Appendix E: Basis for Comparative Cost Analysis

Estimated Probable Construction Costs

	DTX Future with Surface Rail (2026)	Pennsylvania Avenue (2027)	Mission Bay (2030)	Intension to show year of compl
Alignment Construction Probable Cost	-$4,075	-$6,842	-$10,196	
Grade Separation (escalated to mid-year construction 2024, completion 2026)	-$1,116	$0	$0	Estimate Provided by SF DPW
TOTAL ($millions, escalated to mid-year of construction 2023, 2024, 2027)	**-$5,191**	**-$6,842**	**-$10,196**	mid-years 2023, 2024, 2027
Increase over DTX Future with Surface Rail (millions)		$1,651	$5,005	

City Revenue Bonding Potential

	DTX Future with Surface Rail	Pennsylvania Ave	Mission Bay	
Railyard Site Development Fiscal Benefit Bonding Potential [1]	$0	$235	$235	Table 13
Adjacent Property Value attributable to rail: Tax Increment Bonding Potential	$214	$214	$147	Table 15
Railyard Site Land Secured Financing Bonding Potential - CFD on area 0.1% Assessed value	$0	$32	$32	Table 16
Diminished Bonding Potential from Trenching	-$8	$0	$0	Table 5, Secondary Costs memo
TOTAL BONDING POTENTIAL (millions of 2026 $)	**$206**	**$481**	**$414**	

[1] *Assumes 25% of revenues dedicated to costs associated with development (e.g., increased sewer costs, etc)*

Private Sector Benefits(+)/Costs(-)

	DTX Future with Surface Rail	Pennsylvania Ave	Mission Bay	
Railyard Land Value Conferred	$0	$352	$352	Table 2
Diminished Property Value from Trenching intersections at Mission Bay Drive and 16th Street	-$114	$0	$0	Table 4, Secondary Costs memo
Potential Rail Passenger Travel time Savings over 50 years	$0	$0	$82	Table 6, Secondary costs memo
TOTAL PRIVATE SECTOR BENEFITS/COSTS (millions of 2026$)	**-$114**	**$352**	**$434**	

Overall Benefit/Cost Summary

	DTX Future with Surface Rail	Pennsylvania Ave	Mission Bay
Estimated Project Costs (escalated to estimated mid-year of construction 2023, 2024, 2027)	-$5,191	-$6,842	-$10,196
City Bonding Potential	$206	$481	$414
Private Sector +Benefits/-Costs (estimated to 2026$ millions)	-$114	$352	$434
TOTAL (millions)	**-$5,099**	**-$6,010**	**-$9,349**
Delta between alternatives (millions)		$911	$4,250

Construction Costs

ESTIMATED PROBABLE CONSTRUTION COST	DTX Future with Surface Rail (2026)	Pennsylvania Avenue (2027)	Mission Bay (2030)	
Alignment Construction Probable Cost	$4,075	$6,842	$10,196	
Grade Separation (escalated to mid-year construction 2024, completion 2026)	$1,116	$0	$0	
TOTAL ($millions, escalated to mid-year of construction)	**$5,191**	**$6,842**	**$10,196**	mid-years 2023, 2024, 2027
Increase over DTX Future with Surface Rail (millions)		$1,651	$5,005	

ALIGNMENT CONSTRUCTION PROBABLE COST ($2016 millions)	DTX Future with Surface Rail (2026)	Pennsylvania Avenue (2027)	Mission Bay (2030)	
Direct Construction Costs	$1,016	$1,761	$2,185	
Design/Construction Contingency %	15%	25%	35%	
Design/Construction Contingency $	$152	$440	$765	
subtotal construction costs	$1,168	$2,202	$2,950	
ROW Acquisition	$200	$280	$400	
Additional Enviromental Clearance	$0	$1.4	$1.9	
Project Development/Management (32% of construction costs)	$374	$705	$944	
Program Contingency (20%)	$348	$638	$859	
TOTAL ($2016 millions)	$2,090	$3,825	$5,156	
TOTAL escalated to estimated mid-construction year (2023, 2024, 2027)	$2,941	$5,652	$8,818	mid-year is 2023, 2024, and 2027
TTC fitout Costs (escalated, no program contingency)	$1,134	$1,191	$1,378	
TOTAL ($millions escalated to mid-construction)	**$4,075**	**$6,842**	**$10,196**	

	Construction Escalation (5%) - doesn't include TTC fitout			
to mid-year construction	**2022**	$2,801	$5,126	$6,909
	2023	$2,941	$5,383	$7,255
	2024	$3,088	$5,652	$7,617
	2025	$3,243	$5,934	$7,998
	2026	$3,405	$6,231	$8,398
	2027	$3,575	$6,543	$8,818
	2028	$3,754	$6,870	$9,259
	2029	$3,942	$7,213	$9,722
	2030	$4,139	$7,574	$10,208
	2031	$4,346	$7,953	$10,718

TTC FITOUT COSTS	DTX Future with Surface Rail	Pennsylvania Ave	Mission Bay	
Direct Construction Costs ($2016 millions)	$806	$806	$806	
TOTAL escalated to mid-year of construction (2023, 2024, 2027), completion 2026, 2027, 2030	**$1,134**	**$1,191**	**$1,378**	completion 2026, 2027, 2030

COST FOR GRADE SEPARATING ROADWAYS UNDER TRACKS AT INTERSECTIONS	*Grade Sep #1: 7th/Mission Bay Drive*	*Grade Sep #2: 16th/7th/ Mississippi*	DTX Future with Surface Rail - Combined Grade Seps	Pennsylvania Ave	Mission Bay	
Environmental Clearance	*$3*	*$4*	$6	$0	$0	
Construction costs (including 20% PM and 30% contingency)	*$513*	*$236*	$749	$0	$0	
Total ($2016 millions)	*$515*	*$240*	$755	$0	$0	
TOTAL escalated mid-year construction (2024), completion 2026			**$1,116**	**$0**	**$0**	construction start 2024, completior

Grade Separations - Design Assumptions and Costs from DPW

(Not based on CH2M Study Team Review or Analysis)

Cost for grade separating 7th/Mission Bay Drive

	Cost
Environmental Clearance	$2.50
Traffic routing	$21.22
Excavation/Shoring	$151.87
Structural work	$66.51
Utilities	$20.00
Joint Trench Work	$0.52
Roadway Work	$3.63
Mob/Demob	$15.10
Allowances (e.g., differing site conditions, un	$60.62
Subtotal	$341.97
Contingency (30%)	$102.59
Program Management Contingency (20%)	$68.39
Total	$512.96

Escalation (5%)	
2024	$687.41
2025	$721.78
2026	$757.87
2027	$795.76
2028	$835.55
2029	$877.33
2030	$921.19
2031	$967.25
2032	$1,015.62

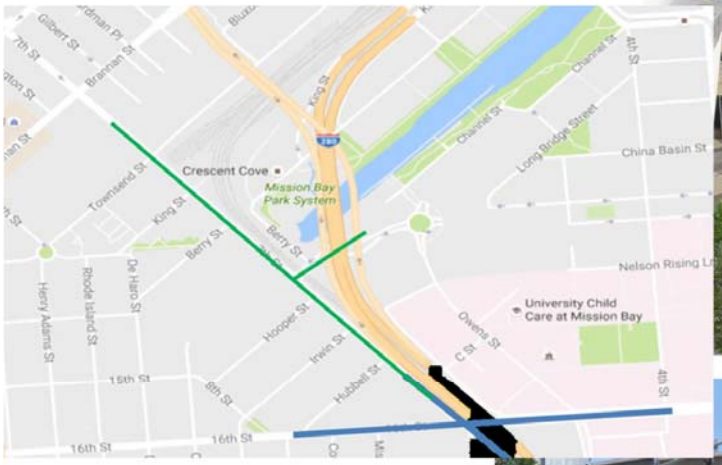
Cost for grade separating 16th/7th/Mississippi Bay Drive

	Cost
Enviromental Clearance	$3.50
Traffic routing	$9.63
Excavation/Shoring	$58.60
Structural work	$37.86
Utilities	$11.81
Joint Trench Work	$0.24
Roadway Work	$1.57
Mob/Demob	$6.89
Allowances (e.g., differing site conditions, un	$27.52
Subtotal	$157.62
Contingency (30%)	$47.29
PM Contingency (20%)	$31.52
Total	$236.43

Escalation (5%)	
2024	$316.84
2025	$332.68
2026	$349.31
2027	$366.78
2028	$385.12
2029	$404.38
2030	$424.59
2031	$445.82
2032	$468.12

MTC Cost Review (TC vs. DTX)

Item	Cost ($millions)		
	TC	DTX	TOTAL
TJPA Base Estimate (YOE)	$683	$2,322	$3,005
Escalation (using 5%, instead of 3%)	$43	$390	$433
Fee Adjust (using 10%, instead of 5%)	$23	$77	$100
Contingency (using 27%, instead of 25%)	$21	$72	$93
Missing Items	$0	$58	$58
Total Adjustments	$87	$597	$684
Add BART/MUNI Connector	$120-$310	$0	$120-$310
Total Adjusted Estimate (YOE) Year of Operation: 2024	**$890-$1,080**	**$2,919**	**$3,809-$3,999**



Potential Funding Sources Identified for Phase 2 ($ millions)

Source	Amount (Range)	Assumed Term	Status
San Francisco County Sales Tax	$83	2016-2019	Committed
San Mateo County Sales Tax	$19	N/A	Committed and spent
Committed MTC/BATA Bridge Tolls	$7	N/A	Committed and spent
Tax Increment (after repayment of existing TIFIA loan)	$200–$340	2019-2050	Committed
Mello-Roos Special Tax	$275–$375	2020-2025	Committed
Regional Transportation Improvement Program	$18	N/A	Committed
Future San Francisco County Sales Tax	$350	2019-2026	Subject to SFCTA or voter approval
FTA New Starts	$650	2019-2026	Subject to federal approval
New MTC/BATA Bridge Tolls	$300	2019-2026	Subject to MTC/BATA and voter approval
Future California High Speed Rail Funds	$557	2019-2026	Subject to federal/state approval
Land Sales	$45	2018	Contingent upon sale
Potential Passenger Facility Charges or Maintenance Contribution	$865–$1,920	2026-2060	Subject to CHSRA and/or Caltrain approval
Total	**$3,369–$4,664**		

SF DPW Notes on Design Assumptions and Costs

Order of Magnitude Planning Estimate for Grade Separated Roadway
7th Street and Mission Bay Drive
FOR DISCUSSION PURPOSES ONLY - SUBJECT TO CHANGE

Assumptions:

General
- Private utilities shall relocate facilities at their own costs, per franchise agreement.
- All costs are in 2016 dollars.
- Topographic survey unavailable at time of estimate development. All costs (and associated quantities) are approximate and subject to change.
- Costs associated with real estate acquisition and impacts are not included in this estimate.

Geotechnical
- Native soil needs to be disposed of as Class 1 Hazardous Material.
- Soil expands by 50% once excavated.
- There is no need to over-excavate.

Structural
- Sound material necessary for secant pile installation located at 80 feet of depth.

Sewer / Strormdrain
- Estimate does not include additional sewer elements which may need to be constructed or rerouted outside of the grade separated roadways. Analysis and coordination with SFPUC required for this effort.

Roadway
- All roadway geometry determined using American Association of State Highways and Transportation Officials' A Policy on Geometric Design of Highways and Streets. All vertical curves designed with a maximum grade of 7%.
- 7th St will be grade separated at the Division Street Sewer to a depth of 50 feet.
- Mission Bay Drive will be grade separated at 7th St to a depth of no less than 35 feet.
- At-grade roads which intersect grade separated roadways will be severed and subsequently converted to cul de sacs. Future cul de sacs, turning restrictions/changes, etc. may require a truck-turning analysis for appropriate design vehicles.

Order of Magnitude Planning Level Construction Cost Estimate:

Traffic Routing	$21,220,000
Excavation and Shoring Work	$151,870,000
Structural Work	$66,510,000
Sewer / Stormwater Work	$8,260,000
City Water Work	$2,600,000
Auxiliary Water Supply System Work	$6,500,000
Joint Trench Work	$520,000
Roadway Work	$3,630,000
Street Lighting Work	$2,600,000
Overhead Contact System Work	$0
Allowances*	$60,620,000
Mobilization	$9,100,000
Demobilization	$6,070,000
Subtotal	$339,500,000
50% Contingency	$169,750,000
Total	**$509,250,000**

*Allowances include, but are not limited to, Differing Site Conditions, Reimbursable Expenses, Unforeseen Sewer Work, Unforeseen Overhead Contact

Rough Order of Magnitude Planning Estimate for Grade Separated Roadway
16th Street and 7th Street/Mississippi Street
FOR DISCUSSION PURPOSES ONLY - SUBJECT TO CHANGE

Assumptions:

General
- Private utilities shall relocate facilities at their own costs, per franchise agreement.
- All costs are in 2016 dollars.
- Topographic survey unavailable at time of estimate development. All costs (and associated quantities) are approximate and subject to change.
- Costs associated with real estate acquisition and impacts are not included in this estimate.

Geotechnical
- Native soil needs to be disposed of as Class 1 Hazardous Material.
- Soil expands by 50% once excavated.
- There is no need to over-excavate.

Structural
- Sound material necessary for secant pile installation located at 80 feet of depth.

Sewer / Strormdrain
- Estimate does not include additional sewer elements which may need to be constructed or rerouted outside o the grade separated roadways. Analysis and coordination with SFPUC required for this effort.

Roadway
- All roadway geometry determined using American Association of State Highways and Transportation Officials" A Policy on Geometric Design of Highways and Streets. All vertical curves designed with a maximum grade of 7%.
- 16th St will be grade separated at 7th Street to a depth of 35 feet.
- 7th St will be maintained at grade by means of a structural support bridge in order to lessen access impact to adjacent properties. A traffic routing study will need to be performed which may include vehicular turning restrictions.
- At-grade roads which intersect grade separated roadways will be severed and subsequently converted to cul de sacs. Future cul de sacs, turning restrictions/changes, etc. may require a truck-turning analysis for appropriate design vehicles.

Order of Magnitude Planning Level Construction Cost Estimate:

Traffic Routing	$9,630,000
Excavation and Shoring Work	$58,590,000
Structural Work	$37,860,000
Sewer / Stormwater Work	$4,920,000
City Water Work	$1,200,000
Auxiliary Water Supply System Work	$3,000,000
Joint Trench Work	$240,000
Roadway Work	$1,570,000
Street Lighting Work	$1,200,000
Overhead Contact System Work	$1,490,000
Allowances*	$27,520,000
Mobilization	$4,130,000
Demobilization	$2,760,000
Subtotal	$154,110,000
50% Contingency	$77,055,000
Total	**$231,165,000**

*Allowances include, but are not limited to, Differing Site Conditions, Reimbursable Expenses, Unforeseen Sewer Work, Unforeseen Overhead Contact

Value Capture (tables from RAB Economic Analysis)

Table 2 Liberated Railyard Sites Land Value Estimates

Item	Commercial Sq. Ft.	Residential Sq. Ft.	Residential Units[1]	Commercial Value per Sq. Ft.	Commercial Value	Residential Value per Unit	Residential Value	Total Land Value
K1	298,932			$162	$48,418,544			
K2	385,394			$162	$62,422,815			
K3	286,781			$162	$46,450,398			
K4	407,675			$162	$66,031,743			
T1	8,912	124,772	104	$127	$1,129,471	$77,500	$8,058,159	
T2	11,490	160,860	134	$127	$1,456,155	$77,500	$10,388,875	
T3	11,925	166,950	139	$127	$1,511,284	$77,500	$10,782,188	
T4	11,925	166,950	139	$127	$1,511,284	$77,500	$10,782,188	
T5	33,077	463,082	386	$127	$4,191,967	$77,500	$29,907,403	
4th/King Tower	6,250	742,141	618	$127	$792,077	$77,500	$47,929,915	
Total	**1,462,362**	**1,824,755**	**1,521**		**$233,915,738**		**$117,848,728**	**$351,764,466**

[1] This analysis assumes 1,200 gross square feet per unit
[2] Average price per buildable commercial sq.ft. in the category 1-5 FAR is $127 and for 5+ FAR is $162.

Table 3 4'" & King Railyard Liberated Sites Development Program and Value Estimate

Item	Liberated Railyard Sites
Development Program	
Residential Units	1,521
Residential Market Rate	1,140
Residential - BMR[1]	380
MIPS	1,318,835
Retail	143,527
Assessed Value Estimate	
Residential Units	$969,400,828
MIPS	$1,007,590,227
Retail	$89,847,667
Total AV Estimate	**$2,066,838,722**

[1] Consistent with San Francisco's inclusionary housing requirement for 25+ unit residential projects, this analysis assumes 25% of units will be rented at a "below market rate" (BMR) price.

Table 4 Pipeline Development and Summary

Location	Land Use: Residential[1]	Medical	MIPS	PDR	Retail	CIE[2]	Visitor	Total
Half mile radius of 4th / Townsend Station								
Total Development Program	3,415	-	960,687	(30,858)	168,874	281,600	535,625	
Unmet Assessed Value	$2,902,920,000	$0	$733,964,868	-$15,807,751	$105,715,124	$0	$390,470,625	**$4,117,262,866**
Half mile radius of 3rd & Mission Bay Station								
Total Development Program	4,056	2,606,902	3,807,008	(143,250)	272,850	1,528,995	486,125	
Unmet Assessed Value	$3,447,600,000	$1,991,673,128	$2,908,554,112	-$73,383,251	$170,804,100	$0	$354,385,125	**$8,799,633,215**
Half mile radius of 22nd Street								
Total Development Program	2,476	-	37,522	(389,122)	(1,029)	-	-	
Unmet Assessed Value	$2,104,600,000	$0	$28,666,808	-$199,337,083	-$644,154	$0	$0	**$1,933,285,571**
Half mile radius of Dogpatch Station								
Total Development Program	1,698	-	(8,989)	(369,997)	(16,350)	-	-	
Unmet Assessed Value	$1,443,640,000	$0	-$6,867,596	-$189,539,843	-$10,235,100	$0	$0	**$1,236,997,461**

[1] Development program is shown in # of units. Only market rate units are being shown, BMR units are tax exempt and therefore will not contribute to assessed value increases.
[2] EPS is assuming CIE space will carry no assessed value.

Source: City of San Francisco, Planning Department; Economic & Planning Systems, Inc.

Table 5 Short Term "Soft Sites" Development Capacity and Summary[1]

Location	Land Use: Residential[1]	Medical	MIPS	PDR	Retail	CIE[2]	Visitor	Total
Half mile radius of 4th / Townsend Station								
Total Short Term Development Capacity	13,065	84,322	8,991,291	218,844	2,532,729	424,192	63,133	
Unmet Short Term Assessed Value	$8,884,200,000	$64,422,008	$6,869,346,324	$112,108,091	$1,585,488,354	$0	$46,023,957	**$17,561,588,734**
Half mile radius of 3rd & Mission Bay Station								
Total Short Term Development Capacity	3,040	5,090	1,869,969	302,216	456,897	30,509	4,860	
Unmet Short Term Assessed Value	$2,067,200,000	$3,888,760	$1,428,656,316	$154,817,399	$286,017,522	$0	$3,542,940	**$3,944,122,937**
Half mile radius of 22nd Street								
Total Short Term Development Capacity	4,204	35,026	246,918	679,367	202,755	82,424	35,026	
Unmet Short Term Assessed Value	$2,858,720,000	$26,759,864	$188,645,352	$348,022,051	$126,924,630	$0	$25,533,954	**$3,574,605,851**
Half mile radius of Dogpatch Station								
Total Short Term Development Capacity	4,564	35,026	1,586,745	651,692	428,154	82,424	35,026	
Unmet Short Term Assessed Value	$3,103,520,000	$26,759,864	$1,212,273,180	$333,844,868	$268,024,404	$0	$25,533,954	**$4,969,956,270**

[1] Development program is shown in # of units. BMR units are tax exempt and therefore will not contribute to assessed value increases.
[2] EPS is assuming CIE space will carry no assessed value.
[1] Short term soft sites are those that have additional unmet development potential under either the existing zoning, zoning changes that are now known to be likely. Discussions with City staff indicated that the timeframe for such development to meet its current zoning potential should be assumed to be on or before 2040.

Table 6 Long Term "Soft Sites" Development Capacity and Summary[4]

Location	Land Use							Total
	Residential[1]	Medical	MIPS	PDR	Retail	CIE[2]	Visitor	
Half mile radius of 4th / Townsend Station								
Total Long Term Development Capacity[3]	3,046	-	1,798,393	962,988	95,000	-	-	
Unmet Long Term Assessed Value	$2,071,280,000	$0	$1,373,972,252	$493,313,715	$59,470,000	$0	$0	$3,998,035,967
Percent Discounted	100%	100%	100%	100%	100%	100%	100%	100%
Total Long Term AV Capture	$0	$0	$0	$0	$0	$0	$0	$0
Half mile radius of 3rd & Mission Bay Station								
Total Long Term Development Capacity[3]	1,242	806,402	5,169,076	18,078	-	-	-	
Unmet Long Term Assessed Value	$844,560,000	$616,091,128	$3,949,174,064	$9,260,889				$5,419,086,081
Percent Discounted	100%	100%	100%	100%	100%	100%	100%	100%
Total Long Term AV Capture	$0	$0	$0	$0	$0	$0	$0	$0
Half mile radius of 22nd Street								
Total Long Term Development Capacity[3]	-	-	-	-	-	-	-	
Unmet Long Term Assessed Value	$0	$0	$0	$0	$0			$0
Percent Discounted	100%	100%	100%	100%	100%	100%	100%	100%
Total Long Term AV Capture	$0	$0	$0	$0	$0	$0	$0	$0
Half mile radius of Dogpatch Station								
Total Long Term Development Capacity[3]	1,564	-	800,000	103,636	220,000	-	-	
Unmet Long Term Assessed Value	$1,063,520,000	$0	$611,200,000	$53,090,028	$137,720,000	$0	$0	$0
Percent Discounted	100%	100%	100%	100%	100%	100%	100%	100%
Total Long Term AV Capture	$0	$0	$0	$0	$0	$0	$0	$0

[4] These sites are not currently considered "soft" but could be in the future if the City were to undergo a rezoning process. Conversations with City staff indicated that they timeframe for these sites meeting their future unmet development potential is 2065.

[1] Development program is shown in # of units. BMR units are tax exempt and therefore will not contribute to assessed value increases.

[2] EPS is assuming CIE space will carry no assessed value.

[3] Long term development potential is speculative and is based on the discrepency between a parcel's existing development condition and a potentially allowable future rezoning.

Source: City of San Francisco, Planning Department; Economic & Planning Systems, Inc.

Table 7 Existing AV and Estimated Value Growth Attributable to HSR Investment

Item	Existing DTX Plan	Pennsylvania Alignment	Mission Bay Alignment
Existing Taxable Use Within 1/2 Mile of Station Areas[1]			
Residential Units	14,365	14,365	8,638
CIE Sq. Ft.	1,126,154	1,126,154	584,753
MED Sq. Ft.	415,922	415,922	248,325
MIPS Sq. Ft.	5,928,499	5,928,499	2,289,399
Retail Sq. Ft.	1,980,849	1,980,849	964,218
PDR Sq. Ft.	4,017,551	4,017,551	2,328,679
Visitor Sq. Ft.	38,067	38,067	5,219
Total Commercial Sq. Ft.[2]	*13,507,042*	*13,507,042*	*6,420,593*
Total Existing Assessed Value	$11,518,072,139	$11,518,072,139	$7,733,562,950
Value Growth due to HSR Proximity (10%)	**$1,151,807,214**	**$1,151,807,214**	**$773,356,295**

Table 8 Summary of Total New Development Values by RAB Alternative

Land Use	Value/ Unit or Sq. Ft.	Existing DTX Plan		Pennsylvania Ave. Alignment		Mission Bay Alignment	
		Dev. Program[1]	AV Estimate	Dev. Program[2]	AV Estimate	Dev. Program[3]	AV Estimate
Residential							
Market Rate	$850,000	19,706	$16,750,440,000	20,847	$17,719,840,828	12,978	$11,031,360,828
BMR[5]	$0	4,308	$0	4,688	$0	3,340	$0
Subtotal	-	*24,014*	*$16,750,440,000*	*25,535*	*$17,719,840,828*	*16,318*	*$11,031,360,828*
Commercial							
MED	$764	119,348	$91,181,872	119,348	$91,181,872	2,647,018	$2,022,321,752
MIPS	$764	10,236,418	$7,820,623,352	11,555,253	$8,828,213,579	8,573,568	$6,550,206,239
PDR	$512	478,231	$244,985,307	478,231	$244,985,307	440,661	$225,739,173
RETAIL	$626	2,903,329	$1,817,483,954	3,046,856	$1,907,331,621	1,285,078	$804,458,593
VISITOR	$729	633,784	$462,028,536	633,784	$462,028,536	526,011	$383,462,019
Subtotal	-	*14,371,110*	*$10,436,303,021*	*15,833,472*	*$11,533,740,915*	*13,472,336*	*$9,986,187,776*
Existing AV Growth (10%)[4]			*$1,151,807,214*		*$1,151,807,214*		*$773,356,295*
Total Future AV Estimate			**$28,338,550,235**		**$30,405,388,957**		**$21,790,904,899**

[1] Includes pipeline projects and short term soft sites within 1/2 mile of Existing 4th / Townsend Station and future Pennsylvania Ave. Station

[2] Includes development on liberated railyard sites and pipeline projects and short term soft sites within 1/2 mile of 4th / Townsend and Pennsylvania Ave. Station

[3] Includes development on liberated railyard sites and pipeline projects and short term soft sites within 1/2 mile of Mission Bay and Dogpatch Stations.

[4] Assuming Investment in HSR will increase existing AV by 10%.

Table 12 Fiscal Revenue Analysis by RAB Alternative at Buildout

Item	GF Revenue 2016-17	Allocation Method		Existing DTX Plan	Pennsylvania Alignment	Mission Bay Alignment
Business Taxes[1]	$669,450,000	$951	per employee	$0	$4,933,832	$4,933,832
Hotel Room Tax	$409,250,000		not estimated	$0	$0	$0
Other Local Taxes	$46,960,000		not estimated			
Stadium Admission Tax	$1,360,000		not estimated			
Parking Tax	$92,820,000	$85	per resident equivalent[3]	$0	$405,100	$405,100
Property Transfer Tax	$235,000,000		Case Study[4]	$0	$838,167	$838,167
Sales and Use Tax	$237,545,000		Case Study[5]	$0	$574,107	$574,107
Gas Electric Steam Users Tax	$45,550,000	$42	per resident equivalent[3]	$0	$198,797	$198,797
Telephone Users Tax	$44,440,000	$41	per resident equivalent[3]	$0	$193,952	$193,952
Water Users Tax	$4,320,000	$4	per resident equivalent[3]	$0	$18,854	$18,854
Property Tax	$1,412,000,000		See Table 8	$0	$11,509,295	$11,509,295
Charges for Service	$236,101,725		not estimated			
Expenditure Recovery	$421,085,839		not estimated			
Fines, Forfeitures & Penalties	$4,579,750	$4	per resident equivalent[3]	$0	$19,988	$19,988
Interest & Investment Income	$13,969,863		not estimated			
Intergovernmental Transfers	$959,099,074		not estimated			
General Fund Support	($640,803,508)		not estimated			
Other Transfers In*	$686,132,452		not estimated			
License, Permits, and Franchises	$28,876,499	$26	per resident equivalent[3]	$0	$126,027	$126,027
Other Financing Sources	$881,000		not estimated			
Other Revenues	$61,333,621		not estimated			
Rents and Concessions	$16,140,178		not estimated			
Transfer Adjustments	-$15,162,070		not estimated			
Unappropriated Fund Balance	$178,109,083		not estimated			
Transfer Adjustments Citywide	($1,234,113,727)		not estimated			
Total General Fund Revenues 2017$	**$3,914,924,779**			**$0**	**$18,818,118**	**$18,818,118**
Potentially Available for RAB Financing[6]	**75%**			**$0**	**$14,113,589**	**$14,113,589**

* Includes Intrafund transfers in as well as operating transfers in

[1] Includes Gross Receipts Tax, Payroll Tax, Administrative Office Tax, and Business Registration Tax

[2] Based on average room rate of $255/night and 30% vacancy

[3] Resident equivalent includes City of San Francisco residents, and considers employee and visitor impact to be half that of a full-time resident

[4] Based on a residential turnover rate of 7% and a commercial turnover rate of 4%

[5] Based on $400 of taxable sales per net new retail square footage.

[6] Assuming 75 percent of fiscal revenues will be available for RAB financing, and 25 percent will be set aside for the General Fund.

Table 13 Annualized Railyard Site Development Fiscal Benefit Bonding Potential

Year	Annual Fiscal Revenues 2017$			Nominal Fiscal Revenues			Bonding Capacity in Nominal Dollars[1]			Total Bond Capacity in 2026$		
	Existing DTX Plan	Pennsylvania Alignment	Mission Bay Alignment	Existing DTX Plan	Pennsylvania Alignment	Mission Bay Alignment	Existing DTX Plan	Pennsylvania Alignment	Mission Bay Alignment	Existing DTX Plan	Pennsylvania Alignment	Mission Bay Alignment
2021	-	$705,679	$705,679	-	$794,248	$794,248	-	$7,942,484	$7,942,484	-	$9,207,516	$9,207,516
2022	-	$1,411,359	$1,411,359	-	$1,636,152	$1,636,152	-	$8,419,033	$8,419,033	-	$9,475,696	$9,475,696
2023	-	$2,117,038	$2,117,038	-	$2,527,854	$2,527,854	-	$8,917,027	$8,917,027	-	$9,743,876	$9,743,876
2024	-	$2,822,718	$2,822,718	-	$3,471,587	$3,471,587	-	$9,437,323	$9,437,323	-	$10,012,056	$10,012,056
2025	-	$3,528,397	$3,528,397	-	$4,469,668	$4,469,668	-	$9,980,812	$9,980,812	-	$10,280,236	$10,280,236
2026	-	$4,234,077	$4,234,077	-	$5,524,510	$5,524,510	-	$10,548,417	$10,548,417	-	$10,548,417	$10,548,417
2027	-	$4,939,756	$4,939,756	-	$6,638,619	$6,638,619	-	$11,141,095	$11,141,095	-	$10,816,597	$10,816,597
2028	-	$5,645,436	$5,645,436	-	$7,814,603	$7,814,603	-	$11,759,840	$11,759,840	-	$11,084,777	$11,084,777
2029	-	$6,351,115	$6,351,115	-	$9,055,171	$9,055,171	-	$12,405,682	$12,405,682	-	$11,352,957	$11,352,957
2030	-	$7,056,794	$7,056,794	-	$10,363,141	$10,363,141	-	$13,079,692	$13,079,692	-	$11,621,137	$11,621,137
2031	-	$7,762,474	$7,762,474	-	$11,741,438	$11,741,438	-	$13,782,977	$13,782,977	-	$11,889,317	$11,889,317
2032	-	$8,468,153	$8,468,153	-	$13,193,107	$13,193,107	-	$14,516,687	$14,516,687	-	$12,157,497	$12,157,497
2033	-	$9,173,833	$9,173,833	-	$14,721,309	$14,721,309	-	$15,282,016	$15,282,016	-	$12,425,677	$12,425,677
2034	-	$9,879,512	$9,879,512	-	$16,329,328	$16,329,328	-	$16,080,199	$16,080,199	-	$12,693,857	$12,693,857
2035	-	$10,585,192	$10,585,192	-	$18,020,580	$18,020,580	-	$16,912,519	$16,912,519	-	$12,962,037	$12,962,037
2036	-	$11,290,871	$11,290,871	-	$19,798,611	$19,798,611	-	$17,780,306	$17,780,306	-	$13,230,217	$13,230,217
2037	-	$11,996,551	$11,996,551	-	$21,667,105	$21,667,105	-	$18,684,939	$18,684,939	-	$13,498,397	$13,498,397
2038	-	$12,702,230	$12,702,230	-	$23,629,889	$23,629,889	-	$19,627,848	$19,627,848	-	$13,766,578	$13,766,578
2039	-	$13,407,909	$13,407,909	-	$25,690,941	$25,690,941	-	$20,610,515	$20,610,515	-	$14,034,758	$14,034,758
2040	-	$14,113,589	$14,113,589	-	$27,854,389	$27,854,389	-	$21,634,477	$21,634,477	-	$14,302,938	$14,302,938
Total	**$0**	**$148,192,683**	**$148,192,683**	**$0**	**$244,942,250**	**$244,942,250**	**$0**	**$278,543,886**	**$278,543,886**	**$0**	**$235,104,538**	**$235,104,538**

[1] This accounts for the net new fiscal revenues in a given year and thus subtracts the fiscal revenues accrued in previous years. Bonding capacity is estimated at 10x the annual net fiscal impact in a given year.

Table 14 Tax Increment Estimates (Gross and Portion Attributed to Rail, 2017$)

Tax Increment Sources	Existing DTX Plan	Pennsylvania Alignment	Mission Bay Alignment
Liberated Railyards Development Value	N/A	$2,066,838,722	$2,066,838,722
Non-Railyards AV Increases			
New Value from Pipeline Development			
Base Value of Pipeline Projects[1]	$6,050,548,436	$6,050,548,436	$10,036,630,675
Value Premium Attributed to Rail (5%)*	$302,527,422	$302,527,422	$501,831,534
Subtotal	$6,353,075,858	$6,353,075,858	$10,538,462,209
Soft Sites Development Market Value			
Base Value of Soft sites Projects[1]	$21,136,194,585	$21,136,194,585	$8,914,079,207
Value Premium Attributed to Rail (5%)*	$1,056,809,729	$1,056,809,729	$445,703,960
Subtotal	$22,193,004,314	$22,193,004,314	$9,359,783,167
Existing AV Growth Attributed to Rail *	$1,151,807,214	$1,151,807,214	$773,356,295
Subtotal Non-Railyards AV Increase Attributed to Rail[2]	***$2,511,144,365***	***$2,511,144,365***	***$1,720,891,789***
Total AV Increase Attributed to Rail	**$2,511,144,365**	**$4,577,983,087**	**$3,787,730,511**

[1] It is assumed that the base value of pipeline and soft sites will be realized regardless of station area locations.

[2] Non-railyard AV growth attributed to rail is inclusive of all line items marked with an *

Source: City of San Francisco Planning Department; Economic & Planning Systems, Inc.

Table 15 Annualized Property Tax Increment Bonding Potential (Exclusive of Liberated Railyard Sites)

Year	Unadjusted AV Growth 2017$[1]			Cumulative Nominal AV Growth[2]			Annual Tax Increment[3]			Bonding Capacity Nominal Dollars[4]		
	Existing DTX Plan	Pennsylvania Alignment	Mission Bay Alignment	Existing DTX Plan	Pennsylvania Alignment	Mission Bay Alignment	Existing DTX Plan	Pennsylvania Alignment	Mission Bay Alignment	Existing DTX Plan	Pennsylvania Alignment	Mission Bay Alignment
2021	$125,557,218	$125,557,218	$86,044,589	$141,315,755	$141,315,755	$96,843,943	$786,924	$786,924	$539,281	$7,869,244	$7,869,244	$5,392,807
2022	$125,557,218	$125,557,218	$86,044,589	$289,697,298	$289,697,298	$198,530,084	$1,613,195	$1,613,195	$1,105,526	$8,262,706	$8,262,706	$5,662,448
2023	$125,557,218	$125,557,218	$86,044,589	$445,413,129	$445,413,129	$305,242,425	$2,480,307	$2,480,307	$1,699,759	$8,671,120	$8,671,120	$5,942,334
2024	$125,557,218	$125,557,218	$86,044,589	$608,740,933	$608,740,933	$417,171,266	$3,389,807	$3,389,807	$2,323,041	$9,094,997	$9,094,997	$6,232,618
2025	$125,557,218	$125,557,218	$86,044,589	$779,967,879	$779,967,879	$534,513,403	$4,343,293	$4,343,293	$2,976,467	$9,534,865	$9,534,865	$6,534,260
2026	$125,557,218	$125,557,218	$86,044,589	$959,390,928	$959,390,928	$657,472,344	$5,342,420	$5,342,420	$3,661,170	$9,991,270	$9,991,270	$6,847,035
2027	$125,557,218	$125,557,218	$86,044,589	$1,147,317,149	$1,147,317,149	$786,258,524	$6,388,898	$6,388,898	$4,378,323	$10,464,773	$10,464,773	$7,171,528
2028	$125,557,218	$125,557,218	$86,044,589	$1,344,064,046	$1,344,064,046	$921,089,529	$7,484,493	$7,484,493	$5,129,137	$10,955,957	$10,955,957	$7,508,137
2029	$125,557,218	$125,557,218	$86,044,589	$1,549,959,898	$1,549,959,898	$1,062,190,330	$8,631,036	$8,631,036	$5,914,864	$11,465,422	$11,465,422	$7,857,274
2030	$125,557,218	$125,557,218	$86,044,589	$1,765,344,104	$1,765,344,104	$1,209,793,517	$9,830,414	$9,830,414	$6,736,801	$11,993,786	$11,993,786	$8,219,363
2031	$125,557,218	$125,557,218	$86,044,589	$1,990,567,544	$1,990,567,544	$1,364,139,549	$11,084,583	$11,084,583	$7,596,285	$12,541,689	$12,541,689	$8,594,842
2032	$125,557,218	$125,557,218	$86,044,589	$2,225,992,950	$2,225,992,950	$1,525,477,007	$12,395,562	$12,395,562	$8,494,701	$13,109,791	$13,109,791	$8,984,164
2033	$125,557,218	$125,557,218	$86,044,589	$2,471,995,286	$2,471,995,286	$1,694,062,854	$13,765,439	$13,765,439	$9,433,481	$13,698,773	$13,698,773	$9,387,794
2034	$125,557,218	$125,557,218	$86,044,589	$2,728,962,142	$2,728,962,142	$1,870,162,707	$15,196,373	$15,196,373	$10,414,102	$14,309,338	$14,309,338	$9,806,216
2035	$125,557,218	$125,557,218	$86,044,589	$2,997,294,144	$2,997,294,144	$2,054,051,115	$16,690,595	$16,690,595	$11,438,095	$14,942,213	$14,942,213	$10,239,925
2036	$125,557,218	$125,557,218	$86,044,589	$3,277,405,370	$3,277,405,370	$2,246,011,846	$18,250,409	$18,250,409	$12,507,038	$15,598,145	$15,598,145	$10,689,437
2037	$125,557,218	$125,557,218	$86,044,589	$3,569,723,779	$3,569,723,779	$2,446,338,182	$19,878,200	$19,878,200	$13,622,567	$16,277,909	$16,277,909	$11,155,260
2038	$125,557,218	$125,557,218	$86,044,589	$3,874,691,667	$3,874,691,667	$2,655,333,229	$21,576,430	$21,576,430	$14,786,367	$16,982,302	$16,982,302	$11,638,002
2039	$125,557,218	$125,557,218	$86,044,589	$4,192,766,114	$4,192,766,114	$2,873,310,224	$23,347,645	$23,347,645	$16,000,183	$17,712,148	$17,712,148	$12,138,167
2040	$125,557,218	$125,557,218	$86,044,589	$4,524,419,468	$4,524,419,468	$3,100,592,870	$25,194,475	$25,194,475	$17,265,819	$18,468,296	$18,468,296	$12,656,357
Total	**$2,511,144,365**	**$2,511,144,365**	**$1,720,891,789**	**$4,524,419,468**	**$4,524,419,468**	**$3,100,592,870**	**$227,670,499**	**$227,670,499**	**$156,023,006**	**$251,944,746**	**$251,944,746**	**$172,658,191**
Total Bonding Capacity (2021-2040) in 2026$										**$214,226,338**	**$214,226,338**	**$146,809,698**

[1] These values include AV growth attributed to rail service among pipeline projects, near-term soft sites, and existing properties (see Table 13).
[2] Assumes that newly constructed development values increase by 3% annually but that once built, AV appreciation is capped at 2 percent, consistent with California Proposition 13.
[3] Assumes a 1% property tax rate and a General Fund share of 55.68% per City instruction.
[4] Bonding capacity is estimated at 10x the annual net fiscal impact in a given year.

Table 16 Railyard Sites Land Secured Financing

Year	Liberated Development Phasing Value			Annual Special Tax[2]	Incremental Special Tax Bonding Capacity
	Unadjusted 2017$	Nominal $	Cumulative Nominal Annual AV $[1]		
2017	$0	$0	$0	$0	$0
2018	$0	$0	$0	$0	$0
2019	$0	$0	$0	$0	$0
2020	$0	$0	$0	$0	$0
2021	$103,341,936	$116,312,260	$116,312,260	$116,312	$1,163,123
2022	$103,341,936	$119,801,627	$238,440,132	$238,440	$1,221,279
2023	$103,341,936	$123,395,676	$366,604,611	$366,605	$1,281,645
2024	$103,341,936	$127,097,546	$501,034,249	$501,034	$1,344,296
2025	$103,341,936	$130,910,473	$641,965,407	$641,965	$1,409,312
2026	$103,341,936	$134,837,787	$789,642,502	$789,643	$1,476,771
2027	$103,341,936	$138,882,921	$944,318,273	$944,318	$1,546,758
2028	$103,341,936	$143,049,408	$1,106,254,047	$1,106,254	$1,619,358
2029	$103,341,936	$147,340,890	$1,275,720,018	$1,275,720	$1,694,660
2030	$103,341,936	$151,761,117	$1,452,995,536	$1,452,996	$1,772,755
2031	$103,341,936	$156,313,951	$1,638,369,397	$1,638,369	$1,853,739
2032	$103,341,936	$161,003,369	$1,832,140,154	$1,832,140	$1,937,708
2033	$103,341,936	$165,833,470	$2,034,616,427	$2,034,616	$2,024,763
2034	$103,341,936	$170,808,474	$2,246,117,230	$2,246,117	$2,115,008
2035	$103,341,936	$175,932,729	$2,466,972,304	$2,466,972	$2,208,551
2036	$103,341,936	$181,210,710	$2,697,522,460	$2,697,522	$2,305,502
2037	$103,341,936	$186,647,032	$2,938,119,941	$2,938,120	$2,405,975
2038	$103,341,936	$192,246,443	$3,189,128,783	$3,189,129	$2,510,088
2039	$103,341,936	$198,013,836	$3,450,925,194	$3,450,925	$2,617,964
2040	$103,341,936	$203,954,251	$3,723,897,949	$3,723,898	$2,729,728
Total	**$2,066,838,722**	**$3,125,353,971**	**$3,723,897,949**	**$33,651,097**	**$37,238,979**
Total Bonding Capacity (2021-2040) in 2026$					**$31,663,967**

[1] Assumes that newly constructed development values increase by 3% annually but that once built, AV appreciation is capped at 2 percent, consistent with California Proposition 13.
[2] Based on a potential special tax of .1% of property value.

Table 17 Comparison of Total Bonding Capacity by Alternative, 2026$

Item	Existing DTX Plan	Pennsylvania Alignment	Mission Bay Alignment
Railyard Development Tax Increment		$235,104,538	$235,104,538
Adjacent Property Increased Value	$214,226,338	$214,226,338	$146,809,698
Annual Land Secured Financing - CFD	$0	$31,663,967	$31,663,967
Potential Total Bonding Capacity	**$214,226,338**	**$480,994,844**	**$413,578,204**

Qualitative Analysis

Table 1 DTX Cut and Cover Construction Travel Time Impacts

Construction Year	Calendar Year	Annual Delay Time (Hrs) Business 4.6%	Personal 95.4%	Total	Cost of Delayed Time Business $24.90/ hr	Personal $12.90/ hr	Total
1	2019	30,736	637,446	668,182	-$765,336	-$8,223,049	-$8,988,384
2	2020	31,155	646,118	677,273	-$775,748	-$8,334,928	-$9,110,676
3	2021	31,573	654,791	686,364	-$786,161	-$8,446,807	-$9,232,969
4	2022	31,991	663,464	695,455	-$796,574	-$8,558,687	-$9,355,261
5	2023	32,409	672,136	704,545	-$806,986	-$8,670,553	-$9,477,539
6	2024	32,827	680,809	713,636	-$817,399	-$8,782,433	-$9,599,831
7	2025	33,245	689,482	722,727	-$827,812	-$8,894,312	-$9,722,124
Total (2016$)		**223,936**	**4,644,246**	**4,868,182**	**-$5,576,016**	**-$59,910,769**	**-$65,486,784**
Total (2026$)					**-$7,493,699**	**-$80,515,063**	**-$88,008,762**

Sources: CH2M Hill, Fehr and Peers; US Department of Transportation; Economic & Planning Systems.

Table 2 Lost Parking Revenue

Construction Year	Blocks Closed	Length of Closure (months)	Lost revenue per block month	Annual Lost Parking Revenue
1	2	6	$10,000	-$120,000
2	2	6	$10,000	-$120,000
3	2	6	$10,000	-$120,000
4	2	6	$10,000	-$120,000
5	2	6	$10,000	-$120,000
6	2	6	$10,000	-$120,000
Total				**-$720,000**

Source: San Francisco Planning Department; Economic & Planning Systems

Table 4 Diminished Property Value from Trenching Project

Percent of Frontage Lost	# of Parcels	Aggregated Loss of Value
0-24%	33	-$26,276,577
25-49%	9	-$37,060,400
50-74%	12	-$50,225,058
75-100%	3	-$365,958
Total	**57**	**-$113,927,993**

Source: San Francisco Department of Public Works; Economic & Planning Systems

Table 3 Grade Separation Travel Time Impacts

Calendar Year	Daily Travel Time Delay (hours)[1]				Annual Travel Time Costs[2]			
	Existing At-Grade Crossings without HSR	Existing At-Grade Crossing with HR	16th St. Underpass Below Rail At-Grade	Rail Underground with 16th St. At-Grade	Existing At-Grade Crossings without HSR	Existing At-Grade Crossing with HR	16th St. Underpass Below Rail At-Grade	Rail Underground with 16th St. At-Grade
2026	1,036	1,243	621	746	$3,482,589	$4,179,107	$2,089,554	$2,507,464
2027	1,089	1,307	654	784	$3,662,723	$4,395,268	$2,197,634	$2,637,161
2028	1,143	1,371	686	823	$3,842,857	$4,611,429	$2,305,714	$2,766,857
2029	1,196	1,436	718	861	$4,022,991	$4,827,589	$2,413,795	$2,896,554
2030	1,250	1,500	750	900	$4,203,125	$5,043,750	$2,521,875	$3,026,250
2031	1,304	1,564	782	939	$4,383,259	$5,259,911	$2,629,955	$3,155,946
2032	1,357	1,629	814	977	$4,563,393	$5,476,071	$2,738,036	$3,285,643
2033	1,411	1,693	846	1,016	$4,743,527	$5,692,232	$2,846,116	$3,415,339
2034	1,464	1,757	879	1,054	$4,923,661	$5,908,393	$2,954,196	$3,545,036
2035	1,518	1,821	911	1,093	$5,103,795	$6,124,554	$3,062,277	$3,674,732
2036	1,571	1,886	943	1,131	$5,283,929	$6,340,714	$3,170,357	$3,804,429
2037	1,625	1,950	975	1,170	$5,464,063	$6,556,875	$3,278,438	$3,934,125
2038	1,679	2,014	1,007	1,209	$5,644,196	$6,773,036	$3,386,518	$4,063,821
2039	1,732	2,079	1,039	1,247	$5,824,330	$6,989,196	$3,494,598	$4,193,518
2040	1,786	2,143	1,071	1,286	$6,004,464	$7,205,357	$3,602,679	$4,323,214
2041	1,839	2,207	1,104	1,324	$6,184,598	$7,421,518	$3,710,759	$4,452,911
2042	1,893	2,271	1,136	1,363	$6,364,732	$7,637,679	$3,818,839	$4,582,607
2043	1,946	2,336	1,168	1,401	$6,544,866	$7,853,839	$3,926,920	$4,712,304
2044	2,000	2,400	1,200	1,440	$6,725,000	$8,070,000	$4,035,000	$4,842,000
2045	2,054	2,464	1,232	1,479	$6,905,134	$8,286,161	$4,143,080	$4,971,696
2046	2,107	2,529	1,264	1,517	$7,085,268	$8,502,321	$4,251,161	$5,101,393
2047	2,161	2,593	1,296	1,556	$7,265,402	$8,718,482	$4,359,241	$5,231,089
2048	2,214	2,657	1,329	1,594	$7,445,536	$8,934,643	$4,467,321	$5,360,786
2049	2,268	2,721	1,361	1,633	$7,625,670	$9,150,804	$4,575,402	$5,490,482
2050	2,321	2,786	1,393	1,671	$7,805,804	$9,366,964	$4,683,482	$5,620,179
2051	2,375	2,850	1,425	1,710	$7,985,938	$9,583,125	$4,791,563	$5,749,875
2052	2,429	2,914	1,457	1,749	$8,166,071	$9,799,286	$4,899,643	$5,879,571
2053	2,482	2,979	1,489	1,787	$8,346,205	$10,015,446	$5,007,723	$6,009,268
2054	2,536	3,043	1,521	1,826	$8,526,339	$10,231,607	$5,115,804	$6,138,964
2055	2,589	3,107	1,554	1,864	$8,706,473	$10,447,768	$5,223,884	$6,268,661
2056	2,643	3,171	1,586	1,903	$8,886,607	$10,663,929	$5,331,964	$6,398,357
2057	2,696	3,236	1,618	1,941	$9,066,741	$10,880,089	$5,440,045	$6,528,054
2058	2,750	3,300	1,650	1,980	$9,246,875	$11,096,250	$5,548,125	$6,657,750
2059	2,804	3,364	1,682	2,019	$9,427,009	$11,312,411	$5,656,205	$6,787,446
2060	2,857	3,429	1,714	2,057	$9,607,143	$11,528,571	$5,764,286	$6,917,143
2061	2,911	3,493	1,746	2,096	$9,787,277	$11,744,732	$5,872,366	$7,046,839
2062	2,964	3,557	1,779	2,134	$9,967,411	$11,960,893	$5,980,446	$7,176,536
2063	3,018	3,621	1,811	2,173	$10,147,545	$12,177,054	$6,088,527	$7,306,232
2064	3,071	3,686	1,843	2,211	$10,327,679	$12,393,214	$6,196,607	$7,435,929
2065	3,125	3,750	1,875	2,250	$10,507,813	$12,609,375	$6,304,688	$7,565,625
2066	3,179	3,814	1,907	2,289	$10,687,946	$12,825,536	$6,412,768	$7,695,321
2067	3,232	3,879	1,939	2,327	$10,868,080	$13,041,696	$6,520,848	$7,825,018
2068	3,286	3,943	1,971	2,366	$11,048,214	$13,257,857	$6,628,929	$7,954,714
2069	3,339	4,007	2,004	2,404	$11,228,348	$13,474,018	$6,737,009	$8,084,411
2070	3,393	4,071	2,036	2,443	$11,408,482	$13,690,179	$6,845,089	$8,214,107
2071	3,446	4,136	2,068	2,481	$11,588,616	$13,906,339	$6,953,170	$8,343,804
2072	3,500	4,200	2,100	2,520	$11,768,750	$14,122,500	$7,061,250	$8,473,500
2073	3,554	4,264	2,132	2,559	$11,948,884	$14,338,661	$7,169,330	$8,603,196
2074	3,607	4,329	2,164	2,597	$12,129,018	$14,554,821	$7,277,411	$8,732,893
2075	3,661	4,393	2,196	2,636	$12,309,152	$14,770,982	$7,385,491	$8,862,589
Total 2026 - 2075 (in 2016$)					**$394,793,527**	**$473,752,232**	**$236,876,116**	**$284,251,339**
Total 2026 - 2075 (in 2026$)					**$530,569,487**	**$636,683,385**	**$318,341,692**	**$382,010,031**

Table 5 Lost Bonding Potential from Diminished Property Values 2,227,795 $148,559,456

Item	Value
2021 Property Loss Associated with Trenching	-$113,927,993
Lost Annual Property Tax General Fund Share[1]	-$634,351
Lost Bonding Potential 2016$[2]	**-$6,343,511**
Lost Bonding Potential 2026$	**-$8,276,843**

[1] Assuming 55.68 percent of the 1 percent annual tax levy to the City's General Fund.

[2] According to City sources, bonding potential is equal to 10 times that of annual revenue.

10 times that of annual revenue.

Table 6 Mission Bay Train Travel Time Savings

Item	Caltrain	HSR	Total
Travel Time Savings (minutes per trip)	0.35	0.30	
Daily Riders at Buildout	31,500	35,460	66,960
Annual Riders at Buildout[1]	7,875,000	8,865,000	16,740,000
Annual Time Savings (Hrs)	45,938	44,325	90,263
Annual Value of Time Savings (2016$)[2]	**$619,697**	**$597,944**	**$1,217,641**
Annual Value of Time Savings (2026$)	**$832,821**	**$803,587**	**$1,636,408**
Value over 50 Years (in 2026$)	**$41,641,039**	**$40,179,354**	**$81,820,393**

[1] Reflects annualization factor of 250 day per year, consistent with other ongoing studies in San Francisco
[2] Based on the US DOT standard for monetized value of time of $13.45 per hour

Sources: CH2M Hill; US DOT; Economic & Planning Systems

Detailed Estimate Backup

Baseline (DTX) Alignment	Unit	Quantity	Unit Cost	Cost
Cut and Cover Transbay Throat Structure	CY	140,400	$670	$94,068,000
SEM Tunnel (DTX box to Townsend Street)	CY	318,963	$760	$242,412,096
Cut and Cover Tunnel (Townsend Street to Station)	CY	142,100	$670	$95,207,000
4th/Townsend Station (2 platform)	CY	115,267	$1,200	$138,320,000
Retained Cut (Station to at-grade)	CY	127,102	$562	$71,468,421
Ventilation / Escape Structures	CY	14,467	$670	$9,692,667
Systems	LS		25%	$162,792,046
4th/King Railyard Upgrade	LS	DTX		$34,159,483
Utility Relocation and Protection	LS	DTX		$75,293,195
Mobilization		10%		$92,341,291
Design/Construction Contingency		15%		$152,363,130
		Total Construction		$1,168,117,329
ROW Acquisition	DTX			$200,000,000
Project Development / Management				
PE/Environmental			4%	$46,724,693
Final Design			8%	$93,449,386
Construction Management			10%	$116,811,733
Project Management/Owner Costs			10%	$116,811,733
Program Contingency			20%	$348,382,975
			Total Probable Cost	**$2,090,000,000**

Pennsylvania Ave Alignment	Unit	Quantity	Unit Cost	Cost
Cut and Cover Transbay Throat Structure	CY	140,400	$670	$94,068,000
SEM Tunnel (DTX box to Townsend Street)	CY	318,963	$760	$242,412,096
Cut and Cover Tunnel (Townsend Street to Station)	CY	142,100	$670	$95,207,000
4th/Townsend Station (4 platform)	CY	155,193	$1,200	$186,231,111
Cut and Cover Tunnel (South of Station)	CY	103,756	$670	$69,516,222
Twin Bore TBM Tunnels (To 22nd Sta)	CY	168,948	$800	$135,158,297
22nd Street Station (Cut and Cover)	CY	155,193	$1,200	$186,231,111
Twin Bore TBM Tunnels (south of 22nd Sta)	CY	39,421	$800	$31,536,936
Cross Passages	CY	1,681	$12,094	$20,333,977
Ventilation / Escape Structures	CY	14,467	$670	$9,692,667
Systems		25%		$264,972,802
Railyard (Relocate to Site 1 or Site 2)	LS			$153,000,000
Utility relocation and protection	DTX		150.0%	$112,939,792
Mobilization		10%		$160,130,001
Design/Construction Contingency		25%		$440,357,503
		Total Construction		$2,201,787,517
ROW Acquisition	DTX		140.0%	$280,000,000
Project Development / Management				
PE/Environmental			4%	$88,071,501
Final Design			8%	$176,143,001
Construction Management			10%	$220,178,752
Project Management/Owner Costs			10%	$220,178,752
Program Contingency			20%	$637,271,904
			Total Probable Cost	**$3,824,000,000**

Mission Bay Alignment - Twin-bore, 2-Track (requires	Unit	Quantity	Unit Cost	Cost
Cut and Cover Transbay Throat Structure	CY	140,400	$670	$94,068,000
SEM Tunnel (DTX box to Station)	CY	450,599	$760	$342,455,183
3rd St. Station (4 platform)	CY	813,037	$1,000	$813,037,037
Twin Bore TBM Tunnels	CY	138,492	$800	$110,793,501
Cross Passages	CY	1,059	$12,094	$12,810,406
Cut and Cover Tunnel (Twin Bore Tunnel to Station)	CY	22,711	$670	$15,216,444
22nd St Station				$120,000,000
Retained Cut (Station to at-grade)	CY	99,926	$562	$56,187,601
Ventilation / Escape Structures	CY	14,467	$670	$9,692,667
Systems		25%		$389,705,913
Railyard (Relocate to Site 1 or Site 2)	LS			$153,000,000
Utility relocation and protection	DTX		300.0%	$225,879,585
Pile removal/protection at AT&T/3rd st bridge	LS	Provisional		$50,000,000
3rd St LRT Temporary Relocation				$20,000,000
Mobilization		10%		$241,284,634
Design/Construction Contingency		30%		$796,239,291
	Total Construction			$3,450,370,261
ROW Acquisition	DTX		200.0%	$400,000,000
Project Development / Management				
PE/Environmental			4%	$138,014,810
Final Design			8%	$276,029,621
Construction Management			10%	$345,037,026
Project Management/Owner Costs			10%	$345,037,026
Program Contingency			20%	$990,897,749
		Total Probable Cost		**$5,945,000,000**

Mission Bay Alignment - Bored Station Option	Unit	Quantity	Unit Cost	Cost
Cut and Cover Transbay throat structure	CY	140,400	$670	$94,068,000
Large Bored TBM Tunnel	CY	649,356	$670	$435,068,229
Station Shaft	CY	44,178	$1,200	$53,013,333
3rd St. Station (4 platform)	CY	83,403	$670	$55,880,323
Station Shaft	CY	44,178	$1,200	$53,013,333
Large Bored TBM Tunnel	CY	548,080	$670	$367,213,551
Cut and Cover Tunnel	CY	22,711	$670	$15,216,444
22nd St Station				$120,000,000
Retained Cut (Station to at-grade)	CY	99,926	$562	$56,187,601
Ventilation / Escape Structures	CY	28,933	$670	$19,385,333
Systems		25%		$314,150,473
Railyard (Relocate to Site 1 or Site 2)	LS			$153,000,000
Utility relocation and protection	DTX		200.0%	$150,586,390
Pile removal/protection at AT&T/3rd st bridge	LS	Provisional		$100,000,000
Mobilization		10%		$198,678,301
Design/Construction Contingency		35%		$764,911,460
		Total Construction		$2,950,372,773
ROW Acquisition	DTX		200.0%	$400,000,000
Project Development / Management				
PE/Environmental			4%	$118,014,911
Final Design			8%	$236,029,822
Construction Management			10%	$295,037,277
Project Management/Owner Costs			10%	$295,037,277
Program Contingency			20%	$858,898,412
		Total Probable Cost		**$5,153,000,000**

New South Railyard Site 1	Unit	Quantity	Unit Cost	Cost
Guideway and Track				$4,837,000
Yard, shop and admin building				$2,930,000
Sitework				$31,328,000
Systems				$9,134,000
General Conditions and Mark Ups				$8,590,000
Mobilization		10%		$5,681,900
Design/Construction Contingency		30%		$18,750,270
		Total Construction		$81,251,170
ROW Acquisition/Relocation	LS			$40,000,000
Project Development / Management				
PE/Environmental			4%	$750,011
Final Design			8%	$1,500,022
Construction Management			10%	$1,875,027
Project Management/Owner Costs			10%	$1,875,027
Program Contingency			20%	$25,450,251
		Total Probable Cost		**$153,000,000**

New South Railyard Site 2	Unit	Quantity	Unit Cost	Cost
Guideway and Track				$6,592,000
Yard, shop and admin building				$2,930,000
Sitework				$17,521,000
Systems				$9,504,000
General Conditions and Mark Ups				$6,509,000
Mobilization		10%		$4,305,600
Design/Construction Contingency		30%		$14,208,480
		Total Construction		$61,570,080
ROW Acquisition	Ac	18	$2,000,000	$36,000,000
Project Development / Management				
PE/Environmental			4%	$2,462,803
Final Design			8%	$4,925,606
Construction Management			10%	$6,157,008
Project Management/Owner Costs			10%	$6,157,008
Program Contingency			20%	$23,454,501
		Total Probable Cost		**$141,000,000**

Basis of Rates (Tab)

See estimate Summary spreadsheet

	Value used
Twin bore tunnel	$ 800 /cy
Cross passages	$ 12,094 /cy
Large bore tunnel	$ 670 /cy
SEM tunnel	$ 760 /cy
Cut and cover	$ 670 /cy
Cut and cover station	$ 1,200 /cy
Large cut and cover station	$ 1,000 /cy
Retained cut	$ 562 /cy

Basis of estimate values

Source: SR-710 estimate

Estimate year: 2014

Inflation allowance to 2016: 0.9%

Addition for Northern California: 20%

Station/C&C Multiplier 121.1%

LRT stations: based on SR710 estimate

Number	Length	Width	Height	Depth	Volume	Cost	cost /cuft Base	inflated
Station 1 - Excavation, Support	400	60	55	70	1,320,000	$28,876,000	$ 21.88	
Station 2/Crossover - Excavation, Su	800	60	45	80	2,160,000	$51,361,000	$ 23.78	
Station 3 - Excavation, Support	400	65	60	80	1,560,000	$33,152,000	$ 21.25	
Station 4/Crossover - Excavation, Su	1300	60	40	75	3,120,000	$65,047,000	$ 20.85	
						Average	$ 21.94	$ 26.56
Additional factor for ground treatment and additional SoE						30%	$ 28.52	$ 34.53
						Price per cubic yard:	$ 770.04	$ 932.36

Stonehenge C&C option 116,517,354 GBP 2002 tender price

$394,784,213 USD 2016

length	6,536	ft			
width	88				
height	30				
volume	17,254,901.96				
rate	22.88	2011	$23.71	2014	**$28.71** cu ft
					$775 cu yd

DTX $427,000,000

less 25% contingency	341600000				
cuy	539,335				
rate	23	2011	$24.31	2014	**$24.58** cu ft
					$664 cu yd

$ 790.40 average

Price per cubic yard: $ 770.04 **$ 664.00** Station/C&C & Cut and cover tunnel

Twin bored tunnel

	OD	Area	length	cost		cost/ft	cost /cuft Base	inflated	
twin bore tunnel only	20.5	330.0635782				$ 7,142	$ 21.64	$ 26.20	cu ft
							$ 21.64		
							$ 584.23	$ 707.38	cu yd
Cross passages (each):	18	254.4690049	20	$ 1,882,769	5,089		$ 369.94	$ 447.92	cu ft
							$ 9,988.40	$ 12,093.96	cu yd

Based on blue plains

Contract award price 340,000,000

DS Shaft	70,100,000				
depth	193				
dia	148				
area	17,203				
	$21	2011	$21.88	2014	**$26.50** cu ft
					$715 cu yd
Tunnel	139,500,000				
length	25,200				
dia	26				
area	531				
	$10	2011	$10.81	2014	**$13.09** cu ft
					$353 cu yd

BAFB Shaft	15,656,000				
depth	150				
dia	67				
area	3,526				
	$30	2011	$30.68	2014	**$37.15** cu ft
					$1,003 cu yd

considered too low based on CSO tunnel with no internal structure

Cut and cover tunnel 530 average

use station rates: crossover box quantities similar to station. Finishes higher but more excavatin and placement pcy of structure

Large bored tunnel

Based on SR710 estimate

Cost cost /cuft

	OD	Area	length	Tunnel	Int. struct.	cost/ft	Base	inflated												
N.Portal Southbound Tunnel Excav a	62.5	3067.961576	11,170	$ 359,837,283	$83,248,713	$ 39,668	$ 12.93	$ 15.66					800000000	9000	28.97327	782.2784				
S.Portal Southbound Tunnel	62.5	3067.961576	11,170	$ 310,972,669	$ 87,642,613	$ 35,686.24	$ 11.63	$ 14.08		22%	cost of internal structure				35.08084	947.1827				
										###	cost of backfill @ $10/cy									
Assuming economies of scale, use the higher value:								$ 15.66		5%	backfill									
										7%	slab + wall + Walkway									
From construction estiamte the markup was:																				
Direct costs				$ 1,945,415,676						10%	reduction for backfill only									
Indirect costs				$ 626,421,313	32%															
Assign indirect to cost rate:								$ 20.70	cu ft											
								$559	cu yd											
Based on Alaskan way contract award														**Portal**						
														Length	300					
contract price 2011	1,100,000,000	systems	25%											Width	485					
less systems	825,000,000													Height	15					
back calculate cost of Cut and cover	length	4,000												Depth	15	Additional factor for ground				
	width	60												Volume	2.E+06	treatment and additional SoE				
	average height	45												Cost	3.E+07	30%	Price per cubic yard:			
	volume	10,800,000											cost /cuft	Base	$ 13.23	$ 17.20	$ 8.10			
	rate	$27.76	2011 price											inflated	$ 16.02	$ 20.83	$ 464.40	#REF!		
	cost	$299,846,473																		
Cost of Tunnel		$525,153,526.96																		
	length	9000																		
	diameter	57												**Additional sums**						
	area	2,552												Original construction sum			$677,443,000			
	rate	$23	2011	$23.70	2014			**$28.70**	cu ft					Tunnel systems			$167,700,000		25%	
								$775	cu yd					Mobilization			$47,856,000		7%	
								$667		TBM	613	average								
DTX		287,000,000																		
less 25% contingency		229,600,000																		
	volume	318,963																		
	rate	$27	2011	$27.63	2014			**$27.93**	cu ft											
								$754		SEM										

RLPA Cost Estimate

Transbay Transit Center

Item Description	Program Phase 2		
	TC	DTX	Total
Construction Cost	$ 369 m	$1,110 m	$1,479 m
Professional Services	$ 57 m	$ 242 m	$ 299 m
Construction Contingency & ROW	$ 37 m	$ 274 m	$ 311 m
Programwide Costs	$ 67 m	$ 176 m	$ 243 m
Total	$ 530 m	$ 1,802 m	**$ 2,332 m**
Total YOE	$ 681 m	$ 2,315 m	**$ 2,996 m**

- Estimate prepared in December $2007

Escalation Rate = 3% Year of operation: 2024

Item Description		From Table Left 2007 Cost	Computed 2016 Cost	Computed 2022 Cost YOE
Construction		$1,110,000,000	$1,326,552,751	$2,066,725,963
Professional Services	21.8%	$242,000,000	$289,212,401.61	$316,030,200
Const. Contingency	20.5%	$228,000,000	$272,481,105.65	$270,000,000.00
ROW		$46,000,000	$60,019,566	$65,585,001
Program Costs	10.8%	$176,000,000	$210,882,401.71	$210,882,401.71
Total		**$1,802,000,000**	**$2,159,148,227**	**$2,929,223,565**

2022 is approximate mid point of cost expenditure

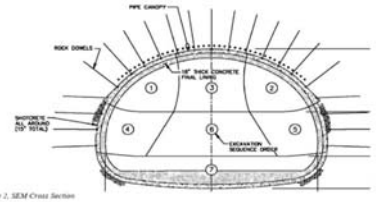


Figure 2. SEM Cross Section

MTC Cost Review

Transbay Transit Center

Summary of Potential Adjustments to Phase 2 Cost Estimate

Item	($ millions)
TJPA Base Estimate (YOE)	$3,005
Escalation (using 5%, instead of 3%)	$433
Fee adjustment (assuming 10%, instead of 5%)	$100
Contingency (using 27%, instead of 24%)	$93
Missing items	$58
Total Adjustments	$684
Add BART/Muni Pedestrian Connector	$120-310
Total Adjusted Estimate	**$3,809-3,999**

MTC Cost Review (TC vs. DTX)

Item	Cost ($millions)		
	TC	DTX	TOTAL
TJPA Base Esimate (YOE)	$683	$2,322	$3,005
Escalation (using 5%, instead of 3%)	$43	$390	$433
Fee Adjust (using 10%, instead of 5%)	$23	$77	$100
Contingency (using 27%, instead of 25%)	$21	$72	$93
Missing Items	$0	$58	$58
Total Adjustments	$87	$597	$684
Add BART/MUNI Connector	$120-$310	$0	$120-$310
Total Adjusted Estimate (YOE)	**$890-$1,080**	**$2,919**	**$3,809-$3,999**
Year of Operation: 2024			

Year of operation: 2024
Add missing/added scope items:
--Townsend Street traffic decking
--Turnback/MOW tracks
--Temporary utility relocation

Table 6.2-2: Capital Cost Estimate for Caltrain Downtown Extension Second-to-Main Street Tunneling Option – Locally Preferred Alternative (Millions of Dollars – Year of Expenditure)

Activity	*Cost Estimate*
Operations Analysis, Preliminary Engineering, Geotechnical Engineering, Program Review/ Value Engineering, Final Design & Permitting, Owner Costs	*$76.83*
Acquire Property & Demolish Buildings along Extension	
Acquisition/Relocation for Train Subway	*$82.85*
Demolition	*$1.24*
Resale Proceeds	*($31.12)*
Subtotal	*$52.97*
Design and Relocate Utility Lines along Extension	*$52.90*
Construct Surface Rail & Improvements at Train Yard	*$13.37*
Construct Cut-and-Cover and Retained-Cut – Caltrain Extension	*$427.13*
Reconstruct Streets	*$7.09*
Construct Train Tunnel	*$287.70*
Construct Track & Systems Facilities	*$58.54*
TOTAL COST ESTIMATE – Caltrain Downtown Extension	***$976.53***

Notes:

- *Costs escalated to year of anticipated expenditure between 2004 and 2011.*
- *Costs are for Second-to-Main Tunneling Alternative, the Locally Preferred Alternative.*
- *Total assumes high end of 2001 real estate estimate escalated to year of expenditure.*
- *Construction costs include a 25% construction contingency, 8% for construction management, and 10% project reserve. Owner costs are factored into each category.*
- *The optional underground pedestrian connection from the train mezzanine to The Embarcadero Muni Metro/BART Station is estimated to cost $45.3 million.*
- *An additional $283 million could need to be added to the Project costs for purchase of dual mode locomotives if the Caltrain corridor is not electrified.*

***Source:** Parsons, 2003*

Budget & Estimate Summary

The following table summarizes the 2013 cost estimate, the MTC's recommended adjustment, and the 2016 cost estimate refresh:

Comparison of 2013 Phase 2 Cost Estimate, MTC's 2015 Recommended Adjustment & 2016 Phase 2 Cost Estimate Refresh (year of expenditure dollars, in $ millions)

	Total Phase 2 (October 2013)	MTC Cost Estimate (November 2015)	Total Phase 2 (June 2016)	Variance of MTC vs June 2016 Estimate
Construction	$1,290	$1,448	1,504	$56
Design Contingency	$206	$206	$211	$5
Subtotal	**$1,496**	**$1,654**	**$1,715**	**$61**
Construction Escalation	$449	$722	$583	$(139)
Construction Cost w/Design Contingency and Escalation	**$1,945**	**$2,376**	**2,298**	**$(78)**
ROW**	$266	$266	$266	-
Programwide	$419	$418	$517	$100
Program Cost	**$2,630**	**$3,060**	**$3,082**	**$22**
Construction Contingency	$184	$184	$230	$46
Program Reserve	$191	$444	$462	$18
Subtotal Contingency and Reserve	**$375**	**$628**	**$692**	**$64**
Total Program Cost	**$3,005**	**$3,688**	**$3,774**	**$86**
BART/Muni Pedestrian Connector	$120	$120-$310	$161	-
Total	**$3,125**	**$3,808-3,998**	**$3,935**	**$86**

***ROW number was last updated with 2013 Phase 2 cost estimate*

FROM TJPA June 2016 Board meeting

FUNDING STRATEGY

Potential Funding Sources Identified for Phase 2 ($ millions)

Source	Amount (Range)	Assumed Term	Status
San Francisco County Sales Tax	$83	2016-2019	Committed
San Mateo County Sales Tax	$19	N/A	Committed and spent
Committed MTC/BATA Bridge Tolls	$7	N/A	Committed and spent
Tax Increment (after repayment of existing TIFIA loan)	$200–$340	2019-2050	Committed
Mello-Roos Special Tax	$275–$375	2020-2025	Committed
Regional Transportation Improvement Program	$18	N/A	Committed
Future San Francisco County Sales Tax	$350	2019-2026	Subject to SFCTA or voter approval
FTA New Starts	$650	2019-2026	Subject to federal approval
New MTC/BATA Bridge Tolls	$300	2019-2026	Subject to MTC/BATA and voter approval
Future California High Speed Rail Funds	$557	2019-2026	Subject to federal/state approval
Land Sales	$45	2018	Contingent upon sale
Potential Passenger Facility Charges or Maintenance Contribution	$865–$1,920	2026-2060	Subject to CHSRA and/or Caltrain approval
Total	**$3,369–$4,664**		

Quantities for costing

Dowtown Extension (DTX)

Description:

Component	**Measur**	Cut and cover Tansbay throat	SEM tunnel	Cut and cover tunnel	Cut and cover station	Retained cut	Vent/escape strcutures	At grade	At grade station	At grade/ existing tunnel	*Total*
Start Stationing		10+00	16+50	48+00	62+50	69+50		87+00	144+00	151+00	
End Stationing		16+50	48+00	62+50	69+50	87+00		144+00	151+00	165+00	77+00
Depth to base/invert (average)		60'	100'	50'	50'	25'	50'				
Width (average)		100'	60'	55'	70'	45'	55'				
Height		30'	50'	30'	45'	25'	50'				
Height of internal structures (average over width)		1'	1'	1'	4'	1'	6'				
Wall thickness		4'	2'	4'	4'	4'	4'				
Roof/base thickness		12'	2'	6'	6'	6'	6'				
Length		650 ft	3150 ft	1450 ft	700 ft	1750 ft	50 ft	5700 ft	700 ft	1400 ft	*15550 ft*
Perimeter		294'	185'	192'	258'	71'	210'				
Heavy civils											
Area of concrete	ft²	2832	358	996	1296	518	778				*6,778*
Excavated area	ft²	7776	2734	3528	4368	1643	3528				*23,577*
Area of concrete internal structures	ft²	100	60	55	280	45	330				*870*
Area of envelope	ft²	5832	2734	2646	4446	1961	3906				
							2				
Volume of lining	yd³	68,178	41,783	53,489	33,600	33,574	2,881	0	0	0	*233,505*
Volume of excavation	yd³	187,200	318,963	189,467	113,244	106,491	13,067	0	0	0	*928,432*
Volume of concrete internal strucutres	yd³	2,407	7,000	2,954	7,259	2,917	1,222	0	0	0	*23,759*
Volume of envelope	yd³	140,400	318,963	142,100	115,267	127,102	14,467	0	0	0	*858,298*
Rate for construction (on envelope)	pcy	$ 670.00	$ 760.00	$ 670.00	$ 1,200.00	$ 562.29	$ 670.00				
Cost		$ 94,068,000	$ 242,412,096	$ 95,207,000	$ 138,320,000	$ 71,468,421	$ 9,692,667				*$ 651,168,184*
Systems	25%	$ 23,286,393	$ 60,008,751	$ 23,568,350	$ 34,240,909	$ 17,691,901	$ 2,399,405				*$ 161,195,709*
Mobilization	7%	$ 6,645,162	$ 17,124,501	$ 6,725,623	$ 9,771,216	$ 5,048,680	$ 684,710				*$ 45,999,892*
Total cost		$ 123,999,554	$ 319,545,348	$ 125,500,973	$ 182,332,125	$ 94,209,001	$ 12,776,782	$ -	$ -	$ -	***$ 858,363,784***
Rate per ft		190,769	101,443	86,552	260,474	53,834		-	-	-	111,476
DTX estimate at 2016 (includeds 25% contingency)			$ 300,149,572			$446,563,997					
			116%			102%					
Other items											
Invert lowering in exisitng tunnel at south end (50% chance)											

Notes

Quantities for costing

Alignment 1 south tunnel option

Description:

Component	**Measure**	Cut and cover Tansbay throat	SEM tunnel	Cut and cover tunnel	Cut and cover station	Cut and cover tunnel	Vent/escape strcutures	Twin bore TBM tunnel	Cross passages	Cut and cover station	Twin bore TBM tunnel	Cross passages	*Total*
Start Stationing		10+00	16+50	48+00	62+50	72+50		84+00	84+00	144+00	151+00	151+00	
End Stationing		16+50	48+00	62+50	72+50	84+00		144+00	144+00	151+00	165+00	165+00	155+00
Depth to base/invert (average)		60'	N/A	60'	50'	70'	50'	N/A	N/A	70'	N/A	N/A	
Width (average)		100'	60'	60'	130'	50'	55'	20'	15'	65'	20'	15'	
Height		30'	50'	30'	40'	30'	50'	20'	15'	70'	20'	15'	
Height of internal structures (average over width)		1'	1'	1'	4'	1'	6'	2'	2'	1'	2'	2'	
Wall /lining thickness		4'	2'	4'	4'	4'	4'	1'	1'	4'	1'	1'	
Roof/base thickness		12'	N/A	6'	6'	6'	6'	N/A	N/A	6'	N/A	N/A	
Spacing			N/A	N/A	N/A	N/A		40'	700'	N/A	40'	700'	
Number		1'	1	1	1	1	2	2	8	1	2	2	
Length		650 ft	3150 ft	1450 ft	1000 ft	1150 ft	50 ft	12000 ft	160 ft	700 ft	2800 ft	40 ft	*22300 ft*
Perimeter		294'	185'	202'	368'	182'	210'	138'	53'	292'	138'	53'	
Heavy civils													
Area of concrete	ft²	2832	358	1056	1976	936	778	132	402	1436	132	101	
Excavated area	ft²	7776	2734	4488	7728	4408	3528	760	1816	5548	760	454	
Area of concrete internal structures	ft²	100	60	60	520	50	330	80	60	65	80	60	
Area of envelope	ft²	5832	2734	2856	7176	2436	3906	380	227	5986	380	227	
Volume of lining	yd³	68,178	41,783	56,711	73,185	39,867	2,881	58,643	2,383	37,230	13,683	149	*326,516*
Volume of excavation	yd³	187,200	318,963	241,022	286,222	187,748	13,067	337,896	10,761	143,837	78,842	673	*1,619,031*
Volume of concrete internal strucutres	yd³	2,407	7,000	3,222	19,259	2,130	1,222	35,556	356	1,685	8,296	89	*78,815*
Volume of envelope	yd³	140,400	318,963	153,378	265,778	103,756	14,467	168,948	1,345	155,193	39,421	336	*1,221,584*
Rate for construction (on envelope)	pcy	$ 670.00	$ 760.00	$ 670.00	$ 1,200.00	$ 670.00	$ 670.00	$ 800.00	$ 12,093.96	$ 1,200.00	$ 800.00	$ 12,093.96	
Cost		$ 94,068,000	$ 242,412,096	$ 102,763,111	$ 318,933,333	$ 69,516,222	$ 9,692,667	$ 135,158,297	$ 16,267,182	$ 186,231,111	$ 31,536,936	$ 4,066,795	*$ 1,116,577,751*
Systems	25%	$ 23,286,393	$ 60,008,751	$ 25,438,854	$ 78,951,469	$ 17,208,637	$ 2,399,405	$ 33,458,234	$ 4,026,917	$ 46,101,233	$ 7,806,921	$ 1,006,729	*$ 276,407,150*
Mobilization	7%	$ 6,645,162	$ 17,124,501	$ 7,259,403	$ 22,530,122	$ 4,910,772	$ 684,710	$ 9,547,867	$ 1,149,148	$ 13,155,758	$ 2,227,836	$ 287,287	*$ 78,877,403*
Total cost		$ 123,999,554	$ 319,545,348	$ 135,461,368	$ 420,414,925	$ 91,635,631	$ 12,776,782	$ 178,164,398	$ 21,443,246	$ 245,488,102	$ 41,571,693	$ 5,360,812	***$ 1,471,862,305***
Rate per ft		190,769	101,443	93,422	420,415	79,683		14,847	134,020	350,697	14,847	134,020	94,959

Other items

Notes

Quantities for costing

Alignment 2 conventional box station

Description: SEM from existing downtown box to Station box in mission bay, twin bore TBM tunnels to south

Component	**Measure**	Cut and cover Tansbay throat	Large bored tunnel	Station shaft	Large bored tunnel	Station shaft	Large bored tunnel	Vent/escape strcutures	Cut and cover tunnel	Retained cut station	Existing tunnel	*Total*
Start Stationing		0+00	6+50	61+00	62+00	69+00	70+00		116+00	118+00	128+00	
End Stationing		6+50	61+00	62+00	69+00	70+00	116+00		118+00	128+00	141+00	141+00
Depth to base/invert (average)		60'	N/A	130'	N/A	130'	N/A	50'	30'	30'	N/A	
Width (average)		100'	60'	76'	60'	76'	60'	55'	65'	65'		
Height		30'	60'	130'	60'	130'	60'	50'	30'	30'		
Height of internal structures (average over width)		1'	8'	4'	8'	4'	4'	6'	1'	2'		
Wall /lining thickness		4'	2'	4'	2'	4'	2'	4'	4'	3'		
Roof/base thickness		12'	N/A	6'	N/A	6'	N/A	6'	6'	4'	N/A	
Spacing			N/A	N/A	40'	N/A	40'		N/A	N/A	700'	
Number		1'	1	1	2	1	2	4	1	1		
Length		650 ft	5450 ft	100 ft	700 ft	100 ft	4600 ft	50 ft	200 ft	1000 ft	1300 ft	*13500 ft*
Perimeter		294'	201'	440'	402'	440'	402'	210'	212'	135'		
Heavy civils												
Area of concrete	ft²	2832	390	2048	779	2048	779	778	1116	464		
Excavated area	ft²	7776	3217	11424	6434	11424	6434	3528	2628	272		
Area of concrete internal structures	ft²	100	480	304	960	304	480	330	65	130		
Area of envelope	ft²	5832	3217	11928	3217	11928	3217	3906	3066	2698		
Volume of lining	yd³	68,178	78,633	7,585	20,199	7,585	132,738	5,763	8,267	17,185	0	*346,133*
Volume of excavation	yd³	187,200	649,356	42,311	166,807	42,311	1,096,160	26,133	19,467	10,074	0	*2,239,819*
Volume of concrete internal strucutres	yd³	2,407	96,889	1,126	24,889	1,126	81,778	2,444	481	4,815	0	*215,956*
Volume of envelope	yd³	140,400	649,356	44,178	83,403	44,178	548,080	28,933	22,711	99,926	0	*1,661,165*
Rate for construction (on envelope)	pcy	$ 670.00	$ 670.00	$ 1,200.00	$ 670.00	$ 1,200.00	$ 604.14	$ 670.00	$ 670.00	$ 562.29	$ 664.00	
Cost		$ 94,068,000	$ 435,068,229	$ 53,013,333	$ 55,880,323	$ 53,013,333	$ 331,114,397	$ 19,385,333	$ 15,216,444	$ 56,187,601	$ -	*$ 1,112,946,994*
Systems	25%	$ 23,286,393	$ 107,700,489	$ 13,123,371	$ 13,833,090	$ 13,123,371	$ 81,966,873	$ 4,798,810	$ 3,766,808	$ 13,909,157	$ -	*$ 275,508,362*
Mobilization	7%	$ 6,645,162	$ 30,734,136	$ 3,744,973	$ 3,947,504	$ 3,744,973	$ 23,390,618	$ 1,369,421	$ 1,074,922	$ 3,969,210	$ -	*$ 78,620,919*
Total cost		$ 123,999,554	$ 573,502,854	$ 69,881,678	$ 73,660,917	$ 69,881,678	$ 436,471,888	$ 25,553,564	$ 20,058,174	$ 74,065,968	$ -	***$ 1,467,076,275***
Rate per ft		190,769	105,230	698,817	105,230	698,817	94,885		100,291	74,066	-	104,048
Other items												
Bridge pier modifications to 3rd Street brdge												
Rail diversion for box construction												
Reduced surface footprint not accunted for.												

Notes

Provides wider platform. Like for like with base scheme would be narrowe

	2nd street		2nd street to station		Northern Station			Station to station		South Station			South station to portal	
Option	**Type**	**Size and length**	**Type**	**Size and length**	**Location**	**Type**	**Size and length**	**Type**	**Size and length**	**Location**	**Type**	**Size and length**	**Type**	**Size and length**
DTX	SEM		Cut and cover		4th and Townsend	Shallow box with two platforms		Retained cut and at grade, then using existing tunnel		22nd to 23rd street, under I280	At grade		Retained cut and at grade, then using existing tunnel	
Pennsylvania Avenue	SEM		SEM		4th and Townsend	Shallow box with two platforms		Twin bore TBM tunnel		4th and Townsend	Shallow box with two platforms		Twin bore TBM tunnel	
	SEM		SEM		3rd street	Deep box with two platforms		Twin bore TBM tunnel		between 22nd and 23rd, east of I210	Retained cut		Use existing tunnel	
Mission Bay	Large bore TBM		Large bore TBM		3rd street	Deep shafts with two platforms		Large bore TBM			Retained cut		Use existing tunnel	

RAB Cost Estimates

Summary

	SEM tunnel	Cut and cover	Station 1	Station 2	TBM	Retained cut	Total	Miles	Cost per mile
DTX (Baseline)	$ 319,545,348	$ 125,500,973	$ 182,332,125	$ -		$ 94,209,001	$ 858,363,784	1.34	$ 642,859,685
Pennsylvania Ave	$ 319,545,348	$ 227,096,999	$ 420,414,925	$ 245,488,102	$ 246,540,149		$ 1,471,862,305	2.81	$ 523,328,819
Mission Bay (large bore)		$ 20,058,174	$ 139,763,356	$ 74,065,968	$ 1,131,221,225		$ 1,514,661,842	2.30	$ 658,223,418

	Total volumes (cy)	
	Installed	Excavated
DTX (Baseline)	858,298	928,432
Pennsylvania Ave	1,221,584	1,619,031
Mission Bay (large bore)	1,661,165	2,239,819

Comments

SEM tunnel rates assumed to be same as large bored tunnel in terms of cost per cubic yard of installed infrastructure.
Rail yards not included
Land aqcuisition not included
Utility and LRT diversions not included
Alignment 2 options are based on 2 x double length platforms, alignment 1 (extended) on 4 x single
Large bore station option includes the same prorata systems proportion. Actual systems costs may vary.
Large bore station provides the facility for a bypass track not included in other schemes.
Escape/ventilation structures not included.
Constrcution contingency management and reserve not included.