 10 microns or less, $PM_{2.5}$: particulate matter with an aerodynamic diameter of 2.5 microns or less, VOC: volatile organic compound, HAP: hazardous air pollutant, CO_2: carbon dioxide, tpy: tons per year, CH_4: methane, N_2O: dinitrogen oxide, CO_2e: carbon dioxide equivalent

Grain Belt Express RAR - Air Resources - Emission Calculations

Table A-8: Operational Fugitive Dust Emissions

Equipment Type	Fuel	Vehicle Duty Type	Unpaved Access Roads (miles)[1]	Number of Vehicles	Number of Trips/ Vehicle	Total Miles/ Year	Emission Factors (lb/VMT)[2]		Emissions (tpy)[3]	
							PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Commuter Passenger Truck	Gasoline	Light Duty Vehicles	1	40	365	14,600	0.93	0.09	6.79	0.66
Light Duty Construction	Gasoline	Light Duty Vehicles	1	4	365	1,460	0.93	0.09	0.68	0.07

Notes:

[1] Unpaved distance is estimated to be up to a mile between the nearest right of way and the work site over unpaved surfaces.

[2] Calculated on Table A-4.

[3] Emissions (ton/yr) = (Unpaved Access Roads (miles) x Emission Factor (lb/VMT)) / 2,000 (lb/ton).

lb/VMT: pounds per vehicle mile traveled, tpy: tons per year, PM_{10}: particulate matter with an aerodynamic diameter of 10 microns or less, $PM_{2.5}$: particulate matter with an aerodynamic diameter of 2.5 microns or less

Grain Belt Express RAR - Air Resources - Emission Calculations

Table A-9: Operation Maintenance SF6 Emissions Summary

Summary of Estimated Station SF_6 Emissions

Location	Number of Circuit Breakers	SF_6 Emissions (mtpy)[1]	CO_2e Emissions (mtpy)[2]
Ford County Interconnection	2.0	0.01	206.84
Tiger Interconnect	2.0	0.01	206.84
TOTAL	**4.00**	**0.02**	**413.68**

Notes:

[1] EPA states old circuit breakers can contain up to 2,000 pounds of SF6, while modern breakers usually contain less than 100 pounds. 100 pounds per breaker has been conservatively assumed. https://www.epa.gov/eps-partnership/sulfur-hexafluoride-sf6-basics

[2] The global warming potential for SF6 is estimated to be 22,800 from 40 Code of Federal Regulations 98, Table A-1.

[3] SF_6 emissions for each station have been calculated based on the total SF_6 content of the breakers and application of a 0.1 percent leak rate.

SF6: sulfur hexafluoride, mtpy: metric tons per year, CO2e: carbon dioxide equivalent

Grain Belt Express RAR - Air Resources - Emission Calculations
Construction Emissions: Equipment Emissions

Equipment	CO	NO_X	SO2	PM / PM_{10}	$PM_{2.5}$	ROG / VOC	CH_4	N_2O
Pavers	0.0476	0.1635	0.0002	0.0083	0.0081	0.0075	0.0007	7.51E-07
Tampers/Rammers	0.0104	0.0171	0.0000	0.0011	0.0010	0.0033	0.0003	2.77E-07
Plate Compactors	0.0161	0.0294	0.0000	0.0017	0.0017	0.0048	0.0004	4.11E-07
Rollers	0.0507	0.1534	0.0002	0.0084	0.0081	0.0077	0.0007	7.28E-07
Paving Equipment	0.0478	0.1340	0.0001	0.0080	0.0077	0.0091	0.0008	7.72E-07
Surfacing Equipment	0.1296	0.3401	0.0002	0.0179	0.0173	0.0199	0.0012	1.18E-06
Trenchers	0.0647	0.2120	0.0002	0.0092	0.0089	0.0104	0.0009	9.32E-07
Bore/Drill Rigs	0.1391	0.5137	0.0003	0.0256	0.0249	0.0353	0.0014	1.37E-06
Concrete/Industrial Saws	0.0451	0.1422	0.0001	0.0063	0.0061	0.0076	0.0007	7.07E-07
Cement & Mortar Mixers	0.0447	0.1078	0.0001	0.0072	0.0069	0.0112	0.0005	4.86E-07
Cranes	0.0529	0.2149	0.0003	0.0095	0.0092	0.0118	0.0009	9.03E-07
Rough Terrain Forklift	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00
Rubber Tire Loaders	0.1125	0.3613	0.0005	0.0188	0.0182	0.0182	0.0013	1.34E-06
Tractors/Loaders/Backhoes	0.0912	0.1193	0.0001	0.0149	0.0145	0.0195	0.0009	8.77E-07
Skid Steer Loaders	0.0879	0.1021	0.0001	0.0138	0.0134	0.0186	0.0006	6.02E-07
Dumpers/Tenders	0.0546	0.0630	0.0000	0.0083	0.0081	0.0127	0.0004	4.27E-07
Other Construction Equipment	0.2955	0.7306	0.0007	0.0410	0.0398	0.0417	0.0024	2.40E-06
Forklifts	0.0149	0.1326	0.0002	0.0023	0.0022	0.0028	0.0004	3.81E-07
Other General Industrial Eqp	0.0386	0.1395	0.0002	0.0074	0.0071	0.0076	0.0006	6.41E-07
Other Material Handling Eqp	0.1050	0.1794	0.0001	0.0178	0.0173	0.0273	0.0012	1.16E-06
Terminal Tractors	0.0214	0.0883	0.0003	0.0045	0.0043	0.0040	0.0003	3.41E-07
Excavators	0.0378	0.1289	0.0003	0.0074	0.0072	0.0064	0.0006	5.72E-07
Graders	0.0436	0.1258	0.0004	0.0090	0.0088	0.0075	0.0006	6.39E-07
Off-highway Trucks	0.1717	1.5658	0.0015	0.0322	0.0312	0.0407	0.0035	3.51E-06
Rough Terrain Forklifts	0.0736	0.1840	0.0002	0.0123	0.0119	0.0090	0.0007	7.31E-07
Crawler Tractor/Dozers	0.0945	0.3135	0.0005	0.0158	0.0153	0.0143	0.0012	1.17E-06
Off-Highway Tractors	0.4094	1.6546	0.0015	0.0581	0.0563	0.0663	0.0046	4.59E-06

Note: Original data in g/mi converted to lb/mi

Notes:
Original data in g/mi converted to lb/mi
Emission Factors Obtained from MOVES 2022 Values for Non-Road Vehicles

dioxide, PM: particulate matter, PM_{10}: particulate matter

Gasoline

Equipment	CO	NO_X	SO_X	PM / PM_{10}	$PM_{2.5}$	ROG / VOC	CH_4	N_2O
Pavers	4.0160	0.0499	0.0001	0.0025	0.0023	0.0965	0.0125	1.25E-05
Tampers/Rammers	1.1593	0.0070	0.0000	0.0421	0.0387	0.2783	0.0051	5.17E-06
Plate Compactors	1.3239	0.0172	0.0000	0.0033	0.0031	0.0563	0.0056	5.65E-06
Rollers	4.0895	0.0488	0.0001	0.0024	0.0022	0.0959	0.0128	1.29E-05
Paving Equipment	2.5925	0.0291	0.0001	0.0038	0.0035	0.0824	0.0088	8.86E-06
Surfacing Equipment	2.4074	0.0270	0.0001	0.0017	0.0015	0.0641	0.0081	8.12E-06
Trenchers	3.2368	0.0433	0.0001	0.0026	0.0024	0.0858	0.0111	1.12E-05
Bore/Drill Rigs	1.0176	0.0250	0.0000	0.0014	0.0013	0.0413	0.0049	4.89E-06
Concrete/Industrial Saws	2.7835	0.0250	0.0001	0.0438	0.0403	0.3152	0.0109	1.09E-05
Cement & Mortar Mixers	2.2739	0.0257	0.0001	0.0015	0.0014	0.0727	0.0074	7.45E-06
Cranes	2.4194	0.1408	0.0002	0.0037	0.0034	0.0886	0.0104	1.05E-05
Rough Terrain Forklift	1.5107	0.1643	0.0004	0.0062	0.0057	0.0749	0.0073	7.30E-06

Grain Belt Express RAR - Air Resources - Emission Calculations
Construction Emissions: Equipment Emissions

Equipment	CO	NO_X	SO2	PM / PM_{10}	$PM_{2.5}$	ROG / VOC	CH_4	N_2O
Rubber Tire Loaders	1.1828	0.1650	0.0004	0.0077	0.0071	0.0690	0.0057	5.69E-06
Tractors/Loaders/Backhoes	4.9115	0.0514	0.0001	0.0025	0.0023	0.1084	0.0148	1.49E-05
Skid Steer Loaders	4.2447	0.1014	0.0002	0.0033	0.0030	0.1103	0.0138	1.39E-05
Dumpers/Tenders	2.0943	0.0243	0.0001	0.0011	0.0010	0.0640	0.0064	6.43E-06
Other Construction Equipment	3.7372	0.4260	0.0005	0.0088	0.0081	0.1927	0.0226	2.28E-05
Forklifts	0.5121	0.0717	0.0002	0.0033	0.0031	0.0300	0.0024	2.45E-06
Other General Industrial Eqp	1.7012	0.0243	0.0001	0.0022	0.0020	0.0605	0.0074	7.42E-06
Other Material Handling Eqp	3.7095	0.0946	0.0002	0.0034	0.0031	0.0978	0.0120	1.21E-05
Terminal Tractors	1.7548	0.2437	0.0006	0.0115	0.0105	0.1001	0.0085	8.51E-06
Excavators	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00
Graders	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00
Off-highway Trucks	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00
Rough Terrain Forklifts	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00
Crawler Tractor/Dozers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00
Off-Highway Tractors	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00

Grain Belt Express RAR - Air Resources - Emission Calculations
Construction Emissions: Equipment Emissions

Equipment	CO_2	HAP's:	1,3-Butadiene	2,2,4-Trimethylpentane	Acetaldehyde	Acrolein	Arsenic Compounds	Benzene	Chromium 6+	Ethyl Benzene	Formaldehyde	Hexane	Manganese Compounds
Pavers	89.0506		0.0000	0.0001	0.0007	0.0001	0.0000	0.0004	0.0000	0.0000	0.0021	0.0000	0.0000
Tampers/Rammers	2.3411		0.0000	0.0000	0.0003	0.0001	0.0000	0.0002	0.0000	0.0000	0.0009	0.0000	0.0000
Plate Compactors	4.2016		0.0000	0.0000	0.0005	0.0001	0.0000	0.0003	0.0000	0.0000	0.0014	0.0000	0.0000
Rollers	67.1494		0.0000	0.0001	0.0008	0.0001	0.0000	0.0004	0.0000	0.0000	0.0022	0.0000	0.0000
Paving Equipment	50.3476		0.0000	0.0001	0.0009	0.0002	0.0000	0.0004	0.0000	0.0000	0.0025	0.0000	0.0000
Surfacing Equipment	79.5533		0.0000	0.0002	0.0018	0.0004	0.0000	0.0008	0.0000	0.0001	0.0051	0.0000	0.0000
Trenchers	56.9926		0.0000	0.0001	0.0010	0.0002	0.0000	0.0005	0.0000	0.0000	0.0028	0.0000	0.0000
Bore/Drill Rigs	89.8302		0.0001	0.0003	0.0030	0.0008	0.0000	0.0011	0.0000	0.0002	0.0084	0.0001	0.0000
Concrete/Industrial Saws	36.5809		0.0000	0.0001	0.0007	0.0001	0.0000	0.0004	0.0000	0.0000	0.0021	0.0000	0.0000
Cement & Mortar Mixers	16.5579		0.0000	0.0001	0.0010	0.0002	0.0000	0.0004	0.0000	0.0001	0.0028	0.0000	0.0000
Cranes	116.7109		0.0000	0.0001	0.0011	0.0002	0.0000	0.0005	0.0000	0.0001	0.0031	0.0000	0.0000
Rough Terrain Forklift	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rubber Tire Loaders	170.3300		0.0000	0.0001	0.0017	0.0003	0.0000	0.0008	0.0000	0.0001	0.0047	0.0000	0.0000
Tractors/Loaders/Backhoes	28.7623		0.0000	0.0001	0.0017	0.0004	0.0000	0.0007	0.0000	0.0001	0.0048	0.0000	0.0000
Skid Steer Loaders	17.5865		0.0000	0.0001	0.0015	0.0004	0.0000	0.0005	0.0000	0.0001	0.0043	0.0000	0.0000
Dumpers/Tenders	10.4492		0.0000	0.0001	0.0011	0.0003	0.0000	0.0004	0.0000	0.0001	0.0030	0.0000	0.0000
Other Construction Equipment	229.7011		0.0001	0.0003	0.0038	0.0008	0.0000	0.0016	0.0000	0.0002	0.0105	0.0000	0.0000
Forklifts	70.0867		0.0000	0.0000	0.0003	0.0000	0.0000	0.0001	0.0000	0.0000	0.0008	0.0000	0.0000
Other General Industrial Eqp	60.3414		0.0000	0.0001	0.0007	0.0001	0.0000	0.0004	0.0000	0.0000	0.0021	0.0000	0.0000
Other Material Handling Eqp	37.2862		0.0001	0.0002	0.0024	0.0006	0.0000	0.0009	0.0000	0.0002	0.0066	0.0000	0.0000
Terminal Tractors	115.9384		0.0000	0.0000	0.0004	0.0001	0.0000	0.0002	0.0000	0.0000	0.0009	0.0000	0.0000
Excavators	120.6487		0.0000	0.0000	0.0006	0.0001	0.0000	0.0003	0.0000	0.0000	0.0017	0.0000	0.0000
Graders	142.9567		0.0000	0.0001	0.0007	0.0001	0.0000	0.0003	0.0000	0.0000	0.0019	0.0000	0.0000
Off-highway Trucks	546.5568		0.0001	0.0003	0.0041	0.0007	0.0000	0.0021	0.0000	0.0002	0.0113	0.0000	0.0000
Rough Terrain Forklifts	71.7104		0.0000	0.0001	0.0009	0.0002	0.0000	0.0004	0.0000	0.0000	0.0025	0.0000	0.0000
Crawler Tractor/Dozers	182.4246		0.0000	0.0001	0.0014	0.0002	0.0000	0.0007	0.0000	0.0001	0.0038	0.0000	0.0000
Off-Highway Tractors	506.0295		0.0001	0.0005	0.0063	0.0012	0.0000	0.0029	0.0000	0.0003	0.0175	0.0001	0.0000

Gasoline

Equipment	CO_2	HAP's:	1,3-Butadiene	2,2,4-Trimethylpentane	Acetaldehyde	Acrolein	Arsenic Compounds	Benzene	Chromium 6+	Ethyl Benzene	Formaldehyde	Hexane	Manganese Compounds
Pavers	20.3623		0.0009	0.0050	0.0007	0.0000	0.0000	0.0041	0.0000	0.0016	0.0013	0.0010	0.0000
Tampers/Rammers	3.1759		0.0007	0.0349	0.0009	0.0001	0.0000	0.0037	0.0000	0.0061	0.0013	0.0022	0.0000
Plate Compactors	7.1032		0.0004	0.0035	0.0003	0.0000	0.0000	0.0021	0.0000	0.0010	0.0006	0.0006	0.0000
Rollers	20.0522		0.0009	0.0050	0.0007	0.0000	0.0000	0.0041	0.0000	0.0016	0.0013	0.0009	0.0000
Paving Equipment	12.0312		0.0007	0.0049	0.0005	0.0000	0.0000	0.0031	0.0000	0.0014	0.0009	0.0009	0.0000
Surfacing Equipment	10.9446		0.0006	0.0033	0.0004	0.0000	0.0000	0.0027	0.0000	0.0011	0.0008	0.0007	0.0000
Trenchers	17.4581		0.0008	0.0044	0.0006	0.0000	0.0000	0.0037	0.0000	0.0014	0.0012	0.0009	0.0000
Bore/Drill Rigs	6.7719		0.0004	0.0021	0.0003	0.0000	0.0000	0.0017	0.0000	0.0007	0.0005	0.0005	0.0000
Concrete/Industrial Saws	10.2925		0.0011	0.0371	0.0012	0.0001	0.0000	0.0054	0.0000	0.0068	0.0019	0.0025	0.0000
Cement & Mortar Mixers	10.6137		0.0005	0.0034	0.0004	0.0000	0.0000	0.0029	0.0000	0.0012	0.0008	0.0011	0.0000
Cranes	38.0847		0.0008	0.0044	0.0006	0.0000	0.0000	0.0037	0.0000	0.0015	0.0011	0.0010	0.0000
Rough Terrain Forklift	63.2452		0.0005	0.0035	0.0004	0.0000	0.0000	0.0030	0.0000	0.0013	0.0008	0.0010	0.0000

Grain Belt Express RAR - Air Resources - Emission Calculations
Construction Emissions: Equipment Emissions

Equipment	CO_2	HAP's:	1,3-Butadiene	2,2,4-Trimethylpentane	Acetaldehyde	Acrolein	Arsenic Compounds	Benzene	Chromium 6+	Ethyl Benzene	Formaldehyde	Hexane	Manganese Compounds
Rubber Tire Loaders	77.7576		0.0004	0.0031	0.0003	0.0000	0.0000	0.0027	0.0000	0.0012	0.0006	0.0011	0.0000
Tractors/Loaders/Backhoes	21.1726		0.0011	0.0057	0.0008	0.0000	0.0000	0.0047	0.0000	0.0018	0.0015	0.0010	0.0000
Skid Steer Loaders	32.3712		0.0010	0.0056	0.0007	0.0000	0.0000	0.0047	0.0000	0.0018	0.0014	0.0012	0.0000
Dumpers/Tenders	9.1725		0.0005	0.0030	0.0003	0.0000	0.0000	0.0025	0.0000	0.0010	0.0007	0.0010	0.0000
Other Construction Equipment	92.8651		0.0017	0.0096	0.0012	0.0001	0.0000	0.0080	0.0000	0.0032	0.0024	0.0022	0.0000
Forklifts	33.9340		0.0002	0.0013	0.0001	0.0000	0.0000	0.0012	0.0000	0.0005	0.0003	0.0005	0.0000
Other General Industrial Eqp	9.4205		0.0005	0.0031	0.0004	0.0000	0.0000	0.0025	0.0000	0.0010	0.0008	0.0007	0.0000
Other Material Handling Eqp	33.4725		0.0009	0.0050	0.0006	0.0000	0.0000	0.0041	0.0000	0.0016	0.0012	0.0011	0.0000
Terminal Tractors	114.5545		0.0006	0.0045	0.0004	0.0000	0.0000	0.0039	0.0000	0.0017	0.0009	0.0015	0.0000
Excavators	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Graders	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-highway Trucks	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rough Terrain Forklifts	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Crawler Tractor/Dozers	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Highway Tractors	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Grain Belt Express RAR - Air Resources - Emission Calculations
Construction Emissions: Equipment Emissions

Equipment	Mercury Divalent Gaseous	Mercury Elemental Gaseous	Mercury Particulate	Mercury Compounds	Naphthalene gas	Naphthalene particle	Nickel Compounds	Propionaldehyde	Styrene	Toluene	Xylene
Pavers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0003	0.0001
Tampers/Rammers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0001	0.0000
Plate Compactors	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0002	0.0001
Rollers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0003	0.0001
Paving Equipment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0003	0.0001
Surfacing Equipment	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0005	0.0000	0.0006	0.0003
Trenchers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	0.0000	0.0003	0.0001
Bore/Drill Rigs	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0009	0.0000	0.0008	0.0006
Concrete/Industrial Saws	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0003	0.0001
Cement & Mortar Mixers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	0.0000	0.0003	0.0002
Cranes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	0.0000	0.0004	0.0002
Rough Terrain Forklift	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rubber Tire Loaders	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0004	0.0000	0.0006	0.0003
Tractors/Loaders/Backhoes	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0005	0.0000	0.0005	0.0003
Skid Steer Loaders	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0005	0.0000	0.0004	0.0003
Dumpers/Tenders	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	0.0000	0.0003	0.0002
Other Construction Equipment	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0009	0.0000	0.0012	0.0007
Forklifts	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0001	0.0001
Other General Industrial Eqp	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0003	0.0001
Other Material Handling Eqp	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0006	0.0000	0.0007	0.0005
Terminal Tractors	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0001	0.0001
Excavators	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0002	0.0001
Graders	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0003	0.0002
Off-highway Trucks	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0009	0.0000	0.0015	0.0006
Rough Terrain Forklifts	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0003	0.0001
Crawler Tractor/Dozers	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0003	0.0000	0.0005	0.0003
Off-Highway Tractors	0.0000	0.0000	0.0000	0.0000	0.0003	0.0000	0.0000	0.0016	0.0000	0.0021	0.0010

Gasoline

Equipment	Mercury Divalent Gaseous	Mercury Elemental Gaseous	Mercury Particulate	Mercury Compounds	Naphthalene gas	Naphthalene particle	Nickel Compounds	Propionaldehyde	Styrene	Toluene	Xylene
Pavers	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0005	0.0090	0.0066
Tampers/Rammers	0.0000	0.0000	0.0000	0.0000	0.0006	0.0000	0.0000	0.0001	0.0005	0.0224	0.0201
Plate Compactors	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0002	0.0053	0.0038
Rollers	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0005	0.0087	0.0066
Paving Equipment	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0004	0.0078	0.0056
Surfacing Equipment	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0003	0.0060	0.0044
Trenchers	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0005	0.0080	0.0059
Bore/Drill Rigs	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0002	0.0040	0.0028
Concrete/Industrial Saws	0.0000	0.0000	0.0000	0.0000	0.0006	0.0000	0.0000	0.0002	0.0007	0.0255	0.0226
Cement & Mortar Mixers	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0003	0.0074	0.0048
Cranes	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0004	0.0087	0.0060
Rough Terrain Forklift	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0003	0.0079	0.0051

Grain Belt Express RAR - Air Resources - Emission Calculations
Construction Emissions: Equipment Emissions

Equipment	Mercury Divalent Gaseous	Mercury Elemental Gaseous	Mercury Particulate	Mercury Compounds	Naphthalene gas	Naphthalene particle	Nickel Compounds	Propionaldehyde	Styrene	Toluene	Xylene
Rubber Tire Loaders	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0002	0.0077	0.0046
Tractors/Loaders/Backhoes	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0006	0.0098	0.0074
Skid Steer Loaders	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0006	0.0104	0.0075
Dumpers/Tenders	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0003	0.0066	0.0042
Other Construction Equipment	0.0000	0.0000	0.0000	0.0000	0.0003	0.0000	0.0000	0.0001	0.0010	0.0188	0.0131
Forklifts	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0033	0.0020
Other General Industrial Eqp	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0003	0.0058	0.0041
Other Material Handling Eqp	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0005	0.0093	0.0066
Terminal Tractors	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0004	0.0111	0.0067
Excavators	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Graders	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-highway Trucks	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rough Terrain Forklifts	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Crawler Tractor/Dozers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Highway Tractors	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Grain Belt Express RAR - Air Resources - Emission Calculations
Construction Emissions: Equipment Emissions

Equipment	Dibenzo(a,h)anthracene particle	Fluoranthene particle	Acenaphthene particle	Acenaphthylene particle	Anthracene particle	Benz(a)anthracene particle	Benzo(a)pyrene particle	Benzo(b)fluoranthene particle
Pavers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tampers/Rammers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Plate Compactors	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rollers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Paving Equipment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Surfacing Equipment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Trenchers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Bore/Drill Rigs	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Concrete/Industrial Saws	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Cement & Mortar Mixers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Cranes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rough Terrain Forklift	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rubber Tire Loaders	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tractors/Loaders/Backhoes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Skid Steer Loaders	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Dumpers/Tenders	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other Construction Equipment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Forklifts	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other General Industrial Eqp	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other Material Handling Eqp	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Terminal Tractors	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Excavators	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Graders	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-highway Trucks	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rough Terrain Forklifts	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Crawler Tractor/Dozers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Highway Tractors	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Gasoline

Equipment	Dibenzo(a,h)anthracene particle	Fluoranthene particle	Acenaphthene particle	Acenaphthylene particle	Anthracene particle	Benz(a)anthracene particle	Benzo(a)pyrene particle	Benzo(b)fluoranthene particle
Pavers								
Tampers/Rammers								
Plate Compactors								
Rollers								
Paving Equipment								
Surfacing Equipment								
Trenchers								
Bore/Drill Rigs								
Concrete/Industrial Saws								
Cement & Mortar Mixers								
Cranes								
Rough Terrain Forklift								

Grain Belt Express RAR - Air Resources - Emission Calculations
Construction Emissions: Equipment Emissions

Equipment	Dibenzo(a,h)anthracene particle	Fluoranthene particle	Acenaphthene particle	Acenaphthylene particle	Anthracene particle	Benz(a)anthracene particle	Benzo(a)pyrene particle	Benzo(b)fluoranthene particle
Rubber Tire Loaders								
Tractors/Loaders/Backhoes								
Skid Steer Loaders								
Dumpers/Tenders								
Other Construction Equipment								
Forklifts								
Other General Industrial Eqp								
Other Material Handling Eqp								
Terminal Tractors								
Excavators								
Graders								
Off-highway Trucks								
Rough Terrain Forklifts								
Crawler Tractor/Dozers								
Off-Highway Tractors								

Grain Belt Express RAR - Air Resources - Emission Calculations
Construction Emissions: Equipment Emissions

Equipment	Benzo(g,h,i)perylene particle	Benzo(k)fluoranthene particle	Chrysene particle	Fluorene particle	Indeno(1,2,3,c,d)pyrene particle	Phenanthrene particle	Pyrene particle	Dibenzo(a,h)anthracene gas	Fluoranthene gas
Pavers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tampers/Rammers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Plate Compactors	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rollers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Paving Equipment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Surfacing Equipment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Trenchers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Bore/Drill Rigs	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Concrete/Industrial Saws	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Cement & Mortar Mixers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Cranes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rough Terrain Forklift	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rubber Tire Loaders	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tractors/Loaders/Backhoes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Skid Steer Loaders	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Dumpers/Tenders	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other Construction Equipment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Forklifts	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other General Industrial Eqp	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other Material Handling Eqp	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Terminal Tractors	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Excavators	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Graders	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-highway Trucks	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rough Terrain Forklifts	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Crawler Tractor/Dozers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Highway Tractors	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Gasoline

Equipment	Benzo(g,h,i)perylene particle	Benzo(k)fluoranthene particle	Chrysene particle	Fluorene particle	Indeno(1,2,3,c,d)pyrene particle	Phenanthrene particle	Pyrene particle	Dibenzo(a,h)anthracene gas	Fluoranthene gas
Pavers									
Tampers/Rammers									
Plate Compactors									
Rollers									
Paving Equipment									
Surfacing Equipment									
Trenchers									
Bore/Drill Rigs									
Concrete/Industrial Saws									
Cement & Mortar Mixers									
Cranes									
Rough Terrain Forklift									

Grain Belt Express RAR - Air Resources - Emission Calculations
Construction Emissions: Equipment Emissions

Equipment	Benzo(g,h,i)perylene particle	Benzo(k)fluoranthene particle	Chrysene particle	Fluorene particle	Indeno(1,2,3,c,d)pyrene particle	Phenanthrene particle	Pyrene particle	Dibenzo(a,h)anthracene gas	Fluoranthene gas
Rubber Tire Loaders									
Tractors/Loaders/Backhoes									
Skid Steer Loaders									
Dumpers/Tenders									
Other Construction Equipment									
Forklifts									
Other General Industrial Eqp									
Other Material Handling Eqp									
Terminal Tractors									
Excavators									
Graders									
Off-highway Trucks									
Rough Terrain Forklifts									
Crawler Tractor/Dozers									
Off-Highway Tractors									

Grain Belt Express RAR - Air Resources - Emission Calculations
Construction Emissions: Equipment Emissions

Equipment	Acenaphthene gas	Acenaphthylene gas	Anthracene gas	Benz(a)anthracene gas	Benzo(a)pyrene gas	Benzo(b)fluoranthene gas	Benzo(g,h,i)perylene gas	Benzo(k)fluoranthene gas	Chrysene gas	Fluorene gas
Pavers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tampers/Rammers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Plate Compactors	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rollers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Paving Equipment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Surfacing Equipment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Trenchers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Bore/Drill Rigs	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Concrete/Industrial Saws	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Cement & Mortar Mixers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Cranes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rough Terrain Forklift	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rubber Tire Loaders	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tractors/Loaders/Backhoes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Skid Steer Loaders	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Dumpers/Tenders	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other Construction Equipment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Forklifts	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other General Industrial Eqp	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other Material Handling Eqp	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Terminal Tractors	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Excavators	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Graders	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-highway Trucks	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Rough Terrain Forklifts	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Crawler Tractor/Dozers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Highway Tractors	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Gasoline

Equipment	Acenaphthene gas	Acenaphthylene gas	Anthracene gas	Benz(a)anthracene gas	Benzo(a)pyrene gas	Benzo(b)fluoranthene gas	Benzo(g,h,i)perylene gas	Benzo(k)fluoranthene gas	Chrysene gas	Fluorene gas
Pavers										
Tampers/Rammers										
Plate Compactors										
Rollers										
Paving Equipment										
Surfacing Equipment										
Trenchers										
Bore/Drill Rigs										
Concrete/Industrial Saws										
Cement & Mortar Mixers										
Cranes										
Rough Terrain Forklift										

Grain Belt Express RAR - Air Resources - Emission Calculations
Construction Emissions: Equipment Emissions

Equipment	Acenaphthene gas	Acenaphthylene gas	Anthracene gas	Benz(a)anthracene gas	Benzo(a)pyrene gas	Benzo(b)fluoranthene gas	Benzo(g,h,i)perylene gas	Benzo(k)fluoranthene gas	Chrysene gas	Fluorene gas
Rubber Tire Loaders										
Tractors/Loaders/Backhoes										
Skid Steer Loaders										
Dumpers/Tenders										
Other Construction Equipment										
Forklifts										
Other General Industrial Eqp										
Other Material Handling Eqp										
Terminal Tractors										
Excavators										
Graders										
Off-highway Trucks										
Rough Terrain Forklifts										
Crawler Tractor/Dozers										
Off-Highway Tractors										

Grain Belt Express RAR - Air Resources - Emission Calculations
Construction Emissions: Equipment Emissions

Equipment	Indeno(1,2,3,c,d)pyrene gas	Phenanthrene gas	Pyrene gas	Polycyclic Organic Matter
Pavers	0.0000	0.0000	0.0000	0.0000
Tampers/Rammers	0.0000	0.0000	0.0000	0.0000
Plate Compactors	0.0000	0.0000	0.0000	0.0000
Rollers	0.0000	0.0000	0.0000	0.0000
Paving Equipment	0.0000	0.0000	0.0000	0.0000
Surfacing Equipment	0.0000	0.0000	0.0000	0.0001
Trenchers	0.0000	0.0000	0.0000	0.0000
Bore/Drill Rigs	0.0000	0.0000	0.0000	0.0001
Concrete/Industrial Saws	0.0000	0.0000	0.0000	0.0000
Cement & Mortar Mixers	0.0000	0.0000	0.0000	0.0000
Cranes	0.0000	0.0000	0.0000	0.0001
Rough Terrain Forklift	0.0000	0.0000	0.0000	0.0000
Rubber Tire Loaders	0.0000	0.0000	0.0000	0.0001
Tractors/Loaders/Backhoes	0.0000	0.0000	0.0000	0.0001
Skid Steer Loaders	0.0000	0.0000	0.0000	0.0001
Dumpers/Tenders	0.0000	0.0000	0.0000	0.0001
Other Construction Equipment	0.0000	0.0001	0.0000	0.0002
Forklifts	0.0000	0.0000	0.0000	0.0000
Other General Industrial Eqp	0.0000	0.0000	0.0000	0.0000
Other Material Handling Eqp	0.0000	0.0000	0.0000	0.0001
Terminal Tractors	0.0000	0.0000	0.0000	0.0000
Excavators	0.0000	0.0000	0.0000	0.0000
Graders	0.0000	0.0000	0.0000	0.0000
Off-highway Trucks	0.0000	0.0000	0.0000	0.0002
Rough Terrain Forklifts	0.0000	0.0000	0.0000	0.0000
Crawler Tractor/Dozers	0.0000	0.0000	0.0000	0.0001
Off-Highway Tractors	0.0000	0.0001	0.0000	0.0003

Gasoline

Equipment	Indeno(1,2,3,c,d)pyrene gas	Phenanthrene gas	Pyrene gas	Polycyclic Organic Matter
Pavers				0.0000
Tampers/Rammers				0.0000
Plate Compactors				0.0000
Rollers				0.0000
Paving Equipment				0.0000
Surfacing Equipment				0.0000
Trenchers				0.0000
Bore/Drill Rigs				0.0000
Concrete/Industrial Saws				0.0000
Cement & Mortar Mixers				0.0000
Cranes				0.0000
Rough Terrain Forklift				0.0000

Grain Belt Express RAR - Air Resources - Emission Calculations
Construction Emissions: Equipment Emissions

Equipment	Indeno(1,2,3,c,d)pyrene gas	Phenanthrene gas	Pyrene gas	Polycyclic Organic Matter
Rubber Tire Loaders				0.0000
Tractors/Loaders/Backhoes				0.0000
Skid Steer Loaders				0.0000
Dumpers/Tenders				0.0000
Other Construction Equipment				0.0000
Forklifts				0.0000
Other General Industrial Eqp				0.0000
Other Material Handling Eqp				0.0000
Terminal Tractors				0.0000
Excavators				0.0000
Graders				0.0000
Off-highway Trucks				0.0000
Rough Terrain Forklifts				0.0000
Crawler Tractor/Dozers				0.0000
Off-Highway Tractors				0.0000

Grain Belt Express RAR - Air Resources - Emission Calculations

Table A-10 : Emissions per County and National Emission Inventory Comparison

		Emissions, tpy							Emissions, mtpy
Project Miles/ County	**County**	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**	**HAPs**	**CO_2e**
30.84	**Ford County**	8.80	4.50	3.68	0.56	0.10	0.45	0.09	1,203.74
4.25	**Hodgeman County**	0.76	0.60	0.51	0.08	0.01	0.06	0.01	127.06
14.57	**Edwards County**	2.62	2.05	1.74	0.26	0.05	0.21	0.04	435.75
29.30	**Pawnee County**	5.27	4.12	3.49	0.53	0.10	0.42	0.08	876.15
31.08	**Barton County**	5.60	4.37	3.70	0.56	0.10	0.45	0.09	929.38
32.25	**Russell County**	5.81	4.53	3.84	0.58	0.11	0.47	0.09	964.46
43.51	**Osborne County**	7.83	6.12	5.18	0.78	0.14	0.63	0.12	1,301.30
31.38	**Mitchell County**	5.65	4.41	3.74	0.56	0.10	0.45	0.09	938.30
31.40	**Cloud County**	5.65	4.41	3.74	0.56	0.10	0.45	0.09	938.97
34.19	**Washington County**	6.16	4.80	4.07	0.62	0.11	0.49	0.10	1,022.35
30.49	**Marshall County**	5.49	4.28	3.63	0.55	0.10	0.44	0.09	911.67
25.33	**Nemaha County**	4.56	3.56	3.02	0.46	0.08	0.37	0.07	757.52
25.31	**Brown County**	4.56	3.56	3.02	0.46	0.08	0.37	0.07	756.95
19.96	**Doniphan County**	3.59	2.81	2.38	0.36	0.07	0.29	0.06	596.93
22.11	**Buchanan County**	3.98	3.11	2.63	0.40	0.07	0.32	0.06	661.08
21.71	**Clinton County**	3.91	3.05	2.59	0.39	0.07	0.31	0.06	649.22
24.89	**Caldwell County**	4.48	3.50	2.97	0.45	0.08	0.36	0.07	744.47
26.69	**Carroll County**	4.80	3.75	3.18	0.48	0.09	0.38	0.08	798.08
33.11	**Chariton County**	5.96	4.65	3.94	0.60	0.11	0.48	0.09	990.18
22.06	**Randolph County**	3.97	3.10	2.63	0.40	0.07	0.32	0.06	659.73
8.20	**Monroe County**	1.48	1.15	0.98	0.15	0.03	0.12	0.02	245.17
26.71	**Audrain County**	4.81	3.75	3.18	0.48	0.09	0.39	0.08	798.67
7.64	**Callaway County**	4.62	1.24	0.91	0.14	0.03	0.12	0.02	510.14
576.96	**Total**								

Grain Belt Express RAR - Air Resources - Emission Calculations

Table A-10 : Emissions per County and National Emission Inventory Comparison

	Percentage of County Wide Emissions							
County	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**	**HAPs**	**CO_2e**
Ford County	0.1%	0.2%	<0.01	<0.01	0.1%	<0.01	<0.01	0.1%
Hodgeman County	<0.01	0.1%	<0.01	<0.01	<0.01	<0.01	<0.01	0.1%
Edwards County	0.1%	0.2%	0.1%	<0.01	0.5%	<0.01	<0.01	0.6%
Pawnee County	0.2%	0.4%	0.1%	<0.01	0.9%	<0.01	<0.01	1.1%
Barton County	0.1%	0.2%	<0.01	<0.01	0.2%	<0.01	<0.01	0.4%
Russell County	0.1%	0.3%	0.1%	<0.01	0.1%	<0.01	<0.01	0.3%
Osborne County	0.3%	0.7%	0.1%	0.1%	1.0%	<0.01	<0.01	2.3%
Mitchell County	0.1%	0.4%	0.1%	0.1%	0.2%	<0.01	<0.01	0.7%
Cloud County	0.1%	0.2%	0.1%	0.1%	0.2%	<0.01	<0.01	0.6%
Washington County	0.1%	0.3%	0.1%	<0.01	0.1%	<0.01	<0.01	0.5%
Marshall County	<0.01	0.2%	0.1%	<0.01	0.1%	<0.01	<0.01	0.4%
Nemaha County	0.1%	0.3%	0.1%	<0.01	0.1%	<0.01	<0.01	0.4%
Brown County	0.1%	0.3%	0.1%	0.1%	0.3%	<0.01	<0.01	0.5%
Doniphan County	0.1%	0.4%	0.1%	0.1%	0.2%	<0.01	<0.01	0.5%
Buchanan County	<0.01	0.1%	<0.01	<0.01	<0.01	<0.01	<0.01	0.1%
Clinton County	0.1%	0.3%	<0.01	<0.01	0.4%	<0.01	<0.01	0.3%
Caldwell County	0.1%	0.3%	0.1%	<0.01	0.1%	<0.01	<0.01	0.4%
Carroll County	<0.01	0.2%	0.1%	<0.01	0.1%	<0.01	<0.01	0.2%
Chariton County	0.1%	0.2%	0.1%	0.1%	0.2%	<0.01	<0.01	0.6%
Randolph County	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Monroe County	<0.01	0.1%	<0.01	<0.01	0.1%	<0.01	<0.01	0.1%
Audrain County	0.1%	0.2%	<0.01	<0.01	0.2%	<0.01	<0.01	0.2%
Callaway County	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1%

Grain Belt Express Transmission Line
Environmental Impact Statement
Appendix 3.3: Soils Maps

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

WIND EROSION GROUPS

Map 1 of 19

Proposed Grain Belt Express Phase 1 Ford County Interconnect

Proposed Grain Belt Express Phase 1 Ford County Interconnect ROW

Proposed Grain Belt Express Phase 1 HVDC Line ROW

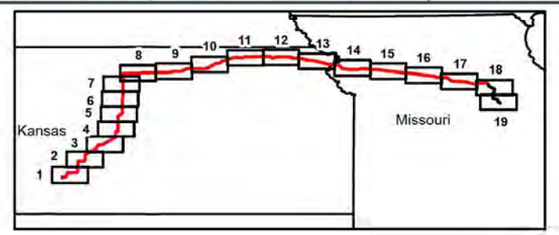
Proposed Grain Belt Express Phase 1 Converter Station

Existing Saddle Substation

Wind Erosion Group

- Not Rated
- 1
- 2
- 3
- 4
- 4L
- 5
- 6

Grain Belt Express
An Invenergy Project



GCS North American 1983
37.7016°N 99.7416°W

Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Wind_Erosion_Groups
Aprx: Soil_Wind_Erosion_Groups

1:175,000

0 1.35 2.7 Miles

0 1.35 2.7 Kilometers

N

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

WIND EROSION GROUPS

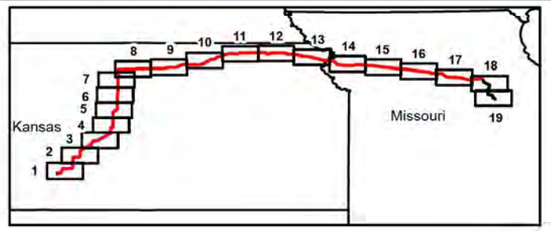
Map 2 of 19

Grain Belt Express
An Invenergy Project

Proposed Grain Belt Express Phase 1 HVDC Line ROW

Wind Erosion Group

- Not Rated
- 4
- 4L
- 5
- 6



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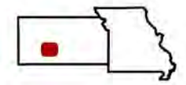
37.9765°N 99.4706°W



Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Wind_Erosion_Groups
Aprx: Soil_Wind_Erosion_Groups

1:175,000

0 1.35 2.7 Miles

0 1.35 2.7 Kilometers

N

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

WIND EROSION GROUPS

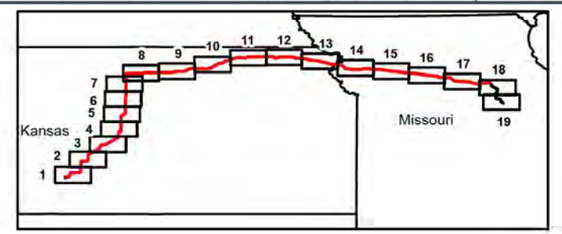
Map 3 of 19

Proposed Grain Belt Express Phase 1
HVDC Line ROW

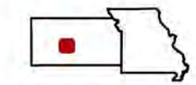
Wind Erosion Group

- Not Rated
- 3
- 4
- 4L
- 5
- 6

Grain Belt Express
An Invenergy Project



GCS North American 1983
38.2513°N 99.1096°W



Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Wind_Erosion_Groups
Aprx: Soil_Wind_Erosion_Groups

1:175,000

0 1.35 2.7 Miles

0 1.35 2.7 Kilometers

N

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

WIND EROSION GROUPS

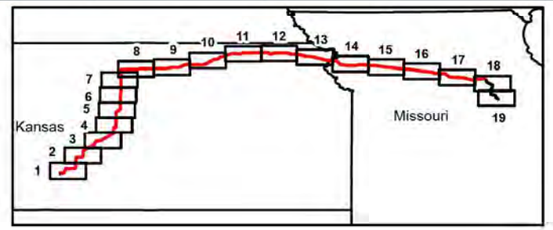
Map 4 of 19

Proposed Grain Belt Express Phase 1 HVDC Line ROW

Wind Erosion Group

- Not Rated
- 3
- 4
- 4L
- 6

Grain Belt Express
An Invenergy Project

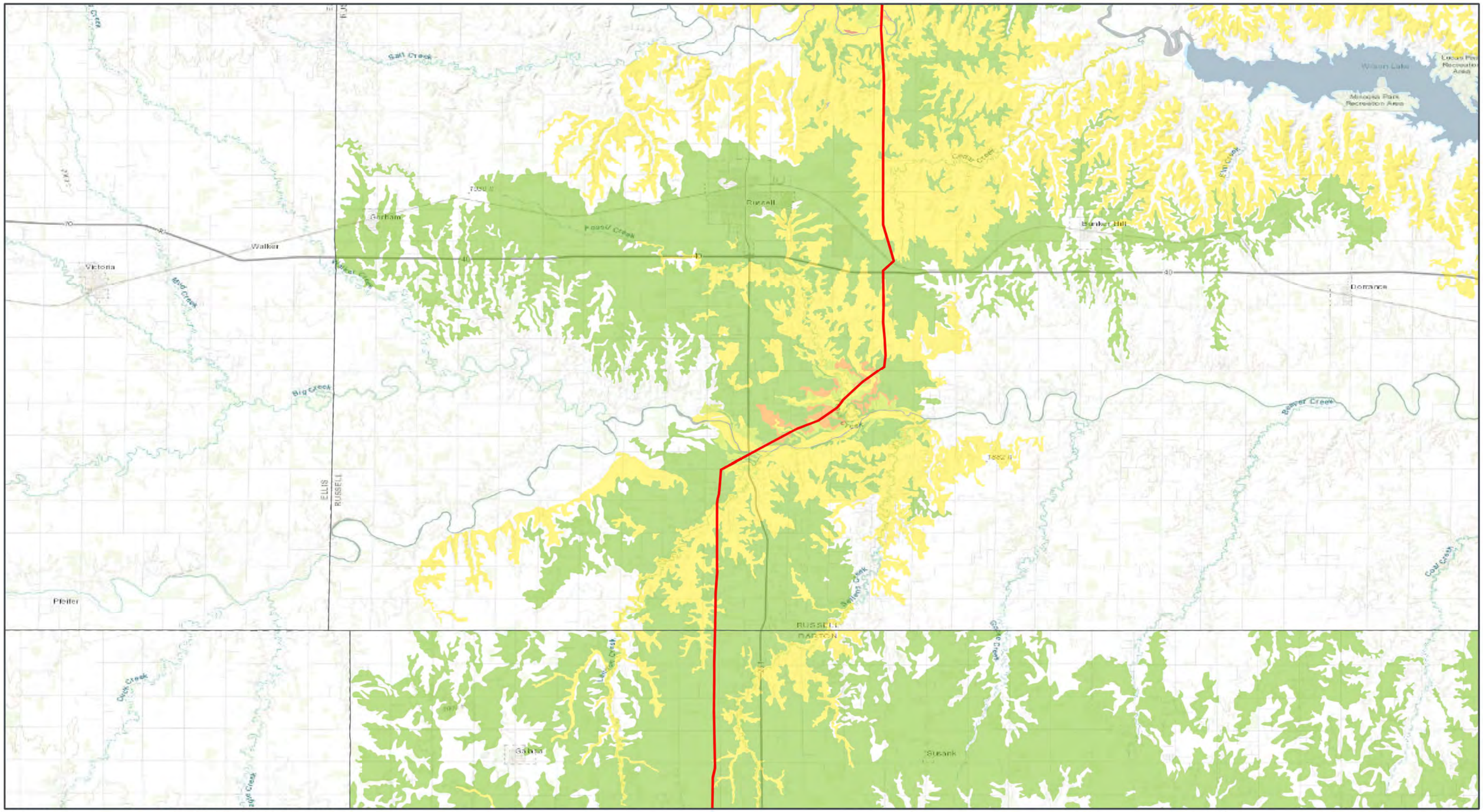


GCS North American 1983
38.5252°N 98.908°W

Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Wind_Erosion_Groups
Aprx: Soil_Wind_Erosion_Groups

1:175,000
0 1.35 2.7 Miles
0 1.35 2.7 Kilometers

N



GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

WIND EROSION GROUPS

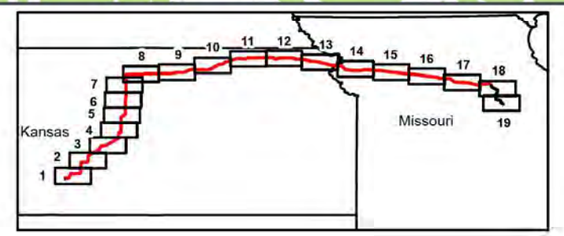
Map 5 of 19

Grain Belt Express
An Invenergy Project

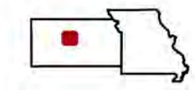
Proposed Grain Belt Express Phase 1 HVDC Line ROW

Wind Erosion Group

- Not Rated
- 2
- 3
- 4L
- 5
- 6



GCS North American 1983
38.797°N 98.8579°W



Kansas and Missouri

Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Wind_Erosion_Groups
Aprx: Soil_Wind_Erosion_Groups

1:175,000

0 1.35 2.7 Miles

0 1.35 2.7 Kilometers

N

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

WIND EROSION GROUPS

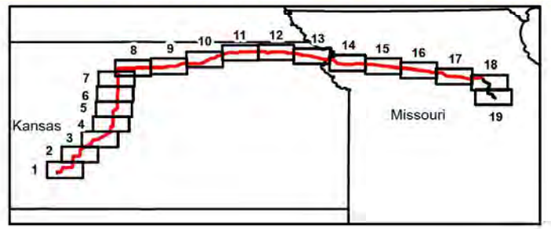
Map 6 of 19

Proposed Grain Belt Express Phase 1 HVDC Line ROW

Wind Erosion Group

- Not Rated
- 2
- 3
- 4
- 4L
- 5
- 6

Grain Belt Express
An Invenergy Project



GCS North American 1983
39.0707°N 98.8374°W

Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Wind_Erosion_Groups
Aprx: Soil_Wind_Erosion_Groups

1:175,000
0 1.35 2.7 Miles
0 1.35 2.7 Kilometers

N

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

WIND EROSION GROUPS

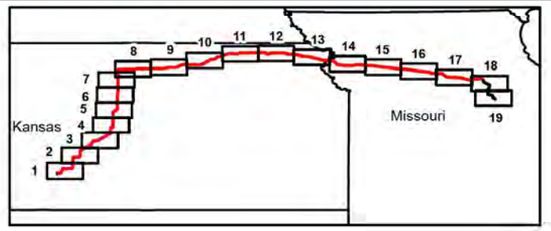
Map 7 of 19

Proposed Grain Belt Express Phase 1 HVDC Line ROW

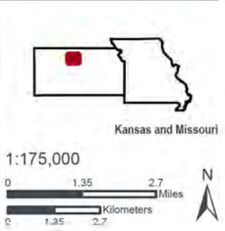
Wind Erosion Group

- Not Rated
- 2
- 3
- 4
- 4L
- 5
- 6

Grain Belt Express
An Invenergy Project



GCS North American 1983
39.3414°N 98.8091°W



Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Wind_Erosion_Groups
Aprx: Soil_Wind_Erosion_Groups

1:175,000

0 1.35 2.7 Miles

0 1.35 2.7 Kilometers

N

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

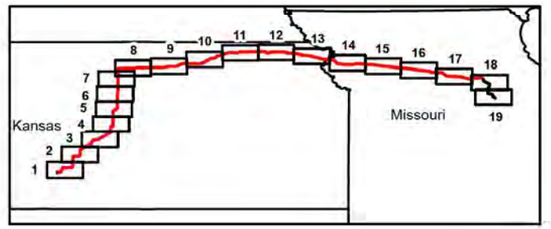
WIND EROSION GROUPS

Map 8 of 19

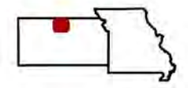
Proposed Grain Belt Express Phase 1 HVDC Line ROW

Wind Erosion Group

- Not Rated
- 2
- 3
- 4
- 4L
- 5
- 6



GCS North American 1983
39.5352°N 98.5101°W



1:175,000

0 1.35 2.7 Miles

0 1.35 2.7 Kilometers

N

Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Wind_Erosion_Groups
Aprx: Soil_Wind_Erosion_Groups

Grain Belt Express
An Invenergy Project

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

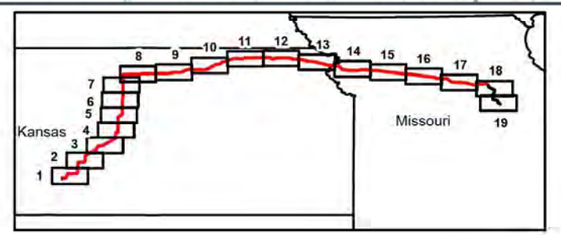
WIND EROSION GROUPS

Map 9 of 19

Proposed Grain Belt Express Phase 1 HVDC Line ROW

Wind Erosion Group

- Not Rated
- 2
- 3
- 4
- 4L
- 5
- 6



GCS North American 1983
39.5677°N 97.8639°W

Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Wind_Erosion_Groups
Aprx: Soil_Wind_Erosion_Groups

1:175,000

0 1.35 2.7 Miles

0 1.35 2.7 Kilometers

N

Grain Belt Express
An Invenergy Project

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

WIND EROSION GROUPS

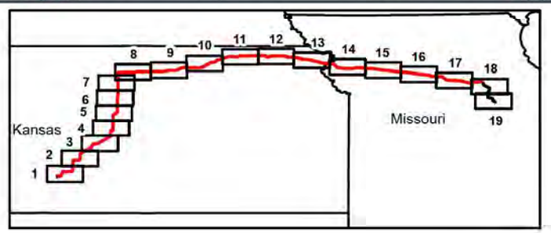
Map 10 of 19

Proposed Grain Belt Express Phase 1 HVDC Line ROW

Wind Erosion Group

- Not Rated
- 2
- 3
- 4
- 4L
- 5
- 6

Grain Belt Express
An Invenergy Project



GCS North American 1983
39.6882°N 97.2156°W

Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Wind_Erosion_Groups
Aprx: Soil_Wind_Erosion_Groups

1:175,000
0 1.35 2.7 Miles
0 1.35 2.7 Kilometers

N

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

WIND EROSION GROUPS

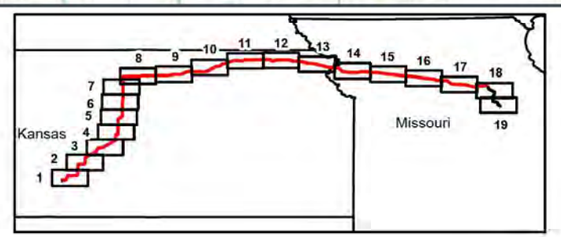
Map 11 of 19

Proposed Grain Belt Express Phase 1 HVDC Line ROW

Wind Erosion Group

- Not Rated
- 3
- 4
- 4L
- 5
- 6

Grain Belt Express
An Invenergy Project



GCS North American 1983
39.8039°N 96.5694°W

Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Wind_Erosion_Groups
Aprx: Soil_Wind_Erosion_Groups

1:175,000

0 1.35 2.7 Miles

0 1.35 2.7 Kilometers

N

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

WIND EROSION GROUPS

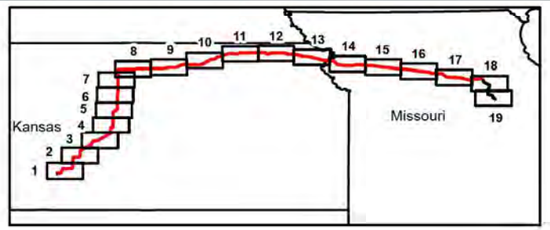
Map 12 of 19

Proposed Grain Belt Express Phase 1
HVDC Line ROW

Wind Erosion Group

- Not Rated
- 4
- 4L
- 6

Grain Belt Express
An Invenergy Project



GCS North American 1983
39.8147°N 95.9252°W

Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Wind_Erosion_Groups
Aprx: Soil_Wind_Erosion_Groups

1:175,000
0 1.35 2.7 Miles
0 1.35 2.7 Kilometers

N

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

WIND EROSION GROUPS

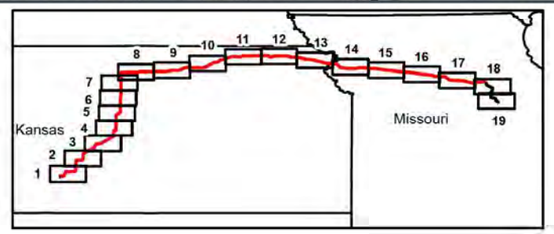
Map 13 of 19

Grain Belt Express
An Invenergy Project

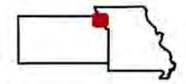
Proposed Grain Belt Express Phase 1
HVDC Line ROW

Wind Erosion Group

- Not Rated
- 2
- 3
- 4
- 4L
- 6



GCS North American 1983
39.7469°N 95.281°W



Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Wind_Erosion_Groups
Aprx: Soil_Wind_Erosion_Groups

1:175,000

0 1.35 2.7 Miles
0 1.35 2.7 Kilometers

N

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

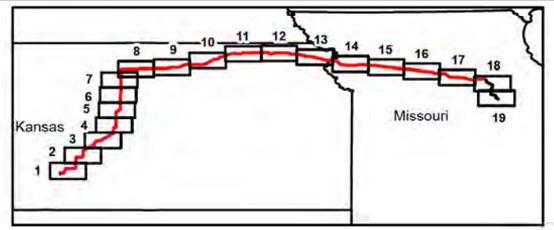
WIND EROSION GROUPS

Map 14 of 19

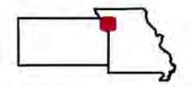
Proposed Grain Belt Express Phase 1 HVDC Line ROW

Wind Erosion Group

- Not Rated
- 2
- 3
- 4
- 4L
- 5
- 6



GCS North American 1983
39.6264°N 94.6368°W



Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Wind_Erosion_Groups
Aprx: Soil_Wind_Erosion_Groups

1:175,000

0 1.35 2.7 Miles

0 1.35 2.7 Kilometers

N

Grain Belt Express
An Invenergy Project

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

WIND EROSION GROUPS

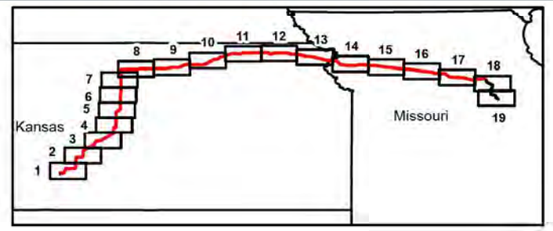
Map 15 of 19

Proposed Grain Belt Express Phase 1
HVDC Line ROW

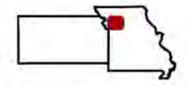
Wind Erosion Group

- Not Rated
- 4
- 5
- 6
- 7

Grain Belt Express
An Invenergy Project



GCS North American 1983
39.5723°N 93.9926°W



Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Wind_Erosion_Groups
Aprx: Soil_Wind_Erosion_Groups

1:175,000

0 1.35 2.7 Miles
0 1.35 2.7 Kilometers

N

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

WIND EROSION GROUPS

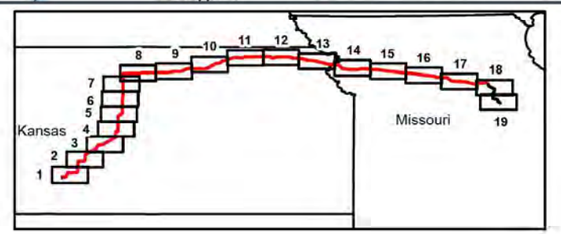
Map 16 of 19

Proposed Grain Belt Express Phase 1
HVDC Line ROW

Wind Erosion Group

- Not Rated
- 4
- 4L
- 5
- 6

Grain Belt Express
An Invenergy Project



GCS North American 1983
39.498°N 93.3484°W

Kansas and Missouri

Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Wind_Erosion_Groups
Aprx: Soil_Wind_Erosion_Groups

1:175,000

0 1.35 2.7 Miles

0 1.35 2.7 Kilometers

N

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

WIND EROSION GROUPS

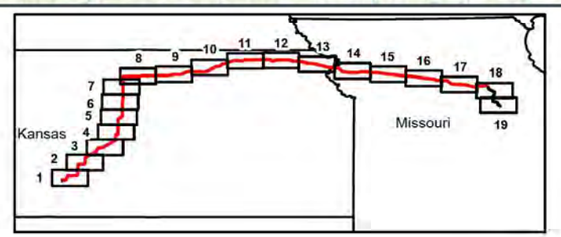
Map 17 of 19

Proposed Grain Belt Express Phase 1
HVDC Line ROW

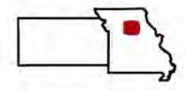
Wind Erosion Group

- Not Rated
- 3
- 4
- 5
- 6
- 7

Grain Belt Express
An Invenergy Project



GCS North American 1983
39.3895°N 92.7062°W



Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Wind_Erosion_Groups
Aprx: Soil_Wind_Erosion_Groups

1:175,000

0 1.35 2.7 Miles

0 1.35 2.7 Kilometers

N

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

WIND EROSION GROUPS

Map 18 of 19

Proposed Grain Belt Express Phase 1 HVDC Line ROW

Proposed Grain Belt Express Phase 1 Tiger Connector ROW

Proposed Grain Belt Express Phase 1 Converter Station

Wind Erosion Group

Not Rated

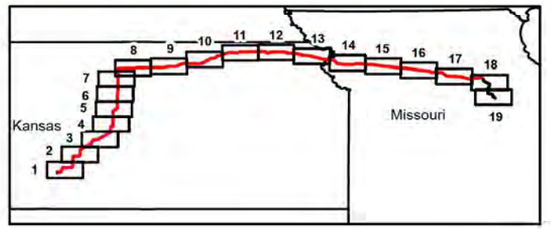
3

4

4L

5

6



GCS North American 1983
39.2746°N 92.068°W

1:175,000

0 1.35 2.7 Miles

0 1.35 2.7 Kilometers

N

Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Wind_Erosion_Groups
Aprx: Soil_Wind_Erosion_Groups

Grain Belt Express
An Invenergy Project

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

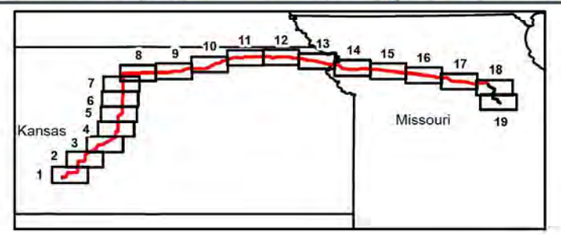
WIND EROSION GROUPS

Map 19 of 19

Proposed Grain Belt Express Phase 1
Tiger Connector ROW
Existing McCredie Substation
Existing Burns Substation

Wind Erosion Group

Not Rated
4
4L
5
6
7



GCS North American 1983
39.0163°N 91.9977°W

Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Wind_Erosion_Groups
Aprx: Soil_Wind_Erosion_Groups

1:175,000
0 1.35 2.7 Miles
0 1.35 2.7 Kilometers

N

Grain Belt Express
An Invenergy Project

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

SOIL ERODIBILITY FACTOR

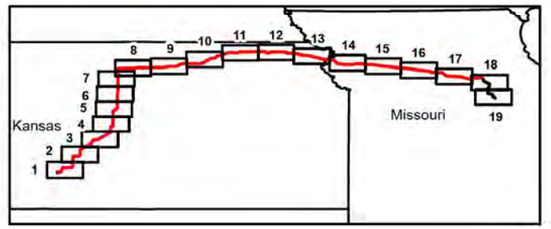
Map 1 of 19

Grain Belt Express
An Invenergy Project

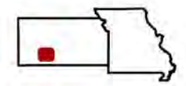
Proposed Grain Belt Express Phase 1 Ford County Interconnect ROW
Proposed Grain Belt Express Phase 1 HVDC Line ROW
Proposed Grain Belt Express Phase 1 Converter Station
Existing Saddle Substation

Soil Erodibility Factor (K Factor)

- 0.00 - 0.10
- 0.10 - 0.25
- 0.25 - 0.33
- 0.33 - 0.40
- 0.40 - 0.47
- 0.47 - 0.63



GCS North American 1983
37.7016°N 99.7416°W



Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Erodibility_Factor_K
Apnx: Soil_Erodibility_Factor

1:175,000
0 1.35 2.7 Miles
0 1.35 2.7 Kilometers

N

PAWNEE
EDWARDS

HODGEMAN
FORD

EDWARDS

Dundee

Kinsley

Offerle

Spearville

Jetmore

Hanston

Sanford

US Highway 183

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

SOIL ERODIBILITY FACTOR

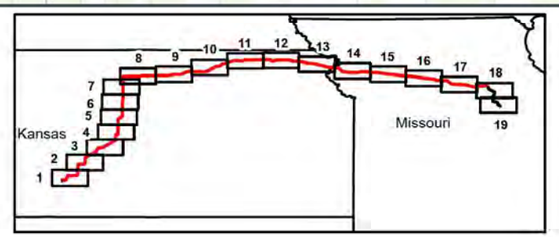
Map 2 of 19

Grain Belt Express
An Invenergy Project

Proposed Grain Belt Express Phase 1 HVDC Line ROW

Soil Erodibility Factor (K Factor)

- 0.00 - 0.10
- 0.25 - 0.33
- 0.33 - 0.40
- 0.40 - 0.47
- 0.47 - 0.63



GCS North American 1983
37.9765°N 99.4706°W

Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Erodibility_Factor_K
Aprx: Soil_Erodibility_Factor

1:175,000

0 1.35 2.7 Miles

0 1.35 2.7 Kilometers

N

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

SOIL ERODIBILITY FACTOR

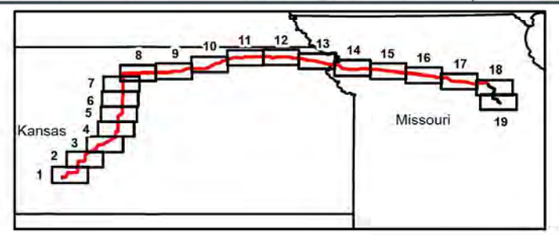
Map 3 of 19

Proposed Grain Belt Express Phase 1
HVDC Line ROW

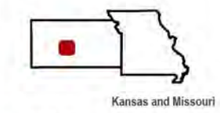
Soil Erodibility Factor (K Factor)

- 0.00 - 0.10
- 0.10 - 0.25
- 0.25 - 0.33
- 0.33 - 0.40
- 0.40 - 0.47
- 0.47 - 0.63

Grain Belt Express
An Invenergy Project



GCS North American 1983
38.2513°N 99.1096°W



Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Erodibility_Factor_K
Aprx: Soil_Erodibility_Factor

1:175,000

0 1.35 2.7 Miles
0 1.35 2.7 Kilometers

N

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

SOIL ERODIBILITY FACTOR

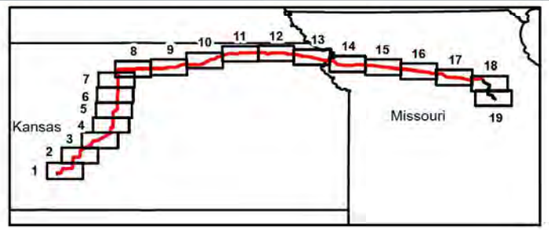
Map 4 of 19

Proposed Grain Belt Express Phase 1 HVDC Line ROW

Soil Erodibility Factor (K Factor)

- 0.00 - 0.10
- 0.25 - 0.33
- 0.33 - 0.40
- 0.40 - 0.47
- 0.47 - 0.63

Grain Belt Express
An Invenergy Project



GCS North American 1983
38.5252°N 98.908°W

Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Erodibility_Factor_K
Aprx: Soil_Erodibility_Factor

1:175,000

0 1.35 2.7 Miles

Kilometers 0 1.35 2.7

N

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

SOIL ERODIBILITY FACTOR

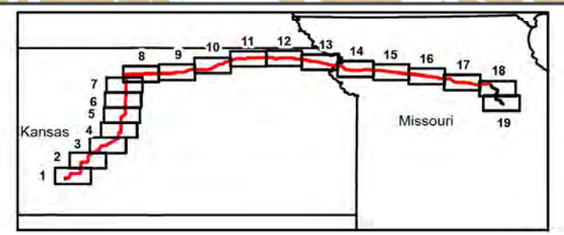
Map 5 of 19

Grain Belt Express
An Invenergy Project

Proposed Grain Belt Express Phase 1 HVDC Line ROW

Soil Erodibility Factor (K Factor)

- 0.00 - 0.10
- 0.10 - 0.25
- 0.25 - 0.33
- 0.33 - 0.40
- 0.40 - 0.47
- 0.47 - 0.63



GCS North American 1983
38.797°N 98.8579°W

Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Erodibility_Factor_K
Aprx: Soil_Erodibility_Factor

1:175,000

0 1.35 2.7 Miles

0 1.35 2.7 Kilometers

N

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

SOIL ERODIBILITY FACTOR

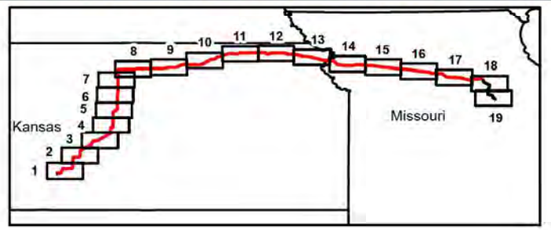
Map 6 of 19

Proposed Grain Belt Express Phase 1
HVDC Line ROW

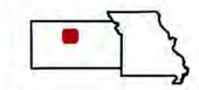
Soil Erodibility Factor (K Factor)

- 0.00 - 0.10
- 0.10 - 0.25
- 0.25 - 0.33
- 0.33 - 0.40
- 0.40 - 0.47
- 0.47 - 0.63

Grain Belt Express
An Invenergy Project



GCS North American 1983
39.0707°N 98.8374°W



Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Erodibility_Factor_K
Aprx: Soil_Erodibility_Factor

1:175,000

0 1.35 2.7 Miles

0 1.35 2.7 Kilometers

N

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

SOIL ERODIBILITY FACTOR

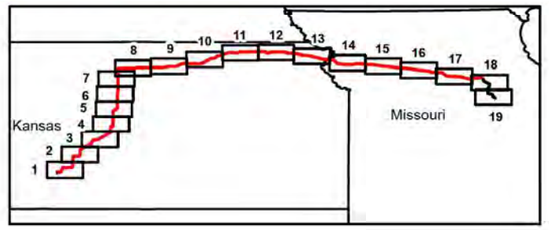
Map 7 of 19

Grain Belt Express
An Invenergy Project

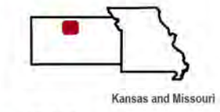
Proposed Grain Belt Express Phase 1 HVDC Line ROW

Soil Erodibility Factor (K Factor)

- 0.00 - 0.10
- 0.10 - 0.25
- 0.25 - 0.33
- 0.33 - 0.40
- 0.40 - 0.47
- 0.47 - 0.63



GCS North American 1983
39.3414°N 98.8091°W



Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Erodibility_Factor_K
Aprx: Soil_Erodibility_Factor

1:175,000

0 1.35 2.7 Miles

0 1.35 2.7 Kilometers

N

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

SOIL ERODIBILITY FACTOR

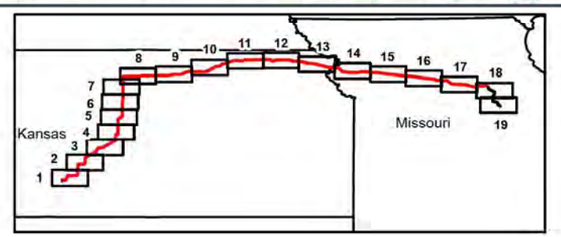
Map 8 of 19

Proposed Grain Belt Express Phase 1 HVDC Line ROW

Soil Erodibility Factor (K Factor)

- 0.00 - 0.10
- 0.10 - 0.25
- 0.25 - 0.33
- 0.33 - 0.40
- 0.40 - 0.47
- 0.47 - 0.63

Grain Belt Express
An Invenergy Project



GCS North American 1983
39.5352°N 98.5101°W

Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Erodibility_Factor_K
Aprx: Soil_Erodibility_Factor

1:175,000

0 1.35 2.7 Miles

0 1.35 2.7 Kilometers

N

GRAIN BELT EXPRESS
TRANSMISSION LINE PROJECT

SOIL ERODIBILITY FACTOR

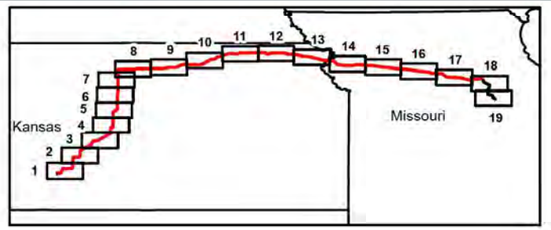
Map 9 of 19

Grain Belt Express
An Invenergy Project

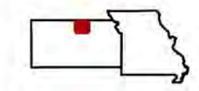
Proposed Grain Belt Express Phase 1
HVDC Line ROW

Soil Erodibility Factor (K Factor)

- 0.00 - 0.10
- 0.10 - 0.25
- 0.25 - 0.33
- 0.33 - 0.40
- 0.40 - 0.47
- 0.47 - 0.63



GCS North American 1983
39.5677°N 97.8639°W



Base Map: Esri ArcGIS Online, accessed November 2024
Updated: 11/25/2024
Project No. 60694559
Layout: Soil_Erodibility_Factor_K
Aprx: Soil_Erodibility_Factor

1:175,000

0 1.35 2.7 Miles

0 1.35 2.7 Kilometers

N