Utilization of Improved Technologies to Streamline Rail Transit Noise Analyses

Transportation Research Board ADC40

July 22, 2014

Abstract

For more than a decade the FTA CREATE (© HMMH) calculation spreadsheet has been used to calculate rail transit noise emissions for environmental clearance studies. The CREATE spreadsheet calculates a single result, and for a single condition (e.g., Existing, No-Build, Build) at a time. Subsequently, most rail transit noise analyses have been based upon calculations of the CREATE algorithm at only a few representative receptor locations. Thanks to improvements in technology (computing power), and readily available resource data (GIS data), the complex CREATE algorithm may now be applied to every noise-sensitive receptor within a study area with great efficiency and numerous benefits to the project planning process, owner(s), and the public.

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CREATE*

(Chicago Rail Efficiency And Transportation Efficiency)

What: Spreadsheet Calculator for Rail Noise

Purpose: Following FTA Guidance Manual (2006)

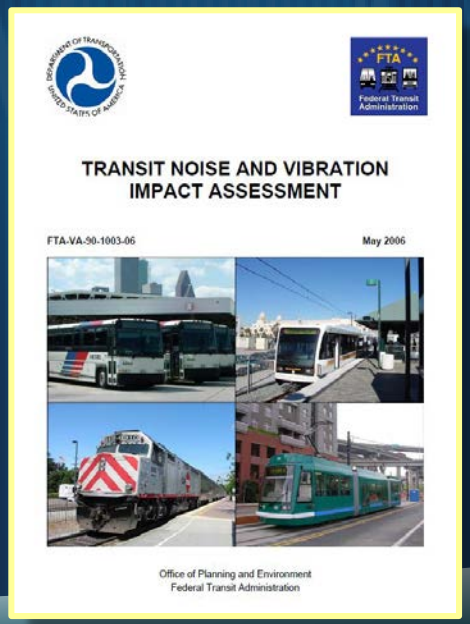
SOURCE REFERENCE LIST
Source
Commuter Electric Locomotive
Commuter Diesel Locomotive
Commuter Rail Cars
RRT/LRT
AGT, Steel Wheel
AGT, Rubber Tire
Monorail
Maglev
Freight Locomotive
Freight Cars
Hopper Cars (empty)
Hopper Cars (full)
Crossover
Automobiles
City Buses
Commuter Buses
Rail Yard or Shop
Layover Tracks
Bus Storage Yard
Bus Op. Facility
Bus Transit Center
Parking Garage
Park & Ride Lot

Noise Model Based on Federal Transit Adminstration General Transit Noise Assessment
Developed for Chicago Create Project
Copyright 2006, HMMH Inc.
Case:

RESULTS		
Noise Source	Ldn (dB)	Leq - daytime (dB)
All Sources	Enter Land Use	
Source 1		
Source 2		
Source 3		
Source 4		
Source 5		
Source 6		
Source 7		
Source 8		

Enter data for up to 8 noise sources below - see reference list for source numbe

NOISE SOURCE PARAMETERS	
Parameter	Source 1
Source Num.	
Distance (source to receiver)	
Daytime Hours (7 AM - 10 PM)	
Nighttime Hours (10 PM - 7 AM)	
Wheel Flats?	
Jointed Track?	
Embedded Track?	
Aerial Structure?	
Barrier Present?	
Intervening Rows of of Buildings	



*Harris, Miller, Miller, Hanson, ©2006

CREATE*

Calculates:

→ L_{dn} or L_{eq} for a Single Receiver

→ From Up to 8 Different Sources

Noise Model Based on Federal Transit Adminstration General Transit Noise Assessment
Developed for Chicago Create Project
Copyright 2006, HMMH Inc.
Case:

RESULTS			
Noise Source	Ldn (dB)	Leq - daytime (dB)	Leq - nighttime (dB)
All Sources	Enter Land Use		
Source 1			
Source 2			
Source 3			
Source 4			
Source 5			
Source 6			
Source 7			
Source 8			

Enter noise receiver land use category below.

LAND USE CATEGORY	
Noise receiver land use category (1, 2 or 3)	

*Harris, Miller, Miller, Hanson, ©2006

CREATE*

Calculates:

→ L_{dn} or L_{eq} for a Single Receiver

→ Based on Source and Path Parameters

Enter data for up to 8 noise sources below - see reference list for source numbers.

NOISE SOURCE PARAMETERS			
Parameter	Source 1	Source 2	Source 3
Source Num.			
Distance (source to receiver)			
Daytime Hours (7 AM - 10 PM)			
Nighttime Hours (10 PM - 7 AM)			
Wheel Flats?			
Jointed Track?			
Embedded Track?			
Aerial Structure?			
Barrier Present?			
Intervening Rows of of Buildings			

*Harris, Miller, Miller, Hanson, ©2006

CREATE*

Calculates:

→ From a Menu of 23 Source Types

SOURCE REFERENCE LIST	
Source	**Number**
Commuter Electric Locomotive	1
Commuter Diesel Locomotive	2
Commuter Rail Cars	3
RRT/LRT	4
AGT, Steel Wheel	5
AGT, Rubber Tire	6
Monorail	7
Maglev	8
Freight Locomotive	9
Freight Cars	10
Hopper Cars (empty)	11
Hopper Cars (full)	12
Crossover	13
Automobiles	14
City Buses	15
Commuter Buses	16
Rail Yard or Shop	17
Layover Tracks	18
Bus Storage Yard	19
Bus Op. Facility	20
Bus Transit Center	21
Parking Garage	22
Park & Ride Lot	23

*Harris, Miller, Miller, Hanson, ©2006

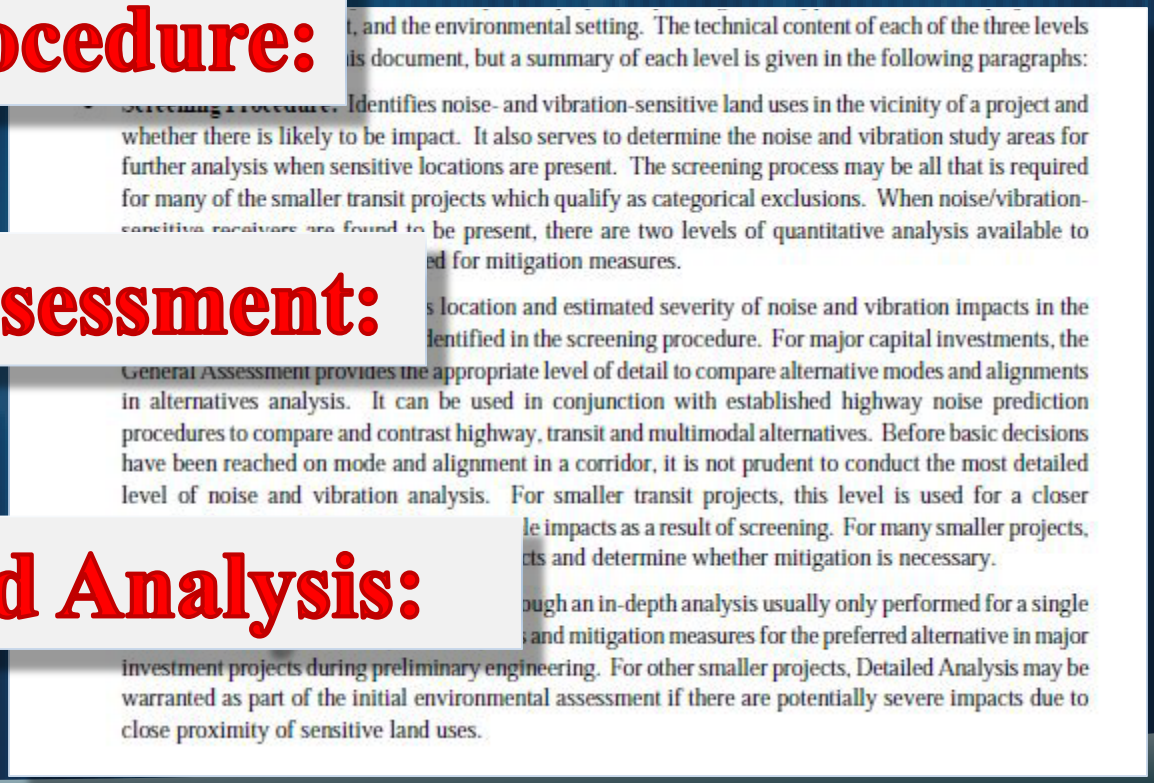
FTA GUIDANCE

Methodology:

Screening Procedure:

General Assessment:

Detailed Analysis:



t, and the environmental setting. The technical content of each of the three levels is document, but a summary of each level is given in the following paragraphs:

Identifies noise- and vibration-sensitive land uses in the vicinity of a project and whether there is likely to be impact. It also serves to determine the noise and vibration study areas for further analysis when sensitive locations are present. The screening process may be all that is required for many of the smaller transit projects which qualify as categorical exclusions. When noise/vibration-sensitive receivers are found to be present, there are two levels of quantitative analysis available to ed for mitigation measures.

s location and estimated severity of noise and vibration impacts in the dentified in the screening procedure. For major capital investments, the General Assessment provides the appropriate level of detail to compare alternative modes and alignments in alternatives analysis. It can be used in conjunction with established highway noise prediction procedures to compare and contrast highway, transit and multimodal alternatives. Before basic decisions have been reached on mode and alignment in a corridor, it is not prudent to conduct the most detailed level of noise and vibration analysis. For smaller transit projects, this level is used for a closer le impacts as a result of screening. For many smaller projects, cts and determine whether mitigation is necessary.

ough an in-depth analysis usually only performed for a single and mitigation measures for the preferred alternative in major investment projects during preliminary engineering. For other smaller projects, Detailed Analysis may be warranted as part of the initial environmental assessment if there are potentially severe impacts due to close proximity of sensitive land uses.

FTA GUIDANCE

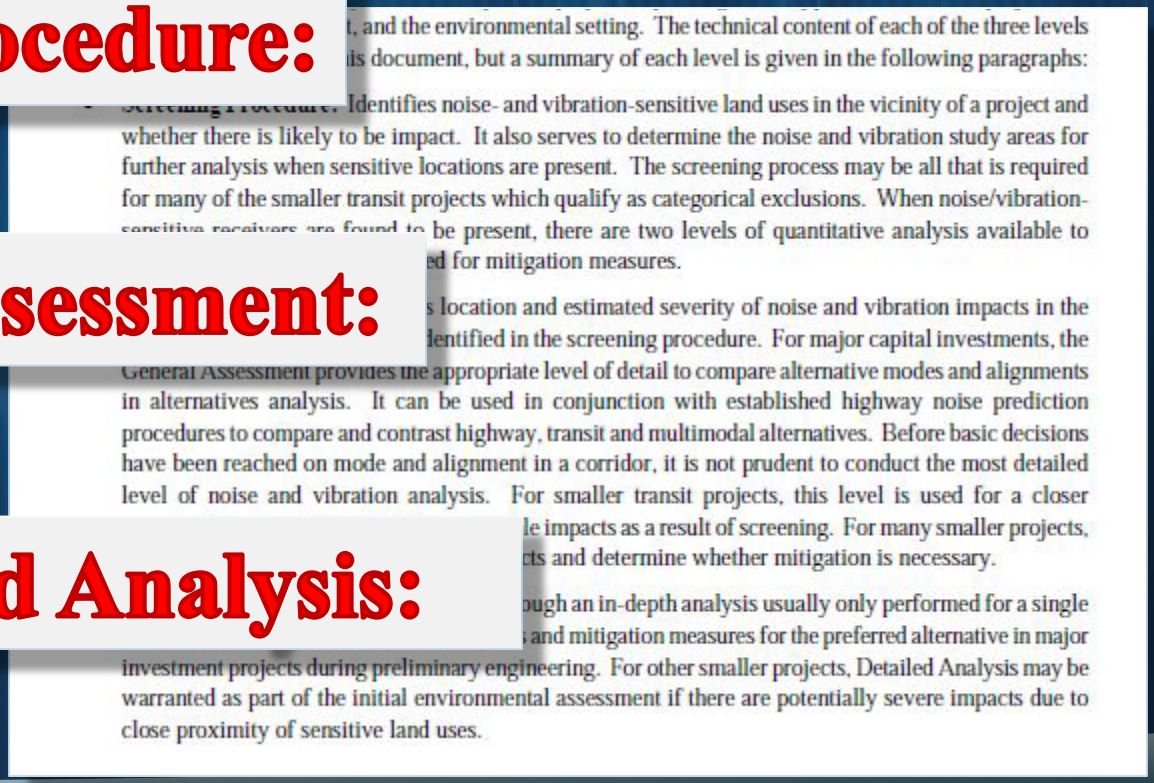
Methodology:

Screening Procedure:

General Assessment:

Define Area of All

Detailed Analysis:



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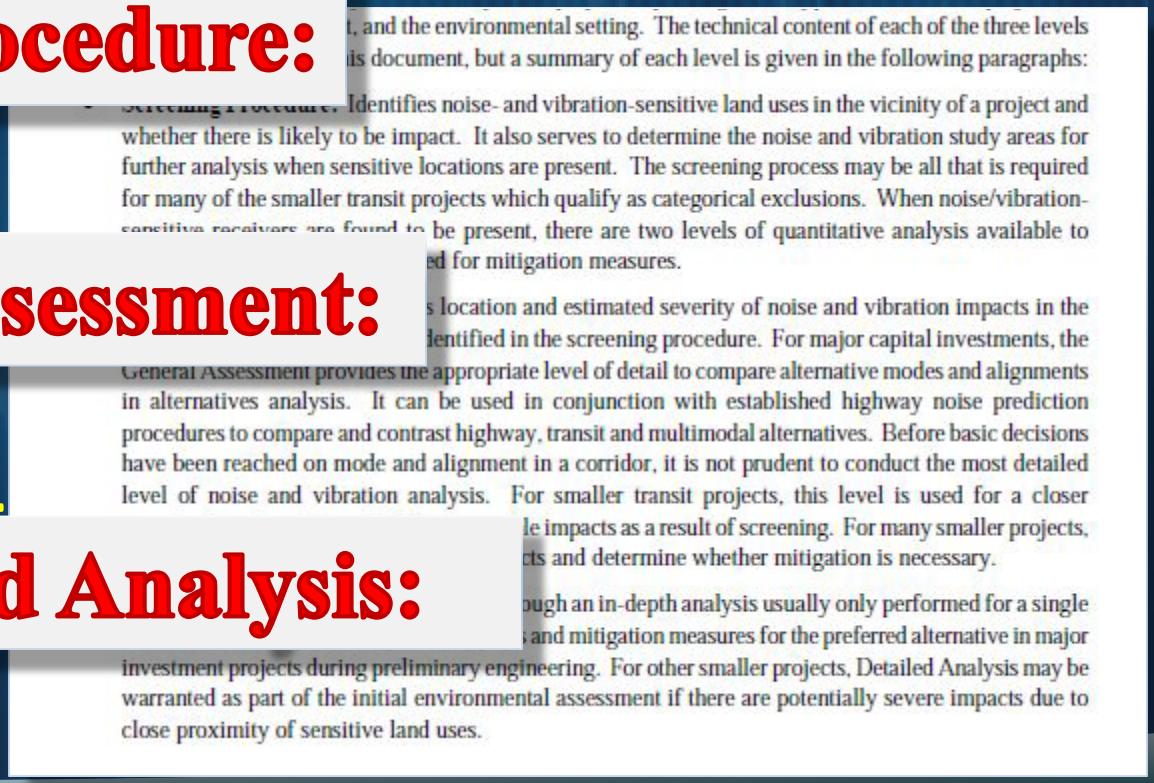

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FTA GUIDANCE

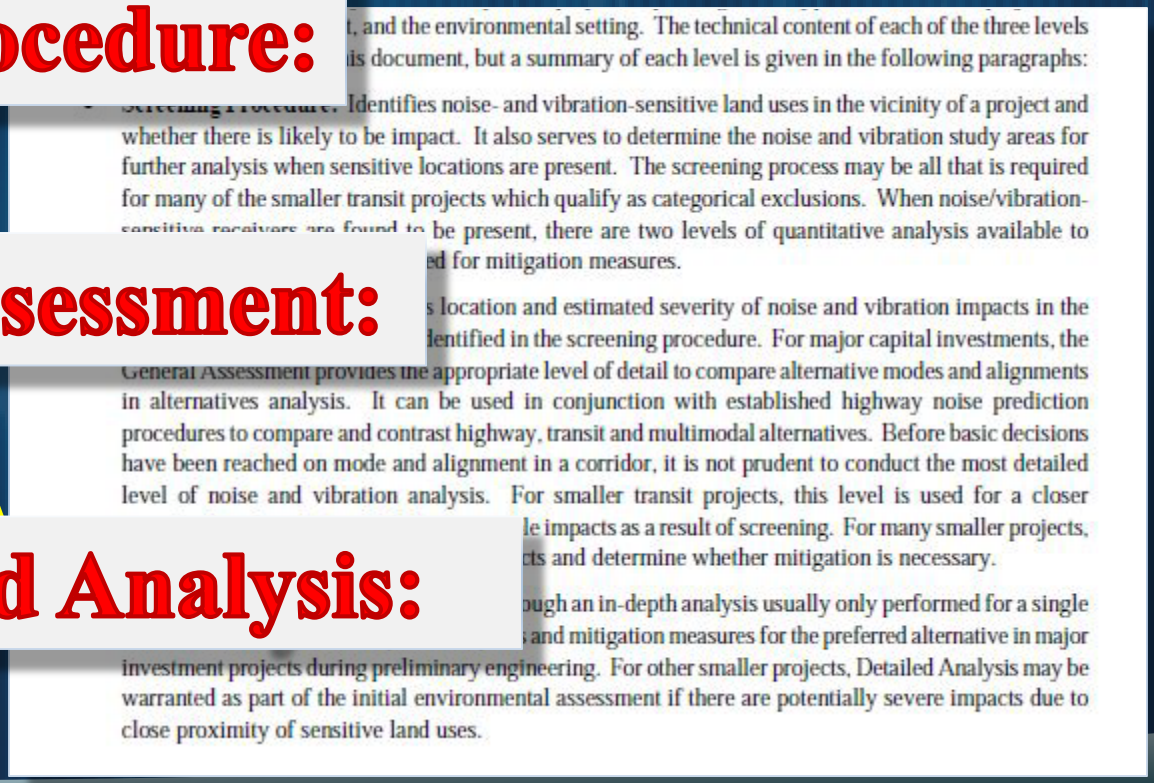
Methodology:

Screening Procedure:

General Assessment:

Detailed Analysis:

*not any more…



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LIMITATIONS

CREATE Algorithm:

- Each Source Calc = 33 Layers / Steps
- Calculate 8 Sources = 422 Columns*

CALCULATIONS								
Term	Sou 1	Sou 2	Sou 3	Sou 4	Sou 5	Sou 6	Sou 7	Sou 8
SELref	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C1 - Coef	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C1 - Denom	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C1 - Day Num	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C1 - Night Num	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C1 - Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C1 - Night	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C2 - Coef	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C2 - Denom	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C2 - Day Num	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C2 - Night Num	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C2 - Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C2 - Night	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C3 - Coef	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C3 - Denom	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C3 - Day Num	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C3 - Night Num	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C3 - Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C3 - Night	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Leq50ft - Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Leq50ft - Night	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ldn50ft	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Dist Coef	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adj. Dist	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adj. Wheel Flats	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adj. Jointed	0	0	0	0	0	0	0	0
Adj. Embed	0	0	0	0	0	0	0	0
Adj. Aerial	0	0	0	0	0	0	0	0
Adj. Shield	0	0	0	0	0	0	0	0
Leq - Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Leq - Night	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ldn	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Need Land Use	1							
Calc Leq	0							

*Excel 2003 Worksheet Limit = 256

LIMITATIONS

CREATE Calculator Returns Single Result

- **One Receptor**
- **One Condition (Existing, No-Build, Build, Alternatives)**

DETAILED ANALYSIS = TOO MUCH WORK

LIMITATIONS

General Assessment

- Distance – Based
- Acoustics Not Always Homogeneous

GENERAL = "FINAL"

because

DETAILED = DIFFICULT*

*Time-consuming, inefficient, tedious…

LIMITATIONS

Detailed Analysis

- **IF Comprehensive = Time Consuming**
- **IF Cursory = Subjective**
- **Also, SOMETIMES…**

DETAILED ANALYSIS ≠ GENERAL ASSESSMENT

PROBLEM STATEMENT

HOW to EFFICIENTLY

MAKE

DEFENSIBLE

- CONSISTENT & ACCURATE –

DETERMINATIONS of

- IMPACTS & ABATEMENT?

PROBLEM STATEMENT

-OR-

CAN

DETAILED ANALYSIS

BE EASIER THAN / SAME AS

GENERAL ASSESSMENT?

HYPOTHESIS

ADVANCEMENTS IN:

GIS -AND- CALCULATIONS

MAKE

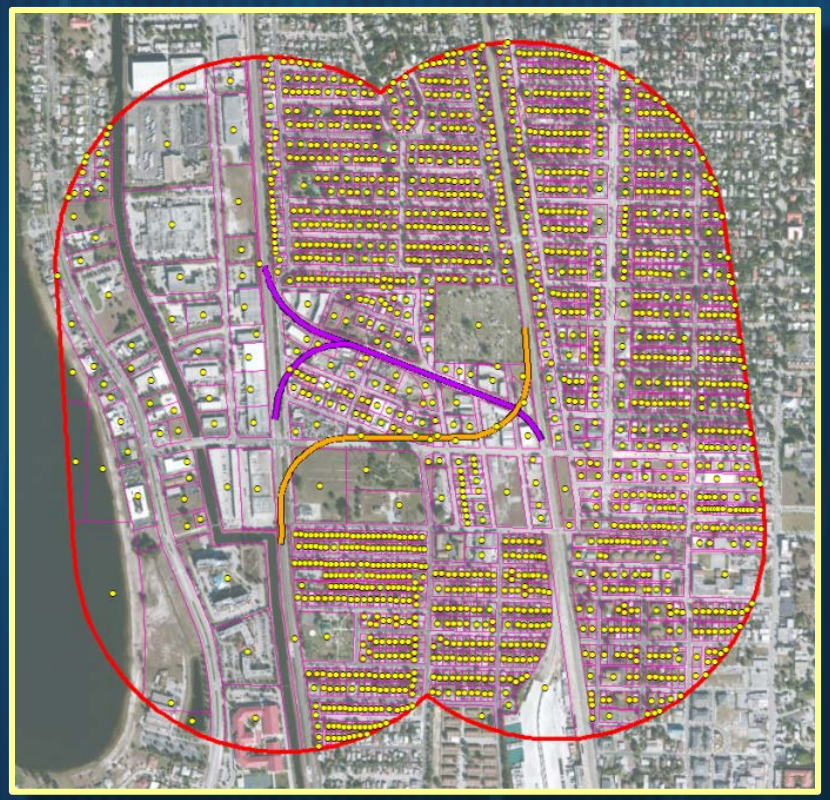
DETAILED ANALYSIS

SAME / EASIER THAN

GENERAL ASSESSMENT

GIS

CAN NOW AUTOMATE ALL RECEPTOR DATA:



- X,Y,Z
- DISTANCES
- LAND USES
- BUILDING ROWS

GIS

CAN INTEGRATE SOURCE TO PROJECT DATA:

Num	Desc	Ref SEL	Dist Term	Desc1	Denom1	Min1	Coef1	Desc2	Denom2	Min2	Coef2	Desc3	Denom3	Min3	Coef3	Jointed	Embedded	Aerial	Barrier	Combine 1&2?
1	Commuter Electric Locomotive	90	15	speed (mph)	50	20	10.0	trains/hour	1	0.01	10.0	locos/train	1	1	10	5.0	3.0	4.0	-5.0	0.0
2	Commuter Diesel Locomotive	92	15	speed (mph)	50	20	-10.0	trains/hour	1	0.01	10.0	locos/train	1	1	10	5.0	3.0	4.0	-5.0	0.0
3	Commuter Rail Cars	82	15	speed (mph)	50	20	20.0	trains/hour	1	0.01	10.0	cars/train	1	1	10	5.0	3.0	4.0	-5.0	0.0
4	RRT/LRT	82	15	speed (mph)	50	20	20.0	trains/hour	1	0.01	10.0	cars/train	1	1	10	5.0	3.0	4.0	-5.0	0.0
5	AGT, Steel Wheel	80	15	speed (mph)	50	20	20.0	trains/hour	1	0.01	10.0	cars/train	1	1	10				-5.0	0.0
6	AGT, Rubber Tire	78	15	speed (mph)	50	20	20.0	trains/hour	1	0.01	10.0	cars/train	1	1	10				-5.0	0.0
7	Monorail	82	15	speed (mph)	50	20	20.0	trains/hour	1	0.01	10.0	cars/train	1	1	10				-5.0	0.0
8	Maglev	72	15	speed (mph)	50	20	20.0	trains/hour	1	0.01	10.0	cars/train	1	1	10			4.0	-5.0	0.0
9	Freight Locomotive	97	15	speed (mph)	40	20	10.0	trains/hour	1	0.01	10.0	locos/train	1	1	10	5.0	3.0	4.0	-5.0	0.0
10	Freight Cars	100	15	speed (mph)	40	20	20.0	trains/hour	1	0.01	10.0	length of cars (ft) / train	2000	40	10	5.0	3.0	4.0	-5.0	0.0
11	Hopper Cars (empty)	104	15	speed (mph)	40	20	20.0	trains/hour	1	0.01	10.0	length of cars (ft) / train	2000	40	10	5.0	3.0	4.0	-5.0	0.0
12	Hopper Cars (full)	100	15	speed (mph)	40	20	20.0	trains/hour	1	0.01	10.0	length of cars (ft) / train	2000	40	10	5.0	3.0	4.0	-5.0	0.0
13	Crossover	100	25	trains/hour	1	0.01	10.0	duration of one train (sec)	3600	0.01	10.0						3.0	4.0	-5.0	0.0
14	Automobiles	73	15	speed (mph)	50	30	28.1	vehicles/hour	1	0.01	10.0								-5.0	0.0
15	City Buses	84	15	speed (mph)	50	30	23.9	vehicles/hour	1	0.01	10.0								-5.0	0.0
16	Commuter Buses	88	15	speed (mph)	50	30	14.6	vehicles/hour	1	0.01	10.0								-5.0	0.0
17	Rail Yard or Shop	118	25	trains/hour	20	0.01	10.0												-5.0	0.0
18	Layover Tracks	109	25	trains/hour	1	0.01	10.0												-5.0	0.0
19	B																			
20	B																			
21	B																			
22	P																			
23	P																			

CONDITION:		=NEED FROM GIS
EXISTING		=NEED FROM PROJECT SOURCE INPUT
		=CALC FROM GIS & PROJECT DATA

Source	1		2		3		4	
Source Value	#N/A	0	#N/A	0	#N/A	0	#N/A	0
CL Dist	Dist.Source1 to CL	0	Dist.Source2 to CL	0	Dist.Source3 to CL	0	Dist.Source4 to CL	0
Day Val1	#N/A	0	#N/A	0	#N/A	0	#N/A	0
Day Val2	#N/A	0	#N/A	0	#N/A	0	#N/A	0
Day Val3	#N/A	0	#N/A	0	#N/A	0	#N/A	0
Night Val1	#N/A	0	#N/A	0	#N/A	0	#N/A	0
Night Val2	#N/A	0	#N/A	0	#N/A	0	#N/A	0
Night Val3	#N/A	0	#N/A	0	#N/A	0	#N/A	0
				0.00%				0.00%
Equip. & Track Conditions	Joined Track	N	Joined Track	N	Joined Track	N	Joined Track	N
	Embedded Track	N	Embedded Track	N	Embedded Track	N	Embedded Track	N
	Aerial Structure	N	Aerial Structure	N	Aerial Structure	N	Aerial Structure	N

CALCULATIONS

CAN EXPAND CALC TO A SINGLE ROW:

(Allows calculation of multiple receptors on single sheet)

	A	C	D	E	F	G	H	I	J	K	L	M	N	PD	PE	PF
1	CONDITION:	=NEED FROM GIS														
2	EXISTING	=NEED FROM PROJECT DESIGN OR FIELD DATA														
3		=CALC FROM GIS & PROJECT DATA														
4														SOURCE 8 Levels		
5	Rec No.	X	Y	Z	Land Cat.	D.U.s	CL Dist	Barrier (?)	# Bldg Rows	Leq(h)	Ldn	Leq(day)	Leq(night)	Leq Day	Leq Night	Ldn
1576	R-1571	964580.32	873262.13	15.27	3	1	880.5	N	6	9				0.0	0.0	0.0
1577	R-1572	963871.41	873284.91	16.06	3	1	182.14	N	1	9				0.0	0.0	0.0
1578	R-1573	963790.53	873291.02	15.91	3	1	102.99	N	0	9				0.0	0.0	0.0
1579	R-1574	963818.12	873137.99	15.72	3	1	108.39	N	0	9				0.0	0.0	0.0
1580	R-1575	963886.45	873132.87	15.45	3	1	175.29	N	1	9				0.0	0.0	0.0
1581	R-1576	963890.01	872937.68	15.48	0	1	150.95	N	1					0.0	0.0	0.0
1582	R-1577	963837.66	872944.21	15.81	3	1	100.07	N	0	9				0.0	0.0	0.0
1583	R-1578	963871.09	872776.97	15.77	2	1	109.29	N	0		9	9	9	0.0	0.0	0.0
1584	R-1579	963883.85	873808.13	15.61	2	1	261.88	N	0		9	9	9	0.0	0.0	0.0
1585	R-1580	963780.25	873698.98	16.01	2	1	144.52	N	0		9	9	9	0.0	0.0	0.0
1586	R-1581	963898	873557.6	16	0	1	246.43	N	1					0.0	0.0	0.0
1587	R-1582	963794.81	873560.76	16	2	1	144.14	N	0		9	9	9	0.0	0.0	0.0
1588	R-1583	963895.21	873443.82	16	2	1	228.55	N	1		9	9	9	0.0	0.0	0.0
1589	R-1584	963950.77	873695.37	15.87	3	1	313.35	N	1	9				0.0	0.0	0.0
1590	R-1585	963953.36	873809.16	15.51	2	1	330.89	N	1		9	9	9	0.0	0.0	0.0
1591	R-1586	964403.08	872500.59	15.34	2	1	596.39	N	7		9	9	9	0.0	0.0	0.0
1592	R-1587	964364.03	872490.2	15.31	2	1	556.26	N	7		9	9	9	0.0	0.0	0.0
1593	R-1588	964315.55	872478.28	15.2	2	1	506.57	N	6		9	9	9	0.0	0.0	0.0
1594	R-1589	964016.52	872467.08	15.27	3	1	209.01	N	3	9				0.0	0.0	0.0
1595	R-1590	963043.25	872466.29	28.22	2	1	754.42	N	11		9	9	9	0.0	0.0	0.0
1596	R-1591	964683.26	872769.89	14.01	3	1	912.14	N	8	9				0.0	0.0	0.0
1597	R-1592	964688.7	872918.26	14.07	3	1	938.7	N	8	9				0.0	0.0	0.0
1598	R-1593	964573.64	872758.06	14.55	3	1	801.95	N	8	9				0.0	0.0	0.0
1599	R-1594	964551.84	872902.37	14.27	4	1	800.97	N	7					0.0	0.0	0.0
1600	R-1595	964528.27	872977.93	14.31	4	1	788.43	N	7					0.0	0.0	0.0
1601	R-1596	964556.64	873118.67	14.94	3	1	836.59	N	6	9				0.0	0.0	0.0
1602	R-1597	964881.93	873111.78	14.08	3	1	1157.57	N	9	9				0.0	0.0	0.0
1603	R-1598	964932.01	873110.72	13.42	3	1	1206.98	N	9	9				0.0	0.0	0.0
1604	R-1599	964979.96	873118.13	12.22	3	1	1255.5	N	11	9				0.0	0.0	0.0
1605	R-1600	965021.53	873152	12	3	1	1301.48	N	11	9				0.0	0.0	0.0
1606	R-1601	964779.28	872956.36	14.01	3	1	1033.79	N	8	9				0.0	0.0	0.0
1607	R-1602	964828.63	872955.32	14	3	1	1082.48	N	9	9				0.0	0.0	0.0
1608	R-1603	964777.57	872881.34	14	3	1	1021.39	N	8	9				0.0	0.0	0.0
1609	R-1604	964825.18	872883.31	14	3	1	1068.79	N	9	9				0.0	0.0	0.0
1610	R-1605	964915.67	872973.42	13.87	3	1	1171.21	N	11	9				0.0	0.0	0.0
1611	R-1606	964760.7	872781.39	14.01	3	1	990.43	N	9	9				0.0	0.0	0.0
1612	R-1607	960211.95	873405.1	9.37	3	1	3430.86	N	1	9				0.0	0.0	0.0

CALCULATIONS

CAN LINK ALL CASES TO CALCULATE IMPACTS:

(Use Equations, Not Graphs)*

	EXISTING - CALC				NO-BUILD				BUILD (ADD'L TRAINS ONLY)				MODERATE IMPACTS = 57				SEVERE IMPACTS = 23			
Rec No.	Leq(h)	Ldn	Leq(day)	Leq(night)	Leq(h)	Ldn	Leq(day)	Leq(night)	Leq(h)	Ldn	Leq(day)	Leq(night)	Cat1, Cat2	Cat3	L_p	MOD IMP?	Cat1, Cat2	Cat3	L_p	SEV IMP?
R-0001	9				9				26				56	61	61		62	67	67	
R-0002													65	70			75	80		
R-0003													65	70			75	80		
R-0004	9				9				27				56	61	61		62	67	67	
R-0005	9				9				24				56	61	61		62	67	67	
R-0006	9				9				24				56	61	61		62	67	67	
R-0007		9	9	9		9	9	9		38	25	32	61	66	61		67	72	67	
R-0008		9	9	9		9	9	9		38	25	32	61	66	61		67	72	67	
R-0009		9	9	9		9	9	9		37	25	32	61	66	61		67	72	67	
R-0010		9	9	9		9	9	9		39	26	33	61	66	61		67	72	67	
R-0011		9	9	9		9	9	9		39	26	33	61	66	61		67	72	67	
R-0012		9	9	9		9	9	9		39	26	33	61	66	61		67	72	67	
R-0013		9	9	9		9	9	9		39	26	33	61	66	61		67	72	67	
R-0014		9	9	9		9	9	9		39	26	33	61	66	61		67	72	67	
R-0015		9	9	9		9	9	9		39	27	33	61	66	61		67	72	67	
R-0016		9	9	9		9	9	9		39	26	33	61	66	61		67	72	67	
R-0017		9	9	9		9	9	9		39	27	34	61	66	61		67	72	67	
R-0018		9	9	9		9	9	9		39	27	34	61	66	61		67	72	67	
R-0019		9	9	9		9	9	9		39	27	34	61	66	61		67	72	67	
R-0020	9				9				24				56	61	61		62	67	67	
R-0021													65	70			75	80		
R-0022													65	70			75	80		
R-0023	9				9				39				56	61	61		62	67	67	
R-0024	9				9				40				56	61	61		62	67	67	
R-0025	9				9				55				56	61	61		62	67	67	
R-0026		9	9	9		9	9	9		68	56	62	61	66	61	1	67	72	67	1
R-0027		9	9	9		9	9	9		67	54	61	61	66	61	1	67	72	67	1
R-0028		9	9	9		9	9	9		70	57	64	61	66	61	1	67	72	67	1
R-0029		9	9	9		9	9	9		67	54	61	61	66	61	1	67	72	67	1
R-0030	9				9				56				56	61	61		62	67	67	
R-0031		9	9	9		9	9	9		41	29	35	61	66	61		67	72	67	

*Ref: FTA Transit Noise and Vibration Impact Assessment, pg. B-5

GIS

UTILIZE *(NOW)* TYPICALLY EXISTING RESOURCES:

Parcels

Centerline Alignment Data

Land Use

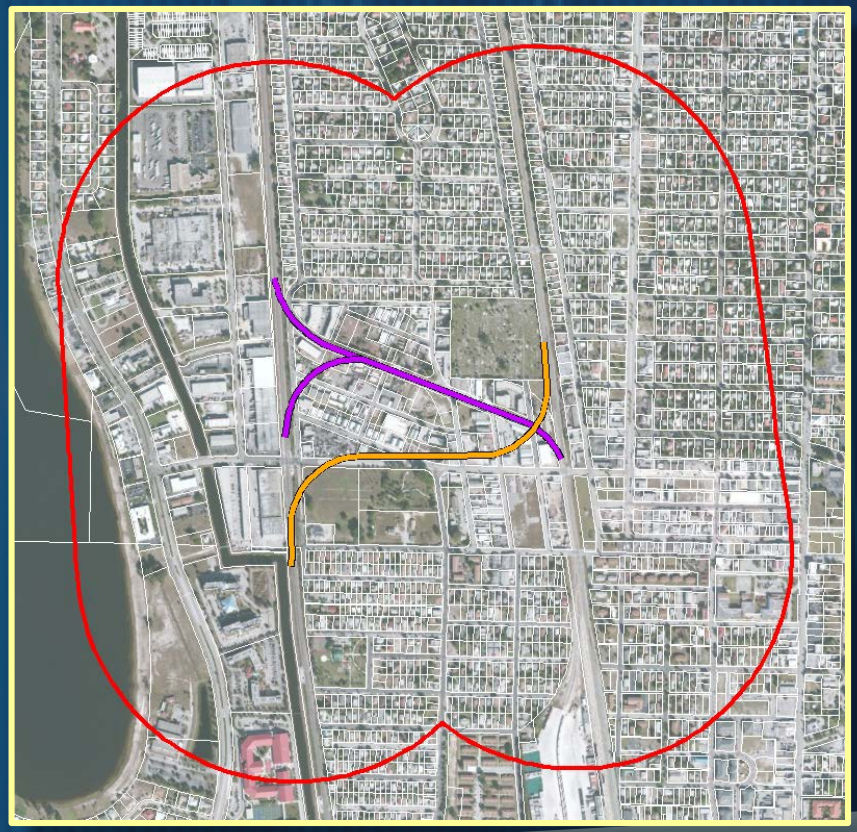
DEM (Digital Elevation Model)

Topo

GIS

GENERATE STUDY AREA:

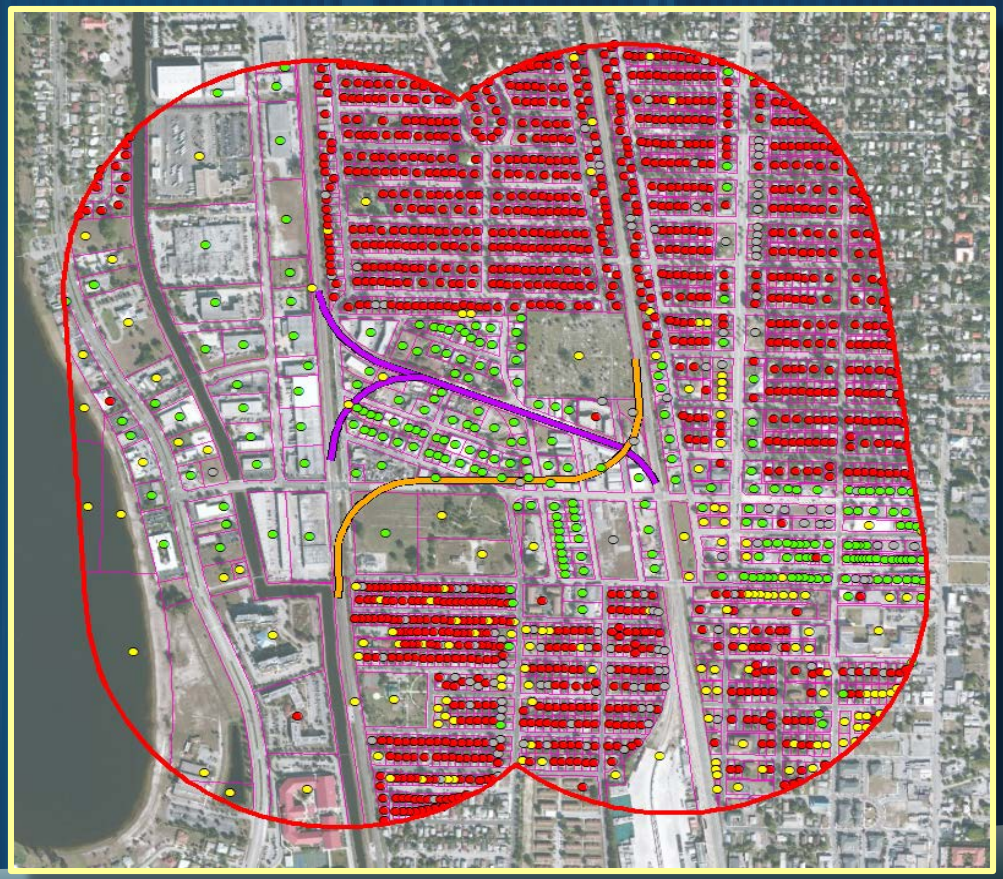
- Buffer Centerline(s)
- Clip PARCEL Layer



GIS

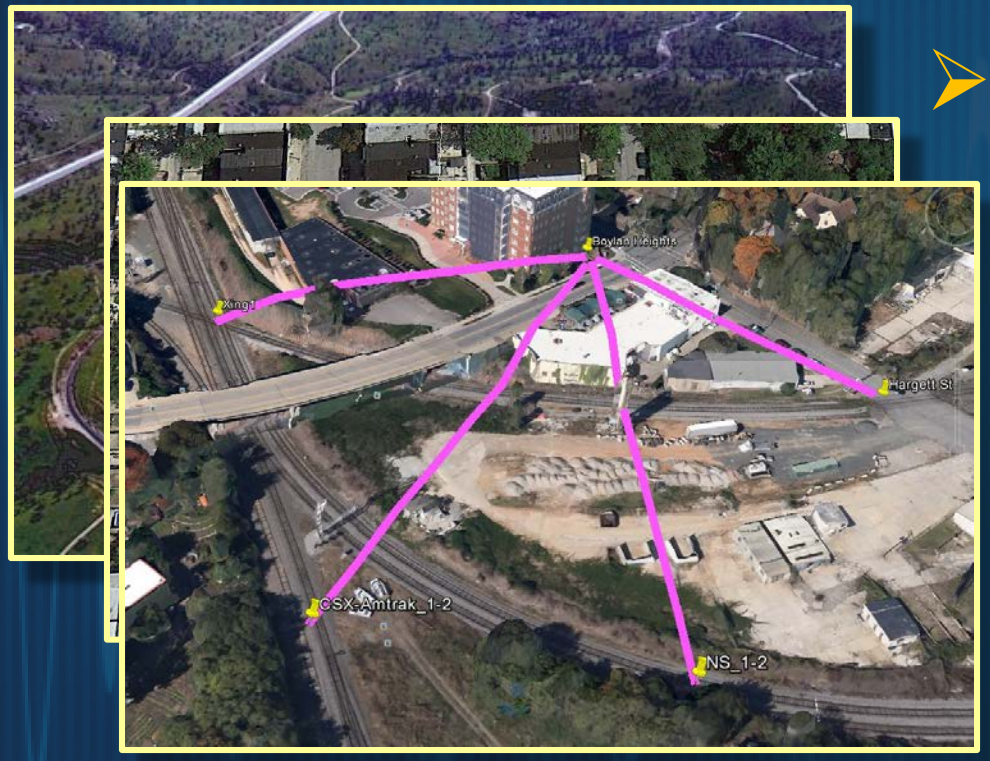
- Land Use Data to Parcel Data
- Assign Land Use Values*

JOIN:



CALCULATIONS

FORM RECEPTOR LAYER ATTRIBUTES:



- X,Y,Z[1]
- Building Rows[1]
- Distances[2]

1. RK&K custom-developed tools
2. Near tool

CALCULATIONS

POPULATE INPUT TABLES:*

CONDITION:		=NEED FROM GIS
EXISTING		=NEED FROM PROJECT SOURCE INPUT
		=CALC FROM GIS & PROJECT DATA

Source	
Source Value	#N
CL Dist	Dist.Source1 to
Day Val1	#N
Day Val2	#N
Day Val3	#N
Night Val1	#N
Night Val2	#N
Night Val3	#N
Equip. & Track Conditions	Joined Track
	Embedded Trac
	Aerial Structure

CONDITION:		=NEED FROM GIS
NO-BUILD		=NEED FROM PROJECT SOURCE INPUT
		=CALC FROM GIS & PROJECT DATA

Source	
Source Value	
CL Dist	Dist.Sourc
Day Val1	
Day Val2	
Day Val3	
Night Val1	
Night Val2	
Night Val3	
Equip. & Track Conditions	Joined Tra
	Embedded
	Aerial Stru

CONDITION:		=NEED FROM GIS
BUILD		=NEED FROM PROJECT SOURCE INPUT
		=CALC FROM GIS & PROJECT DATA

Source	1		2	
Source Value	Commuter Diesel Locomotive	2	Commuter Rail Cars	3
CL Dist	Dist.Source1 to CL	0	Dist.Source2 to CL	0
Day Val1	speed (mph)	0	speed (mph)	0
Day Val2	trains/hour	0	trains/hour	0
Day Val3	locos/train	0	cars/train	0
Night Val1	speed (mph)	0	speed (mph)	0
Night Val2	trains/hour	0	trains/hour	0
Night Val3	locos/train	0	cars/train	0
			% Cars w/Wheel Flats	0.00%
Equip. & Track Conditions	Joined Track	N	Joined Track	N
	Embedded Track	N	Embedded Track	N
	Aerial Structure	N	Aerial Structure	N

*One input table per condition (Ex., NB, Build)

CALCULATIONS

LINK INPUT TO CALCULATIONS

CONDITION: BUILD

Rec No.	Land Cat.	D.U.s	CL Dist	Barrier (?)	# Bldg Rows	Leq(h)	Ldn	Leq(day)	Leq(night)
R-0001	3	1	3458.16	N	3	26			
R-0002	4	1	3517.12	N	3				
R-0003	4	1	2000.8	N	3				
R-0004	3	1	3330.51	N	2	27			
R-0005	3	1	3573.41	N	4	24			
R-0006	3	1	3502.9	N	4	24			
R-0007	2	1	3169.02	N	4		38	25	32
R-0008	2	1	3190.42	N	4		38	25	32
R-0009	2	1	3220.35	N	4		37	25	32
R-0010	2	1	3351.56	N	3		39	26	33
R-0011	2	1	3297.88	N	3		39	26	33
R-0012	2	1	3209.3	N	3		39	26	33
R-0013	2	1	3096.21	N	3		39	26	33
R-0014	2	1	3064.63	N	3		39	26	33
R-0015	2	1	3027.31	N	3		39	27	33
R-0016	2	1	3076.5	N	3		39	26	33
R-0017	2	1	3006.81	N	3		39	27	34
R-0018	2	1	2999.01	N	3		39	27	34
R-0019	2	1	2969.02	N	3		39	27	34
R-0020	3	1	3371.68	N	4	24			
R-0021	4	1	1733.91	N	0				
R-0022	4	1	880.85	N	0				
R-0023	3	1	1369.74	N	0	39			
R-0024	3	1	1158.17	N	0	40			
R-0025	3	1	116.89	N	0	55			
R-0026	2	1	111.87	N	0		68	56	62
R-0027	2	1	138.44	N	0		67	54	61
R-0028	2	1	84.39	N	0		70	57	64
R-0029	2	1	138.8	N	0		67	54	61
R-0030	3	1	110.73	N	0	56			

*One input table per condition (Ex., NB, Build)

CALCULATIONS

LINK CASES TO CALCULATE IMPACTS*

	EXISTING - CALC				NO-BUILD				BUILD (ADD'L TRAINS ONLY)				MODERATE IMPACTS = 57				SEVERE IMPACTS = 23			
Rec No.	Leq(h)	Ldn	Leq(day)	Leq(night)	Leq(h)	Ldn	Leq(day)	Leq(night)	Leq(h)	Ldn	Leq(day)	Leq(night)	Cat1, Cat2	Cat3	L_p	MOD IMP?	Cat1, Cat2	Cat3	L_p	SEV IMP?
R-0001	9				9				26				56	61	61		62	67	67	
R-0002													65	70			75	80		
R-0003													65	70			75	80		
R-0004	9				9				27				56	61	61		62	67	67	
R-0005	9				9				24				56	61	61		62	67	67	
R-0006	9				9				24				56	61	61		62	67	67	
R-0007		9	9	9		9	9	9		38	25	32	61	66	61		67	72	67	
R-0008		9	9	9		9	9	9		38	25	32	61	66	61		67	72	67	
R-0009		9	9	9		9	9	9		37	25	32	61	66	61		67	72	67	
R-0010		9	9	9		9	9	9		39	26	33	61	66	61		67	72	67	
R-0011		9	9	9		9	9	9		39	26	33	61	66	61		67	72	67	
R-0012		9	9	9		9	9	9		39	26	33	61	66	61		67	72	67	
R-0013		9	9	9		9	9	9		39	26	33	61	66	61		67	72	67	
R-0014		9	9	9		9	9	9		39	26	33	61	66	61		67	72	67	
R-0015		9	9	9		9	9	9		39	27	33	61	66	61		67	72	67	
R-0016		9	9	9		9	9	9		39	26	33	61	66	61		67	72	67	
R-0017		9	9	9		9	9	9		39	27	34	61	66	61		67	72	67	
R-0018		9	9	9		9	9	9		39	27	34	61	66	61		67	72	67	
R-0019		9	9	9		9	9	9		39	27	34	61	66	61		67	72	67	
R-0020	9				9				24				56	61	61		62	67	67	
R-0021													65	70			75	80		
R-0022													65	70			75	80		
R-0023	9				9				39				56	61	61		62	67	67	
R-0024	9				9				40				56	61	61		62	67	67	
R-0025	9				9				55				56	61	61		62	67	67	
R-0026		9	9	9		9	9	9		68	56	62	61	66	61	1	67	72	67	1
R-0027		9	9	9		9	9	9		67	54	61	61	66	61	1	67	72	67	1
R-0028		9	9	9		9	9	9		70	57	64	61	66	61	1	67	72	67	1
R-0029		9	9	9		9	9	9		67	54	61	61	66	61	1	67	72	67	1
R-0030	9				9				56				56	61	61		62	67	67	
R-0031		9	9	9		9	9	9		41	29	35	61	66	61		67	72	67	

*Calculate, not Estimate

GIS

EXPORT BACK TO GIS

RESULTS

DETAILED ANALYSIS TOOL

Microsoft® Office-Based

(Common Licensing Requirements)

FTA-Compliant

(Uses CREATE Algorithm)

FLEXIBLE

RESULTS

INTEGRATED GIS RESULTS

esri ArcReader Compatible

(No Licensing Requirements to View)

Project & Municipal Use

(Formatted for Web Publishing)

BENEFITS

RECEPTORS EQUAL CONSIDERATION

(Defensible)

ACCOMMODATE LARGE STUDY AREAS

ADDRESS VARYING ACOUSTICS

BENEFITS

FLEXIBLE FOR PROJECT CHANGES

(Parameter input changes = automatically updated calculations & GIS)

NOISE PROACTIVE, NOT REACTIVE

RESULTS ACCESSIBLE, VISIBLE

CONCLUSION STATEMENT

ADVANCEMENTS IN

GIS -AND- CALCULATIONS*

HAVE MADE POSSIBLE FOR

DETAILED ANALYSIS

TO BE SAME / EASIER THAN

GENERAL ASSESSMENT

*E.g., Microsoft® Office Excel

QUESTIONS?