ALTERNATIVES TECHNICAL DETAIL

June 2016

TRIP GENERATION

TABLE 1
SUMMARY OF PROJECT ALTERNATIVE LAND USE PLANS

	Project	Alternative A	Alternative B	Alternative C
Residential Units (Dwelling Units)				
Single-Family	363	344	551	249
Multi-Family	0	15	15	105
Townhomes	572	257	0	0
Total Residential	935	616	566	354
Commercial (Square Feet)				
Total Shopping Center	82,000	36,000	0	0

Source: Fehr & Peers, 2016.

TABLE 2
OAK KNOLL AUTOMOBILE TRIP GENERATION ESTIMATES FOR ALTERNATIVE A

Land Use	ITE Code	Units[a]	AM Peak Hour			PM Peak Hour			Daily Total
			In	Out	Total	In	Out	Total	
Single-Family Homes	210[b]	344 DU	65	193	258	217	127	344	3,280
Townhomes	230[c]	257 DU	19	94	113	90	44	134	1,490
Apartment	220[d]	15 DU	2	6	8	6	3	9	100
Subtotal Automobile Trips Before Mode Split Adjustment – Residential Uses			86	293	379	313	174	487	4,870
Mode Split Adjustment – Residential Uses[e]			*-3*	*-9*	*-12*	*-10*	*-5*	*-15*	*-150*
Subtotal Automobile Trips After Mode Split Adjustment – Residential Uses			*83*	*284*	*367*	*303*	*169*	*472*	*4,720*
Shopping Center	820[f]	36 KSF	52	32	84	145	157	302	3,500
Subtotal Automobile Trips Before Mode Split Adjustment – Retail Uses			*52*	*32*	*84*	*145*	*157*	*302*	*3,500*
Mode Split Adjustment – Retail Uses[e]			*-2*	*-1*	*-3*	*-4*	*-5*	*-9*	*-110*
Subtotal Automobile Trips After Mode Split Adjustment – Retail Uses			*50*	*31*	*81*	*141*	*152*	*293*	*3,390*
Subtotal Automobile Trips – Residential and Retail			*133*	*315*	*448*	*444*	*321*	*765*	*8,110*
ITE Internalization Trip Capture[g]			*-7*	*-7*	*-14*	*-58*	*-58*	*-116*	*-730*
Total Automobile Trips			***126***	***308***	***434***	***386***	***263***	***649***	***7,380***

TABLE 2

OAK KNOLL AUTOMOBILE TRIP GENERATION ESTIMATES FOR ALTERNATIVE A

Land Use	ITE Code	Units[a]	AM Peak Hour			PM Peak Hour			Daily Total
			In	Out	Total	In	Out	Total	

a. DU = dwelling unit. KSF = 1,000 square feet
b. ITE Trip Generation (9th Edition) land use category 210 - Single-Family Detached Housing:
AM: (T) = 0.75 (X); Enter = 25%, Exit = 75%
PM: (T) = 1.00 (X); Enter = 63%, Exit = 37%
Daily: (T) = 9.52 (X)
Where X = dwelling unit, T = number of automobile trips
c. ITE Trip Generation (9th Edition) land use category 230 - Residential Condominium/Townhouse:
AM: (T) = 0.44 (X); Enter = 17%, Exit = 83%
PM: (T) = 0.52 (X); Enter = 67%, Exit = 33%
Daily: (T) = 5.81 (X)
Where X = dwelling unit, T = number of automobile trips
d. ITE Trip Generation (9th Edition) land use category 220 - Apartment:
AM: (T) = 0.51 (X); Enter = 20%, Exit = 80%
PM: (T) = 0.62 (X); Enter = 65%, Exit = 35%
Daily: (T) = 6.65 (X)
Where X = dwelling unit, T = number of automobile trips
e. Reduction of 3.1% assumed. Based on *City of Oakland Transportation Impact Study Guidelines* for a project site in a dense suburban environment more than a mile from a BART/Amtrak station.
f. ITE Trip Generation (9th Edition) land use category 820 - Shopping Center:
AM: Ln(T) = 0.61 Ln(X) + 2.24; Enter = 62%, Exit = 38%
PM: Ln(T) = 0.67 Ln(X) + 3.31; Enter = 48%, Exit = 52%
Daily: Ln(T) = 0.65 Ln(X) + 5.83
Where X = 1,000 feet of gross leasable area, T = number of automobile trips
g. Trip internalization factors based on ITE *Trip Generation Handbook* Internal Trip capture methodology: 3% factor applied during the AM peak hour, 16% factor applied during the PM peak hour. Methodology does not assess internalization for daily trips, thus 8% applied for daily trips, which is between 3% and 16%.

Source: *ITE Trip Generation, 9th Edition;* Fehr & Peers, 2016.

TABLE 3

OAK KNOLL AUTOMOBILE TRIP GENERATION ESTIMATES FOR ALTERNATIVE B

Land Use	ITE Code	Units[a]	AM Peak Hour			PM Peak Hour			Daily Total
			In	Out	Total	In	Out	Total	
Single-Family Homes	210[b]	551 DU	103	310	413	347	204	551	5,250
Apartment	220[c]	15 DU	2	6	8	6	3	9	100
Subtotal Automobile Trips Before Mode Split Adjustment – Residential Uses			*105*	*316*	*421*	*353*	*207*	*560*	*5,350*
Mode Split Adjustment – Residential Uses[d]			*-3*	*-10*	*-13*	*-11*	*-6*	*-17*	*-170*
Total Automobile Trips			**102**	**306**	**408**	**342**	**201**	**543**	**5,180**

a. DU = dwelling unit. KSF = 1,000 square feet
b. ITE Trip Generation (9th Edition) land use category 210 - Single-Family Detached Housing:
AM: (T) = 0.75 (X); Enter = 25%, Exit = 75%
PM: (T) = 1.00 (X); Enter = 63%, Exit = 37%
Daily: (T) = 9.52 (X)
Where X = dwelling unit, T = number of automobile trips
c. ITE Trip Generation (9th Edition) land use category 220 - Apartment:
AM: (T) = 0.51 (X); Enter = 20%, Exit = 80%
PM: (T) = 0.62 (X); Enter = 65%, Exit = 35%
Daily: (T) = 6.65 (X)
Where X = dwelling unit, T = number of automobile trips
d. Reduction of 3.1% assumed. Based on *City of Oakland Transportation Impact Study Guidelines* for a project site in a dense suburban environment more than a mile from a BART/Amtrak station.

Source: *ITE Trip Generation, 9th Edition;* Fehr & Peers, 2016.

TABLE 4

OAK KNOLL AUTOMOBILE TRIP GENERATION ESTIMATES FOR ALTERNATIVE C

Land Use	ITE Code	Units[a]	AM Peak Hour			PM Peak Hour			Daily Total
			In	Out	Total	In	Out	Total	
Single-Family Homes	210[b]	249 DU	47	140	187	157	92	249	2,370
Apartment	220[c]	105 DU	11	43	54	42	23	65	700
Subtotal Automobile Trips Before Mode Split Adjustment – Residential Uses			*58*	*183*	*241*	*199*	*115*	*314*	*3,070*
Mode Split Adjustment – Residential Uses[d]			*-2*	*-5*	*-7*	*-6*	*-4*	*-10*	*-100*
Total Automobile Trips			**56**	**178**	**234**	**193**	**111**	**304**	**2,970**

a. DU = dwelling unit. KSF = 1,000 square feet
b. ITE Trip Generation (9th Edition) land use category 210 - Single-Family Detached Housing:
AM: (T) = 0.75 (X); Enter = 25%, Exit = 75%
PM: (T) = 1.00 (X); Enter = 63%, Exit = 37%
Daily: (T) = 9.52 (X)
Where X = dwelling unit, T = number of automobile trips
c. ITE Trip Generation (9th Edition) land use category 220 - Apartment:
AM: (T) = 0.51 (X); Enter = 20%, Exit = 80%
PM: (T) = 0.62 (X); Enter = 65%, Exit = 35%
Daily: (T) = 6.65 (X)
Where X = dwelling unit, T = number of automobile trips
d. Reduction of 3.1% assumed. Based on *City of Oakland Transportation Impact Study Guidelines* for a project site in a dense suburban environment more than a mile from a BART/Amtrak station.

Source: *ITE Trip Generation, 9th Edition;* Fehr & Peers, 2016.

TABLE 5

OAK KNOLL AUTOMOBILE TRIP GENERATION ESTIMATES FOR ALTERNATIVE C

Time Period	Preferred Project Alternative Trip Generation	Alternative A		Alternative B		Alternative C	
		Trip Generation	% Difference	Trip Generation	% Difference	Trip Generation	% Difference
AM Peak Hour	624	434	-30%	408	-35%	234	-63%
PM Peak Hour	965	649	-33%	543	-44%	304	-68%
Daily	11,370	7,380	-35%	5,180	-54%	2,970	-74%

Source: Fehr & Peers, 2016.

TABLE 6

SUMMARY OF SIGNIFICANT IMPACTS THAT WOULD BE REDUCED TO LESS THAN SIGNIFICANT ASSUMING PROJECT ALTERNATIVES

Project Transportation Impacts	Does Alternative A Eliminate Significant Impacts?	Does Alternative B Eliminate Significant Impacts?	Does Alternative C Eliminate Significant Impacts?
TRANS-1 (SU)	No (SU)	No (SU)	**Yes**
TRANS-2 (SU)	**Yes**	**Yes**	**Yes**
TRANS-3 (SU)	No (SU)	No (SU)	No (SU)
TRANS-4 (LTS)	No (LTS)	No (LTS)	No (LTS)
TRANS-5 (SU)	No (SU)	No (SU)	**Yes**
TRANS-6 (SU)	No (SU)	No (SU)	No (SU)
TRANS-7 (SU)	No (SU)	No (SU)	No (SU)
TRANS-8 (SU)	No (SU)	No (SU)	**Yes**
TRANS-9 (SU)	**Yes**	**Yes**	**Yes**
TRANS-10 (SU)	No (SU)	No (SU)	No (SU)
TRANS-11 (LTS)	No (LTS)	No (LTS)	No (LTS)
TRANS-12 (SU)	No (SU)	No (SU)	**Yes**
TRANS-13 (SU)	**Yes**	**Yes**	**Yes**
TRANS-14 (SU)	No (SU)	No (SU)	No (SU)
TRANS-15 (SU)	No (SU)	No (SU)	No (SU)
TRANS-16 (SU)	No (SU)	No (SU)	No (SU)

Notes:

a. Values in parenthesis specify impact significance after mitigation: SU = Significant and Unavoidable, LTS = Less than Significant.

Source: Fehr & Peers, 2016.

Alternative A

Project Construction Criteria Pollutant Emissions

Phase I - On-site Crushing

Source	Average Daily Emissions (lb/day)			
	ROG	NOx	PM_{10} (exhaust)	$PM_{2.5}$ (exhaust)
Tons	16.43	36.10	1.41	1.32
Project	22.08	48.52	1.90	1.77
BAAQMD Thresholds	54	54	82	54
Threshold Exceeded?	No	No	No	No

Source: ESA 2016

Tons to pounds	2000
Total construction days	1488

Phase I - Off-site Hauling

Source	Average Daily Emissions (lb/day)			
	ROG	NOx	PM_{10} (exhaust)	$PM_{2.5}$ (exhaust)
Tons	16.22	34.22	1.30	1.21
Project	21.80	45.99	1.75	1.63
BAAQMD Thresholds	54	54	82	54
Threshold Exceeded?	No	No	No	No

Source: ESA 2016

Tons to pounds	2000
Total construction days	1488

Phase III

Source	Average Daily Emissions (lb/day)			
	ROG	NOx	PM_{10} (exhaust)	$PM_{2.5}$ (exhaust)
Tons	5.35	10.36	0.47	0.44
Project	12.06	23.36	1.06	0.99
BAAQMD Thresholds	54	54	82	54
Threshold Exceeded?	No	No	No	No

Source: ESA 2016

ton to pounds conversion	2000
Total construction days	887

Project Construction Criteria Pollutant Emissions

Total Construction Emissions - On-site Crushing

Source	Average Daily Emissions (lb/day)			
	ROG	NOx	PM_{10} (exhaust)	$PM_{2.5}$ (exhaust)
Tons	21.78	46.46	1.88	1.76
Project	18.34	39.12	1.58	1.48
BAAQMD Thresholds	54	54	82	54
Over/(Under)	(35.66)	(14.88)	(80.42)	(52.52)
Threshold Exceeded?	No	Yes	No	No

Source: ESA 2016

Tons to pounds	2000
Total construction days (no Phase II)	2375

Project Operational Emissions								
Source	Average Daily Emissions (lb/day)				Annual Emissions (tons/yr)			
	ROG	NOx	PM_{10} (exhaust)	$PM_{2.5}$ (exhaust)	ROG	NO_x	PM_{10} (Exhaust)	$PM_{2.5}$ (Exhaust)
Area	28.60	0.38	1.10	1.10	5.22	0.07	0.20	0.20
Energy	0.55	4.66	0.38	0.38	0.10	0.85	0.07	0.07
Mobile	25.10	25.15	0.27	0.22	4.58	4.59	0.05	0.04
Project Total	**54.2**	**30.2**	**1.8**	**1.7**	**9.9**	**5.5**	**0.3**	**0.3**
BAAQMD Thresholds	54	54	82	54	10	10	15	10
Over/(Under)	0.2	(23.8)	(80.2)	(52.3)	(0.1)	(4.5)	(14.7)	(9.7)
Threshold Exceeded?	Yes	No	No	No	No	No	No	No

Source: ESA 2016

Project Operational Emissions w/ TDM								
Source	Average Daily Emissions (lb/day)				Annual Emissions (tons/yr)			
	ROG	NOx	PM_{10} (exhaust)	$PM_{2.5}$ (exhaust)	ROG	NO_x	PM_{10} (Exhaust)	$PM_{2.5}$ (Exhaust)
Area	28.60	0.38	1.10	1.10	5.22	0.07	0.20	0.20
Energy	0.55	4.66	0.38	0.38	0.10	0.85	0.07	0.07
Mobile	22.58	22.63	0.22	0.22	4.12	4.13	0.04	0.04
Project Total	**51.7**	**27.7**	**1.7**	**1.7**	**9.4**	**5.1**	**0.3**	**0.3**
BAAQMD Thresh	54	54	82	54	10	10	15	10
Over/(Under)	(2.3)	(26.3)	(80.3)	(52.3)	(0.6)	(5.0)	(14.7)	(9.7)
Threshold Excee	No	No	No	No	No	No	No	No

Source: ESA 2016

ton to pounds	2000
Days per year	365
Total Residents	2081
Total Employees	119
Service Population	2200

resident + worker population based on EIR Population and Housing Section

Village Center/Commercial Space Multiplier	44%

Project Construction GHG Emissions

Project Construction GHG Emissions (On-Site Crushing)

Phase	$MTCO_2e$
1 (On-Site)	9,628
3	2,513
Total	12,141

SOURCE: ESA, 2016

Project Operational GHG Emissions

Category	$MTCO_2e$
Area	67
Energy	1,520
Mobile	5,427
Waste	30
Water	72
Total	**7,116**

Project Operational GHG Emissions + TDM

Category	$MTCO_2e$
Area	67
Energy	1,520
Mobile	4,885
Waste	30
Water	72
Total	**6,574**

Total Project GHG Emissions (On-Site Crushing)

Source	Annual Emissions ($MTCO_2e$/yr)
Operational Emissions	7,116
Construction	12,141
Annualized Construction	304
Annualized Net Vegetation Emissions	(11)
Operational + Annualized Construction/Vegetation GHG Emissions[1]	7,408
City of Oakland Land Development Operational-Related Mass Emissions Threshold	1,100
Threshold Exceeded?	Yes
Over/(Under)	6,308
Operational-Related Efficiency	3.4
City of Oakland Land Development Operational-Related Efficiency Threshold (per service population)	4.6
Threshold Exceeded?	No
Over/(Under)	(1.2)

[1]Assumed a project lifetime of 40 yearsSource: ESA 2016

Project lifetime (yrs)	40
Service Population	2,200

76%	% of mobile GHGs of operational total (excluding annualized construction + vegetation)	

Alternative B

Project Construction Criteria Pollutant Emissions
On-site Crushing

Total Construction Emissions (On-site Crushing)

Source	Average Daily Emissions (lb/day)			
	ROG	NOx	PM_{10} (exhaust)	$PM_{2.5}$ (exhaust)
Tons	20.91	47.73	1.90	1.78
Project	16.72	38.17	1.52	1.42
BAAQMD Thresholds	54	54	82	54
Over/(Under)	(37.28)	(15.83)	(80.48)	(52.58)
Threshold Exceeded?	No	No	No	No

Source: ESA 2016

Tons to pounds	2000
Total construction days	2501

Project Operational Emissions

Source	Average Daily Emissions (lb/day)				Annual Emissions (tons/yr)			
	ROG	NOx	PM_{10} (exhaust)	$PM_{2.5}$ (exhaust)	ROG	NO_x	PM_{10} (Exhaust)	$PM_{2.5}$ (Exhaust)
Area	30.96	0.38	1.59	1.59	5.65	0.07	0.29	0.29
Energy	0.66	5.48	0.44	0.44	0.12	1.00	0.08	0.08
Mobile	15.51	16.00	0.16	0.16	2.83	2.92	0.03	0.03
Project Total	47.1	21.9	**2.2**	**2.2**	8.6	4.0	0.4	0.4
BAAQMD Thresholds	54	54	82	54	10	10	15	10
Over/(Under)	(6.88)	(32.14)	(79.81)	(51.81)	(1.40)	(6.01)	(14.60)	(9.60)
Threshold Exceeded?	No	No	No	No	No	No	No	No

Source: ESA 2016

ton to pounds conversion	2000
Days per year	365
Total Residents	1619

Project Construction GHG Emissions

Project Construction GHG Emissions (On-Site Crushing)
Total $MTCO_2e$ (all years)
13,688

SOURCE: ESA, 2016

Project Operational GHG Emissions

Category	$MTCO_2e$
Area	85
Energy	1672
Mobile	3,549
Waste	35
Water	63
Total	**5,404**

Total Project GHG Emissions (On-Site Crushing)

Source	Annual Emissions ($MTCO_2e$/yr)
Operational Emissions	5,404
Construction	13,688
Annualized Construction	342
Annualized Net Vegetation Emissions	(11)
Operational + Annualized Construction/Vegetation GHG Emissions[1]	5,735
City of Oakland Land Development Operational-Related Mass Emissions Threshold	1,100
Over/(Under)	**4,635**
Threshold Exceeded?	Yes
Operational-Related Efficiency	3.5
City of Oakland Land Development Operational-Related Efficiency Threshold (per service population)	4.6
Over/(Under)	(1.1)
Threshold Exceeded?	No

[1]Assumed a project lifetime of 40 years

Source: ESA 2016

Project lifetime (yrs)	40
Service Population	1,619

Alternative C

Project Construction Criteria Pollutant Emissions
On-site Crushing

Total Construction Emissions (On-site Crushing)

Source	Average Daily Emissions (lb/day)			
	ROG	NOx	PM_{10} (exhaust)	$PM_{2.5}$ (exhaust)
Tons	17.43	46.38	1.88	1.75
Project	13.94	37.09	1.50	1.40
BAAQMD Thresholds	54	54	82	54
Over/(Under)	(40.06)	(16.91)	(80.50)	(52.60)
Threshold Exceeded?	No	No	No	No

Source: ESA 2016

Tons to pounds	2000
Total construction days	2501

Project Operational Emissions

Source	Average Daily Emissions (lb/day)				Annual Emissions (tons/yr)			
	ROG	NOx	PM_{10} (exhaust)	$PM_{2.5}$ (exhaust)	ROG	NO_x	PM_{10} (Exhaust)	$PM_{2.5}$ (Exhaust)
Area	19.73	0.22	0.77	0.77	3.60	0.04	0.14	0.14
Energy	0.33	2.90	0.22	0.22	0.06	0.53	0.04	0.04
Mobile	10.52	10.85	0.11	0.11	1.92	1.98	0.02	0.02
Project Total	30.6	14.0	1.1	1.1	5.6	2.6	0.2	0.2
BAAQMD Thresholds	54	54	82	54	10	10	15	10
Over/(Under)	(23.42)	(40.03)	(80.90)	(52.90)	(4.42)	(7.45)	(14.80)	(9.80)
Threshold Exceeded?	No	No	No	No	No	No	No	No

Source: ESA 2016

ton to pounds conversion	2000
Days per year	365
Total Residents	1012

Project Construction GHG Emissions

Project Construction GHG Emissions (On-Site Crushing)
Total $MTCO_2e$ (all years)
12,978

SOURCE: ESA, 2016

Project Operational GHG Emissions

Category	$MTCO_2e$
Area	44
Energy	900
Mobile	2,404
Waste	19
Water	40
Total	**3,407**

Total Project GHG Emissions (On-Site Crushing)

Source	Annual Emissions ($MTCO_2e$/yr)
Operational Emissions	3,407
Construction	12,978
Annualized Construction	324
Annualized Net Vegetation Emissions	(11)
Operational + Annualized Construction/Vegetation GHG Emissions[1]	3,720
City of Oakland Land Development Operational-Related Mass Emissions Threshold	1,100
Over/(Under)	2,620
Threshold Exceeded?	Yes
Operational-Related Efficiency	3.7
City of Oakland Land Development Operational-Related Efficiency Threshold (per service population)	4.6
Over/(Under)	(0.9)
Threshold Exceeded?	No

[1]Assumed a project lifetime of 40 years

Source: ESA 2016

Project lifetime (yrs)	40
Service Population	1,012