

# Appendix F

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Energy Calculations

# Central Coast Blue - Well Construction

Last Updated: March 30, 2020

Compression-Ignition Engine Brake-Specific Fuel Consumption (BSFC) Factors [1]:

HP: 0 to 100	0.0588	HP: Greater than 100	0.0529
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*Values above are expressed in gallons per horsepower-hour/BSFC.*

## CONSTRUCTION EQUIPMENT

Construction Equipment	#	Hours per		Load		Construction Phase	Fuel Used (gallons)
		Day	Horsepower	Factor			
Tractors/Loaders/Backhoes	1	8	97	0.37		Site Preparation	84.36
Air Compressors	1	8	78	0.48		Monitoring Well Installation	616.04
Bore/Drill Rigs	1	8	221	0.50		Monitoring Well Installation	1,635.46
Forklifts	1	6	89	0.20		Monitoring Well Installation	219.66
Generator Sets	2	8	84	0.74		Monitoring Well Installation	2,045.56
Tractors/Loaders/Backhoes	1	6	97	0.37		Monitoring Well Installation	442.90
Excavator	1	8	158	0.73		Outfall Connection	243.87
Tractors/Loaders/Backhoes	1	8	97	0.37		Outfall Connection	84.36
Air Compressors	1	24	78	0.48		Critical Drilling	1,108.87
Bore/Drill Rigs	1	24	221	0.50		Critical Drilling	2,943.82
Forklifts	1	6	89	0.20		Critical Drilling	131.80
Generator Sets	2	24	84	0.74		Critical Drilling	3,682.01
Tractors/Loaders/Backhoes	1	6	97	0.37		Critical Drilling	265.74
Air Compressors	1	8	78	0.48		Groundwater Well Installation	1,056.06
Bore/Drill Rigs	1	8	221	0.50		Groundwater Well Installation	2,803.64
Forklifts	1	6	89	0.20		Groundwater Well Installation	376.56
Generator Sets	2	8	84	0.74		Groundwater Well Installation	3,506.67
Tractors/Loaders/Backhoes	1	8	97	0.37		Groundwater Well Installation	1,012.34
Forklifts	1	6	89	0.20		Site Restoration	87.86
Generator Sets	2	8	84	0.74		Site Restoration	818.22
Tractors/Loaders/Backhoes	1	8	97	0.37		Site Restoration	236.21
<b>Total Fuel Used</b>							<b>23,402.02</b>
							(Gallons)

### Construction Phase      Days of Operation

Site Preparation	5
Monitoring Well Installation	35
Outfall Connection	5
Critical Drilling	21
Groundwater Well Installation	60
Site Restoration	14
<b>Total Days</b>	<b>140</b>

## WORKER TRIPS

Constuction Phase	MPG [2]	Trips	Trip Length (miles)	Fuel Used (gallons)
Site Preparation	24.0	20	13.0	54.17
Monitoring Well Installation	24.0	20	13.0	379.17
Outfall Connection	24.0	20	13.0	54.17
Critical Drilling	24.0	20	13.0	227.50
Groundwater Well Installation	24.0	20	13.0	650.00
Site Restoration	24.0	20	13.0	151.67
<b>Total</b>				<b>1,516.67</b>

**HAULING AND VENDOR TRIPS**

Trip Class	MPG [2]	Trips	Trip Length (miles)	Fuel Used (gallons)
<b>VENDOR TRIPS</b>				
Site Preparation	7.4	2	5.0	6.76
Monitoring Well Installation	7.4	2	300.0	2837.84
Outfall Connection	7.4	2	5.0	6.76
Critical Drilling	7.4	2	300.0	1702.70
Groundwater Well Installation	7.4	2	5.0	81.08
Site Restoration	7.4	2	5.0	18.92
<b>Total</b>				<b>4,654.05</b>
<b>HAULING TRIPS</b>				
Critical Drilling	7.4	10	20.0	1621.62
<b>Total</b>				<b>1,621.62</b>

	One Well	Seven Wells
Total Gasoline Consumption (gallons)	1,516.67	10,616.67
Total Diesel Consumption (gallons)	29,677.70	207,743.90

**Sources:**

[1] United States Environmental Protection Agency. 2018. *Exhaust and Crankcase Emission Factors for Nonroad Compression-Ignition Engines in MOVES2014b*. July 2018. Available at: <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100UXEN.pdf>.

[2] United States Department of Transportation, Bureau of Transportation Statistics. 2018. *National Transportation Statistics 2018*. Available at: <https://www.bts.gov/sites/bts.dot.gov/files/docs/browse-statistical-products-and-data/national-transportation-statistics/223001/ntsntire2018q4.pdf>.

# Central Coast Blue - Water Distribution Pipeline Construction

Last Updated: March 30, 2020

Compression-Ignition Engine Brake-Specific Fuel Consumption (BSFC) Factors [1]:

HP: 0 to 100	0.0588	HP: Greater than 100	0.0529
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*Values above are expressed in gallons per horsepower-hour/BSFC.*

CONSTRUCTION EQUIPMENT						
Construction Equipment	#	Hours per Day	Horsepower	Load Factor	Construction Phase	Fuel Used (gallons)
Concrete/Industrial Saws	1	8	81	0.73	Pavement Cutting	366.93
Tractors/Loaders/Backhoes	2	8	97	0.37	Pavement Cutting	445.43
Signal Boards	1	8	6	0.82	Pavement Cutting	30.53
Excavator	1	6	158	0.38	Trenching	1,131.09
Tractors/Loaders/Backhoes	1	8	97	0.37	Trenching	1,002.22
Signal Boards	1	8	6	0.82	Trenching	137.39
Air Compressor	1	8	78	0.48	Installation	697.00
Bore/Drill Rigs	1	8	700	0.50	Installation	5,861.01
Cement and Mortar Mixers	1	8	9	0.56	Installation	93.83
Excavators	1	8	158	0.38	Installation	1,005.41
Forklifts	1	8	89	0.20	Installation	331.37
Generator Set	1	8	84	0.74	Installation	1,157.20
Plate Compactor	1	8	8	0.43	Installation	64.04
Pumps	1	8	84	0.74	Installation	1,157.20
Rubber Tired Loader	1	8	203	0.36	Installation	1,223.78
Signal Boards	1	8	6	0.82	Installation	91.59
Welders	1	8	46	0.45	Installation	385.36
Pavers	1	8	130	0.42	Paving	457.16
Rollers	1	8	80	0.38	Paving	282.97
Off-Highway Truck	1	8	402	0.38	Paving	1,279.04
Signal Boards	1	8	6	0.82	Paving	45.80
<b>Total Fuel Used</b>						<b>17,246.36</b>
						<b>(Gallons)</b>

Construction Phase	Days of Operation
Grubbing/Land Clearing (Pavement Cutting)	13.2
Grading/Excavation (Trenching) Draginage/Utilities/Sub-Grade (Installation)	59.4
Paving	39.6
<b>Total Days</b>	<b>19.8</b>
	<b>132</b>

### WORKER TRIPS

Constuction Phase	MPG [2]	Trips	Trip Length (miles)	Fuel Used (gallons)
Pavement Cutting	24.0	20	13.0	143.00
Trenching	24.0	20	13.0	643.50
Installation	24.0	20	13.0	429.00
Paving	24.0	20	13.0	214.50
<b>Total</b>				<b>1,430.00</b>

### HAULING AND VENDOR TRIPS

Trip Class	MPG [2]	Trips	Trip Length (miles)	Fuel Used (gallons)
<b>HAULING TRIPS</b>				
Pavement Cutting	7.4	53	20.0	142.70
Trenching	7.4	1901	20.0	5137.30
Installation	7.4	1188	20.0	3210.81
Paving	7.4	119	20.0	321.08
<b>Total</b>				<b>5,137.30</b>

### WATER TRUCK TRIPS

Pavement Cutting	7.4	2	20.0	71.35
Trenching	7.4	2	20.0	321.08
Installation	7.4	2	20.0	214.05
Paving	7.4	2	20.0	107.03
<b>Total</b>				<b>713.51</b>

<b>Total Gasoline Consumption (gallons)</b>	<b>1,430.00</b>
<b>Total Diesel Consumption (gallons)</b>	<b>23,097.17</b>

**Sources:**

[1] United States Environmental Protection Agency. 2018. *Exhaust and Crankcase Emission Factors for Nonroad Compression-Ignition Engines in MOVES2014b*. July 2018. Available at: <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100UXEN.pdf>.

[2] United States Department of Transportation, Bureau of Transportation Statistics. 2018. *National Transportation Statistics 2018*. Available at: <https://www.bts.gov/sites/bts.dot.gov/files/docs/browse-statistical-products-and-data/national-transportation-statistics/223001/ntsntire2018q4.pdf>.

# Central Coast Blue - Agricultural Irrigation Pipeline Construction

Last Updated: March 30, 2020

Compression-Ignition Engine Brake-Specific Fuel Consumption (BSFC) Factors [1]:

HP: 0 to 100	0.0588	HP: Greater than 100	0.0529
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*Values above are expressed in gallons per horsepower-hour/BSFC.*

CONSTRUCTION EQUIPMENT						
Construction Equipment	#	Hours per Day	Horsepower	Load Factor	Construction Phase	Fuel Used (gallons)
Concrete/Industrial Saws	1	8	81	0.73	Pavement Cutting	733.86
Tractors/Loaders/Backhoes	2	8	97	0.37	Pavement Cutting	890.86
Signal Boards	1	8	6	0.82	Pavement Cutting	61.06
Excavator	1	6	158	0.38	Trenching	2,262.18
Tractors/Loaders/Backhoes	1	8	97	0.37	Trenching	2,004.44
Signal Boards	1	8	6	0.82	Trenching	274.78
Air Compressor	1	8	78	0.48	Installation	1,394.00
Bore/Drill Rigs	1	8	700	0.50	Installation	11,722.01
Cement and Mortar Mixers	1	8	9	0.56	Installation	187.65
Excavators	1	8	158	0.38	Installation	2,010.83
Forklifts	1	8	89	0.20	Installation	662.75
Generator Set	1	8	84	0.74	Installation	2,314.40
Plate Compactor	1	8	8	0.43	Installation	128.08
Pumps	1	8	84	0.74	Installation	2,314.40
Rubber Tired Loader	1	8	203	0.36	Installation	2,447.56
Signal Boards	1	8	6	0.82	Installation	183.19
Welders	1	8	46	0.45	Installation	770.72
Pavers	1	8	130	0.42	Paving	914.32
Rollers	1	8	80	0.38	Paving	565.94
Off-Highway Truck	1	8	402	0.38	Paving	2,558.08
Signal Boards	1	8	6	0.82	Paving	91.59
<b>Total Fuel Used</b>						<b>34,492.71</b>
						<b>(Gallons)</b>

Construction Phase	Days of Operation
Grubbing/Land Clearing (Pavement Cutting)	26.4
Grading/Excavation (Trenching) Draginage/Utilities/Sub-Grade (Installation)	118.8
Paving	79.2
<b>Total Days</b>	<b>39.6</b>
	<b>264</b>

**WORKER TRIPS**

Constuction Phase	MPG [2]	Trips	Trip Length (miles)	Fuel Used (gallons)
Pavement Cutting	24.0	20	13.0	286.00
Trenching	24.0	20	13.0	1287.00
Installation	24.0	20	13.0	858.00
Paving	24.0	20	13.0	429.00
<b>Total</b>				<b>2,860.00</b>

**HAULING AND VENDOR TRIPS**

Trip Class	MPG [2]	Trips	Trip Length (miles)	Fuel Used (gallons)
<b>HAULING TRIPS</b>				
Pavement Cutting	7.4	132	20.0	356.76
Trenching	7.4	4039	20.0	10916.76
Installation	7.4	1901	20.0	5137.30
Paving	7.4	238	20.0	642.16
<b>Total</b>				<b>10,916.76</b>

**WATER TRUCK TRIPS**

Pavement Cutting	7.4	2	20.0	142.70
Trenching	7.4	2	20.0	642.16
Installation	7.4	2	20.0	428.11
Paving	7.4	2	20.0	214.05
<b>Total</b>				<b>1,427.03</b>

<b>Total Gasoline Consumption (gallons)</b>	<b>2,860.00</b>
<b>Total Diesel Consumption (gallons)</b>	<b>46,836.50</b>

**Sources:**

[1] United States Environmental Protection Agency. 2018. *Exhaust and Crankcase Emission Factors for Nonroad Compression-Ignition Engines in MOVES2014b*. July 2018. Available at: <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100UXEN.pdf>.

[2] United States Department of Transportation, Bureau of Transportation Statistics. 2018. *National Transportation Statistics 2018*. Available at: <https://www.bts.gov/sites/bts.dot.gov/files/docs/browse-statistical-products-and-data/national-transportation-statistics/223001/ntsntire2018q4.pdf>.

# Central Coast Blue - ATF Construction

Last Updated: March 30, 2020

Compression-Ignition Engine Brake-Specific Fuel Consumption (BSFC) Factors [1]:

HP: 0 to 100	0.0588	HP: Greater than 100	0.0529
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Values above are expressed in gallons per horsepower-hour/BSFC.

CONSTRUCTION EQUIPMENT						
Construction Equipment	#	Hours per		Load Factor	Construction Phase	Fuel Used (gallons)
		Day	Horsepower			
Forklifts	1	8	89	0.20	Site Preparation	83.68
Graders	1	8	187	0.41	Site Preparation	324.22
Tractors/Loaders/Backhoes	1	8	97	0.37	Site Preparation	168.72
Graders	1	8	187	0.41	Grading	745.70
Plate Compactors	1	8	8	0.43	Grading	37.20
Rubber Tired Dozer	1	8	247	0.40	Grading	960.93
Scrapers	2	8	367	0.48	Grading	3,426.68
Tractors/Loaders/Backhoes	3	7	97	0.37	Grading	1,018.67
Air Compressors	3	8	78	0.48	Building Construction	12,672.76
Cranes	1	8	231	0.29	Building Construction	6,798.77
Excavators	1	8	158	0.38	Building Construction	6,093.42
Forklifts	2	7	89	0.20	Building Construction	3,514.57
Generators	3	8	84	0.74	Building Construction	21,040.04
Plate Compactors	1	8	8	0.43	Building Construction	388.13
Skid Steer Loaders	1	8	65	0.37	Building Construction	2,713.50
Tractors/Loaders/Backhoes	3	6	97	0.37	Building Construction	9,111.09
Welders	3	8	46	0.45	Building Construction	7,006.58
Air Compressors	1	6	78	0.48	Architectural Coating	132.01
Pavers	1	8	130	0.42	Paving	230.89
Cement/Mortar Mixer	1	8	9	0.56	Paving	23.69
Paving Equipment	1	8	132	0.36	Paving	200.95
Rollers	2	8	80	0.38	Paving	285.83
Tractors/Loaders/Backhoes	1	8	97	0.37	Paving	168.72
<b>Total Fuel Used</b>						<b>77,146.73</b>
						<b>(Gallons)</b>

Construction Phase	Days of Operation
Site Preparation	10
Grading	23
Building Construction	240
Paving	10
Architectural Coating	10
<b>Total Days</b>	<b>293</b>

**WORKER TRIPS**

Constuction Phase	MPG [2]	Trips	Trip Length (miles)	Fuel Used (gallons)
Site Preparation	24.0	20	13.0	108.33
Grading	24.0	20	13.0	249.17
Building Construction	24.0	20	13.0	2600.00
Paving	24.0	20	13.0	108.33
Architectural Coating	24.0	20	13.0	108.33
<b>Total</b>				<b>3,174.17</b>

**HAULING AND VENDOR TRIPS**

Trip Class	MPG [2]	Trips	Trip Length (miles)	Fuel Used (gallons)
<b>HAULING TRIPS</b>				
Grading	7.4	181	20.0	489.19
<b>Total</b>				<b>489.19</b>
<b>VENDOR TRIPS</b>				
Site Preparation	7.4	2	5	13.51
Grading	7.4	2	5.0	31.08
Building Construction	7.4	6	5.0	972.97
<b>Total</b>				<b>1,017.57</b>

<b>Total Gasoline Consumption (gallons)</b>	<b>3,174.17</b>
<b>Total Diesel Consumption (gallons)</b>	<b>78,653.49</b>

**Sources:**

[1] United States Environmental Protection Agency. 2018. *Exhaust and Crankcase Emission Factors for Nonroad Compression-Ignition Engines in MOVES2014b* . July 2018. Available at: <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockkey=P100UXEN.pdf>.

[2] United States Department of Transportation, Bureau of Transportation Statistics. 2018. *National Transportation Statistics 2018* . Available at: <https://www.bts.gov/sites/bts.dot.gov/files/docs/browse-statistical-products-and-data/national-transportation-statistics/223001/ntsntire2018q4.pdf>.

# Central Coast Blue - Operation

Last Updated: March 30, 2020

**Populate one of the following tables (Leave the other blank):**

<b>Annual VMT</b>	<b>OR</b>	<b>Daily Vehicle Trips</b>
Annual VMT: 140,977		Daily Vehicle Trips: Average Trip Distance:

Fleet Class	Fleet Mix	Fuel Economy (MPG)	
Light Duty Auto (LDA)	0.491350	Passenger Vehicles	24.0
Light Duty Truck 1 (LDT1)	0.491350	Light-Med Duty Trucks	17.4
Light Duty Truck 2 (LDT2)	0.000000	Heavy Trucks/Other	7.4
Medium Duty Vehicle (MDV)	0.017300	Motorcycles	43.9
Light Heavy Duty 1 (LHD1)	0.000000		
Light Heavy Duty 2 (LHD2)	0.000000		
Medium Heavy Duty (MHD)	0.000000		
Heavy Heavy Duty (HHD)	0.000000		
Other Bus (OBUS)	0.000000		
Urban Bus (UBUS)	0.000000		
School Bus (SBUS)	0.000000		
Motorhome (MH)	0.000000		
Motorcycle (MCY)	0.000000		

### Fleet Mix

Vehicle Type	Percent	Fuel Type	Annual VMT:		Fuel Consumption
			VMT	Vehicle Trips: VMT	(Gallons)
Passenger Vehicles	49.14%	<i>Gasoline</i>	69269	0.00	2886.21
Light-Medium Duty Trucks	50.87%	<i>Gasoline</i>	71708	0.00	4121.15
Heavy Trucks/Other	0.00%	<i>Diesel</i>	0	0.00	0.00
Motorcycle	0.00%	<i>Gasoline</i>	0	0.00	0.00

<b>Total Gasoline Consumption (gallons)</b>	<b>7007.36</b>
<b>Total Diesel Consumption (gallons)</b>	<b>0.00</b>